ADDENDUM No. 3

RFP No. 23-50

Ultraviolet (UV) Disinfection System Replacement Project

Due: OCTOBER 17, 2023 by 11:00 A.M. (local time)

The information contained herein shall take precedence over the original documents and all previous addenda (if any), and is appended thereto. **This Addendum includes eight hundred fifty two (852) pages.**

The Proposer is to acknowledge receipt of this Addendum No. 3, including all attachments in its Proposal by so indicating in the proposal that the addendum has been received. Proposals submitted without acknowledgement of receipt of this addendum may be considered non-conforming.

The following forms provided within the RFP Document should be included in submitted proposal:

- **Attachment D - Prevailing Wage Declaration of Compliance**
- **Attachment E - Living Wage Declaration of Compliance**
- **Attachment G - Vendor Conflict of Interest Disclosure Form**
- **Attachment H - Non-Discrimination Declaration of Compliance**

Proposals that fail to provide these completed forms listed above upon proposal opening may be rejected as non-responsive and may not be considered for award.

I. CORRECTIONS/ADDITIONS/DELETIONS

Changes to the RFP documents which are outlined below are referenced to a page or Section in which they appear conspicuously. Offerors are to take note in its review of the documents and include these changes as they may affect work or details in other areas not specifically referenced here.

Section/Page(s)	Correction
Section III. Minimum Information Required, E. Schedule of Pricing/Cost	Revised Bid Item 1.3, including Footnote and addition of Alternate No. 3 Remove: Pages 16 (AD-1) and Page 17 Replace with: Pages 16 (AD-3) and 17 (AD-3)
Section 46 66 56, Appendix 1	Remove: Original Appendix 1, and Trojan Submittal included in Addendum No. 2. Replace with: Trojan Technologies Scope of Supply, and Submittal dated 10/5/2023 as Appendix 1-AD-3.

Section 07 54 53,
Paragraph 2.6.B

Remove “Extruded-Polystyrene Board Insulation (XPS)”

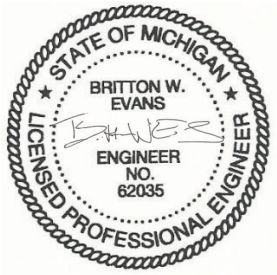
Replace with paragraph below:

B. Polyisocyanurate Board Insulation (ISO): ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces with a minimum compressive strength of 20 psi
   1. Thickness: Minimum base layer thickness 1-1/2 inches. Upper Layer thickness as required to meet minimum energy code requirements or R-value as stated herein.
   2. Manufacturers:
      a. Firestone Building Products.
      b. GAF.
      c. Johns Manville; a Berkshire Hathaway company.
      d. Or approved equal.

   3. Tapered Insulation: Provide factory-tapered insulation boards that match roof insulation. Roof slope to be 1/4 inch per foot unless otherwise indicated on Drawings.
      a. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

   4. Roof is to receive substrate board as specified.

Offerors are responsible for any conclusions that they may draw from the information contained in the Addendum.



E. Schedule of Pricing/Cost – 20 Points

Company: _____

Bid Items Notes –

1. Provide a Unit Price and Total Price for all bid items specified in Division 01 Section "Measurement and Payment" and herein.
2. Quantities included in the bid table represent estimated quantities for different work. The CONTRACTOR shall be compensated for the actual number of items completed using the unit prices provided.
3. The City, at its sole discretion, may elect to delete any portion of the work delineated below, with no change to the unit prices provided. Work shall be determined based upon the availability of funds.
4. Any item not provided in the following list shall be considered incidental.
5. Contract shall be awarded based on the base bid or any combination of a base bid and alternate bid in any manner the City believes to be in its best interest.

Base Bid Items –

For the entire work outlined in these documents for **RFP 23-50 – Ultraviolet (UV) Disinfection System Replacement Project**, complete as specified, using equipment and materials only of the type and manufacturers where specifically named.

	Description	Unit	Quantity	Unit Cost	Extended Cost
1.0	General Conditions (max 10%)	LS	1		
1.1	Mobilization (max 10%)	LS	1		
1.2	Permit Allowance	LS	1	$15,000.00	$15,000.00
1.3	[1]UVSS Balance of Work	LS	1	**$1,248,329.00**	**$1,248,329.00**
1.4	Installation of All Work (except UV Disinfection Building)	LS	1		
1.5	Electrical, Instrumentation & Controls	LS	1		
1.6	UV Disinfection Building	LS	1		
1.7	Start-up, Commissioning, Training	LS	1		
1.8	Special Inspections	LS	1		
1.9	Maintenance of Plant Operations	LS	1		

BASE BID TOTAL: _____ ($_____)

1. The UVSS Balance of Work is defined in Trojan Technologies Scope of Supply and accepted shop drawing, which is included in **Appendix 1-AD-3** of the Technical Specification Section 46 66 56, and includes the following:

Balance of Equipment
Spare Parts
Services
Owner Training
Testing Support
RFP 23-13 Bid Alternate D
Bid Item 1.3 Total: $1,248,329.00

Alternates
Bidder shall list alternate bid item prices below.

Alternate 1 – Extend 12-month Warranty to 36 months
As defined in Trojan Technologies proposal in response to RFP 23-13, Alternate A value was set as indicated below.

Add/~~Subtract~~ (Circle One) **$52,000.00**

Alternate 2 – Extend 12-month Warranty Bond to 36 months
As defined in Trojan Technologies proposal in response to RFP 23-13, Alternate B value was set as indicated below.

Add/~~Subtract~~ (Circle One) **$5,500.00**

Alternate 3 – Sales Tax Allowance

Add/~~Subtract~~ (Circle One) **$75,000.00**

APPENDIX 1-AD-3: TROJAN TECHNOLOGIES SCOPE OF SUPPLY AND FINAL SUBMITTAL

SCOPE OF SUPPLY FOR ANN ARBOR REPLACEMENT WASTEWATER TREATMENT PLANT ULTRAVIOLET DISINFECTION EQUIPMENT – TROJANUVSigna™

Prepared for: City of Ann Arbor

Specification Section: 46 66 56

Addendum: Addendum No 1 & 2
Reference

Submitted by: Rob Jansen

Trojan Quote: 223428

Design Criteria:

Current Peak Design Flow:	54 MGD(US)
Average Flow:	25 MGD(US)
UV Transmission:	60 % minimum
Total Suspended Solids:	30 **mg/l** (Maximum, grab sample)
Minimum Dose:	30 mJ/cm^2 MS2 Red
Discharge Limit:	200 Fecal Coliform, 30 Day Geometric Mean, 400 FC 7-day geometric mean

We are pleased to submit the following scope of equipment based on the above criteria.

The purchaser is responsible for reading all information contained in this Supply Contract. Trojan will not be held accountable for the supply of equipment not specifically detailed in this document. Detailed installation instructions are provided with the shop drawings and are available earlier upon request. Changes to this Scope of Supply that affect selling price will be handled through a change order.

Please refer inquiries to Trojan Manufacturer's Representative:

Representative: Kyle Bentley
Peterson & Matz, Inc.
Phone: 248-476-3204

This proposal has been respectfully submitted by,
Trojan Technologies

Rob Jansen
Regional Sales Manager

GENERAL CONFIGURATION

The TrojanUVSigna equipment described in this Scope of Supply consists of 2 channels with 3 duty banks and 1 redundant UV bank in each channel.

Channel Dimensions:	Length:	30’ 4”
	Width:	5’ 6”
	Depth:	14’ 1”

Note: Dimensions do not include inlet or outlet structures upstream or downstream of the UV channel.

Unless otherwise indicated in this proposal all anchor bolts, conduit, conductors, local disconnects and transformers (if required) are the responsibility of the Installation Contractor and are not included in Trojan’s Scope of Supply. Specific cable types listed below are for reference only. Selecting cables that are appropriate for the installation environmental conditions and in compliance with local code is the responsibility of the Installation Contractor.

Site to provide approved (engineered) anchor points for personnel to use as part of their fall restraint system around open channels. The anchor points must be positioned so that the preferred retractable lifeline of 8 ft (2.4 m) is of sufficient length to access the work at the channel. Refer to local safety regulation.

UV BANKS

Trojan’s Responsibility:
Each bank supplied will consist of TrojanUV Solo Lamps™, quartz sleeves, supporting structures, ActiClean™ chemical/mechanical cleaning system and an automatic bank lifting mechanism. UV lamps are powered from an individual electric feed from a lamp driver located in a Power Distribution Center (PDC).

Model and Make:	TrojanUVSigna™
Quantity:	Four (4) UV Banks / Channel Each bank will be supplied with 24 UV lamps and quartz sleeves, one (1) UV intensity sensor, one (1) ActiClean chemical-mechanical wiping system and one (1) automatic bank lifting mechanism
Rating:	Type 6P / IP68 (lamp sleeve assemblies)
Approximate Weight:	24 Lamp - 690 lbs (314kg)

Installation Contractor’s Responsibility:
The Installation Contractor shall install, align, secure, and seal (grout) each UV bank and lifting system in the channel per the instructions provided. The Installation Contractor shall provide solid grating downstream of the UV bank to block out UV light. Please refer to the supplied Trojan-supplied drawings for details.

SYSTEM CONTROL CENTER

Trojan’s Responsibility:
A System Control Center (SCC) shall be supplied to monitor and control the UV disinfection System. Trojan will provide a PLC I/O and soft address map to aid the Installation Contractor with integration of the UV PLC and SCADA system. The UV SCC shall consist of the following:

Quantity Supplied:	One (1) SCC will be supplied
Location:	PLC Wall Mount with sunshade
Controller Type:	Control Logix – L73
Operator Interface:	SCC HMI - Beijer -15" (Outdoor 4X Rated)
Material / Rating:	316 Stainless Steel (Type 4X, IP 66)
Approximate Weight:	200 lbs (91 kg) - wall mount
SCADA:	EtherNetI/P
Surge Protection:	TVSS
UPS	24 VDC, 30 minutes

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for mounting the SCC as indicated on the drawings. Unless otherwise indicated, the Installation Contractor to be responsible for the supply, installation and connection of the following at the SCC:

1. One (1) 110-240V, 50/60 Hz, 1 Phase, 2 Wire + GND, 1.8kVA (maximum)
2. One (1) bond link to plant ground, in accordance with applicable codes and standards
3. One (1) Modbus communication link, Belden 3106A (or equivalent), to PDCs (daisy chained per channel)
4. One (1) Modbus communication link, Belden 3106A (or equivalent), to HSCs (daisy chained)
5. One (1) Cat 5e Ethernet communication link to SCADA
6. One (1) 4-20 mA analog shielded twisted pair from online UV Transmittance monitor
7. One (1) discrete, 2 conductor signal from level sensor control box for high water level signal
8. Control signal conductors (as required by actuator) for control of inlet and outlet gates
9. One (1) 24V DC, 2 conductors + GND, power to the Level Sensor Monitor

POWER DISTRIBUTION CENTERS

Trojan's Responsibility:
The Power Distribution Center (PDC) distributes power to the UV lamps and shall consist of the following:

Quantity Supplied:	Four (4) PDCs will be supplied
Method of Cooling:	Air-conditioning
Material / Rating:	316 Stainless Steel
Approximate Weight:	PDC (Single Wide) – 1213 lbs (550 kg) PDC (Double Wide) – 1984 lbs (900 kg)
Additional Options	TVSS, Heater

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for setting in place and bolting the PDC in location. The Installation Contractor to be responsible for the supply, installation and connection of the following at each PDC:

1. One (1) 480Y / 277V, 50/60 Hz, 3 phase, 4 wire + GND, 82.1 kVA power feed with local disconnect to each double wide PDC
2. One (1) 480Y / 277V, 50/60 Hz, 3 phase, 4 wire + GND, 27.4 kVA power feed with local disconnect to each single wide PDC
3. One (1) bond link to plant ground, in accordance with applicable codes and standards (to underside of panel)
4. One (1) bond link from each UV bank to the corresponding PDC in accordance with the applicable drawings, specifications, codes, and standards
5. One (1) bank-in-place sensor cable (by Trojan) from each UV bank to corresponding PDC
6. One (1) UV intensity sensor cable (by Trojan) from each UV bank to corresponding PDC
7. One (1) Modbus communication link, Belden 3106A (or equivalent), from the SCC
8. One (1) discrete, 2 conductor, cable from level sensor control box for low water level signal
9. Installation and termination of lamp cables from the UV banks to each PDC. (Qty: 24 per UV Bank – supplied by Trojan)

HYDRAULIC SYSTEM CENTER

Trojan's Responsibility:
The Hydraulic System Center (HSC) houses the ancillary equipment required to operate the quartz sleeve cleaning system and automatic bank lifting mechanism.

Quantity Supplied:	Two (2) HSCs will be supplied
Materials / Rating:	316 Stainless Steel (Type 4X, IP 66)
Hydraulic Fluid:	Mineral Oil

Approximate Weight:	500lbs (228 kg)
Addition Options	TVSS, Heater

Installation Contractor's Responsibility:
The Installation Contractor shall be responsible for setting in place and bolting the HSC's as shown on the Trojan drawings. The HSC's must be located within 50 ft (15 m) of the furthest PDC. The Installation Contractor shall be responsible for the supply, connection and installation of the following at each HSC:

1. One (1) 480V 60Hz, 2.5 kVA power feed with local disconnect
2. One (1) bond link to plant ground, in accordance with applicable codes and standards
3. One (1) Modbus communication link, Belden 3106A (or equivalent), from the SCC
4. Cut and crimp hydraulic hoses (coordination with Parker Store) (hoses and connections supplied by Trojan)
5. Connection of the hydraulic hoses, total of four (4) per UV bank

WATER LEVEL CONTROLLER

Trojan's Responsibility
A level control device is required to maintain and control the effluent level in the channel, regardless of flow rate.

Quantity Supplied:	Twenty (20) Fixed Weir troughs
Material of Construction:	304 Stainless Steel

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for setting in place, bolting, grouting and sealing each level control weir trough as per Trojan's and Engineer's drawings.

LOW WATER LEVEL SENSORS

Trojan's Responsibility:
A Low Water Level Sensor is required downstream of the UV System to generate a low water level signal that will shut down and protect the UV System if the water level in the channel drops too low.

Quantity Supplied:	One (1) of each water level sensor to be supplied per channel
Approximate Weight:	10 lbs (22 kg) (panel)

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for setting in place and bolting the water level sensor panel to the effluent channel wall as per Trojan's and Engineer's drawings.

LEVEL SENSOR CONTROL BOX

Trojan's Responsibility:
Trojan will provide a wall mounted Level Sensor Control Box 24 x 14 x 6 in (61 x 36 x 15 cm) to provide power and relays for low level sensors.

Quantity Supplied:	One (1) Level Sensor Control Box per channel
Materials / Rating:	304 Stainless Steel (Type 4X)
Approximate Weight:	40 lbs (18 kg)

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for mounting the Level Sensor Control Box as indicated on the drawings. The Installation Contractor shall also be responsible for supplying mounting hardware, watertight conduit and for the supply, installation and connection of the following at each Control Box:

1. One (1) 120 Volt, 1 phase, 2 wire + GND 72 VA power supply
2. One (1) discrete, 2 conductor cable from the Low Level Sensor to the level sensor control box

3. One (1) discrete, 2 conductor cable from the level sensor control box to each PDC

UV TRANSMISSION MONITOR

Trojan's Responsibility:
An on-line UV Transmission Monitor will be supplied to provide a UVT measurement of the source water.

Description:	One (1) Hach UVASsc UVT monitor including • One (1) submersible probe with mounting kit • One (1) sc200 Controller • 25 ft (7.6 m) cable between the probe and the controller
Enclosure Rating:	Type 4X
Controller Dimensions:	12 x 12 x 4 in (30 x 30 x 10 cm)
Approximate Weight:	30 pounds (includes probe and Controller)
Probe Immersion Depth:	up to 6 ft (1.8 m)

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for setting in place and mounting the Controller panel and the probe. The Installation Contractor shall also be responsible for the supply, installation and connection of the following at each Controller:

1. One (1) 120 Volt, 1 phase, 2 wire + GND, 14 VA power supply
2. One (1) 4-20mA analog shielded twisted pair to the SCC
3. Installation of sensor communication cable (by Trojan) between the probe and Controllero
4. Anchor bolts as required for mounting Controller and probe to the channel edge

UV PHOTOMETER

Trojan's Responsibility:
A single beam UV Photometer (manufactured by RealTech) shall be provided to measure the UV transmission of the effluent. The range of the UV Photometer shall be 5 - 100% transmittance with uncertainty of +/- 0.5% full scale (FS). The UV Photometer will come equipped with two matched quartz cuvettes, 100% T standard solution and cuvette cleaning solution.

CHANNEL ISOLATION SLIDE GATES

Trojan's Responsibility
An upstream slide gate and downstream slide gate are required to isolate each channel depending on flow rates and requirements for maintenance.

Quantity Supplied:	Four (4) gates to be supplied (one upstream and one downstream for each channel)
Description:	Slide Gate
Material of Construction:	304 stainless steel frame and yoke
Operating Mechanism:	Yoke mounted, electric actuator (480v-3 phase power)
Approximate Weight:	1000 pounds each

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for setting in place, grouting and sealing the slide gate, and installation of actuators.

SPARE PARTS AND ADDITIONAL EQUIPMENT

Trojan's Responsibility:
The following equipment will be supplied with the UV system:

Spare PartsCustom PartsIndirect Costs

Description	Qty
908081-003 1000W Solo Lamp	20
916841 2kW Solo Lamp Driver	10
338229G 1000W Solo Sleeve	20
337743 Signa 2 Row - Pair of Wiper Seals	20

NOTES AND CLARIFICATIONS TO SPECIFICATION

1) 46 66 56, 1.2..1 - *Seismic Design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section. UVSS shall utilize a licensed Professional Engineer in Michigan, as necessary, to meet these requirements*. – EXCEPTION – The UVSigna system has been validated on previous projects in regions of high seismic activity (California). Project specific seismic analysis costing is not included in this scope of supply. If required, this will be costed as a separate line item and/or process through a change request.

MICROBIOLOGICAL PERFORMANCE TESTING

Trojan's Responsibility:
Trojan will supply a performance testing protocol to the Installation Contractor to be forwarded to the Engineer for approval. Trojan will produce the final test report (based on data supplied by the independent lab) and will forward the final report to the Installation Contractor.

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for completing the performance testing as per the testing protocol supplied by Trojan and approved by the Engineer.

DOCUMENTATION (SHOP DRAWINGS AND O&M MANUALS)

The following documentation will be supplied by Trojan per the following schedule:

- One (1) electronic copy of Trojan Shop Drawing Submittals 4 - 6 weeks after receipt of written purchase order (hardcopies available upon request)
- One (1) electronic copy of Trojan Standard O&M manuals at time of equipment delivery (hardcopies available upon request)

DELIVERY, START-UP AND TRAINING

Equipment shipped **34-35** weeks after approval of Shop Drawings

Installation Contractor's Responsibility:
The Contractor is responsible for:

- Un loading of the components supplied by Trojan, storage of all components, if required in a clean dry environment
- Installing the equipment outlined in the scope of Supply in accordance with contract drawings, Trojan's shop drawings, instructions and installation checklist.
- Supplying all conduits and conductors and components per the sites state regulations and components indicated as supplied by others,
- Completing the Checklist and returned at least two (2) weeks prior to date requested for commissioning.

The following start-up services will be provided by Trojan-certified technicians:

- Installation assistance as required by phone or fax. Technical Assistance Center 1-866-388-0488 or tac@trojanuv.com
- Start-up and testing of the installed UV equipment.

  - If the Trojan's Certified Service Technician determines the Contractor work is not complete and the start-up cannot be completed in the allotted time a return visit will be scheduled at the Contractors expense.
- Classroom and/or jobsite training for operations staff
  - If trainees are not available a return visit will be scheduled at the Contractors expense.
- Performance testing supervision.

WARRANTY

- UV lamps shall be warranted for 15,000 hours prorated after 9,000 hours.
- Lamp drivers shall be warranted for 10 years, prorated after 1 year.

PAYMENT TERMS

As per Pre Selection Specification

Sell Price

$1,248,329

Oct 5, 2023

Britton Evans
Black & Veatch
EvansB@BV.com

RE: **TrojanUVSigna Re-Submittal – Ann Arbor Replacement Project, MI**.

Dear Mr. Evans,

Enclosed please find one (1) electronic copy of the re-submittal package for the Ultraviolet Disinfection Equipment specified for the Ann Arbor Replacement project. Please also find below the Trojan response to each submittal comment provided in review letter dated August 25, 2023.

Comment #	Comment Reference	Comment	Response
1	Page 1 of 860:	The delivery date shall be coordinated with the construction contractor. Delivery of equipment should be closer to Spring of 2024.	Delivery of equipment will be coordinated with the construction contractor. Note, standard lead time for the UV equipment is currently 28 weeks from the date of submittal approval by the contractor.
2	Page 21, 476, 474-477 of 860:	The City previously stated that the WRRF's PLC preference is the Allen-Bradley ControlLogix model 1756-L73, this submittal notes L71. Please provide the L73 as previously discussed or provide explanation on difference between them.	As per item 1 of email from B&V dated Sept 6, we will proceed with the L73 processor. Submittal package has been updated to provide an L73 controller. A Change request to address the price change will be provided separately.
3	Page 21 of 860	Bank frame mentions wedge anchors. Epoxy anchors were previously discussed. Please advise.	Epoxy anchors are preferred in this application. The submittal package has been revised to address this clarification.
4	Page 22 of 860	Please provide a recommended location for the UVt sensor. It is our understanding that this needs to be located in the common influent channel.	As per item 2 of email from B&V dated Sept 6, it is recommended that the UVT sensor be mounted in the effluent channel, upstream of the weir, in a non-turbulent location.
5	Page 23 of 860	Please review the provided spare parts list. Trojan to provide spare parts for one UV module or 10% of overall installed system, whichever is greater. There are 24 lamps /bank. Please review and revise as needed. Trojan should provide 24 spare UV lamp assemblies, 24 quartz sleeve assemblies, 24 spare wiper seals and 12 spare lamp drivers.	As per item 3 of email from B&V dated Sept 6, spare parts list based on 10% of provided equipment has been provided

6	Page 23 of 860	Trojan to indicate on the drawings where the warning signs are to be placed.	Note has been added to drawing. Warning signs should be posted at any access or walkway to the UV equipment
7	PDF Page 23 of 860:	Specification indicates that 8 warning signs be provided. Trojan's scope only includes 2. Please update.	Submittal package has been updated to provide 8 warning signs.
8	Page 29 of 860	We were under the impression that Trojan was going to supply the cable tray as there is a detail on Sheet 32 (Detail E). Please confirm that the Construction contractor is to provide, and Trojan will NOT be providing the cable tray.	As per item 4 of email from B&V dated Sept 6, cable trays are not within Trojan's scope of supply for the UV equipment. To be supplied by the contractor
9	Page 30 of 860	It is our understanding that the level sensor monitor, and transducer should be located upstream of the influent gates to monitor level into the UV channels. Is this controlling anything in terms of whether lamps are on or is it just a backup? Our concern is that what if this channel is drained, then there is no indication of level control. Does Trojan need to add another one to the other channel? BOM and drawings indicate 1 level control sensor, but P&IDs indicate 1 per channel. Trojan to clarify/advise.	As per item 5 of email from B&V dated Sept 6, analog level sensors are not required for this application and have been removed from the design. A Change request to address the price change will be provided separately.
10	Page 30 of 860	Provide installation details for level sensor and transducer.	Removed from design, see above.
11	Page 30 of 860	Confirm gates can be controlled by SCADA.	Confirmed, SCADA points have been included to support gate control and feedback.
12	Page 31 of 860	Please indicate the flow associated with the water levels indicated in the profile. Water levels should match those as indicated on G-004, Hydraulic Profile, of the Contract Drawings.	Based on Trojan calculations, at a flow rate of 54 MGD, the banks can sustain a maximum water level of 735.20' which aligns with the hydraulic profile provided in G-004
13	Page 32 of 860	Section D indicates weir supports to be provided by others. Per previous correspondence, Trojan indicated that no supports were needed "by others" and will be supported by the existing concrete and then flange connections at the wall. Please confirm.	Confirmed, weir supports are not required for this design and have been removed from drawings.
14	Page 32/122 of 860	Trojan to confirm that all cabling can adequately fit within the cable trays detailed on the drawings with adequate venting.	Confirmed
15	Page 33 of 860	Indicate width of weir troughs and spacing between them.	Updated weir drawing have been included in revised submittal package. Trough width is 16.75" and spacing between trough is also 16.75"

16	Page 37 of 860	Revise documentation to indicate which “Optional” items are being furnished, cross out inapplicable items. Typical all datasheets.	Interconnect drawings have been updated
17	Page 38 of 860	Revise electrical interconnection diagram to conform to layout of system to be provided.	Interconnect drawings have been updated
18	Page 40-42 of 860	Drawings indicate inconsistent number of banks in the tables. Edit to be applicable to this project.	Interconnect drawings have been updated
19	Page 50 of 860	Revise FIT-001/FE-001 to FIT-600/FE-600. Revise connection from AIT-001 to AE-001 to dashed linetype – this is understood to be a separately mounted transmitter.	Drawing has been revised
20	Page 50 of 860	Flow meter is indicated in influent channel prior to channel split. Please advise on appropriate location and update drawings as necessary.	As per item 6 of email from B&V dated Sept 6, plant will use the outfall flowmeter (South of UV) which feeds back to the tertiary PLC and the UV system over SCADA
21	Page 50 of 860	Channel labeling looks to be opposite of that indicated on the plan arrangement drawings. Please review and revise.	P&ID has been revised
22	Page 51 and 52 of 860	Communication indicate Modbus communication. Per previous discussions, the client prefers ethernet/IP communication. Please advise and update documents accordingly.	Modus is used for internal communications. Confirmed that SCADA interface is Ethernet I/P
23	Page 51 of 860	Slide Gates indicate to be provided “by others”. Trojan is providing these. Review and update.	Corrected. Confirmed that gates will be supplied by Trojan
24	Page 307 of 860	Confirm the use and procurement of a non-rising stem as previously discussed. This appears to NOT be a non-rising stem. Please advise.	As per item 7 of email from B&V dated Sept 6, it was confirmed that the 72” rising stem does not conflict with anything in the building. Rising stem is sufficient for this application.
25	Page 407 of 860	General description #5 mentioned Teflon-insulated stranded wire. Is there any concern with PFAS leaching from Teflon? If so, how will this be mitigated?	There may be trace amounts of Polytetrafluoroethylene (PTFE) found in wire coatings at the particle level, but these quantities should fall below any current reporting thresholds. These wires are not in contact with process water, therefore leaching would not be a concern, and has not been in past applications. Reference item 10 of email from B&V dated Sept 6. Trojan Technologies is aware PFAS are currently regulated including the Toxic Substances Control Act (TSCA) Significant New Use Rule (SNUR), Code of Federal Regulations Title 40, Part 721.The European Chemicals Agency (ECHA) is working on a

			restriction dossier for the use of PFAS (per- and polyfluoroalkyl substances). Trojan Technologies will monitor the progress of the restriction process and will ensure that our products comply with the regulatory requirements once they entered into force.
26	Page 681 and 703 of 860	Trojan to confirm that outlet/downstream isolation gate will be closed if channel is out of service.	Confirmed
27	Page 694 of 860	Trojan to confirm if the existing FIT600 is the flow signal used to pace the lamps.	Trojan will use the outfall flowmeter as per item 20
28	Page 733 of 860	Specification indicates a headloss of 8 inches. Headloss calculations indicate a headloss of 8.93 inches. This needs to be updates as Trojan indicates a max of 54 MGD per duty channel, this should be revised to 27 MGD.	Trojan calculations confirm that headloss with 4 banks per channel is 8.93 inches. More detail to be provide prior to award.
29	Page 735 of 860	Dose calculations also indicate a max of 54 MGD per duty channel, this should be revised to 27 MGD.	This has been corrected
30	Page 739 of 860	Ambient temperature maximum for heat load calculation on SCC indicates 59.3 F, specification requirement is to design around an ambient temperature range between 33 F and 104 F, review calculation and advise if cabinet will require a cooling solution. If one is needed, who is responsible for providing.	SCC design has been updated to include a cooling system as well as a heater to address potential condensation. ~~**Note for contractor**, power feed for updated SCC design is 120VAC, **20**A.~~
31	Page 759 and 409 of 860	Trojan to confirm warranty for lamp driver. Specification calls for warranty of 5 years from substantial completion regardless of power output and operating hours. Review and revise.	As per item 9 of email from B&V dated Sept 6, the lamp driver warranty is acceptable. No change
32	Page 762 of 860	No quartz sleeve warranty is provided. Specification Section 1.7D says that quartz sleeves shall be warranted for a minimum of 10 years from Substantial completion. Review and revise.	Sleeve warranty has been added
33	Page 765 of 860	Trojan to confirm pricing of lamps over the life of the equipment. $10,271.50 seems higher than recent pricing received from Trojan.	Lamp pricing error has been corrected
34	Page 827 of 860	Page indicates bacteriological and commissioning testing protocol however only system commissioning checklist is provided. Verify this is correct and/or update Table of Contents.	This sections has been revised and corrected

35	Page 830 thru 840 of 860	Please update the PN and Location on the system commissioning checklist.	This document has been revised and corrected
36	Pages 841 thru 860 of 860	Please remove these sheets, they are not applicable or blank. If this data is missing here, please include	This document has been revised and corrected
37	Page 840 of 860	Verify flow rate for dose pace testing	This document has been revised and corrected
38	General	Indicate acceptance and adherence to testing, commissioning, and training protocols outlined in the RFP (Section 46 66 56).	Confirmed, Trojan accepts and will adhere to testing, commissioning, and training protocols outlined in the RFP (Section 46 66 56)
39	General	Please explain in more detail how the system will be controlled at lower solids (<5 mg/L) and higher transmittance (70%).	The Trojan system does not monitor and control to TSS levels. The Trojan system does monitor and control to UV transmittance levels and will adjust lamp output power accordingly based on algorithms derived from third party product validation data and limits.
40	General	Please provide a copy of the validation report. We will review and provide comments.	As per item 8 of email from B&V dated Sept 6, an NDA is required prior to providing this report. Will be addressed separately from this submittal.
41	General	Please provide documentation/verification on end of lamp life and fouling factor. We will review and provide comments.	To be provided separately for review.

We ask that you please review this documentation carefully to ensure that it is appropriate.

We have tentatively scheduled delivery of this equipment for **May 2024** however this date will be revised and coordinated with the contractor once the submittals have been approved. Please note, current standard lead-time for this equipment is 28 - 30 weeks from approved submittal.

If you should have any questions or concerns at this time, please do not hesitate to contact me at Trojan Technologies.

Best regards,

TROJAN TECHNOLOGIES

Michael Bartram

Mike Bartram
Project Manager
(519) 457-3400 ext. 2374
(226) 688-7845 (cell)
mbartram@trojantechnologies.com

SUBMITTAL

Ann Arbor Replacement, MI 171100051

TROJANUV3000PLUS™

IMPORTANT CONTACTS

HEAD OFFICE - CANADA

Trojan Technologies
3020 Gore Road,
London, Ontario,
Canada, N5V 4T7
Tel.: +519 457 3400
Fax: +519 457 3030
http://www.trojanuv.com

TOLL FREE NUMBER:
1-800-291-0213

TOLL FREE FAX NUMBER:

1-800-290-6193

To ORDER PARTS, contact TROJAN TECHNOLOGIES
Tel:1-800-291-0213
Email: easternus@trojanuv.com

To schedule SERVICE, or if you have a TECHNICAL EMERGENCY contact TROJAN TECHNOLOGIES' TECHNICAL ASSISTANCE CENTER:
Toll Free Phone: 1-866-388-0488
Email: TAC@Trojanuv.com

TROJAN UV™

Water Confidence™

Document #: SU171100051	**Completed By: JRN**	**Date: 23OC04**
Customer Revision: B	**Checked By: SPM**	**Date: 23OC05**
	Approved By: MB	**Date: 23OC05**

TABLE OF CONTENTS

MECHANICAL DRAWINGS & CUT SHEETS

Operator's Kit
Hose Kit
ActiClean™ Drill Kit
Warning Sign UV Light
Lamp Plug Specification
Lamp Specification
Lamp Driver Specification
Solo™ Lamp Sleeve, SG0031D01 - Rev B

ELECTRICAL DRAWINGS & CUT SHEETS

System Control Center (SCC)

- 341382 - Rev. 2
- Bill of Materials / Catalogue Data (Major Components Only)

Power Distribution Center (PDC)

- 3401383 - PDC 1A-1C- Rev. 1
- 3401384 - PDC 1D- Rev. 1
- 3401385 - PDC 2A-2C- Rev. 1
- 3401386 - PDC 2D- Rev. 1
- Bill of Materials / Catalogue Data (Major Components Only)

Hydraulic System Center (HSC)

- E171100051H1 - Rev. 1
- E171100051H2 - Rev. 1
- SG0024 - HSC G4 Assy - Rev C
- 907717C, Sheet 15 - Wiper/Lift Hydraulic Diagram - Rev. Y
- Bill of Materials / Catalogue Data (Major Components Only)

Level Sensor Control Box (LCP)

- 340393G - Rev. G
- Bill of Materials / Catalogue Data (Major Components Only)

CONTROLS PHILOSOPHY

CP171100051 - Rev 1.2
Scada List

CALCULATIONS & CERTIFICATIONS

Calculations

- TrojanUVSigna™ Headloss Calculation
- TrojanUVSigna™ Dose Calculation
- System Control Center (SCC) UPS Load Calculation
- System Control Center (SCC) Heat Calculation
- Double Wide Power Distribution Center (PDC) & Hydraulic System Center (HSC)Thermal Report
- Single Wide Power Distribution Center (PDC) & Hydraulic System Center (HSC)Thermal Report

Certifications

- TrojanUVSigna™ Validation Test Certification
- TrojanUVSolo™ Lamp 1000W PSS Measurement
- TrojanUVSolo™ End of Lamp Life Factor Letter
- TrojanUVSolo™ Fouling Factor Letter

WARRANTIES

Equipment Limited Warranty
Solo Lamp Limited Warranty
Sleeve Limited Warranty
Lamp Driver Limited Warranty
UV Intensity Limited Warranty
Performance Guarantee
Replacement Parts Price Guarantee
Warranty Claim Form
Lamp Recycling Program & Form

SAFETY DATA SHEETS (SDS)

Hg Lamps
ActiClean™ Gel
Mobil DTE 10 Excel 15
Food Machinery Grease
100%T Reference Solution
Cuvette Cleaner

TEST PROTOCOLS

Bacteriological (Performance) Test Protocol
Commissioning Testing Protocol

OVERVIEW

SECTION CONTENTS

Company Background

Trojan Technologies is part of Danaher Corporation's environmental platform. Danaher is a Fortune 200, global science and technology leader.

Trojan Technologies encompasses six businesses: Aquafine, Trojan Marinex, TrojanUV, Salsnes Filter, US Peroxide and VIQUA. The products and services provided by these businesses play vital roles in making various stages of the water treatment process more effective, efficient and sustainable.

Aquafine Aquafine's advanced UV water treatment systems meet the changing requirements and needs of a diverse customer base around the world. They provide UV solutions for TOC reduction, chlorine and chloramine destruction, ozone destruction and disinfection for many applications in the industrial/commercial sector.	Aquafine™
Salsnes Filter Salsnes Filter's patented filter technology removes particles from municipal and industrial process water. Industries such as food, paper, cruise lines and aquaculture use the fully-automated treatment technology to treat effluent, improve the quality of influent or enhance the utilization of raw materials.	salsnes filter™
TrojanUV TrojanUV designs, manufactures and sells pressurized and open-channel UV disinfection systems for municipal wastewater and drinking water, and UV-oxidation systems for environmental contaminant treatment applications.	TROJAN UV™
VIQUA VIQUA is a leading water treatment technology company focused on providing customers with confidence in their water. In over 100 countries, VIQUA UV systems are disinfecting water in homes, apartment complexes, manufacturing facilities, campgrounds, resorts, hotels and hospitals.	VIQUA

Trojan Technologies continually strives to develop industry-defining technology, making a significant investment each year to ensure unparalleled discovery and development (~5.0% annual investment in R&D).

The Trojan Technologies mission statement:

We enable customers to meet their water quality objectives by providing eco-efficient solutions that reduce and recover costs, energy, resources and space.

Collaboratively solving problems with our customers, we deliver low-risk, innovative technologies that offer sustainable results.

We ensure greater water confidence and environmental stewardship for people, industries and municipalities, improving the lives of over one billion people globally.

Certificates

Certificates are included on the following pages.

Certificate of Registration

QUALITY MANAGEMENT SYSTEM - ISO 9001:2015

This is to certify that:

Trojan Technologies
3020 Gore Road
London
Ontario
N5V 4T7
Canada

Holds Certificate No: **FM 63961**

and operates a Quality Management System which complies with the requirements of ISO 9001:2015 for the following scope:

Research, design, engineering, manufacturing, sales and service of ultraviolet (UV) water treatment solutions for municipal, industrial, light commercial and residential applications.

For and on behalf of BSI:

Carlos Pitanga, Chief Operating Officer Assurance – Americas

Original Registration Date: 1998-03-27
Effective Date: 2021-07-11
Latest Revision Date: 2021-07-06
Expiry Date: 2024-07-10

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Certificate of Registration

ENVIRONMENTAL MANAGEMENT SYSTEM - ISO 14001:2015

This is to certify that:

Trojan Technologies Group ULC
3020 Gore Road
London
Ontario
N5V 4T7
Canada

Holds Certificate No: **EMS 633149**

and operates an Environmental Management System which complies with the requirements of ISO 14001:2015 for the following scope:

The environmental management system for the control of risks associated with the engineering and assembly of ultraviolet (UV) light technologies for wastewater, industrial, and drinking water disinfection applications, and for the destruction of pollutants in liquid streams.

For and on behalf of BSI:

Carlos Pitanga, Chief Operating Officer Assurance – Americas

Original Registration Date: 2016-03-08
Effective Date: 2022-03-06
Latest Revision Date: 2022-02-17
Expiry Date: 2025-03-07

...making excellence a habit.™

PROJECT DESCRIPTION & SYSTEM DESCRIPTION

SECTION CONTENTS

TROJAN UV™

Water Confidence™

Project Description

Project Name	Ann Arbor Replacement, MI
Trojan Project Number	171100051
Specification Section	46 66 56
Peak Flow	54 MGD
Average Flow	25 MGD
Minimum Flow	10 MGD
Total Suspended Solids	≤ 30 mg/L Based on a Maximum
Percent Transmittance	60 % Minimum at 253.7nm
Disinfection Standards	≤ 200 Fecal Coliform / 100mL Based on a 30 Day Geometric Mean
	≤ 400 Fecal Coliform / 100mL Based on a 7 Day Geometric Mean

System Description

Descriptions & Requirements

System Control Center (SCC)		Quantity:	1	Weight: 150lbs / 68kg
PLC Controller:	Allen Bradley ControlLogix 1756-L73			
Operator Interface:	Beijer 15” Colour Touchscreen			
Lan Protocol:	Ethernet/IP			
Panel Enclosure Material:	316SST			
Enclosure Rating:	Type 4X			
Panel Mounting:	Wall			

Refer to SCC Drawings for Electrical and Component Details

Power Distribution Center (PDC)		Quantity:	4	Weight: 1600lbs / 726kgs
Power Distribution Center Material:	316SST			
Enclosure Rating:	Type 4X			

Refer to PDC Drawings for Electrical and Component Details

Hydraulic System Center (HSC)		Quantity:	2	Weight: 350lbs / 159kgs
Hydraulic Fluid:	Mobil DTE 10 Excel 15			
Enclosure Material:	316SST			
Enclosure Rating:	Type 4X			
Enclosure Mounting:	Floor			

Refer to HSC Drawings for Electrical and Component Details

TrojanUVSigna™ Bank		Quantity:	8	Weight: 690lbs / 314kgs
Number of UV Lamps per Bank:	24			
ActiClean™ Cleaning System (ACS):	Included			
UV Bank Material:	316 SST, Quartz, Teflon™			
Rating:	Type 6P			
Cable Management:	Spiral Wrap			
Lamp Cables:	Integrated Plug & **98’ Cable included (One (1) per lamp)			

***Refer to Project Layout Drawings for allowable routing distance.*

TrojanUVSigna™ Bank Frame		Quantity:	4	Weight: 310lbs / 141kgs
Number of UV Banks to Support:	Up to Two (2) UV Banks			
Bank Frame Material:	316SST			
Bank Frame Hardware:	Eighteen (18) Epoxy Anchors Included per Frame, 3/8” dia. x 3.75” long			

UV Intensity Sensor		Quantity:	8	Weight: ----
Number Required per UV Bank:	One (1)			
Interconnection Cable:	Sensor to PDC			

UV Intensity Reference Sensor	Quantity: 2	Weight: ----	
Case:	Foam Filled Airtight Case		
Bank in Place Proximity Sensor	Quantity: 8	Weight: ----	
Number Required per UV Bank:	One (1)		
Interconnection Cable:	Sensor to PDC		
Electrode Level Sensor	Quantity: 2	Weight: ----	
Water Level Detection:	Low		
Number per UV Channel:	One (1)		
Electrical Requirements:	12 VDC - 2 Conductor		
Level Sensor Control Box	Quantity: 2	Weight: 50lbs / 23kgs	
Number per UV Channel:	One (1)		
Enclosure Material:	304SST		
Enclosure Rating:	Type 4X		
Enclosure Mounting:	Wall		

Refer to Level Sensor Control Box Drawings for Electrical and Component Details

Level Control Fixed Trough	Quantity: 4	Weight: ----	
Level Controller Material:	304SST		

Refer to Project Layout Drawings & Water Level Control Device Manual

Inlet/ Outlet Slide Gate	Quantity: 4	Weight: ----	
Weir Gate Material:	304SST		
Weir Gate Mounting:	Channel Side		

Refer to Weir Gate & Actuator Submittal for Electrical and Component Details

Hach On-Line UVT Monitor & Sensor	Quantity: 1	Weight: ----	
Controller Type:	Hach sc4500		
Controller Mounting:	Wall		
Sensor Type:	Hach UVAS		
Sensor Mounting:	Pole & Mounting Bracket		
Interconnection Cable:	75’ Cable (Controller to Sensor)		

Refer to Project Layout Drawings & Manufacturer Information

UV Photometer (Portable)	Quantity: 1	Weight: ----	
Model:	Real Tech UV245 P200		

Refer to Manufacturer Information

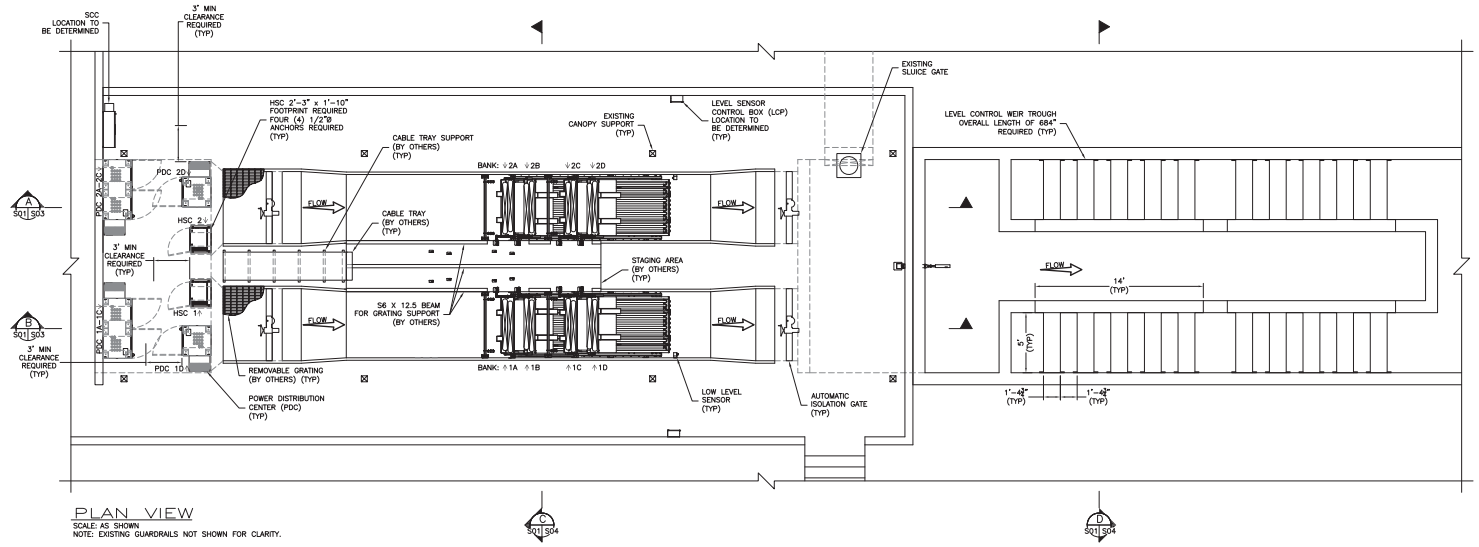
Hose Kits	Quantity: 8	Weight: ----
Hose Lengths: ** 70’		
Hydraulic Fitting Material: 316SST		
***Refer to Project Layout Drawings for allowable routing distance.*		
Operator Kit	Quantity: 1	Weight: ----
Start-Up Provisions are Provided in Addition to the Operator Kit Quantities		
ActiClean™ Drill Kit	Quantity: 1	Weight: ----
Warning Sign	Quantity: 8	Weight: ----

Spare Equipment	
Spare UV Lamp Assembly	Quantity: 20
Spare Quartz Sleeves Assembly	Quantity: 20
Spare Lamp Driver	Quantity: 10
Spare UVI Reference Sensor	Quantity: 1
Spare Wiper Seals	Quantity: 20

LAYOUT DRAWINGS

SECTION CONTENTS

General Arrangement Drawings



PLAN VIEW

SCALE: AS SHOWN
NOTE: EXISTING GUARDRAILS NOT SHOWN FOR CLARITY.

NOTES:

: DO NOT SLOPE CHANNEL FLOOR.
: CHANNEL WIDTH MUST BE KEPT WITHIN A TOLERANCE OF −/+½" AT UV BANK FRAME AND −/+¼" FOR REST OF CHANNEL.
: ALL CHANNEL ELEVATIONS MUST BE KEPT WITHIN A TOLERANCE OF −/+¼" AGAINST A COMMON DATUM ELEVATION.
: ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES.
: SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
: ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY.
: REMOVABLE GRATING SECTIONS SHALL BE EASILY REMOVED BY ONE PERSON. MAXIMUM WEIGHT OF THE SECTIONS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE APPLICABLE JURISDICTION.
: CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
: EFFLUENT LEVELS SHOWN REFLECT HYDRAULICS ASSOCIATED WITH TROJAN EQUIPMENT ONLY. EFFLUENT LEVELS MAY BE ALTERED DUE TO CHANNEL DEBRIS OR GEOMETRY.
: HYDRAULIC HOSE ELEVATIONS NOT TO EXCEED 12" ABOVE HSC MOUNTING ELEVATION.
: INCLUDED CABLE LENGTH ALLOWS FOR **42.0'** ROUTING (RISE + RUN) BETWEEN CABLE/HOSE MANAGEMENT BRACKET AND UNDERSIDE OF PDC. (**31.5'** ROUTING ASSUMED BASED ON THIS LAYOUT.)
: INCLUDED HOSE LENGTH ALLOWS FOR **43.5'** ROUTING (RISE + RUN) BETWEEN CABLE/HOSE MANAGEMENT BRACKET AND HOSE CONNECTION ON THE HSC. (**37.5'** ROUTING ASSUMED BASED ON THIS LAYOUT.)
: SITE TO PROVIDE APPROVED (ENGINEERED) ANCHOR POINTS FOR PERSONNEL TO USE AS PART OF THEIR FALL RESTRAINT SYSTEM AROUND OPEN CHANNELS. THE ANCHOR POINTS MUST BE POSITIONED SO THAT THE PREFERRED RETRACTABLE LIFELINE OF 8 FEET IS OF SUFFICIENT LENGTH TO ACCESS THE WORK AT THE CHANNEL.

** SOLID GRATING REQUIRED TO BLOCK ULTRAVIOLET (UV) LIGHT.
*** STAGING AREA WIDTH BASED ON TROJAN STANDARD CABLE MANAGEMENT SYSTEM. A CUSTOM VERTICAL CABLE MANAGEMENT SYSTEM DESIGNED WITH CONSULTATION OF THE ENGINEER MAY BE ABLE TO REDUCE OR ELIMINATE THE REQUIRED STAGING AREA WIDTH.

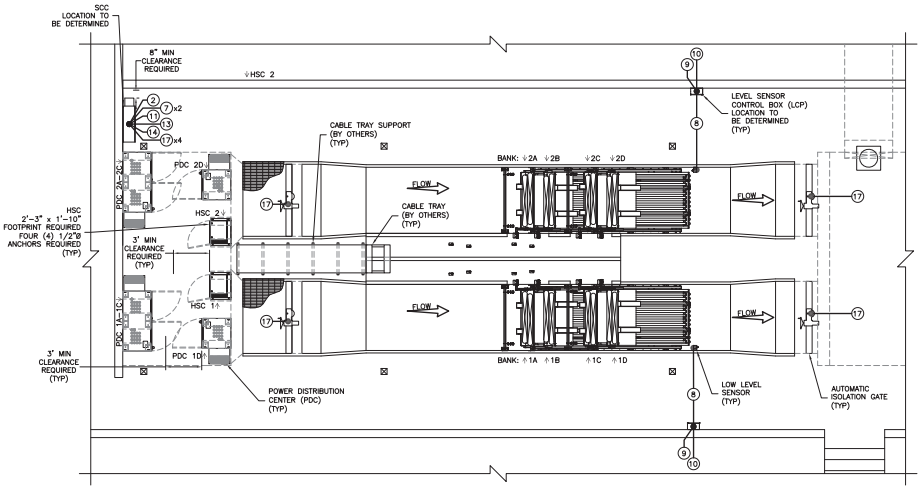
DESIGN CRITERIA		
	PEAK FLOW	54 (27 PER CHANNEL) MGD
	U.V TRANSMITTANCE AT 253.7 nm	60 %
	SUSPENDED SOLIDS	30 mg / L (MAXIMUM)
	DISINFECTION STANDARD	200 FC / 100mL (30 DAY GEO MEAN) 400 FC / 100mL (7 DAY GEO MEAN)

TROJANUV

CONFIDENTIALITY NOTICE

DESCRIPTION:	LAYOUT, TROJANUVSIGNA ANN ARBOR REPLACEMENT MI	
DRAWN BY : JRN	DATE : 230C05	
CHECKED BY : SPM	DATE : 230C05	
APPROVED BY : MB	DATE : 230C05	
SCALE (11x17) : 1/8" = 1'-0"	LOG NUMBER : N/A	

QUOTE NO.	223428
PROJECT NO.	171100051
DWG NO.	S01
REV.	B



INTERCONNECTIONS PLAN VIEW

SCALE: AS SHOWN

TROJAN UVSIGNA™

EQUIPMENT INTERCONNECTIONS

No.	DESCRIPTION	FROM	TO
1	POWER DISTRIBUTION CENTER (PDC)* POWER SUPPLY 480Y/277V, 3 PHASE, 4 WIRE + GROUND 99 AMPS MAXIMUM CURRENT/PHASE 82.1 kVA/PDC POWER DRAW	DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN)	PDC (xA–xC) (TOP OF PANEL)
	POWER DISTRIBUTION CENTER (PDC)* POWER SUPPLY 480Y/277V, 3 PHASE, 4 WIRE + GROUND 34 AMPS MAXIMUM CURRENT/PHASE 27.4 kVA/PDC POWER DRAW	DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN)	PDC (xD) (TOP OF PANEL)
2	SYSTEM CONTROL CENTER (SCC)* POWER SUPPLY 120V, 1 PHASE, 2 WIRE + GROUND 12 AMPS, 1.5 kVA	DP (BY OTHERS) (NOT SHOWN)	SCC
3	HYDRAULIC SYSTEM CENTER (HSC)* POWER SUPPLY 480V, 3 PHASE, 3 WIRE + GROUND 3 AMPS, 2.5 kVA	DP (BY OTHERS) (NOT SHOWN)	HSCs
4	BONDING CONDUCTOR 8 AWG TYPE THW STRANDED	PDCs (UNDERSIDE OF PANEL)	UV BANKS
5	UV INTENSITY 4–20MA ANALOG INPUT (SUPPLIED)	UV BANKS	PDCs (UNDERSIDE OF PANEL)
6	BANK IN PLACE PROXIMITY SENSOR 3 CONDUCTOR CABLES (SUPPLIED)	PROXIMITY SENSORS	PDCs (UNDERSIDE OF PANEL)
7	MODBUS BELDEN 3106A OR EQUIVALENT (ONE LINE PER CHANNEL)	SCC	HSCs & PDCs (UNDERSIDE OF PANEL) (DAISY CHANNED)
8	DISCRETE LOW LEVEL SIGNAL 12 VDC – 2 CONDUCTORS	LOW LEVEL SENSORS	LEVEL SENSOR CONTROL BOXES (LCP)
9	DISCRETE WATER LEVEL SIGNAL 2 CONDUCTORS	LEVEL SENSOR CONTROL BOXES (LCP)	PDCs (UNDERSIDE OF PANEL)
10	LEVEL SENSOR CONTROL BOX (LCP)* POWER SUPPLY 120V, 1 PHASE, 2 WIRE + GROUND, 0.12 kVA	DP (BY OTHERS) (NOT SHOWN)	LEVEL SENSOR CONTROL BOXES (LCP)
11	FLOW SIGNAL	PLANT SCADA (BY OTHERS) (NOT SHOWN)	SCC
12	LAMP CABLES (SUPPLIED)	UV BANKS	PDCs (UNDERSIDE OF PANEL)
13	ETHERNET I/P COMMUNICATION	SCC	PLANT SCADA (BY OTHERS) (NOT SHOWN)
14	ON–LINE UV TRANSMITTANCE CONTROLLER SIGNAL 4–20 mA	ON–LINE UV TRANSMITTANCE CONTROLLER	SCC
15	ON–LINE UV TRANSMITTANCE CONTROLLER* POWER SUPPLY 120V, 1 PHASE, 2 WIRE + GROUND, 50 VA	DP (NOT SHOWN) (BY OTHERS)	ON–LINE UV TRANSMITTANCE CONTROLLER
16	ON–LINE UV TRANSMITTANCE SENSOR COMMUNICATION (SENSOR CABLE PROVIDED BY HACH)	ON–LINE UV TRANSMITTANCE SENSOR	ON–LINE UV TRANSMITTANCE CONTROLLER
17	DISCRETE GATE OPEN CONTROL INPUT 2 CONDUCTORS DISCRETE GATE CLOSED CONTROL INPUT 2 CONDUCTORS DISCRETE OPEN COMMAND OUTPUT 2 CONDUCTORS DISCRETE CLOSE COMMAND OUTPUT 2 CONDUCTORS DISCRETE GATE IN REMOTE MODE INPUT 2 CONDUCTORS	SLIDE GATES SLIDE GATES SCC SCC SLIDE GATES	SCC SCC SLIDE GATES SLIDE GATES SCC

* GROUND CONNECTION REQUIRED TO PLANT GRID (BY OTHERS).

NOTES:

: DO NOT SLOPE CHANNEL FLOOR.
: CHANNEL WIDTH MUST BE KEPT WITHIN A TOLERANCE OF −/+½" AT UV BANK FRAME AND −/+¼" FOR REST OF CHANNEL.
: ALL CHANNEL ELEVATIONS MUST BE KEPT WITHIN A TOLERANCE OF −/+¼" AGAINST A COMMON DATUM ELEVATION.
: ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES.
: SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
: ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY.
: REMOVABLE GRATING SECTIONS SHALL BE EASILY REMOVED BY ONE PERSON. MAXIMUM WEIGHT OF THE SECTIONS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE APPLICABLE JURISDICTION.
: CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
: EFFLUENT LEVELS SHOWN REFLECT HYDRAULICS ASSOCIATED WITH TROJAN EQUIPMENT ONLY. EFFLUENT LEVELS MAY BE ALTERED DUE TO CHANNEL DEBRIS OR GEOMETRY.
: HYDRAULIC HOSE ELEVATIONS NOT TO EXCEED 12" ABOVE HSC MOUNTING ELEVATION.
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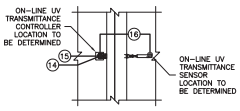
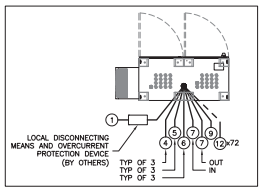
: WARNING SIGNS SHOULD BE POSTED AT ANY ACCESS OR WALKWAY TO THE UV EQUIPMENT
** SOLID GRATING REQUIRED TO BLOCK ULTRAVIOLET (UV) LIGHT.
*** STAGING AREA WIDTH BASED ON TROJAN STANDARD CABLE MANAGEMENT SYSTEM. A CUSTOM VERTICAL CABLE MANAGEMENT SYSTEM DESIGNED WITH CONSULTATION OF THE ENGINEER MAY BE ABLE TO REDUCE OR ELIMINATE THE REQUIRED STAGING AREA WIDTH.



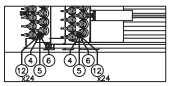
ON–LINE UVT PLAN VIEW

SCALE: AS SHOWN



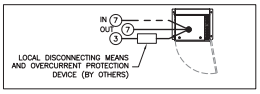
PDC INTERCONNECT DETAIL

SCALE:NOT TO SCALE



UV BANK INTERCONNECT DETAIL

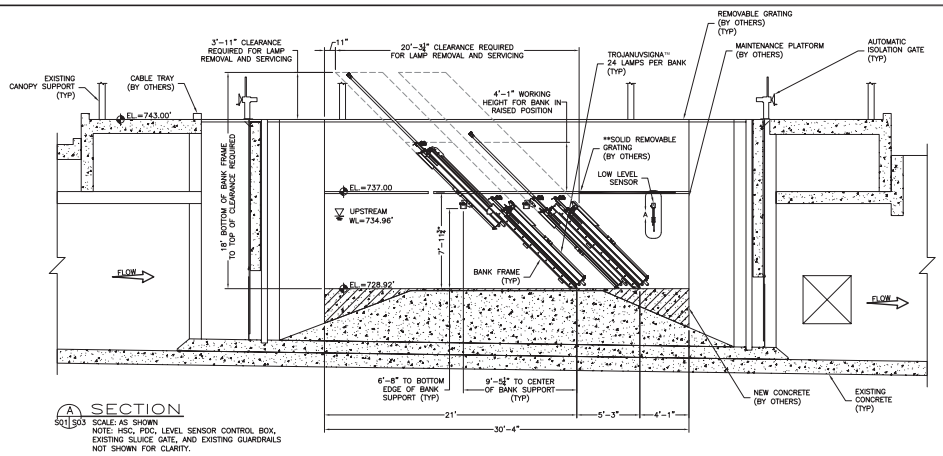
SCALE:NOT TO SCALE
NOTE: TYPICAL FOR ALL UV BANKS. TROUGH NOT SHOWN FOR CLARITY.



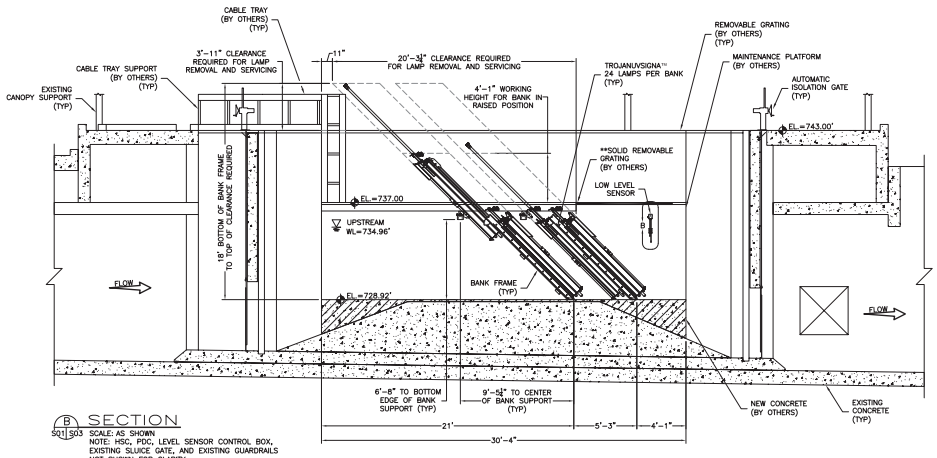
HSC INTERCONNECT DETAIL

SCALE:NOT TO SCALE
NOTE: TYPICAL OF EACH HSC.

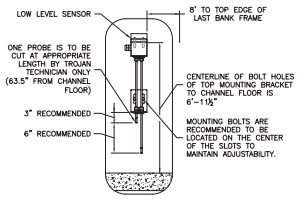
DESCRIPTION:	LAYOUT, TROJANUVSIGNA ANN ARBOR REPLACEMENT MI	QUOTE NO. 223428
DRAWN BY : JRN	DATE : 230C05	PROJECT NO. 171100051
CHECKED BY : SPM	DATE : 230C05	
APPROVED BY : MB	DATE : 230C05	DWG NO. S02 / REV. B
SCALE (11x17) : 1/8" = 1'-0"	LOG NUMBER : N/A	



A SECTION
S01 | S03 SCALE: AS SHOWN
NOTE: HSC, PDC, LEVEL SENSOR CONTROL BOX, EXISTING SLUICE GATE, AND EXISTING GUARDRAILS NOT SHOWN FOR CLARITY.



B SECTION
S01 | S03 SCALE: AS SHOWN
NOTE: HSC, PDC, LEVEL SENSOR CONTROL BOX, EXISTING SLUICE GATE, AND EXISTING GUARDRAILS NOT SHOWN FOR CLARITY.

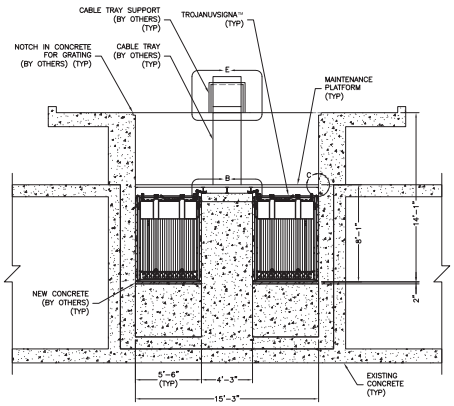


DETAIL A
SCALE:NOT TO SCALE

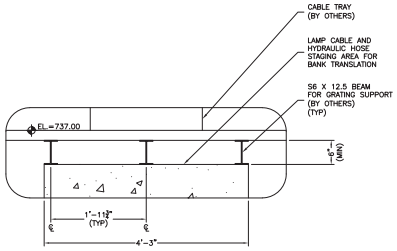
NOTES:
: DO NOT SLOPE CHANNEL FLOOR.
: CHANNEL WIDTH MUST BE KEPT WITHIN A TOLERANCE OF −/+½" AT UV BANK FRAME AND −/+¼" FOR REST OF CHANNEL.
: ALL CHANNEL ELEVATIONS MUST BE KEPT WITHIN A TOLERANCE OF −/+¾" AGAINST A COMMON DATUM ELEVATION.
: ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES.
: SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
: ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY.
: REMOVABLE GRATING SECTIONS SHALL BE EASILY REMOVED BY ONE PERSON. MAXIMUM WEIGHT OF THE SECTIONS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE APPLICABLE JURISDICTION.
: CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
: EFFLUENT LEVELS SHOWN REFLECT HYDRAULICS ASSOCIATED WITH TROJAN EQUIPMENT ONLY. EFFLUENT LEVELS MAY BE ALTERED DUE TO CHANNEL DEBRIS OR GEOMETRY.
: HYDRAULIC HOSE ELEVATIONS NOT TO EXCEED 12" ABOVE HSC MOUNTING ELEVATION.
: INCLUDED CABLE LENGTH ALLOWS FOR **42.0'** ROUTING (RISE + RUN) BETWEEN CABLE/HOSE MANAGEMENT BRACKET AND UNDERSIDE OF PDC. (**31.5'** ROUTING ASSUMED BASED ON THIS LAYOUT.)
: INCLUDED HOSE LENGTH ALLOWS FOR **43.5'** ROUTING (RISE + RUN) BETWEEN CABLE/HOSE MANAGEMENT BRACKET AND HOSE CONNECTION ON THE HSC. (**37.5'** ROUTING ASSUMED BASED ON THIS LAYOUT.)
: SITE TO PROVIDE APPROVED (ENGINEERED) ANCHOR POINTS FOR PERSONNEL TO USE AS PART OF THEIR FALL RESTRAINT SYSTEM AROUND OPEN CHANNELS. THE ANCHOR POINTS MUST BE POSITIONED SO THAT THE PREFERRED RETRACTABLE LIFELINE OF 8 FEET IS OF SUFFICIENT LENGTH TO ACCESS THE WORK AT THE CHANNEL.
: WARNING SIGNS SHOULD BE POSTED AT ANY ACCESS OR WALKWAY TO THE UV EQUIPMENT
** SOLID GRATING REQUIRED TO BLOCK ULTRAVIOLET (UV) LIGHT.
*** STAGING AREA WIDTH BASED ON TROJAN STANDARD CABLE MANAGEMENT SYSTEM. A CUSTOM VERTICAL CABLE MANAGEMENT SYSTEM DESIGNED WITH CONSULTATION OF THE ENGINEER MAY BE ABLE TO REDUCE OR ELIMINATE THE REQUIRED STAGING AREA WIDTH.

TROJANUV

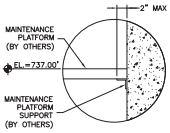
DESCRIPTION: LAYOUT, TROJANUVSIGNA ANN ARBOR REPLACEMENT MI		QUOTE NO. 223428
DRAWN BY : JRN	DATE : 23OCT05	PROJECT NO. 171100051
CHECKED BY : SPM	DATE : 23OCT05	
APPROVED BY : MB	DATE : 23OCT05	DWG NO. S03 / REV. B
SCALE (11x17) : 1/8" = 1'-0"	LOG NUMBER : N/A	



C SECTION
S01 S04 SCALE: AS SHOWN
NOTE: SCC, PDCs, HSCs, AUTOMATIC ISOLATION GATES, EXISTING GUARDRAILS, EXISTING CANOPY SUPPORTS, AND REMOVABLE GRATING (BY OTHERS) NOT SHOWN FOR CLARITY.

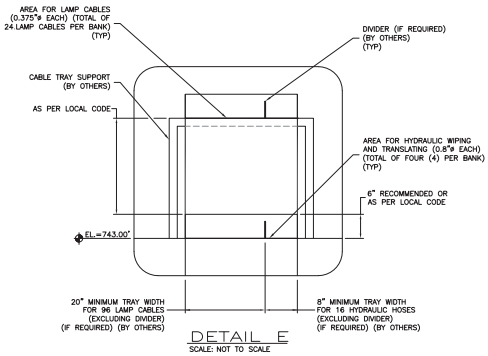


DETAIL B
SCALE: NOT TO SCALE

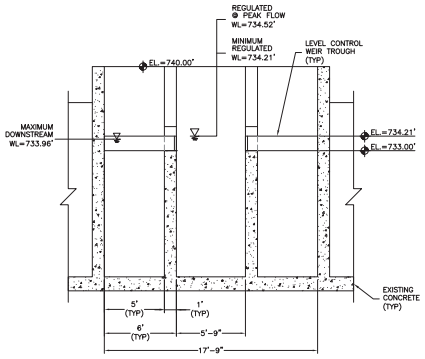


DETAIL C
SCALE:NOT TO SCALE

NOTES:
: DO NOT SLOPE CHANNEL FLOOR.
: CHANNEL WIDTH MUST BE KEPT WITHIN A TOLERANCE OF −/+1½" AT UV BANK FRAME AND −/+¾" FOR REST OF CHANNEL.
: ALL CHANNEL ELEVATIONS MUST BE KEPT WITHIN A TOLERANCE OF −/+¼" AGAINST A COMMON DATUM ELEVATION.
: ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES,
: SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
: ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY.
: REMOVABLE GRATING SECTIONS SHALL BE EASILY REMOVED BY ONE PERSON. MAXIMUM WEIGHT OF THE SECTIONS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE APPLICABLE JURISDICTION.
: CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
: EFFLUENT LEVELS SHOWN REFLECT HYDRAULICS ASSOCIATED WITH TROJAN EQUIPMENT ONLY. EFFLUENT LEVELS MAY BE ALTERED DUE TO CHANNEL DEBRIS OR GEOMETRY.
: HYDRAULIC HOSE ELEVATIONS NOT TO EXCEED 12" ABOVE HSC MOUNTING ELEVATION.
: INCLUDED CABLE LENGTH ALLOWS FOR **42.0"** ROUTING (RISE + RUN) BETWEEN CABLE/HOSE MANAGEMENT BRACKET AND UNDERSIDE OF PDC. (**31.5"** ROUTING ASSUMED BASED ON THIS LAYOUT.)
: INCLUDED HOSE LENGTH ALLOWS FOR **43.5"** ROUTING (RISE + RUN) BETWEEN CABLE/HOSE MANAGEMENT BRACKET AND HOSE CONNECTION ON THE HSC. (**37.5"** ROUTING ASSUMED BASED ON THIS LAYOUT.)
: SITE TO PROVIDE APPROVED (ENGINEERED) ANCHOR POINTS FOR PERSONNEL TO USE AS PART OF THEIR FALL RESTRAINT SYSTEM AROUND OPEN CHANNELS. THE ANCHOR POINTS MUST BE POSITIONED SO THAT THE PREFERRED RETRACTABLE LIFELINE OF 8 FEET IS OF SUFFICIENT LENGTH TO ACCESS THE WORK AT THE CHANNEL.
: WARNING SIGNS SHOULD BE POSTED AT ANY ACCESS OR WALKWAY TO THE UV EQUIPMENT
** SOLID GRATING REQUIRED TO BLOCK ULTRAVIOLET (UV) LIGHT.
*** STAGING AREA WIDTH BASED ON TROJAN STANDARD CABLE MANAGEMENT SYSTEM. A CUSTOM VERTICAL CABLE MANAGEMENT SYSTEM DESIGNED WITH CONSULTATION OF THE ENGINEER MAY BE ABLE TO REDUCE OR ELIMINATE THE REQUIRED STAGING AREA WIDTH.



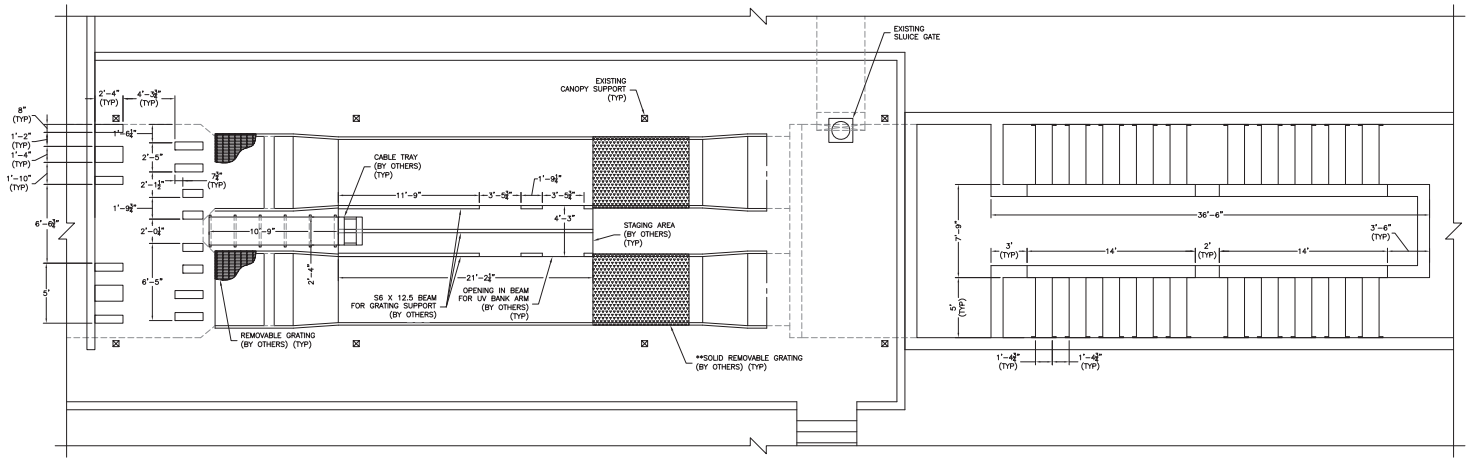
DETAIL E
SCALE: NOT TO SCALE



D SECTION
S01 S04 SCALE: AS SHOWN
NOTE: DIMENSIONS OF CHANNELS AT WEIR TO BE CONFIRMED BY CUSTOMER.

TROJANUV

DESCRIPTION: LAYOUT, TROJANUVSIGNA ANN ARBOR REPLACEMENT MI		QUOTE NO. 223428
DRAWN BY : JRN	DATE : 230C05	PROJECT NO. 171100051
CHECKED BY : SPM	DATE : 230C05	
APPROVED BY : MB	DATE : 230C05	DWG NO. S04 / REV. B
SCALE (11x17) : 1/8" = 1'-0"	LOG NUMBER : N/A	



GRATING, TRAY AND TROUGH PLAN VIEW

SCALE: AS SHOWN

NOTE: DESIGN OF GRATING SECTIONS SHOULD BE SIZED TO ALLOW FOR EASY REMOVAL BY SERVICE TECHNICIANS. SOLID GRATING MUST BE PROVIDED IN AREA INDICATED TO BLOCK UV LIGHT.

TROJANUV

DESCRIPTION: LAYOUT, TROJANUVSIGNA ANN ARBOR REPLACEMENT MI		QUOTE NO. 223428
DRAWN BY : JRN	DATE : 230C05	PROJECT NO. 171100051
CHECKED BY : SPM	DATE : 230C05	
APPROVED BY : MB	DATE : 230C05	DWG NO. S05 / REV. B
SCALE (11x17) : 1/8" = 1'-0"	LOG NUMBER : N/A	

Interconnection Diagram

REV	REVISION DESCRIPTION	LOG NO.	REV'D BY	CHK'D BY	APPRV'D BY	DATE YYYY-MM-DD
1	RELEASE FOR RE-SUBMITTAL	--	BJR	LF	LF	2023-10-05

ELECTRICAL INTERCONNECTS			
No.	DESCRIPTION	FROM	TO
1	POWER DISTRIBUTION CENTER (PDC) POWER FEED 277Y/480V, 3 PHASE, 4 WIRE + GROUND	DISTRIBUTION PANEL (NOT SHOWN)	PDC (TOP OF PANEL)
2	SYSTEM CONTROL CENTER (SCC) POWER FEED 120V, 1 PHASE, 2 WIRE + GROUND	DISTRIBUTION PANEL (NOT SHOWN)	SCC
3	HYDRAULIC SYSTEM CENTER (HSC) POWER FEED 480V, 3 PHASE, 3 WIRE + GROUND	DISTRIBUTION PANEL (NOT SHOWN)	HSC
4	LEVEL CONTROL PANEL (LCP) POWER FEED 120V, 1 PHASE, 2 WIRE + GROUND	DISTRIBUTION PANEL (NOT SHOWN)	LCP
5	BONDING CONDUCTOR 8 AWG, TYPE TEW, STRANDED	PDC (UNDERSIDE OF PANEL)	UV BANK
6	BANK IN PLACE SENSOR M12, 24AWG, 5 CONDUCTOR, SHIELDED (SUPPLIED)	UV BANK	PDC (UNDERSIDE OF PANEL)
7	UV INTENSITY (UVI) – ANALOG M8, 22AWG, 5 CONDUCTOR, SHIELDED (SUPPLIED)	UV BANK	PDC (UNDERSIDE OF PANEL)
8	SOLO LAMP CABLES (SUPPLIED)	PDC (UNDERSIDE OF PANEL)	UV BANK
9	UV TRANSMITTANCE CONTROLLER SIGNAL (UVT) 4–20mA, ANALOG INPUT	UV TRANSMITTANCE CONTROLLER	SCC
10	ETHERNET/IP COMMUNICATION CAT 5E	SCC	PLANT SCADA
11	MODBUS BELDEN 3106A, 22AWG, 1 TWISTED PAIR + ONE CONDUCTOR, SHIELDED OR EQUIVALENT	SCC	PDC (UNDERSIDE OF PANEL)
12	MODBUS BELDEN 3106A, 22AWG, 1 TWISTED PAIR + ONE CONDUCTOR, SHIELDED OR EQUIVALENT	PDC (UNDERSIDE OF PANEL)	PDC (UNDERSIDE OF PANEL)
13	MODBUS BELDEN 3106A, 22AWG, 1 TWISTED PAIR + ONE CONDUCTOR, SHIELDED OR EQUIVALENT	PDC (UNDERSIDE OF PANEL)	HSC
14	LOW WATER LEVEL SENSOR 2 CONDUCTORS, 14AWG	LOW WATER LEVEL SENSOR	LCP
15	LOW WATER LEVEL INTERCONNECT 2 CONDUCTORS, 14AWG	LCP	PDC (UNDERSIDE OF PANEL)
16	INLET GATE CONTROL & STATUS SIGNALS 4 WIRES FOR COMMAND & 6 WIRES FOR STATUS SIGNALS	SCC	INTLET GATE ACTUATOR
17	OUTLET GATE CONTROL & STATUS SIGNALS 4 WIRES FOR COMMAND & 6 WIRES FOR STATUS SIGNALS	SCC	OUTLET GATE ACTUATOR

TABLE OF CONTENTS	
SHEET	DESCRIPTION
00	TABLE OF CONTENTS
01	SYSTEM WIRING DETAIL
02	UV BANK FIELD WIRING DETAIL
03	PDC FIELD WIRING DETAIL, SINGLE WIDE – ANALOG
04	PDC FIELD WIRING DETAIL, DOUBLE WIDE – ANALOG
05	HSC FIELD WIRING DETAIL
06	SCC FIELD WIRING DETAIL
07	SCC GATE FIELD WIRING DETAIL
08	LCP FIELD WIRING DETAIL

NOTES:
1. DRAWINGS NOT TO SCALE
2. CABLE PROVIDE BY OTHERS UNLESS SPECIFIED

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: 2 PL DEC ± N/A
3 PL DEC ± N/A
ANGLE DEG ± N/A
REMOVE ALL BURRS, ALL CORNERS R 0.010 OR BREAK EDGE
ID – CRITICAL CHARACTERISTIC

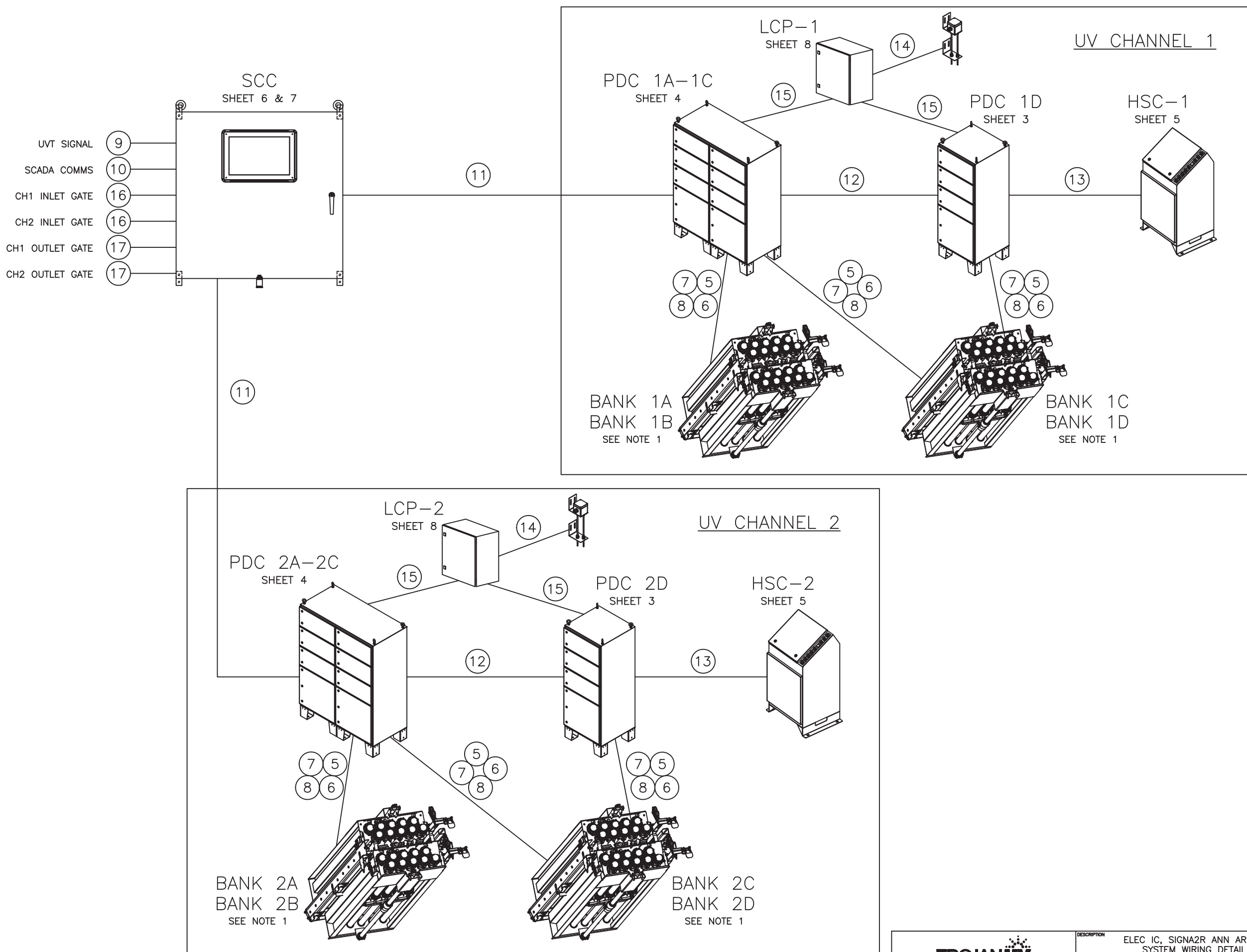
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: ELEC IC, SIGNA2R ANN ARBOR
TABLE OF CONTENTS

THIRD ANGLE PROJECTION

DRG NO. IC171100051 REV 1
SCALE: NTS SHEET 00 OF 08 SIZE D

LEGEND	
5	BONDING CONDUCTOR
6	BANK IN PLACE SENSOR
7	UV INTENSITY (UVI)
8	SOLO LAMP CABLES
9	UV TRANSMITTANCE (UVT)
10	SCADA COMMS VIA CAT5E ETHERNET I/P
11	MODBUS
12	MODBUS
13	MODBUS
14	LOW WATER LEVEL SENSOR
15	LOW WATER LEVEL INTERCONNECT
16	INLET GATE CONTROL AND STATUS SIGNALS
17	OUTLET GATE CONTROL AND STATUS SIGNALS

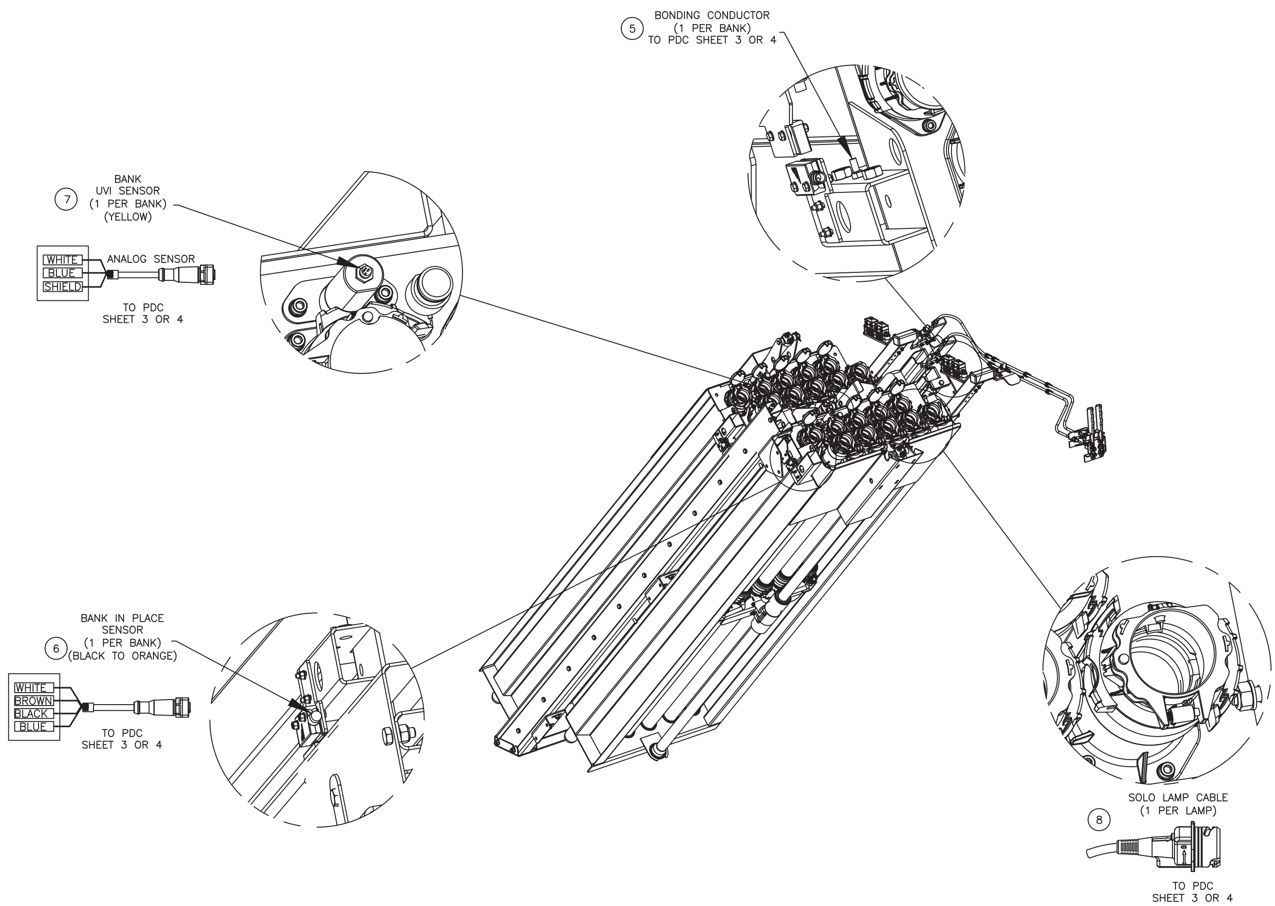


LEGEND	
SCC	SYSTEM CONTROL CENTER
HSC	HYDRALIC SYSTEM CENTER
PDC	POWER DISTRIBUTION CENTER
LCP	LEVEL CONTROL PANEL

NOTES:
1. TWO UV BANKS SHOWN

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION	ELEC IC, SIGNA2R ANN ARBOR SYSTEM WIRING DETAIL
REVISED BY	BJR
CHECKED BY	LF
APPROVED BY	LF
APPROVAL DATE YYYY-MM-DD	2023-10-05
SCALE:	NTS
0 0.5 1.0	1.0" ON ORIGINAL DWG
DWG NO.	IC171100051
REV	1
SHEET	01 OF 08
SIZE	D

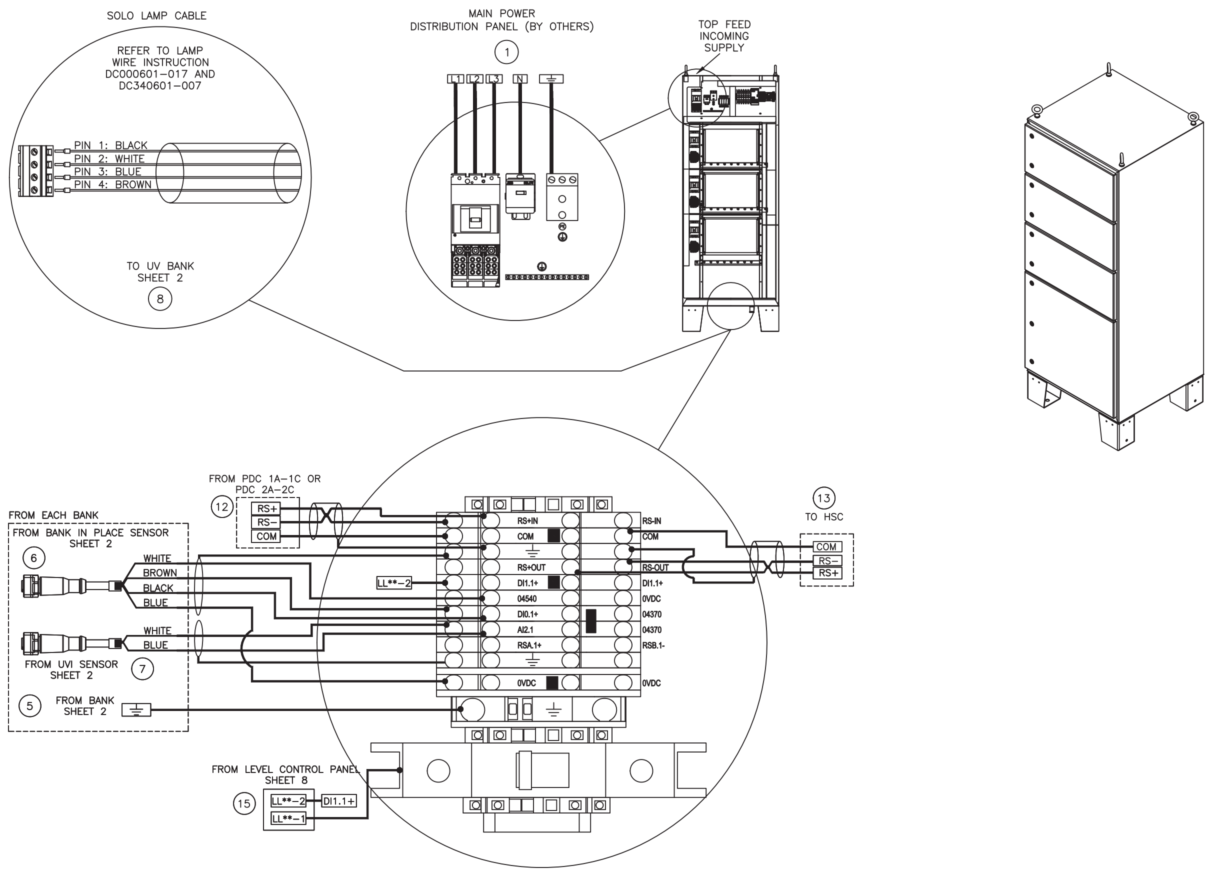


NOTES:
1. TWO UV BANKS SHOWN
2. BANK TO BE BONDED ON SAME SIDE AS CABLE MANAGEMENT ARM
3. LAMP CABLES TO BE INSTALLED AS PER INSTRUCTION DC000601-017

TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: ELEC IC, SIGNA2R ANN ARBOR UV BANK FIELD WIRING DETAIL				
0 0.5 1.0 / 1.0" ON ORIGINAL DWG	REVISED BY: BJR / CHECKED BY: LF / APPROVED BY: LF	DWG NO. IC171100051		REV 1
SCALE: NTS	APPROVAL DATE YYYY-MM-DD: 2023-10-05	SHEET 02	OF 08	SIZE D



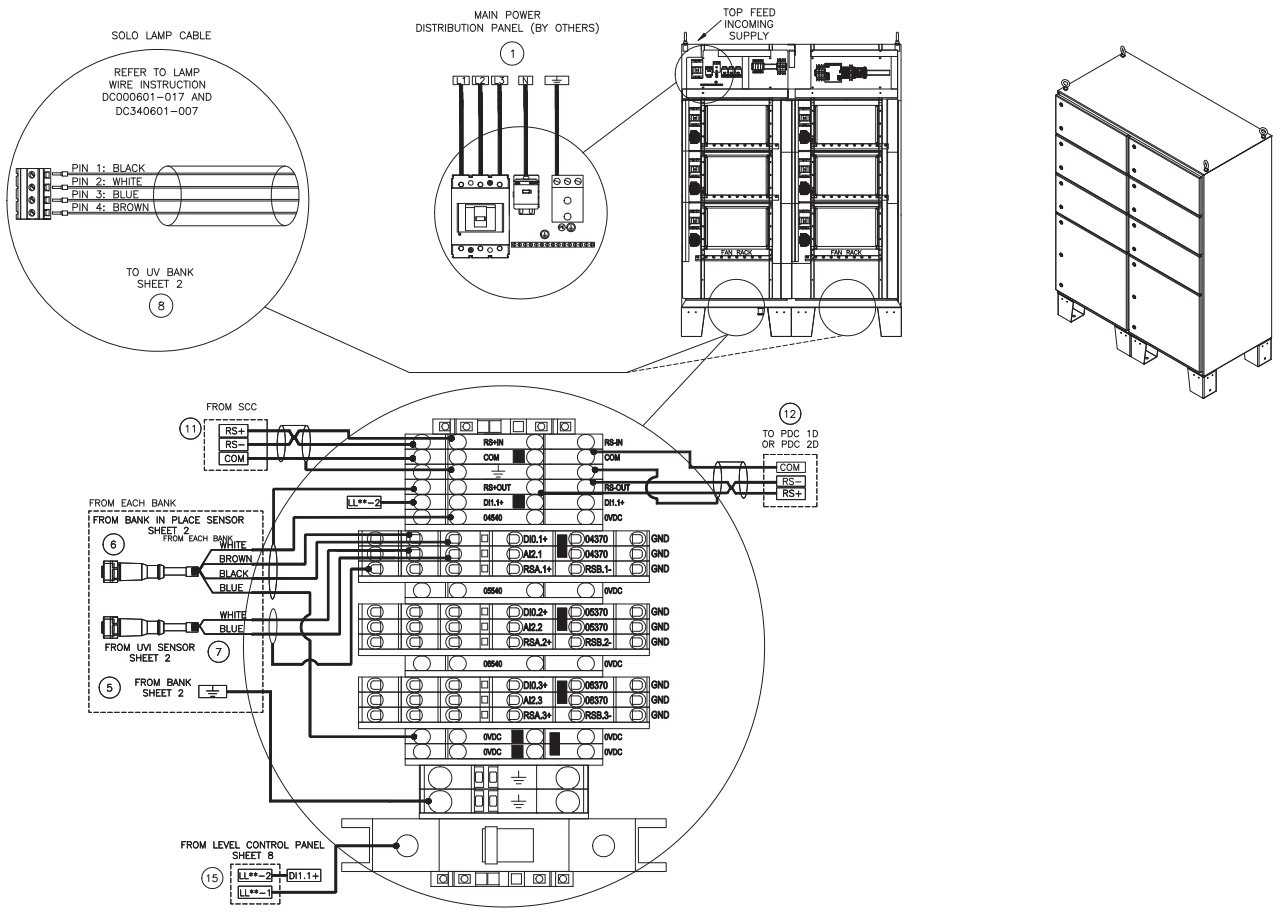
BANK 1D AND BANK 2D	
BANK IN PLACE SENSOR	
WIRE COLOUR	TERMINAL
WHITE	04540
BROWN	04370
BLACK	DI0.1+
BLUE	0VDC
ANALOG UVI SENSOR	
WHITE	04370
BLUE	AI2.1

NOTES:
1. ALL FIELD WIRING TO CONNECT TO LEFT SIDE OF TERMINAL BLOCK
2. DO NOT ALTER FACTORY WIRING, ON RIGHT SIDE OF TERMINAL BLOCK
3. LAMP CABLES INSTALLED AS PER DC000601-017 AND DC340601-007
4. ONLY CONNECT SHIELD OF MODBUS AND ANALOG CABLES AT ONE END

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: ELEC IC, SIGNA2R ANN ARBOR PDC FIELD WIRING DETAIL, SINGLE WIDE

0 0.5 1.0 — 1.0" ON ORIGINAL DWG	REVISED BY: BJR	DWG NO.: IC171100051	REV: 1
	CHECKED BY: LF		
	APPROVED BY: LF		
SCALE: NTS	APPROVAL DATE YYYY-MM-DD: 2023-10-05	SHEET 03 OF 08	SIZE D



BANK 1A AND 2A	
BANK IN PLACE SENSOR	
WIRE COLOUR	TERMINAL
WHITE	04540
BROWN	04370
BLACK	DI0.1+
BLUE	0VDC
ANALOG UVI SENSOR	
WHITE	04370
BLUE	AI2.1

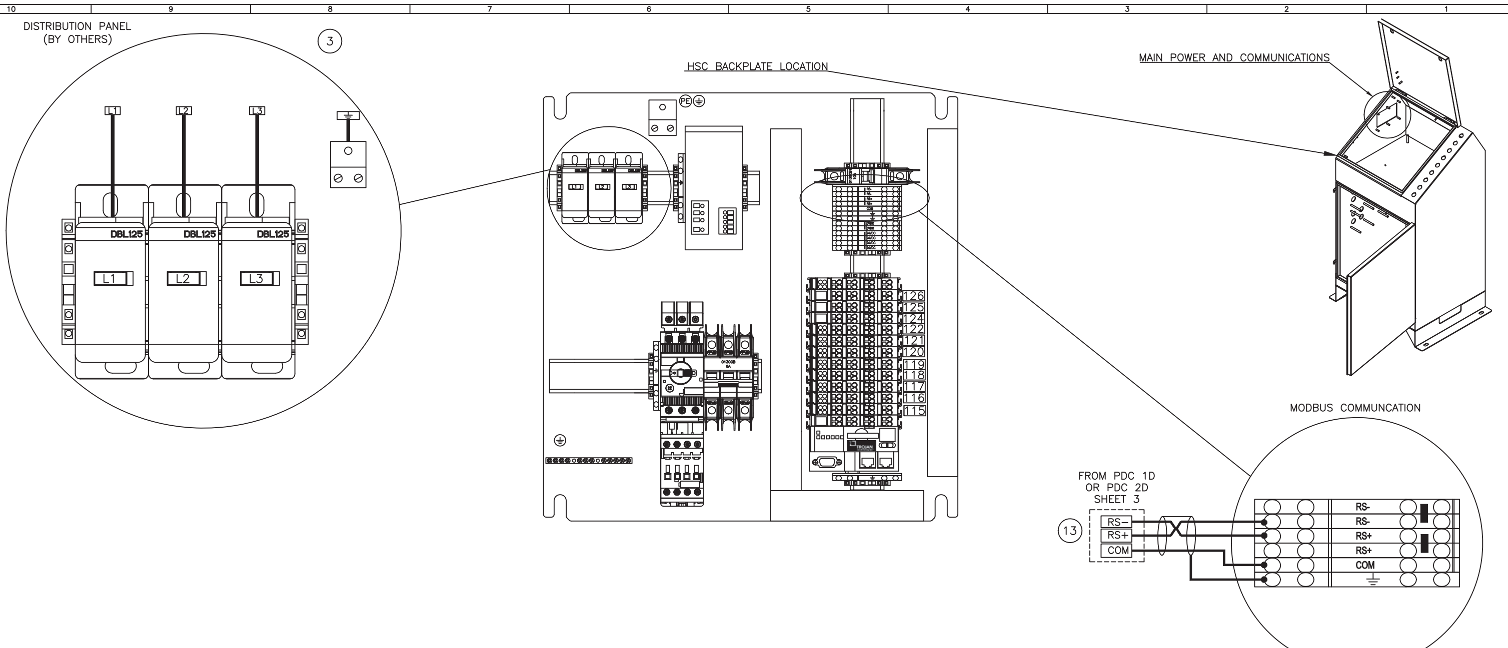
BANK 1B AND 2B	
BANK IN PLACE SENSOR	
WIRE COLOUR	TERMINAL
WHITE	05540
BROWN	05370
BLACK	DI0.2+
BLUE	0VDC
ANALOG UVI SENSOR	
WHITE	05370
BLUE	AI2.2

BANK 1C AND 2C	
BANK IN PLACE SENSOR	
WIRE COLOUR	TERMINAL
WHITE	06540
BROWN	06370
BLACK	DI0.3+
BLUE	0VDC
ANALOG UVI SENSOR	
WHITE	06370
BLUE	AI2.3

NOTES:
1. ALL FIELD WIRING TO CONNECT TO LEFT SIDE OF TERMINAL BLOCK
2. DO NOT ALTER FACTORY WIRING, ON RIGHT SIDE OF TERMINAL BLOCK
3. LAMP CABLES INSTALLED AS PER DC000601-017 AND DC340601-007
4. ONLY CONNECT SHIELD OF MODBUS AND ANALOG CABLES AT ONE END

DESCRIPTION: ELEC IC, SIGNA2R ANN ARBOR PDC FIELD WIRING DETAIL, DOUBLE WIDE

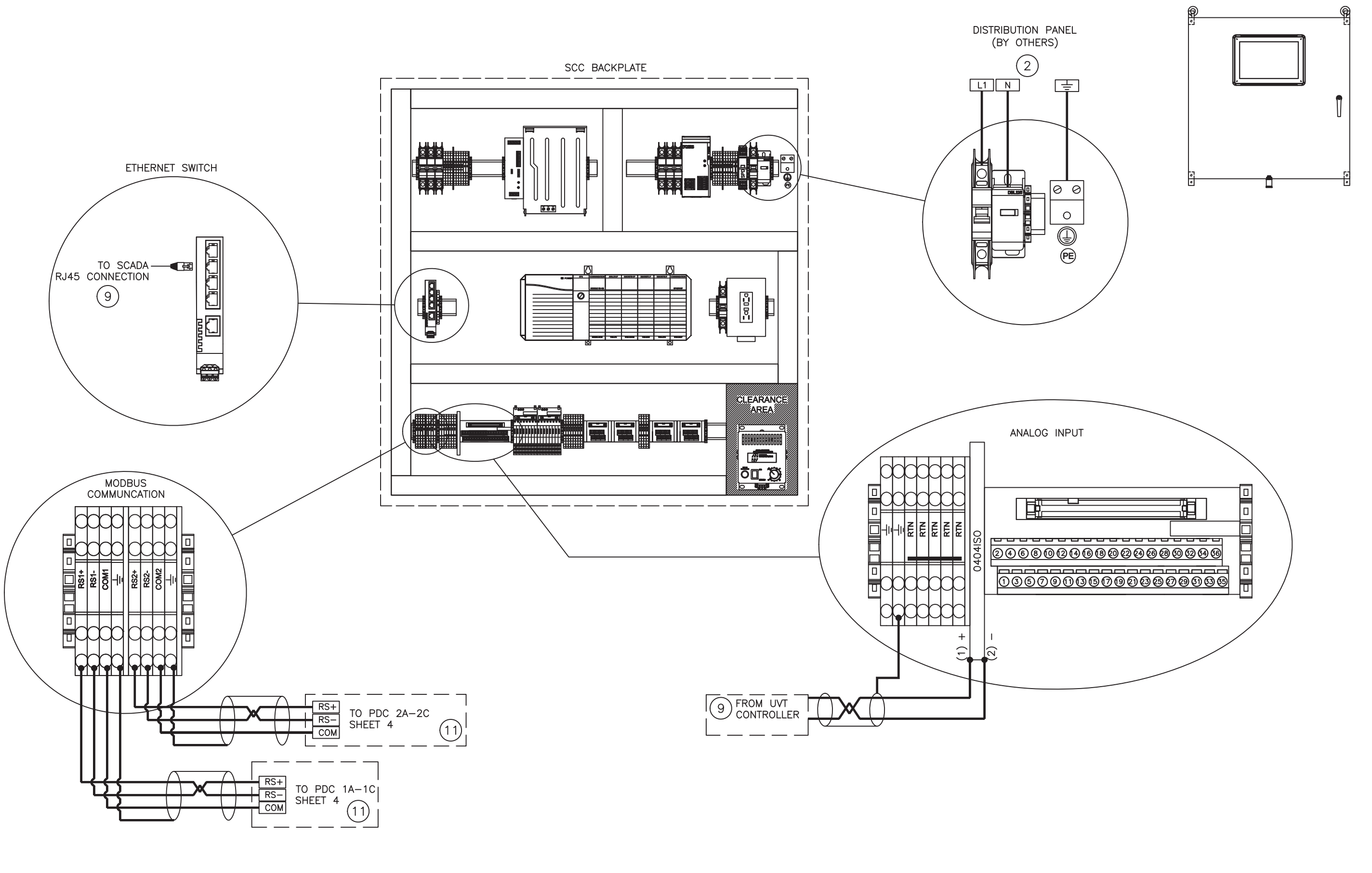
DRAWN BY	BJE
CHECKED BY	LF
APPROVED BY	LF
APPROVAL DATE (YYYY-MM-DD)	2023-10-05
DWG NO.	IC171100051
REV	1
SCALE	NTS
SHEET	04 OF 08
SIZE	D



NOTES:
1. ALL FIELD WIRING TO CONNECT TO LEFT SIDE OF TERMINAL BLOCK
2. DO NOT ALTER FACTORY WIRING, ON RIGHT SIDE OF TERMINAL BLOCK
3. ONLY CONNECT SHIELD OF MODBUS AND ANALOG CABLES AT ONE END

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

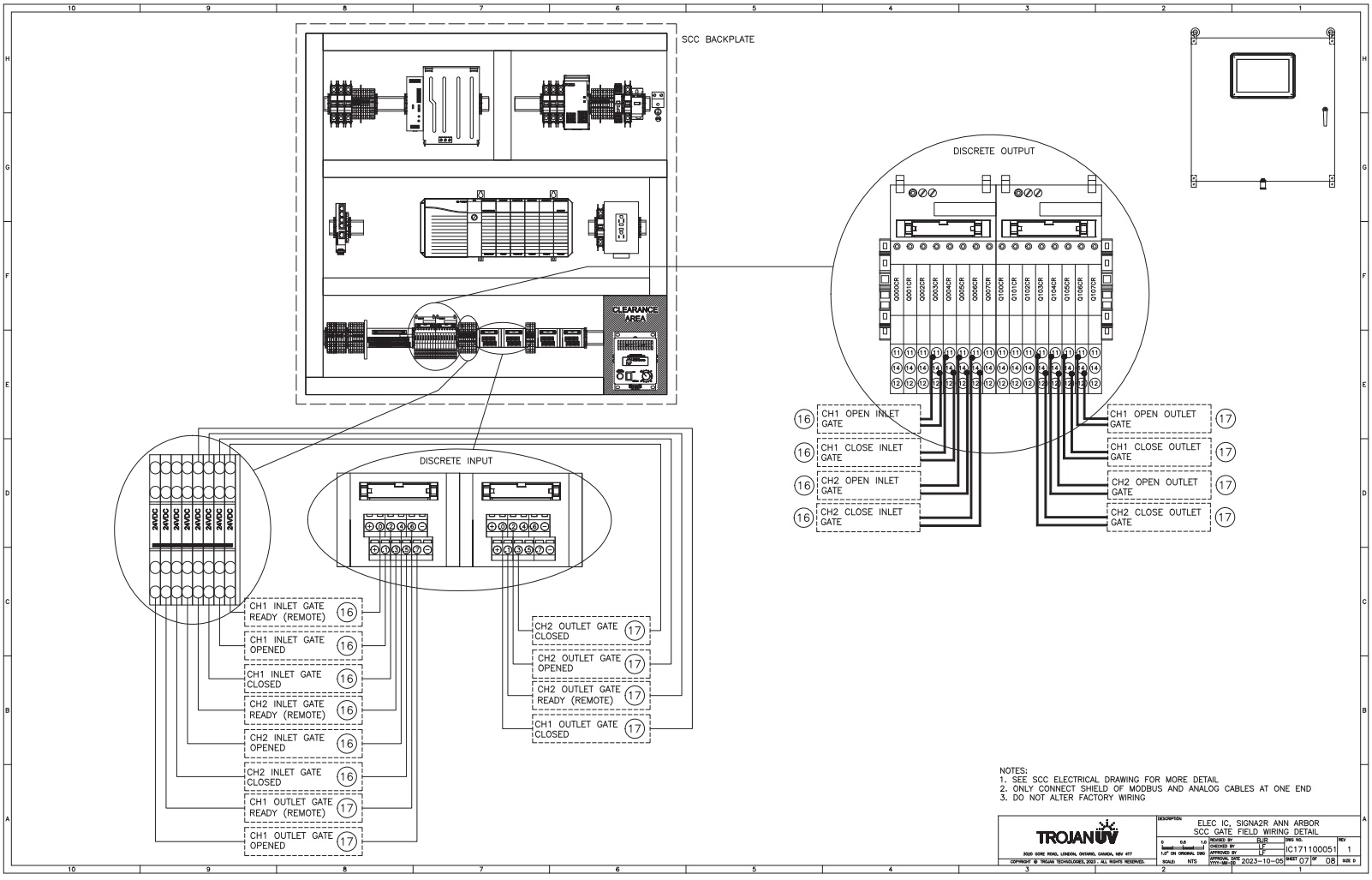
DESCRIPTION	ELEC IC, SIGNA2R ANN ARBOR HSC FIELD WIRING DETAIL		
1.0" ON ORIGINAL DWG	REVISED BY: BJR	DWG NO. IC171100051	REV 1
	CHECKED BY: LF		
	APPROVED BY: LF		
SCALE: NTS	APPROVAL DATE YYYY-MM-DD: 2023-10-05	SHEET 05 OF 08	SIZE D



NOTES:
1. SEE SCC ELECTRICAL DRAWING FOR MORE DETAIL
2. DO NOT ALTER FACTORY WIRING
3. ETHERNET IP SHOWN: OTHER SCADA OPTIONS ARE PROFIBUS, MOUDBUS RTU AND MODBUS TCP
4. ONLY CONNECT SHIELD OF MODBUS AND ANALOG CABLES AT ONE END

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION	ELEC IC, SIGNA2R ANN ARBOR SCC FIELD WIRING DETAIL		
0 0.5 1.0 — 1.0" ON ORIGINAL DWG	REVISED BY BJR	DWG NO. IC171100051	REV 1
	CHECKED BY LF		
	APPROVED BY LF		
SCALE: NTS	APPROVAL DATE YYYY-MM-DD 2023-10-05	SHEET 06 OF 08	SIZE D



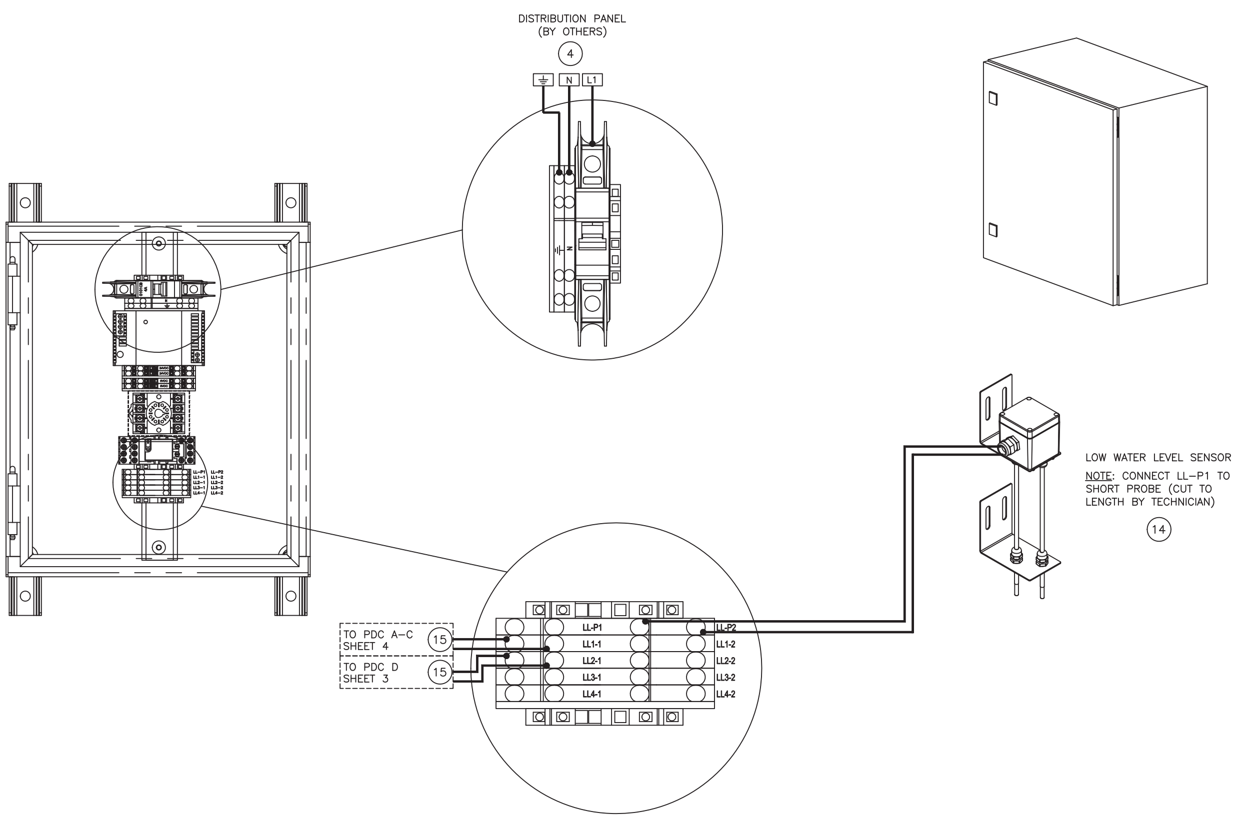
NOTES:
1. SEE SCC ELECTRICAL DRAWING FOR MORE DETAIL
2. ONLY CONNECT SHIELD OF MODBUS AND ANALOG CABLES AT ONE END
3. DO NOT ALTER FACTORY WIRING

TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: ELEC IC, SIGNA2R ANN ARBOR
SCC GATE FIELD WIRING DETAIL

DRAWN BY	SJS	DRG NO.	REV
CHECKED BY	LF	IC171100051	1
APPROVED BY	LF		
APPROVAL DATE (YYYY-MM-DD)	2023-10-05	SHEET 07 OF 08	SIZE D

SCALE: NTS



PDC CONNECTION	
PDC 1A-1C AND PDC 2A-2C	
LL1-1	LL1-2
PDC 1D AND PDC 2D	
LL2-1	LL2-2
SPARE	
LL3-1	LL3-2
SPARE	
LL4-1	LL4-2

NOTES:
1. OPTIONAL EQUIPMENT SHOWN
2. DO NOT ALTER FACTORY WIRING

TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: ELEC IC, SIGNA2R ANN ARBOR LCP FIELD WIRING DETAIL

REVISED BY	BJR
CHECKED BY	LF
APPROVED BY	LF
APPROVAL DATE YYYY-MM-DD	2023-10-05
DWG NO.	IC171100051
REV	1
SHEET	08 OF 08
SIZE	D
SCALE:	NTS

0 0.5 1.0
1.0" ON ORIGINAL DWG

Process & Instrumentation (P&ID) Drawings

GENERAL INSTRUMENT OR FUNCTION SYMBOLS

	LOCATION NORMALLY ACCESSIBLE TO OPERATOR	FIELD MOUNTED	LOCATION NORMALLY NOT ACCESSIBLE TO OPERATOR
PRIMARY LOCATION OR CONTROL PANEL			
SECONDARY LOCATION OR CONTROL PANEL			

INDICATES A SINGLE INSTRUMENT OR OTHER COMPONENT HAVING MULTIPLE FUNCTIONS

INDICATES GENERAL OR MISCELLANEOUS HARDWARE INTERLOCK

ABBREVIATION

1. SCC – SYSTEM CONTROL CENTER
2. PDC – POWER DISTRIBUTION CENTER
3. HSC – HYDRAULIC SYSTEM CENTER
4. CH – CHANNEL
5. UV – ULTRA VIOLET
6. OSC – OPEN–STOP–CLOSE
7. LOR – LOCAL–OFF–REMOTE

INSTRUMENT LINES AND SYMBOLS

 DISCRETE SIGNAL

 ANALOG SIGNAL

 PROCESS LINE

 SOFTWARE LINK VIA DATA HIGHWAY

 INSTRUMENT SUPPLY OR CONNECTION TO PROCESS

 HYDRAULIC LINE

▲ ANALOG INPUT

△ DISCRETE INPUT

INSTRUMENTATION FUNCTIONAL CODE

	FIRST LETTER		SUCCEEDING LETTER		
	MEASURED OR INITIATING VARIABLE	(MODIFIER)	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	(MODIFIER)
A	ANALYSIS		ALARM		
C			CONTROL		CLOSE
D	DENSITY	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO			
G			GLASS OR VIEWING DEVICE		
H	HAND (MANUAL)				HIGH (OPENED)
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		PILOT LIGHT		LOW (CLOSED)
M		MOMENTARY			MIDDLE OR INTERMEDIATE
O			ORIFICE		OPEN
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE OR TOTALIZE			
R	RADIATION		RECORD		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE (1)		MULTIFUNCTION (1)	MULTIFUNCTION (1)	MULTIFUNCTION (1)
V	VIBRATION, MECH ANAL.			VALVE, DAMPER OR LOUVER	
W	WEIGHT OR FORCE		WELL		
X	STATUS				
Y	EVENT, STATE OR PRESENCE			RELAY, COMPUTE OR CONVERT	
Z	POSITION			DRIVE, ACTUATE OR UNCLASSIFIED FINAL ELEMENT	

TABLE NOTE:–
(1) WHEN USED SYMBOL OR SIGNAL LINE IS ANNOTATED.

DEVICE SYMBOLS

 – MOTORIZED GATE

 – CAPACITANCE PROBE

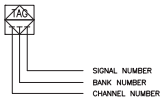
 – ULTRA SONIC LEVEL SENSOR

 – RECIRCULATION PUMP

 – WEIR

 – AUTOMATIC LEVEL CONTROLLER (ALC)

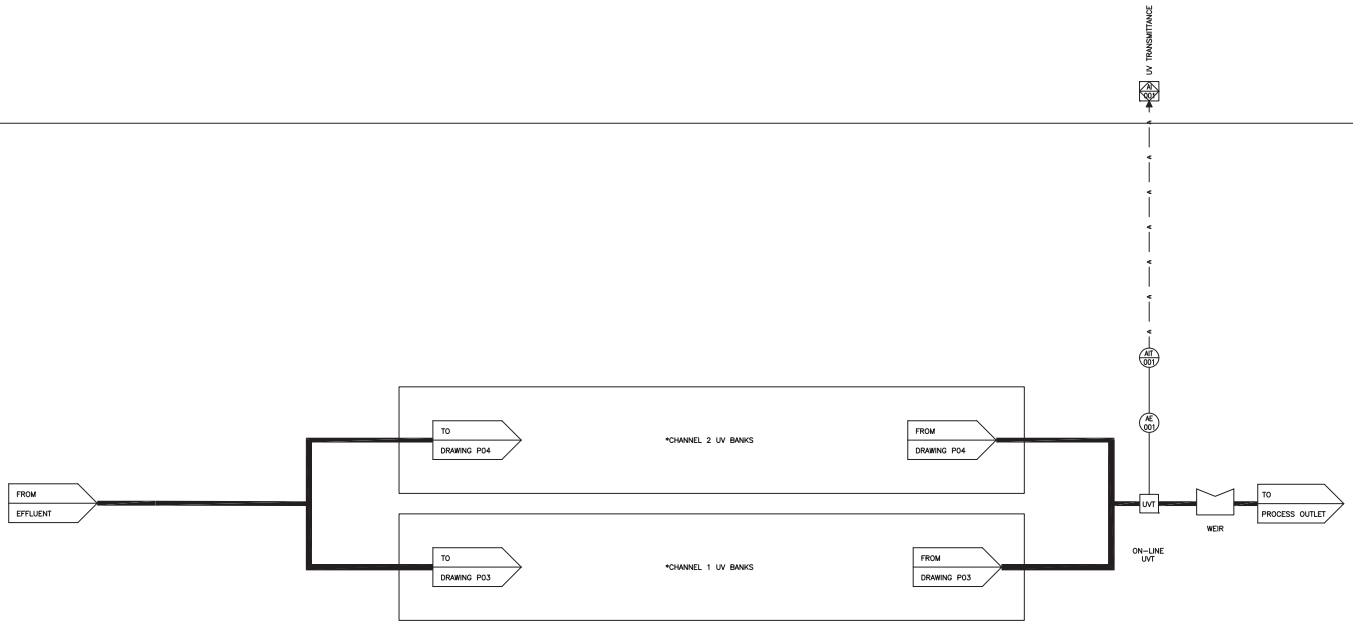
GENERAL INSTRUMENT TAG NUMBER LEGEND



DESCRIPTION:	LAYOUT, TROJANUVSIGNA ANN ARBOR REPLACEMENT MI
DRAWN BY : JRN	DATE : 230C04
CHECKED BY : SPM	DATE : 230C05
APPROVED BY : MB	DATE : 230C05
SCALE (11x17) : 1/8" = 1'–0"	LOG NUMBER : N/A
QUOTE NO.	223428
PROJECT NO.	171100051
DWG NO.	S01
REV.	B

SYSTEM CONTROL CENTER (SCC)

FIELD



*PLEASE NOTE: CHANNEL PROVIDED BY OTHERS.

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CHECKED BY : SPM	DATE : 230C05	DWG NO. S02 / REV. B
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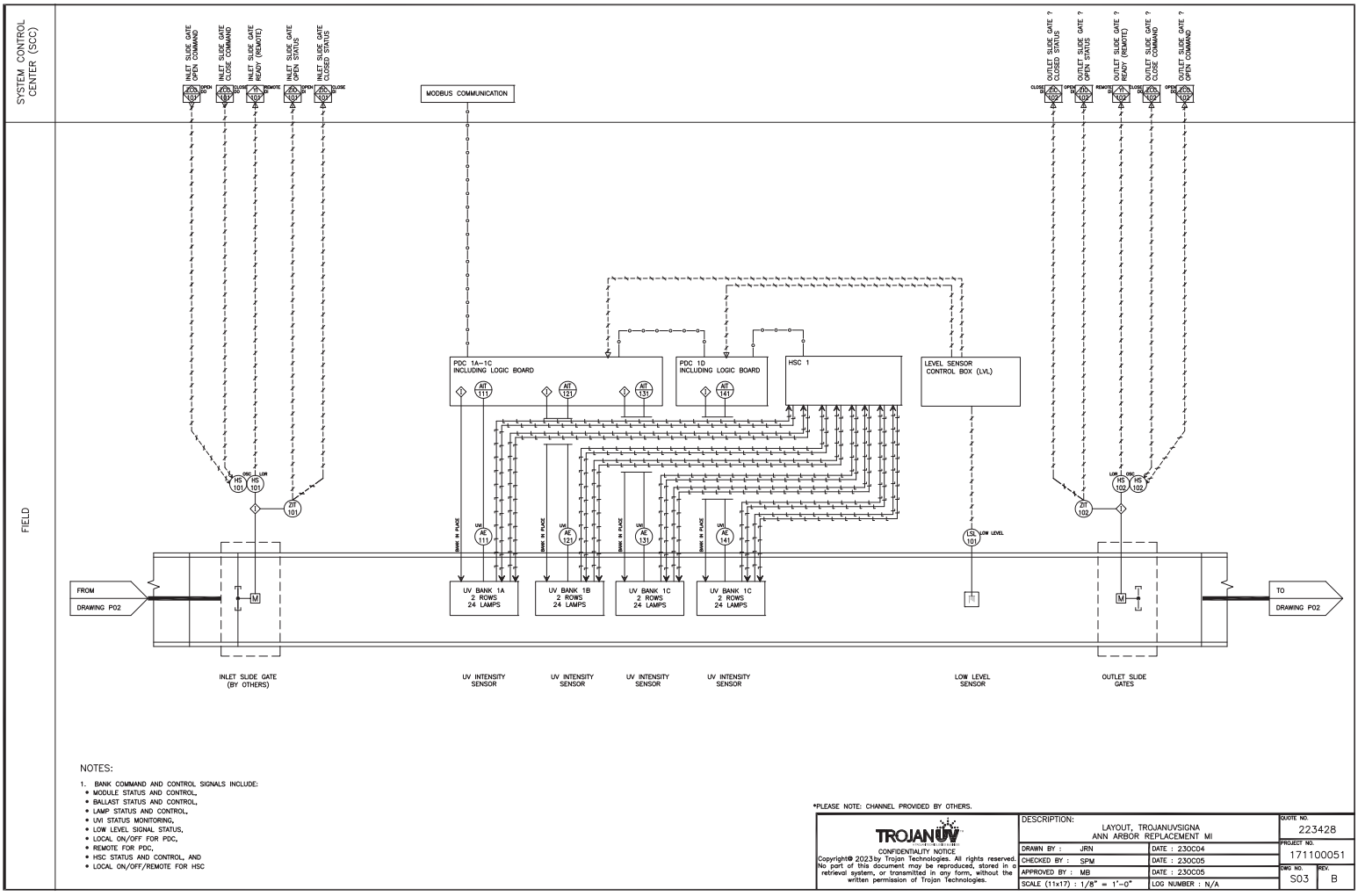

NOTES:

1. BANK COMMAND AND CONTROL SIGNALS INCLUDE:
   - MODULE STATUS AND CONTROL,
   - BALLAST STATUS AND CONTROL,
   - LAMP STATUS AND CONTROL,
   - UVI STATUS MONITORING,
   - LOW LEVEL SIGNAL STATUS,
   - LOCAL ON/OFF FOR PDC,
   - REMOTE FOR PDC,
   - HSC STATUS AND CONTROL, AND
   - LOCAL ON/OFF/REMOTE FOR HSC

*PLEASE NOTE: CHANNEL PROVIDED BY OTHERS.

TROJANUV

DESCRIPTION: LAYOUT, TROJANUVSIGNA ANN ARBOR REPLACEMENT MI		QUOTE NO. 223428
DRAWN BY : JRN	DATE : 230C04	PROJECT NO. 171100051
CHECKED BY : SPM	DATE : 230C05	
APPROVED BY : MB	DATE : 230C05	DWG NO. S03 / REV. B
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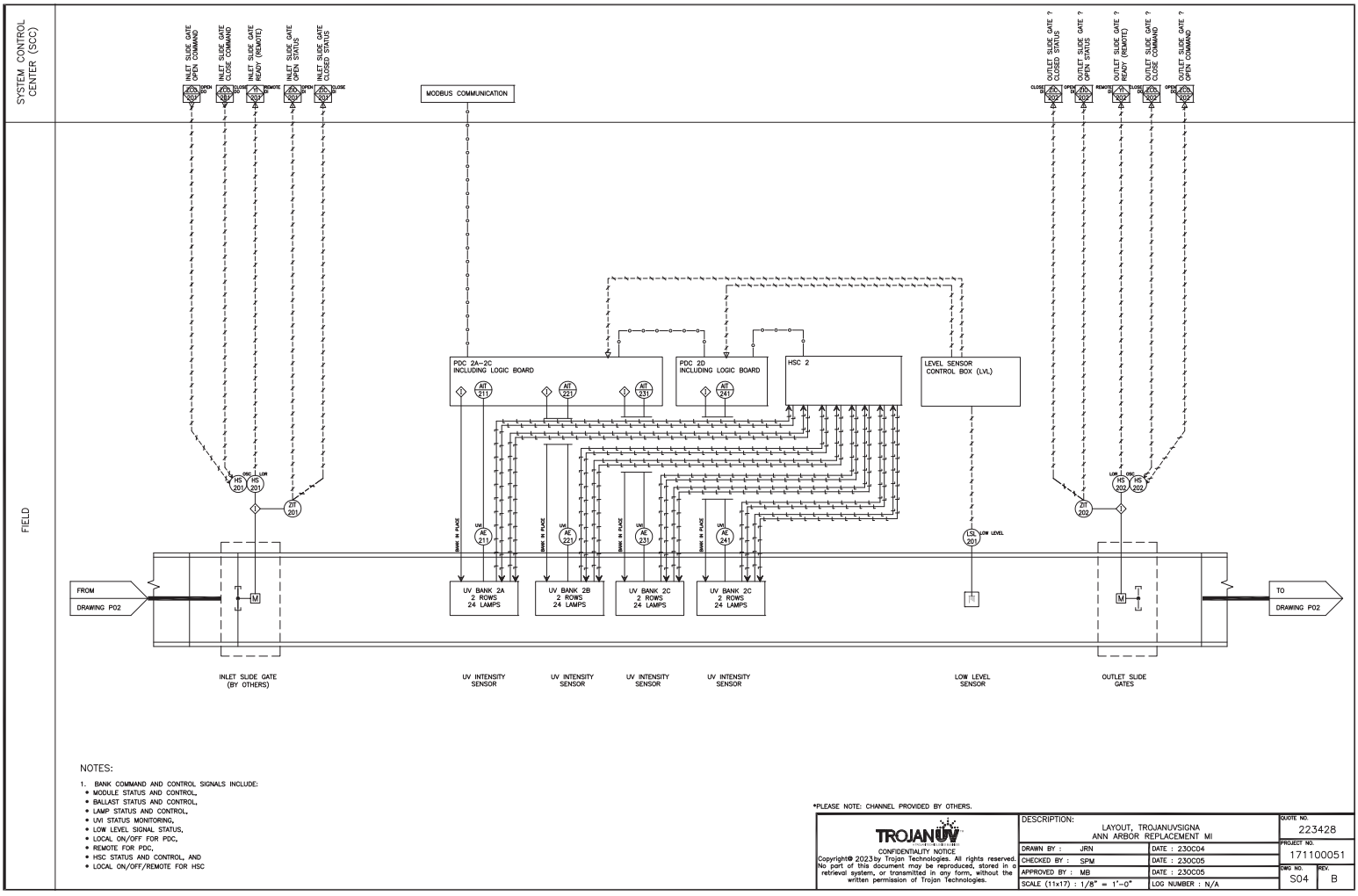

NOTES:

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   - LAMP STATUS AND CONTROL,
   - UVI STATUS MONITORING,
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   - REMOTE FOR PDC,
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*PLEASE NOTE: CHANNEL PROVIDED BY OTHERS.

TROJANUV

DESCRIPTION: LAYOUT, TROJANUVSIGNA ANN ARBOR REPLACEMENT MI		QUOTE NO. 223428
DRAWN BY : JRN	DATE : 230C04	PROJECT NO. 171100051
CHECKED BY : SPM	DATE : 230C05	
APPROVED BY : MB	DATE : 230C05	DWG NO. S04 / REV. B
SCALE (11x17) : 1/8" = 1'-0"	LOG NUMBER : N/A	

PRODUCT INFORMATION

SECTION CONTENTS

TROJAN UV™

A TROJAN TECHNOLOGIES BUSINESS

TROJANUVSIGNA®

Operation and Maintenance

User Manual

Original Instructions

Edition 10

DC340101-10-01

If you require technical assistance, please contact the Technical Assistance Center (TAC) using the contact information below:

North America:	1-866-388-0488
All other areas:	1-519-457-2318
E-mail:	tac@trojantechnologies.com

At the time of publishing, the information within this document is current. Due to continuous improvements, we may have future changes and recommendations which will be sent via product bulletins.

Table of Contents

Section 1 Specifications

Specifications are subject to change without notice.

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<tr><td colspan="6">Channel Frame and UV Bank</td></tr>
<tr><td rowspan="11">Weight</td><td rowspan="2"># Lamps</td><td colspan="2">UV Bank
(Fully Assembled)</td><td colspan="2">Channel Frame</td></tr>
<tr><td>Kg</td><td>Lbs</td><td>Kg</td><td>Lbs</td></tr>
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<tr><td>18</td><td>259</td><td>570</td><td>113</td><td>250</td></tr>
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<tr><td colspan="6">Hydraulic System Center</td></tr>
<tr><td>Voltage</td><td colspan="5">Refer to Component Label or Electrical Drawings</td></tr>
<tr><td>Enclosure Rating</td><td colspan="5" rowspan="3">Refer to Component Label or System Description</td></tr>
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<tr><td>Material</td></tr>
<tr><td>Weight</td><td colspan="5">454 kgs (1000 lbs) - Single Cabinet
726 kgs (1600 lbs) - Double Cabinet
Refer to Component Label for actual weight</td></tr>
<tr><td>Cooling Type</td><td colspan="2">with Forced Air (no A/C)
Note: Must be suitable for electrical distribution and drive equipment</td><td colspan="3">with Air Conditioner (A/C)</td></tr>
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<tr><td>Maximum Distance between PDC to UV Bank Edge</td><td colspan="5">Refer to notes in project layout drawing, 14AWG, four (4) conductor, tray cable</td></tr>
</table>

Specifications

System Control Center (SCC)	
Voltage	Refer to Component Label or Electrical Drawings
Enclosure Rating	Refer to Component Label or System Description
Material	
Weight	
UVI Sensor	
Supply voltage	24 VDC from the PDC
Water Level Sensor	
Supply voltage	Refer to Electrical Drawings
System Certification	
UL, CE available	

Section 2 Safety Information

Please read this entire manual before installing this equipment. Pay attention to all danger, warning and caution statements in this manual. Failure to do so could result in serious personal injury or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in installation manual.

2.1 Use of Hazard Information

⚠ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a situation that is not related to personal injury.

2.2 Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.

	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user. ***Note**: For recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal. No equipment is to be returned without authorization. Local recycling programs may be used. For the manufacturer recycling UV lamp program or producer-supplied electrical accessories and auxiliary items, contact the equipment supplier for proper disposal instructions.*
	This symbol indicates there is Mercury present.
	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. When on the equipment, refer to the Operation and Maintenance manual for additional safety information.
	This symbol indicates a risk of electrical shock and/or electrocution exists.
	This symbol indicates the marked item has stored energy. Obey procedures to wait 5 (five) minutes after disconnecting main power, to allow stored energy to dissipate.
	This symbol indicates the marked item is a pressurized device. Obey all procedures to safely depressurize.
	This symbol indicates the marked item could inject fluid into the skin.

	This symbol indicates a potential crushing pinch hazard.
	This symbol indicates a lifting clearance hazard.
	This symbol indicates a trained and competent lift operator should be used to move the equipment.
	This symbol indicates a body crush hazard. People should stay clear from under overhead loads.
	This symbol indicates there is a potential fall from height hazard.
	This symbol indicates surfaces may be slippery and there is a potential fall hazard.
	This symbol indicates there is a potential UV hazard. Proper protection must be worn.
	This symbol indicates the marked item could be hot and should not be touched without gloves.
	This symbol indicates the presence of devices sensitive to Electro-static Discharge (ESD). Proper care must be taken to prevent damage to the equipment.
	This symbol indicates the marked item should not be touched.
	This symbol indicates a risk of electrical shock and/or electrocution exists, and that all appropriate lockout tag out procedures must be obeyed.
	This symbol indicates to secure the device with a safety device / hook.
	This symbol indicates a safety glasses with side protection is required for protection against UV exposure.
	This symbol indicates a UV rated full face shield is required. Faces shields are to be worn with safety glasses or safety goggles.

	This symbol indicates gloves must be worn.
	This symbol indicates safety boots must be worn.
	This symbol indicates hearing protection is required.
	This symbol indicates a hard hat must be worn.
	This symbol indicates safety harness or fall protection equipment must be worn.
	This symbol indicates the operator must read all available documentation to perform the required procedures.

2.3 Safety Precautions

Read the safety precautions in this section before doing installation, maintenance, service or repair. Obey the instructions in the safety precautions. Failure to follow the instructions in the safety precautions can result in serious injury or death.

⚠ DANGER



Arc Flash and Shock Hazard - Live Electrical Circuit Present.

- Failure to follow these instructions will result in electrical shock, injury or death from electrocution.
- Equipment should be accessed by competent personnel only.
- Devices inside this equipment contain stored energy.
- NEVER work inside this equipment until at least 5 (five) minutes after disconnecting main power to allow stored energy to dissipate.
- Lockout tag out all sources of power before performing any inspection, repair, or maintenance. ***There may be more than one source of power!***

⚠ DANGER

Shock Hazard.

- Failure to use manufacturer approved parts, including UV Lamps, may result in significant thermal damage to insulation systems which may result in the exposure of live parts.

⚠ DANGER



Depressurize Device. Fluid Injection Hazard.

- Failure to depressurize hydraulic circuit before servicing will result in serious injury or death due to high pressure hydraulic fluid.
- NEVER physically inspect, repair or do maintenance unless hydraulic circuit has been depressurized by competent personnel.
- Protect hands, face and body before disconnecting hydraulic or other lines.
- If accidental skin injection occurs, seek immediate medical attention.

⚠ DANGER


Fall Hazard.

- Failure to follow these instructions will result in injuries due to fall.
- Always use appropriate fall resistant procedures and equipment while working near an uncovered channel, when a fall hazard is present, in compliance with local regulations.

⚠ WARNING

Personal Injury Hazard.

- Use of parts not approved by the manufacturer may cause personal injury, damage to the UV system or malfunction of the UV System and may void the manufacturer's warranty.
- Use of UV Lamps and Lamp Drivers, not approved by the manufacturer, will void UL and CE product safety certifications.
- The parts listed in Section 11 are approved by the manufacturer.

⚠ WARNING


Body Crush Hazard.

- Failure to follow these instructions could result in serious injury or death due to improper lifting procedures, underrated lifting equipment and, moving parts.
- ALWAYS secure with safety device.
- ALWAYS stay clear of elevated loads.
- ALWAYS comply with local safety regulations.

⚠ WARNING

Pinch Hazard.

- Failure to follow these instructions could result in serious injury or death due to moving parts.
- ALWAYS keep hands clear of this area.

⚠ CAUTION


Burn Hazard.

- Failure to follow these instructions may result in minor or moderate injury due to burns.
- NEVER touch hot surface.
- Allow UV lamps to cool for a minimum of 10 (ten) minutes before handling.
- If accidental exposure occurs, immediately cool affected area. Consult physician.

⚠ CAUTION

Slip and Fall Hazard.

- Failure to follow these instructions may result in injuries from slip and fall.
- ALWAYS ensure safe footing.
- ALWAYS clean up spills promptly.
- ALWAYS comply with site-specific safety protocols and procedures.

⚠ CAUTION

UV Light Hazard.

- Failure to follow these instructions may result in serious burns to unprotected eyes and skin.
- ALWAYS use UV protective gear, including gloves, clothing, and face shield when UV light is present.
- NEVER look directly at illuminated UV lamp, even with protective gear.
- NEVER illuminate UV lamp if personnel may be directly exposed to UV light.

NOTICE

Mercury Chemical

- UV lamps contain a small amount of mercury in either elemental or bound amalgam state, depending on lamp type. These lamps are similar to fluorescent and compact fluorescent lamps (CFL). Always comply with local regulations governing the disposal of lamps containing mercury and the waste associated with breakage.
- NEVER use a vacuum cleaner to clean up broken lamps containing mercury. Vacuuming could spread mercury-containing powder or vapor.
- Thoroughly collect broken glass and trace amounts of mercury and place into a sealable bag or container. For further reference see the U.S. EPA guidelines http://www.epa.gov/cfl/cleaning-broken-cfl.
- If you have further questions about the safe clean-up of mercury containing lamps, contact the TrojanUV Technical Assistance Center at tac@trojantechnologies.com.

NOTICE

Personal Protective Equipment Required.

- ALWAYS use appropriate eye, hand, and foot protection.
- ALWAYS wear UV-C safety glasses when around equipment or a UV-C faceshield with safety glasses or safety goggles when inspecting open running equipment.
- ALWAYS follow plant safety procedures and protocols.
- ALWAYS take necessary precautions when working around, operating, or working on this equipment, if contamination of components is expected within this application due to effluent biological or chemical contaminants.

NOTICE

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this manual. Maintain the continuity of the lockout tag out between shifts. If you do not understand the information or procedure explanations in this manual, STOP.

NOTICE

The **TrojanUVSigna®** has been validated through microbial testing. Through this testing, performance data has been generated for UV dose delivery to inactivate Escherichia coli (E. coli) and fecal coliform.

WARNING: This product can expose you to chemicals including phthalates, which is known to the State of California to cause cancer, and mercury, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Notes: *1) Dispose of contaminated parts/components as per country requirements.*

2) Refer to the Safety Data Sheets for accidental exposure to materials.

Section 3 General Information

The information in this manual has been carefully checked and is believed to be accurate. However, the manufacturer assumes no responsibility for any inaccuracies that may be contained in this manual. In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. In the interest of continued product development, the manufacturer reserves the right to make improvements in this manual and the products it describes at any time, without notice or obligation.

3.1 Acceptable Noise Levels

The airborne noise emissions, A-weighted emission sound pressure level, is below 80dB(A). When working within 10 feet of the air conditioner hearing protection must be worn.

3.2 Patents and Permissions

The products described in this document may be protected by one or more patents in The United States of America, Canada and/or other countries. For a list of patents owned by Trojan Technologies, go to: www.trojantechnologies.com/patents.

3.3 Abbreviations and Acronyms

Table 1 describes the abbreviations and acronyms included in this manual.

Table 1 Abbreviations and Acronyms

Abbreviation/Acronym	Description
BCB	Bank Control Board
ESD	Electro-Static Discharge
HMI	Human Machine Interface
HSC	Hydraulic System Center
kgs	Kilograms
lbs	Pounds
PDC	Power Distribution Center
SBC	Sensor Base Control
SCADA	System Control and Data Acquisition
SCC	System Control Center
UPS	Uninterruptible Power Supply
UV	Ultraviolet
UVI	UV Intensity
UVT	UV Transmittance

3.4 System Overview

The system is an open-channel, UV system that uses high-output amalgam UV lamps in an inclined, staggered array for use with Municipal waste water.

The system includes:

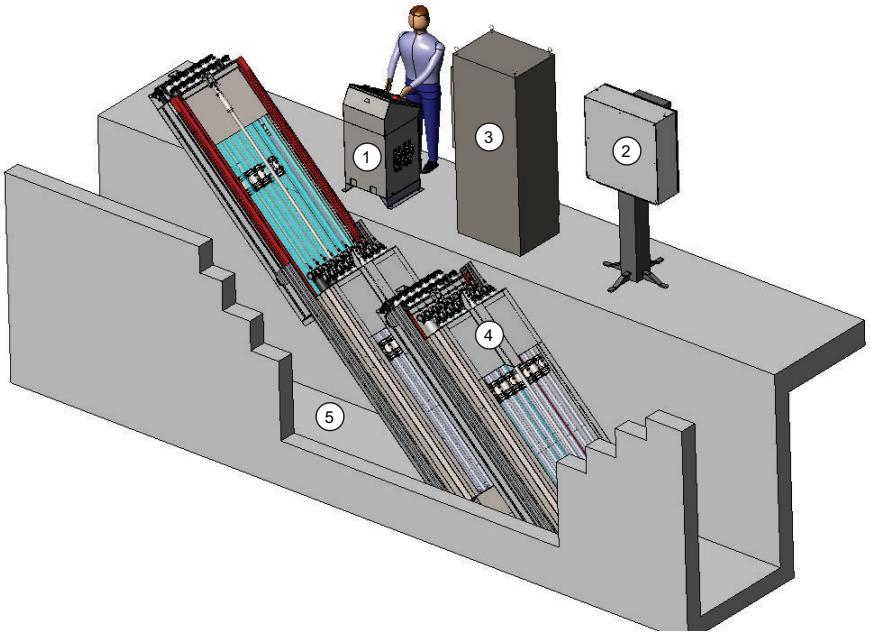


Figure 1 System Overview

1	Hydraulic System Center	**2**	System Control Center
3	Power Distribution Center	**4**	UV Bank
5	UV Channel (by others)	**6**	Level Controller (options) (not shown)
7	Low Water Level Sensor (not shown)	**8**	High Water Level Sensor (optional) (not shown)

3.4.1 System Control Center (SCC)

The SCC monitors and controls all UV functions, including dose pacing. Dose pacing is an automatic, effluent parameter based program that maintains a constant performance while conserving power and extending UV lamp life.

3.4.2 Hydraulic System Center (HSC)

The HSC actuates the ActiClean Cleaning System (ACS). The HSC contains the pump, valves and additional equipment required to operate the cleaning system and lift/lower the UV Bank.

ActiClean Sleeve Cleaning System

Dual-action cleaning system uses mechanical wiping in conjunction with a cleaning solution contained within wiper canisters surrounding the quartz sleeves. This system operates automatically, without operator involvement. Quartz sleeves and intensity sensors are cleaned regularly without disrupting operation.

3.4.3 Power Distribution Center (PDC)

The PDC contains lamp drivers that power and control the UV lamps.

3.4.4 UV Bank

A UV bank consists of UV Lamps, positioned in a staggered, inclined array.

3.4.5 Low Water Electrode Level Sensor

One low water electrode level sensor is located in each channel between the furthest downstream UV bank and the level controller. If a preset low water level condition exists, the UV lamps will de-energize and remain off until the proper water level is present.

Section 4 Lockout Tag Out

⚠ DANGER

Obey all warning and caution statements. Refer to Section 2.

Read and understand this Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

The procedure in Section 4.1 is the minimum lockout requirement. Use additional precautions, as needed. Obey all site-specific protocols.

4.1 Lockout Tag Out Procedure

4.1.1 Equipment Shutdown

Contact the plant manager or shift supervisor for help regarding equipment location and identification.

1. Ensure that no hazards will be created by equipment shutdown.
2. Shut down all equipment that will need Lockout Tag Out.
3. Ensure that all moving parts come to a complete stop.

4.1.2 Deactivate Energy Sources

A hazardous energy source is any energy source that can cause serious personal injury or death. The potential hazardous energy sources in this system are:

1. Identify and deactivate the main isolating device of each energy source:
   -  Electrical energy (Incoming power)
   - 

Hydraulic (Hydraulic Pressure)
   -  Thermal (Thermal energy)
   - 

UV Light (Radiation Energy)
   -  Mechanical (Kinetic Energy)
2.  Disconnect all electrical equipment from power:
   - Disconnect all electrical equipment
   - Power off and disconnect electrical power to hard-wired equipment
3.  Dissipate stored electrical energy in lamp drivers.
4. Close all shut-off valves.

4.1.3 Lockout Tag Out Energy Sources

1. Use a multi-lock scissor adapter to lockout each energy source.
2. Attach a completed lockout tag. Include the required information:
   - Person and company applying the lockout
   - Reason for the lockout
   - Date of the lockout
3. Apply a personal lock.

4.1.4 Lockout Tag Out PDC for Individual Bank Compartments

1. Select the appropriate PDC compartment for the UV Bank to be shutdown (i.e Bank 1A and PDC compartment Bank 1A).
2. Follow standard lockout tag out procedures.

4.1.5 Verify the Lockout

1. Ensure that the meter is working correctly with a test before and after measuring the de-energized source:
   a. Test the voltmeter to a known, energized 24 VAC/120 VAC source.
   b. Use the same voltmeter to test the locked-out energy sources to verify that there is no voltage.
   c. Test the voltmeter again to a known, energized 24 VAC/120 VAC source.
2. Ensure that the stored energy sources have dissipated.
3. Try to start the de-energized equipment.

4.2 Remove the Lockout Tag Out

When the work is finished and the system has been restored to full operational condition, the lockout tag out can be removed.

1. Ensure that no hazards will be created by removal of the lockout.
2. Obey manufacturer's instructions and safe work procedures to energize and start the equipment.

Section 5 Startup and Shutdown

⚠ DANGER

Obey all warning and caution statements. Refer to Section 2.

Read and understand this Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

5.1 Startup the UV System

1. Ensure that all circuit breakers in the UV system are ON.
2. Ensure that the PDC and HSC doors are properly closed.
3. Turn the selector switches on all PDCs to ◯ or (OFF) position (Section 8.2).
4. Ensure that the UV Banks are in the Home position. If not, turn on power at HSC and lower the UV Bank to Home position (Section 8.1.3).
5. Ensure that all solid grating sections are in place.
6. Ensure that the HSC is in ↗ or (REM) wipe mode for all UV Banks and the Mode Selector Switch is at ↗ or (REM) position (Section 8.1).
7. Ensure at SCC, system mode is set to ◯ or (OFF) (Section 8.2).
8. Switch on all power to the PDC and SCC.
9. Turn disconnect on HSC and PDC to | or (ON) (Section 8.1.1 and Section 8.2.1).
10. Turn the selector switches on all PDCs to the ↗ or (REM) position (Section 8.2).
11. Go back to SCC and set system mode to Auto (Section 8.2).

5.2 Shutdown the UV System

5.2.1 Shutdown Procedure for the SCC

1. Home Screen ⟶ Channel Overview Screen ⟶ Select individual UV Bank button ⟶ Change UV Bank model to REMOTE OFF.
2. Repeat step 1 for all remaining UV Banks.

5.2.2 Shutdown Procedure for PDC

1. PDC mode selector switch ⟶ ◯ or (OFF).
2. PDC disconnect ⟶ ◯ or (OFF) (Section 8.2).
3. Lockout Tag Out the upstream main high voltage supply to the PDC (Section 4).

5.2.3 Shutdown Procedure for the HSC

1. Turn all UV Bank wiper group mode switches ⟶ ◯ or (OFF).
2. HSC disconnect ⟶ OFF (Section 8.1).
3. Lockout Tag Out the upstream main high voltage supply to the HSC (Section 4).

5.3 Long Term Storage (i.e. Winterization) Procedures

In some instances, waste water treatment plants are only required to have seasonal operation. If this is the case for your plant, please follow the procedures listed to winterize the UV Equipment.

NOTICE

Ensure power is retained to all panels [i.e. SCC, PDC(s), HSC(s)] by leaving disconnects on for all equipment. Failure to leave panels energized can lead to condensation or corrosion of electronic components. Damage caused by condensation or corrosion of electronic components due to inadequate winterization procedure is not covered by Trojan's warranty.

5.3.1 UV System - UV Banks Lifted out of UV Channel Option

The following procedures outline winterization procedures for a plant that continues flow through the UV Equipment while not in operation.

1. Shutdown the UV System by doing one of the following steps:
   a. Follow the Shutdown Procedure from the SCC. Refer to Section 8.2.1.

      OR

   b. Turn all PDC mode selector switches to the ◯ or (OFF) position.

      Note: *DO NOT turn the PDC disconnect switches to the ◯ or (OFF) position.*
2. Lift UV Banks Up (Section 8.1.3).
3. Remove any debris from the UV Bank.
4. Flush the wiping system (Section 9.7.3).
5. Grease the wiping cylinders (Section 9.9.1).
6. If lamps and lamp sleeves are being left in the UV Bank, ensure all lamp plugs are installed.
7. If lamps are being removed for storage, re-install all lamp plugs into the sleeve sockets.
8. If lamps and sleeves are being removed, cover the lamp plugs with a protective (i.e. waterproof) bag and secure to prevent moisture penetration.
9. Cover UV Bank with tarp to avoid snow or ice buildup in the UV Bank.
10. Make sure that the enclosure doors for the SCC, HSC(s) and PDC(s) are securely closed.

    Note: *HSC's may be optionally covered with a tarp to prevent snow or ice buildup.*

5.3.2 UV System - UV Banks Lowered in UV Channel Option

The following procedures outline winterization procedures for a plant that either diverts flow around the UV Channel OR continues flow through the UV Equipment while not in operation.

1. Shutdown the UV System by doing one of the following steps:
   a. Follow the Shutdown Procedure from the SCC. Refer to Section 8.2.1.

      OR

   b. Turn all PDC mode selector switches to the ◯ or (OFF) position.

      Note: *DO NOT turn the PDC disconnect switches to the ◯ or (OFF) position.*

2. Lift UV Banks Up (Section 8.1.3).
3. Remove any debris from the UV Bank.
4. Flush the wiping system (Section 9.7.3).
5. Grease the wiping cylinders (Section 9.9.1).
6. If there will be effluent present in the UV Channel over the winterization period:
   a. Remove the Lamp Sleeves (Section 9.4.2) and the UVI Sensor Housing (Section 9.5.2). Store UV Lamps, Lamp Sleeves, UVI Sensor(s) and the UVI Sensor Housing in a location in accordance to Section 6.
   b. Cover the lamp plugs with a protective (i.e. waterproof) bag and secure to prevent moisture penetration.
7. If effluent will not be present in the UV Channel over the winterization period, follow steps 6 and 7 in Section 5.3.1.
8. Lift UV Banks Down (Section 8.1.3).
9. Make sure that the enclosure doors for the SCC, HSC(s) and PDC(s) are securely closed.

   Note: *HSC's may be optionally covered with a tarp to prevent snow or ice buildup.*

5.3.3 UVT Controller and Sensor

NOTICE
Use either diluted acid or bleach to clean the UVT sensor. Do not use both.

1. Shut down all power to UVT controller.
2. Disconnect the UVT sensor from the controller.
3. Clean the UVT sensor, especially the optical path. Dry the UVT sensor.
4. Disconnect the controller. Store both the controller and sensor in a dry, clean location where the temperature is above freezing.

5.4 Startup after Extended Periods of Time

1. Inspect for damaged, worn or cracked wiping system hoses and seals.
2. Flush the wiping system (Section 9.7.3).
3. Fill the wiping system (Section 9.7.2).
4. Grease the wiping cylinders (Section 9.9.1).
5. Clean any debris from the UV Bank.
6. Install UV Lamps into UV Bank, if previously removed (Section 9.3.2).
7. Install UVI Sensor Housing (Section 9.5.2) and UVI Sensor (Section 9.5.1) if previously removed.
8. Lift UV Banks down (Section 8.1.3).
9. Start Up the UV System (Section 5.1).

Section 6 Shipment and Storage

The following instructions outline the duties and responsibilities of the contractor on receiving the system. The contractor assumes responsibility for the system after it has arrived at the project site.

These instructions define the minimum requirements for care of the equipment prior to commissioning by the Trojan Service Department. Additional care must be demonstrated by the contractor, as necessary, to ensure that the equipment is not damaged.

6.1 How the Equipment is Shipped

The system is delivered to the site by truck. System components are packed in wooden crates labeled with the component name(s), part number(s) and project number. Other labels identify components which are fragile or breakable and components which must be kept dry.

On receiving the Trojan bank frame and UV banks, unpack and inspect for physical damage. Contact your nearest Trojan Technologies representative in case of missing parts or damage.

Note: *The system is usually shipped as separate pieces - Bank frame, UV banks and Electrical Panels.*

6.2 Storage Requirements

The manufacturer recommends indoor storage of the equipment. The equipment should be stored in a dry warehouse. Heating is not necessary during storage. However, before system startup, the equipment must be warmed to greater than 15ºC (60ºF) for a period of 24 hours.

Storage area conditions:

- Ambient air temperature between -25ºC to 55ºC (-13ºF to 130ºF)
- Ambient Relative humidity from 5% to 100%, condensing environment
- Free from dust and dirt ingress
- Must not contain corrosive or explosive gases
- Free from salt air
- Vermin free

Note: ActiClean Gel must be stored in a non-freezing environment.

If indoor storage is not possible, the UV Bank(s), HSCs and PDCs may be stored outdoors, with additional conditions:

- Equipment is stored on high ground that is not susceptible to flooding.
- Equipment is elevated to a minimum height of 300 mm above the ground or as appropriate to prevent flooding.
- Equipment is completely covered with waterproof tarps to prevent exposure to the elements (e.g., rain, snow, sand, dust, etc.). Tarps must be tight fitting, attached securely and examined regularly. Water and snow accumulation should be removed regularly.
- Storage crates should not be exposed to direct sunlight.
- Equipment can be stored in sea containers.

6.3 Overview of Equipment Connections

Refer to the electrical and layout drawings provided by Trojan Technologies. If the supplied layout drawings does not match the site conditions, contact Trojan Technologies for assistance.

6.4 Startup and System Commission

After the UV system has been shipped, the contractor will be issued documentation for a startup request. These documents must be completed and returned to the issuer before a commission date can be scheduled.

⚠ DANGER

Obey all warning and caution statements. Refer to Section 2.

Read and understand this Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

An appropriate sized crane will be required for off-loading and installation of systems. The size of the crane is dependent on each project configuration. Refer to Section 1 and to project documentation for assembled weights of the components. Use additional precautions, as needed. Obey all site-specific protocols.

The contents of the Installation Section are separated into two (2) main sections:

- Section 7.1 Contractor(s) Scope of Work for Mechanical focused installation procedures relating to the UV System panels, UV Banks and Additional Equipment.
- Section 7.2 Contractor(s) Scope of Work for Electrical / Interconnections focused installation procedures relating to the UV System wiring, cables and hoses.

Important Note: *Review all contents of Section 7.1.1 and Section 7.2.1 prior to starting the UV System installation process.*

7.1 Panels, UV Banks and Additional Equipment

7.1.1 Scope of Work - Mechanical Installation Contractor

Table 2 is a general overview of installation tasks required for the UV System Panels, UV Banks and additional equipment. Installation procedures for interconnecting wires, cables and hoses are found in Section 7.2.

For a complete list of tasks to be completed before system start-up can be initiated, refer to the Start-up Checklist provided by Trojan Service.

NOTICE

DO NOT energize the equipment prior to the Trojan Service Technician arriving on site for system start-up.

Trojan Technologies personnel must install the UVI Sensors, UV Sensor Housing, lamp sleeves and UV lamps in the UV bank.

DO NOT move the wiper, install the UVI sensor, UV Sensor Housing, lamp sleeves and UV lamps, a Trojan Technologies associate will do the initial install when contacted for the system start up.

Table 2 Panels, UV Banks and Additional Equipment Scope of Work - Installation Contractor

Install Task:	Refer to:	The following items must be installed first, in order to complete the installation task:
SCC	Section 7.1.4	--
PDC	Section 7.1.5	--
HSC	Section 7.1.6	--
Level Sensor Control Box	Section 7.1.7	--
Bank Frame Assembly	Section 7.1.8	--
UV Bank	Section 7.1.9	Bank Frame Assembly
Bank Support Assembly	Section 7.1.10	UV Bank
Lift Cylinders	Section 7.1.11	UV Bank
Cable Management Arm	Section 7.1.12	UV Bank
Bank In Place Sensor	Section 7.1.13	UV Bank

Table 2 Panels, UV Banks and Additional Equipment Scope of Work - Installation Contractor

Install Task:	Refer to:	The following items must be installed first, in order to complete the installation task:
Level Sensor	Section 7.1.14	--
Additional Equipment	Section 7.1.15	--

7.1.2 Scope of Work - Trojan Start up Technician

The following tasks are to be completed by a Trojan Startup Technician.

Table 3 Panels, UV Banks and Additional Equipment Scope of Work - Trojan Start up Technician

Task:
Inspect Panel, UV Bank and Additional Equipment installations
Install Lamp Sleeves
Install UV Lamps
Install UVI Sensor Housing
Install UVI Sensor
Fill Wiper Canisters with ActiClean Gel
Cut Level Sensor Rods to length

7.1.3 Tools and Materials

Symbols	Description	Symbols	Description
	Wrench - Open		Wrench - Combination
	Socket Wrench and Socket		Power Drill with Bits
	Hex Key		Level
	Lint-free Cloth (Kimwipes®)		Lifting Straps (properly rated for equipment load)
	Adjustable Wrench		Trowel
	Tape Measure		Pliers - Needlenose
	Wrench - Torque		Grout (by others)
	Anti-Seize		Spreader Bar (properly sized and rated for equipment load)

7.1.4 System Control Center

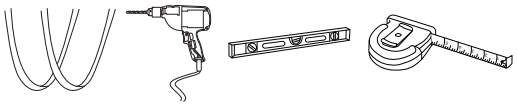
7.1.4.1 Mounting the SCC

Prerequisites:

- Clear area where SCC will be installed. Refer to the project layout drawings.

  Note: *For outdoor installations, the HMI must be positioned away from the sun.*

Tools:



Materials:

- Anchor bolts (by others)
- Electrical Drawings, Electrical Interconnect Drawings, provided

Procedure:

1. Connect lifting straps to the lifting lugs on the SCC. Lift the SCC enclosure into the final installed position.
2. Mark the anchor points on the wall. Lift and set aside SCC enclosure.

   Note: *It is recommended to position the HMI height at a height that an operator can easily read the screen.*
3. Drill anchor bolt holes and install 6 mm (1/4 inch) anchors.
4. Lift and install the SCC enclosure onto the anchors. Secure with mounting hardware as per local codes. Remove lifting straps.

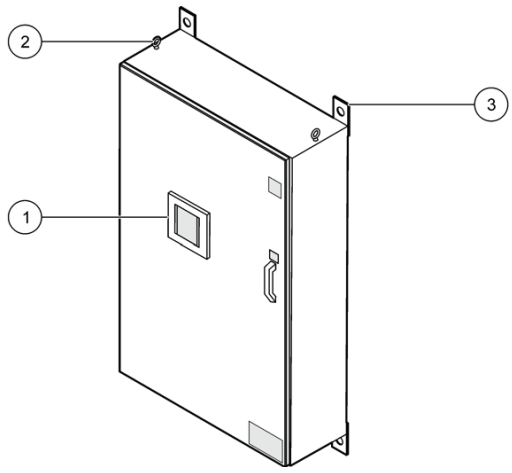


Figure 2 SCC

1	SCC HMI	**3**	Panel mounting lugs
2	Panel lifting lugs		

Note: *For floor mounted SCC's, follow the similar steps as outlined for installing a single PDC (Section 7.1.5.1).*

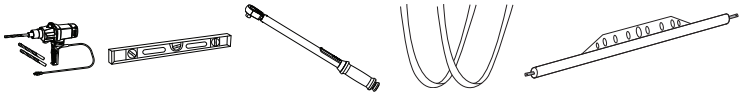
7.1.5 Power Distribution Center

7.1.5.1 Mounting the PDC

Prerequisites:

- Refer to layout drawings for PDC location.
- Clear area where PDC will be installed.
- Refer to Electrical Wiring Diagram, Interconnect Drawing and Layout Drawings provided for additional information.

Tools:

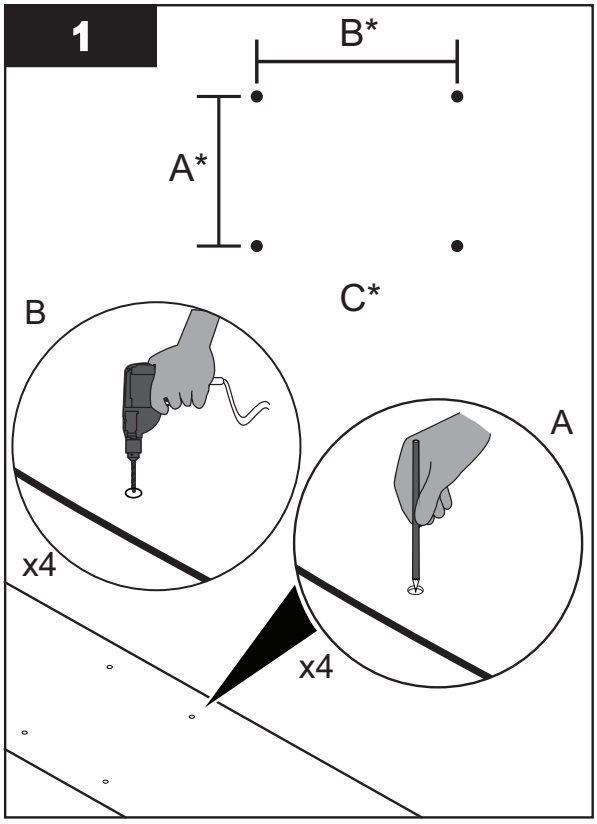


Materials:

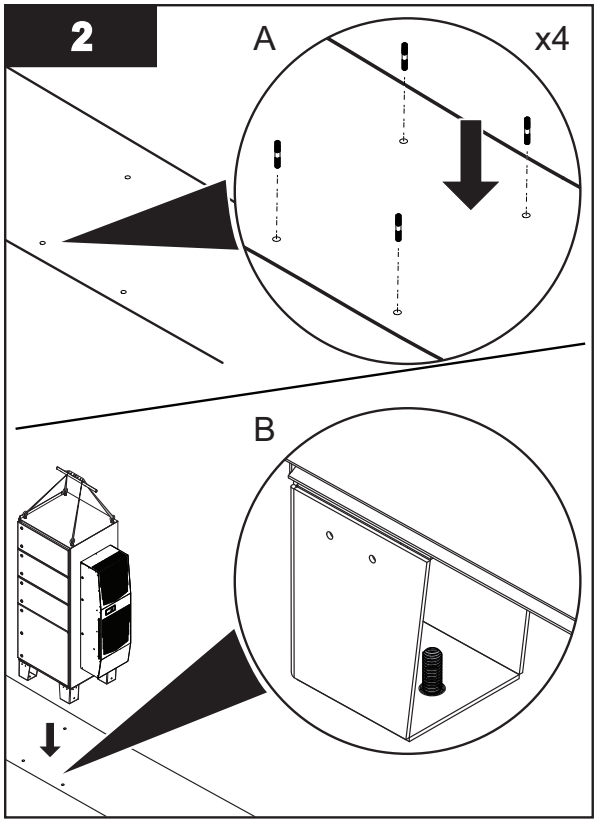
- Anchor bolts (by others)
- Shims (if required, by others)

Procedure:

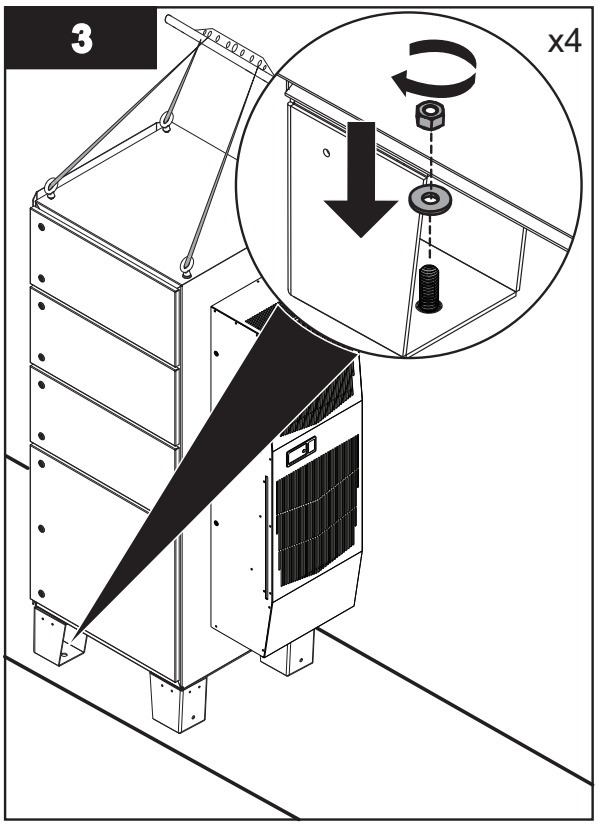
Single PDC:



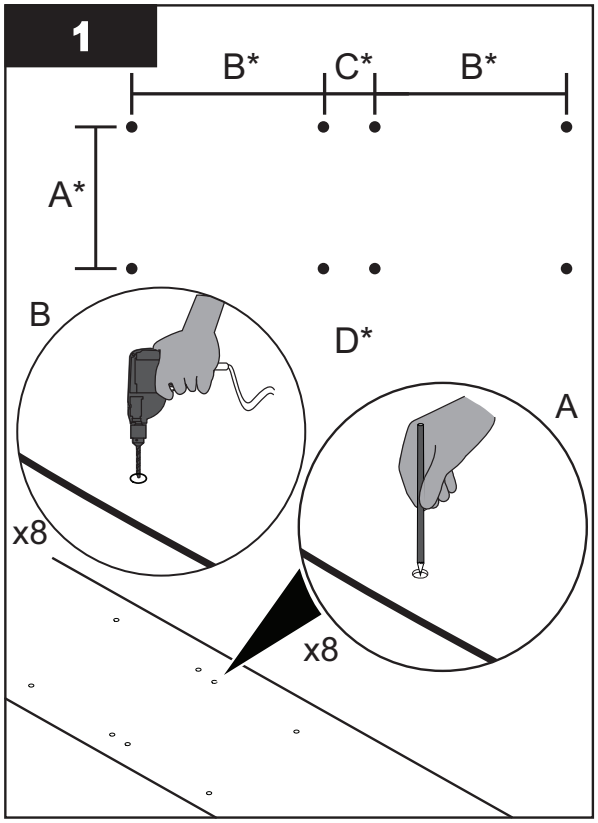
Dimension A* = 573mm (22.59”)
Dimension B* = 560mm (22.05”)
Reference C* = Front of PDC
Mounting Hole Diameter = 22mm (0.87”)



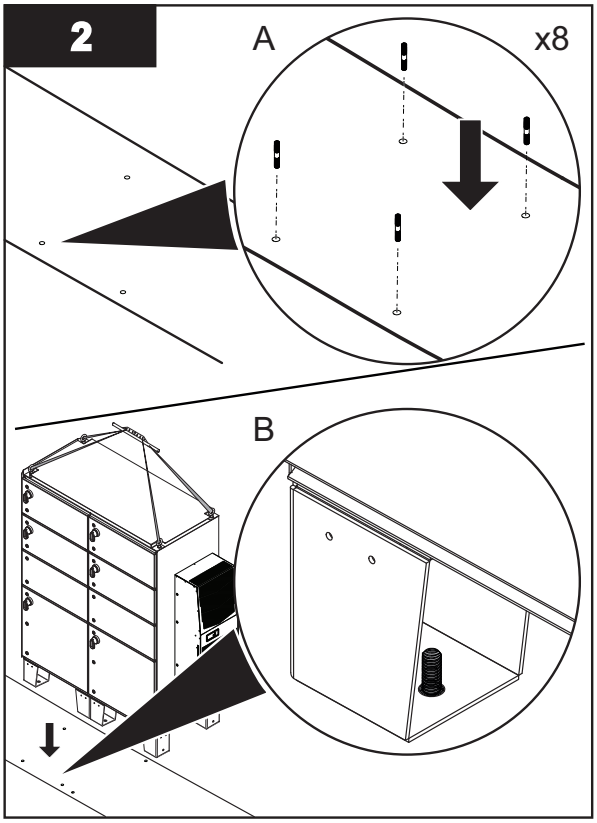
Notes: *1) Install anchor bolts as per civil engineering drawings and/or contract specifications.*
2) Level the PDC in both directions (Top to bottom and front to back). Use shims as required.
3) Fill gap (if any) between the feet and the floor with shims.



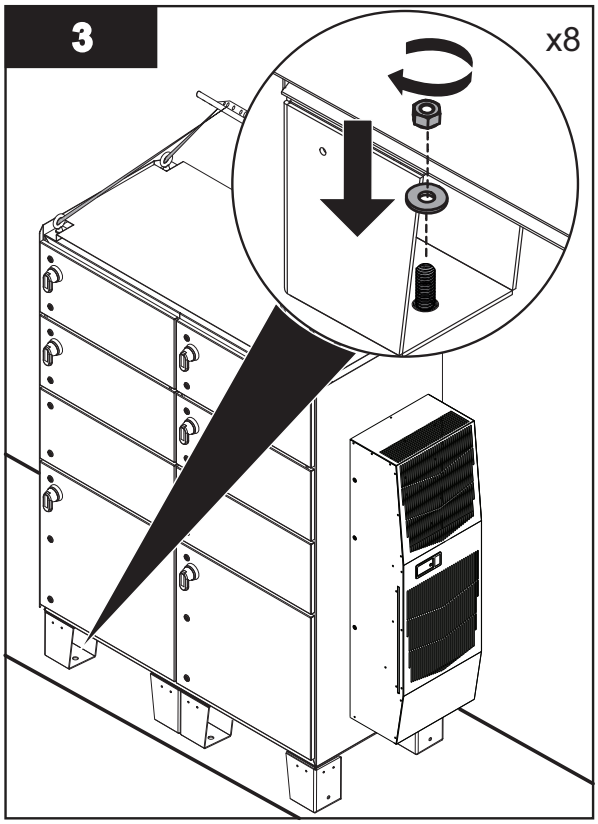
Double PDC:



Dimension A* = 573mm (22.59”)
Dimension B* = 560mm (22.05”)
Dimension C* = 203mm (7.98”)
Reference D* = Front of PDC
Mounting Hole Diameter = 22mm (0.87”)



Notes: *1) Install anchor bolts as per civil engineering drawings and/or contract specifications.*
2) Level the PDC in both directions (Top to bottom and front to back). Use shims as required.
3) Fill gap (if any) between the feet and the floor with shims.



7.1.6 Hydraulic System Center

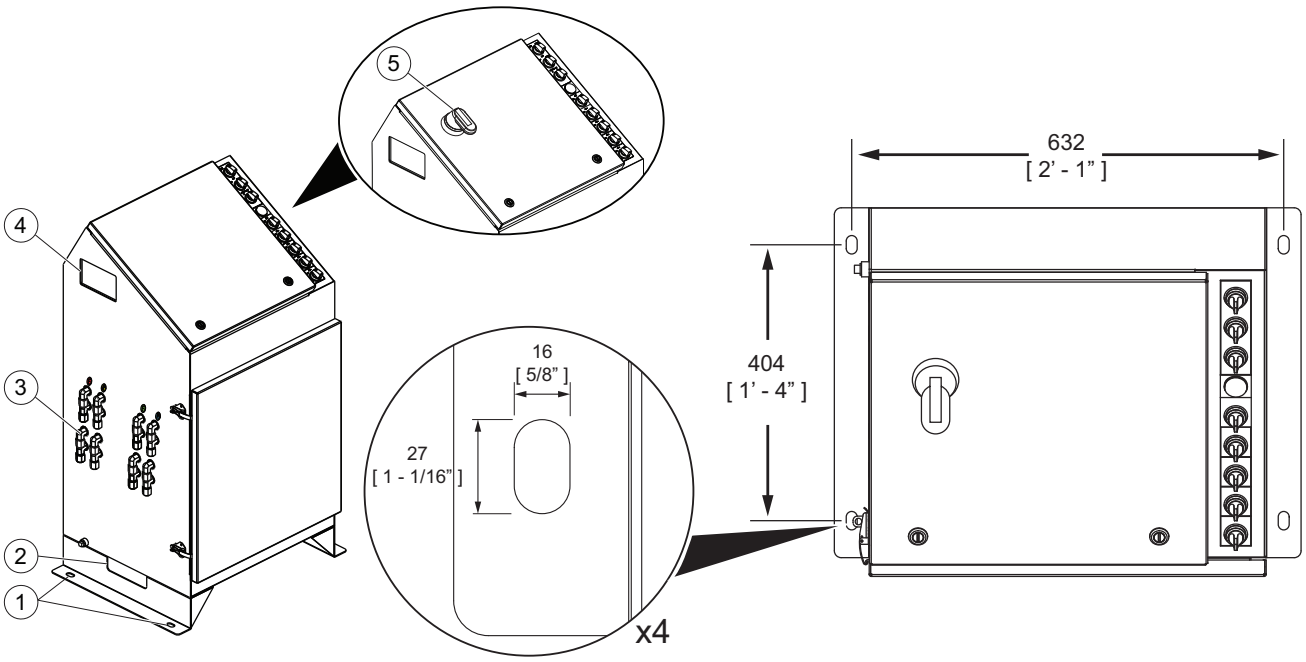


Figure 3 HSC Assembly Mounting and Connections

1	Mounting Holes (4x)	**4**	Gland Plate Low Voltage (Left Side) High Voltage (Right Side)
2	Lifting sling access	**5**	Disconnect Handle (optional)
3	Hydraulic Ports		

7.1.6.1 Mounting the HSC

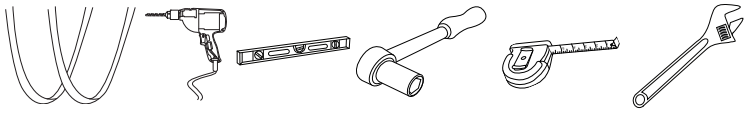
Prerequisites:

- Refer to project layout drawing for HSC placement.
- Clear area where HSC will be installed.

Notes: *1) Keep bends and elevation changes in the hydraulic hoses to a minimum.*

2) The maximum hose distance for the HSC is 15.2 m (50 feet).

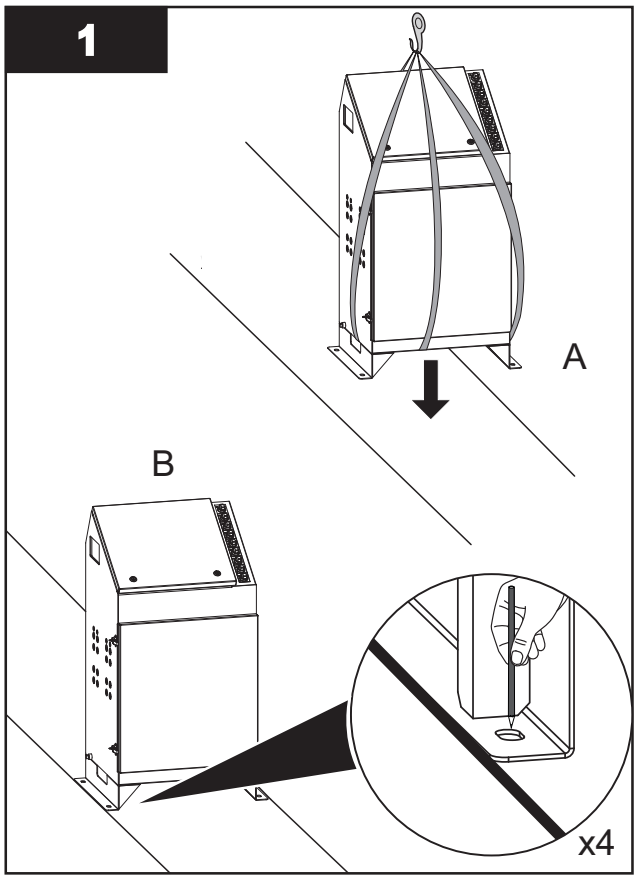
Tools:

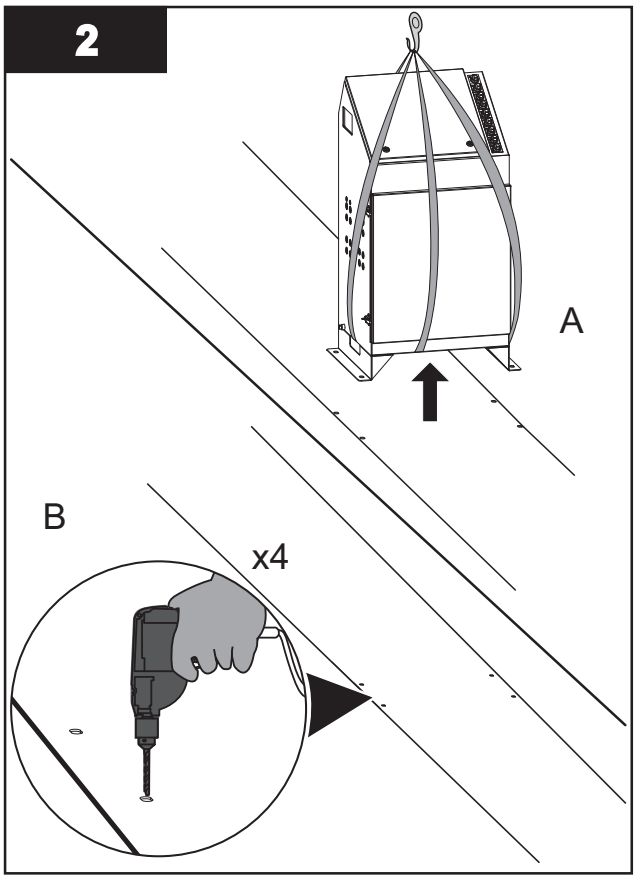


Materials:

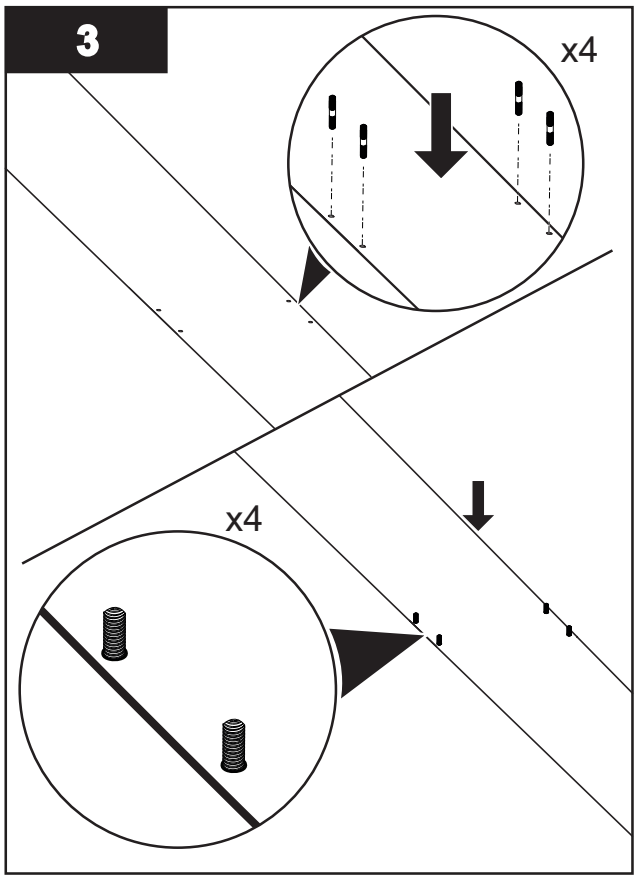
- Anchor hardware (by others)

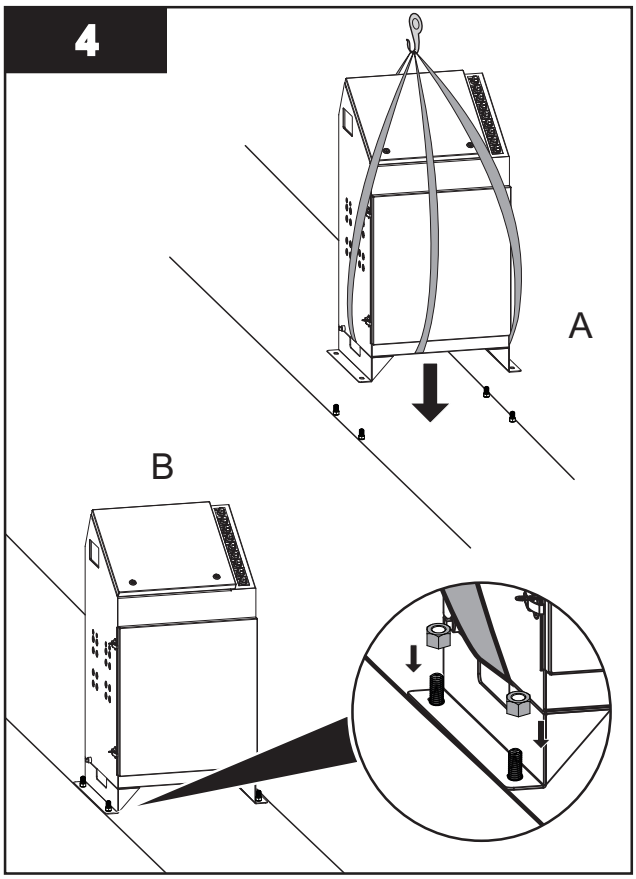
Procedure:





Note: *Install lifting straps as required to safely lift and lower the HSC.*





Note: *Level the HSC in both directions (Top to bottom and front to back.*

7.1.7 Level Sensor Control Box

Refer to **DC090601-006** for installation instructions.

7.1.8 Bank Frame Assembly

NOTICE

DO NOT remove the frame support located in the middle of the frame assembly. Remove only after the bank frame grouting is complete.

Prerequisites:

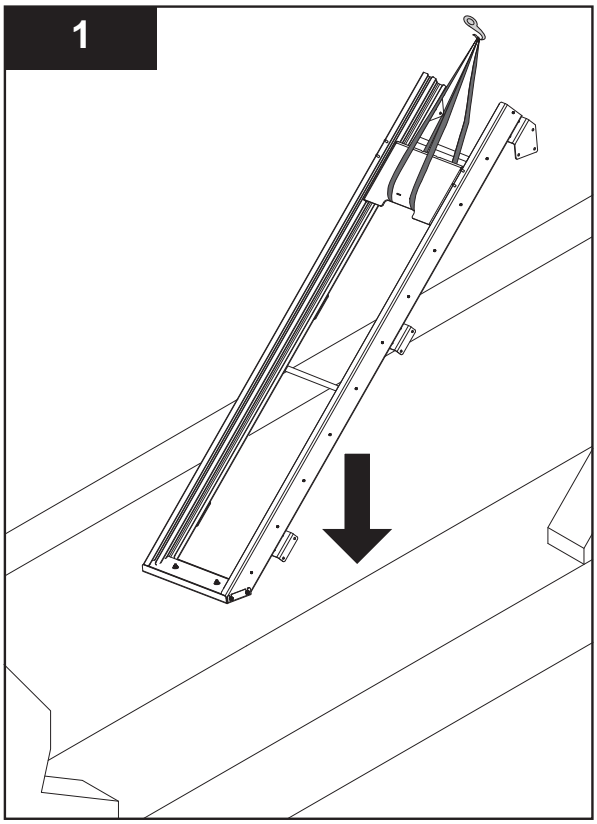
- Refer to Project Layout Drawings provided by the manufacturer for install location.
- The Bank Support Assembly is strapped to the Bank Frame for shipping purposes. Remove and set aside, until it is the time for installation (Section 7.1.10).

Tools:

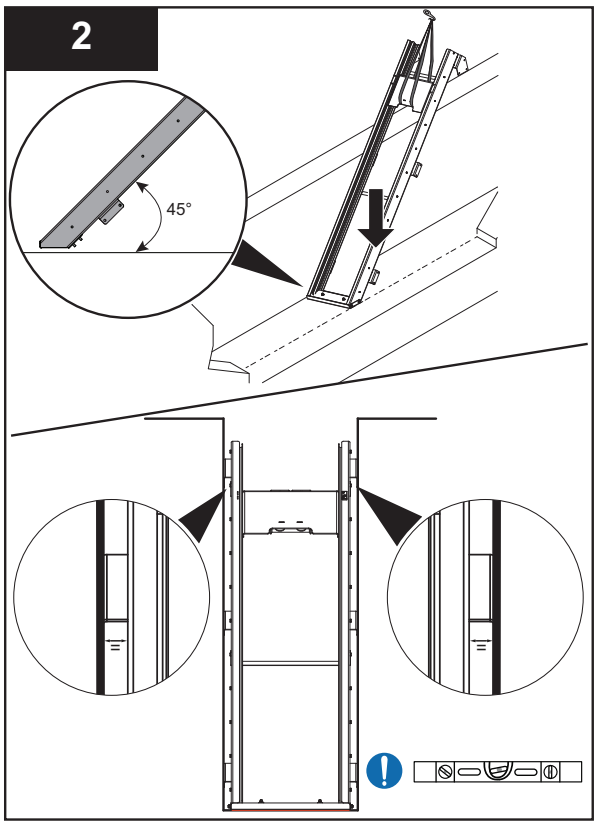
Materials:

- Anchors (provided)

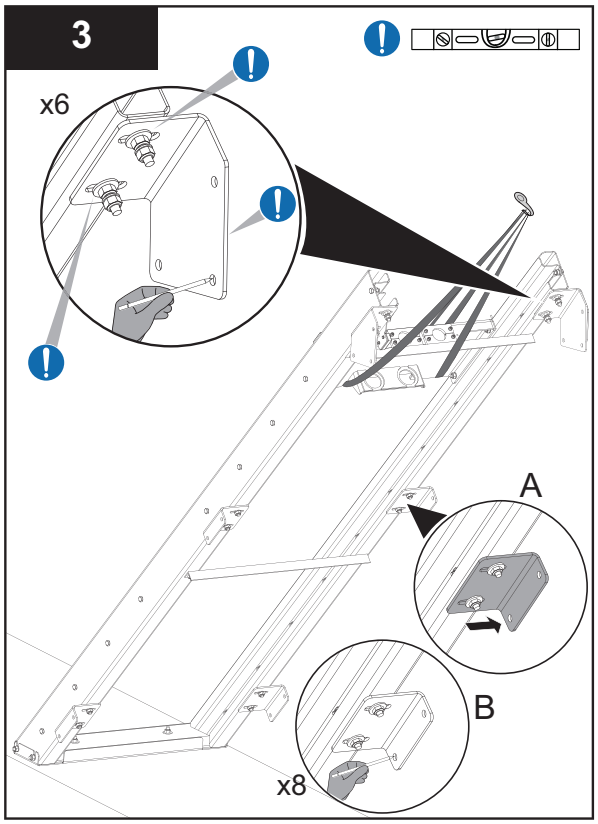
Procedure:

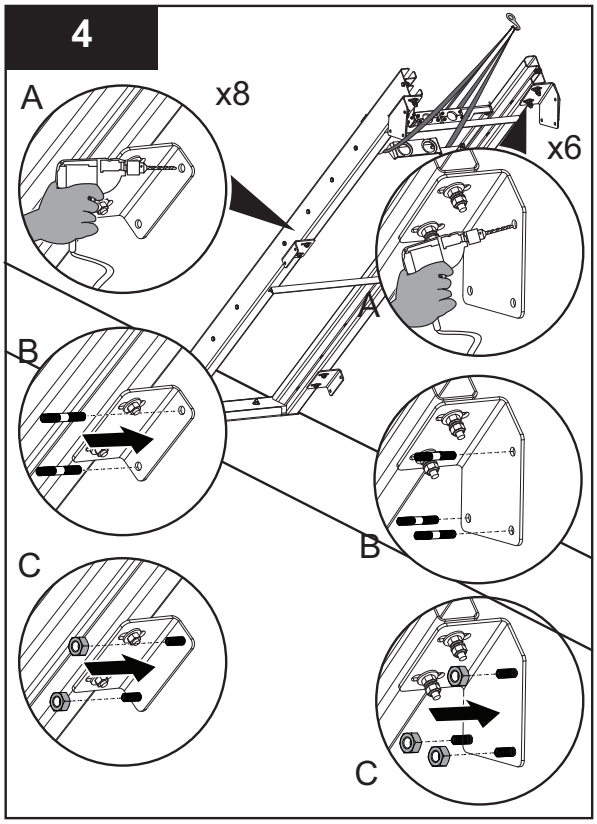


Note: *Make sure orientation of Frame Assembly aligns with layout drawings.*

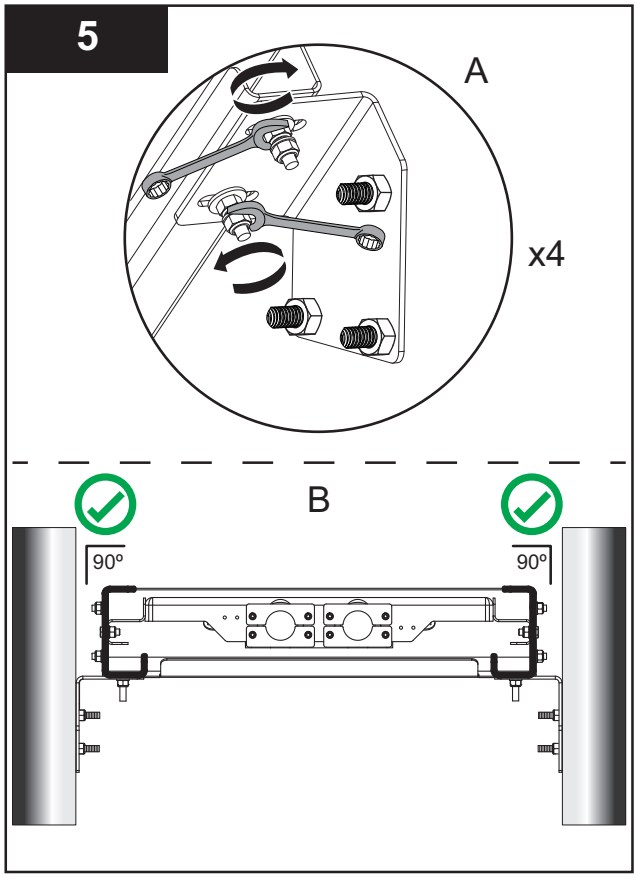


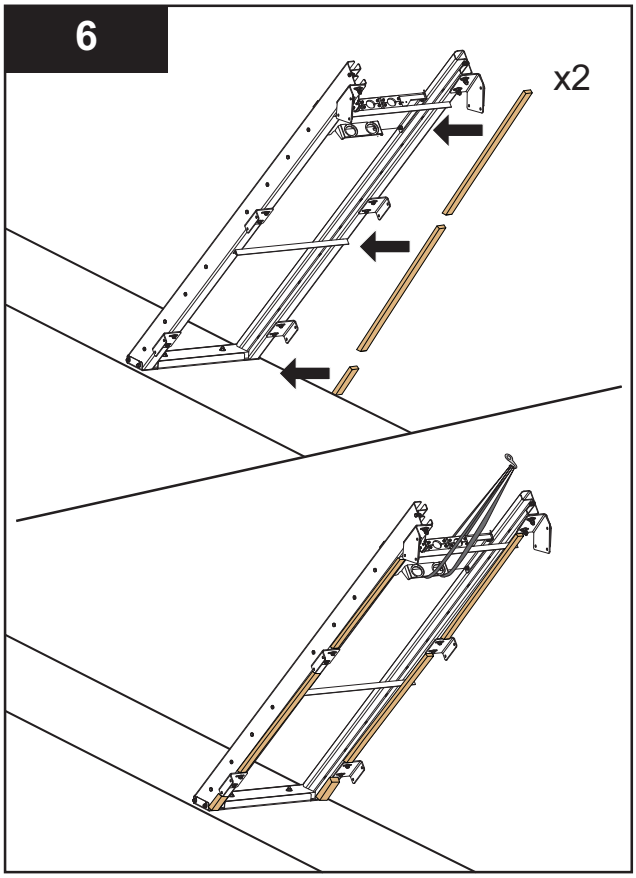
Note: *Level mounting frame assembly side to side and front to back.*



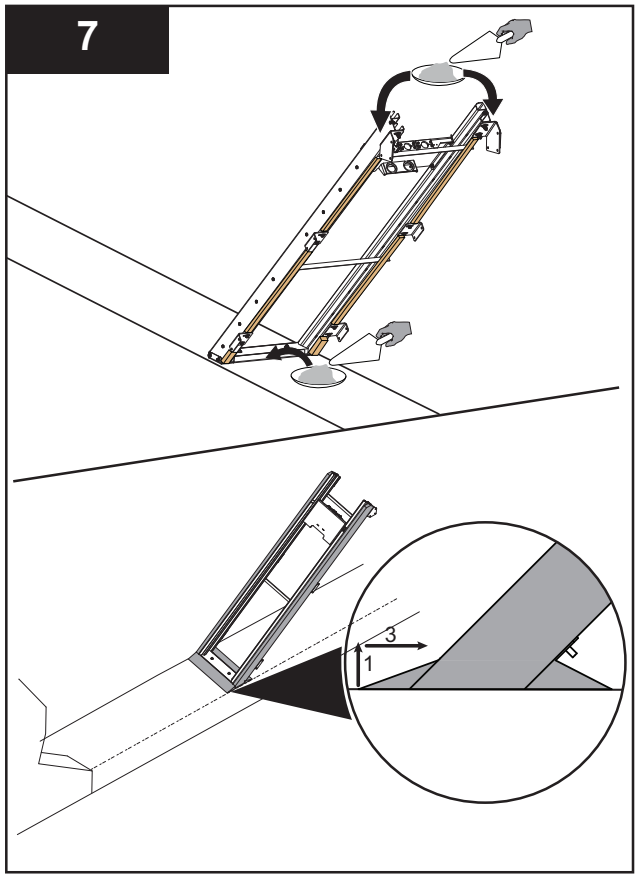


Notes: *1) Level the top brackets on the straight edges to ensure proper installation.*
2) Make sure the bracket hardware is loose and able to move freely.

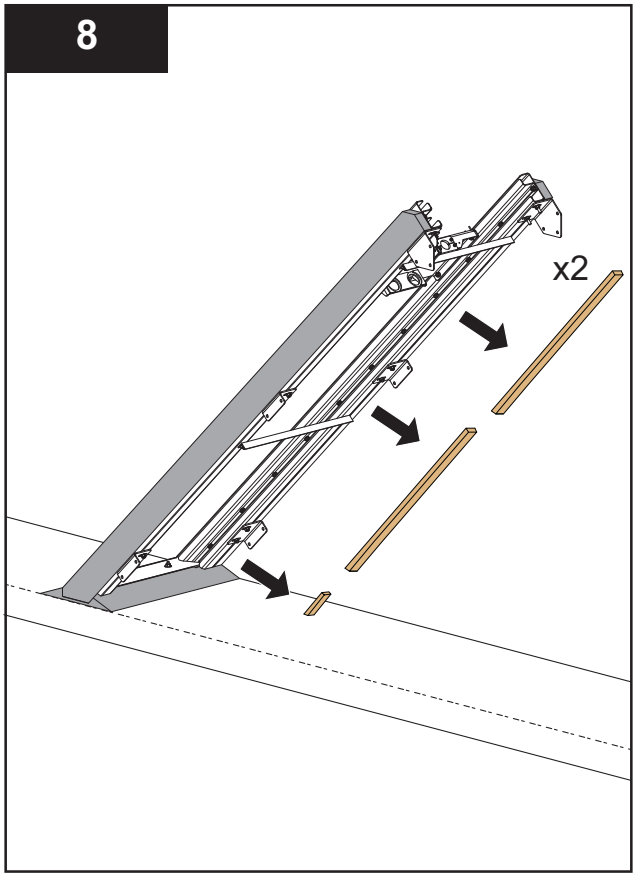




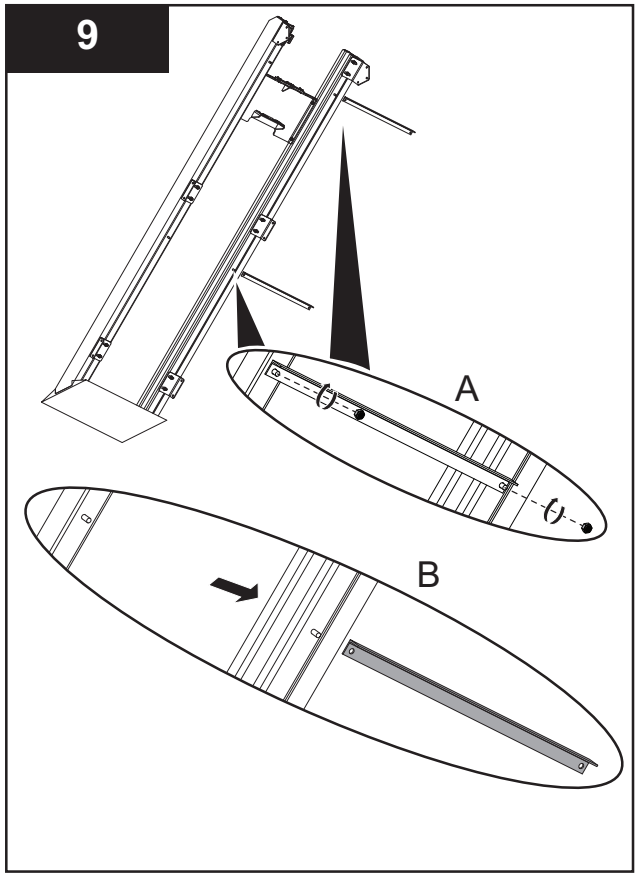
Note: *Apply anti-seize to fastening hardware.*



Note: *Place grout in between bank frame and channel wall. DO NOT allow grout to fill the inside slots of the bank frame.*



Note: *Remove wood forms after grout has completely dried.*



Note: *The angle braces can be recycled where facilities exist.*

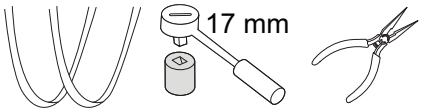
7.1.9 UV Bank

7.1.9.1 Install UV Bank(s)

Prerequisites:

- Clean and remove all debris from the UV Channel and from the Bank Frame Assembly.
- Install Bank Frame Assembly. Refer to Section 7.1.8.
- **Remove Bank Lift Cylinder brackets from hydraulic cylinder mounts located at the top of the UV Bank. Set aside.**

Tools:



- Hoist Ring (x2)

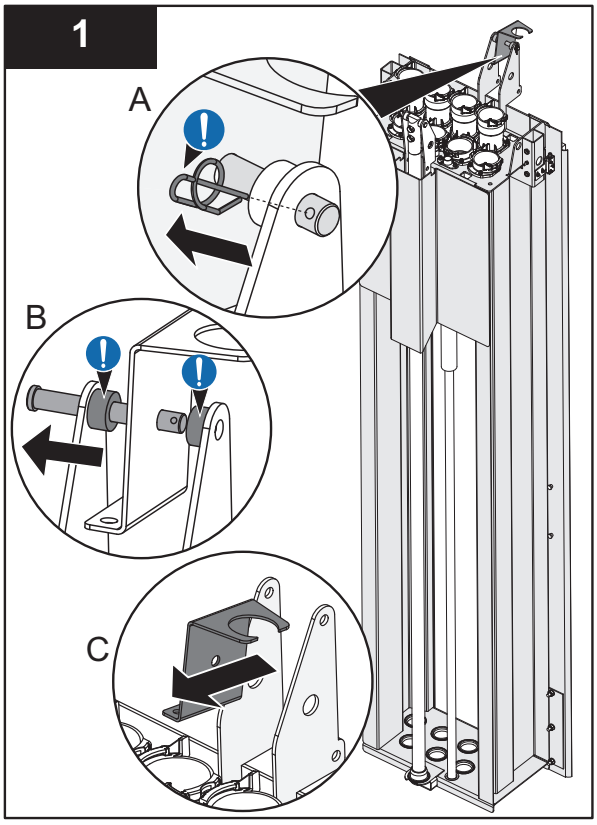
Materials:

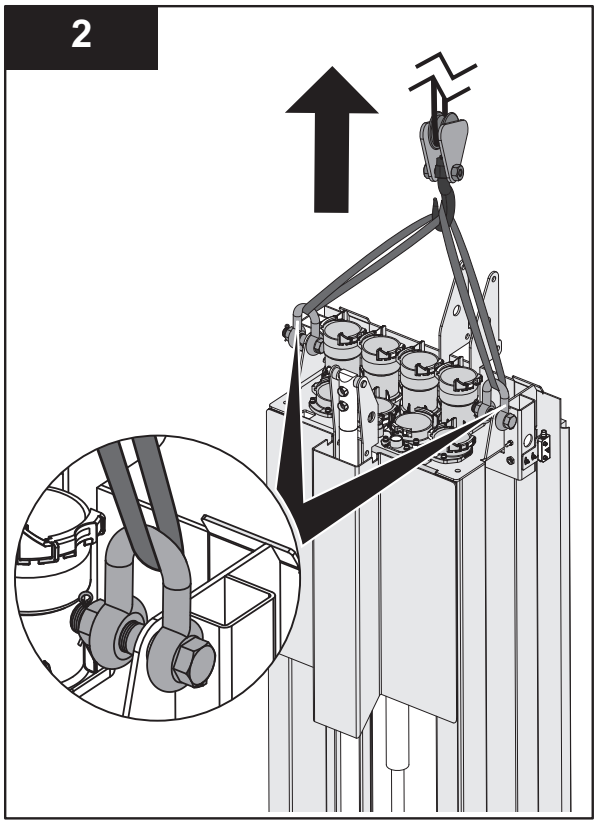
- Cylinder Brackets (provided)
- Cylinder Bracket hardware (provided)

Procedure:

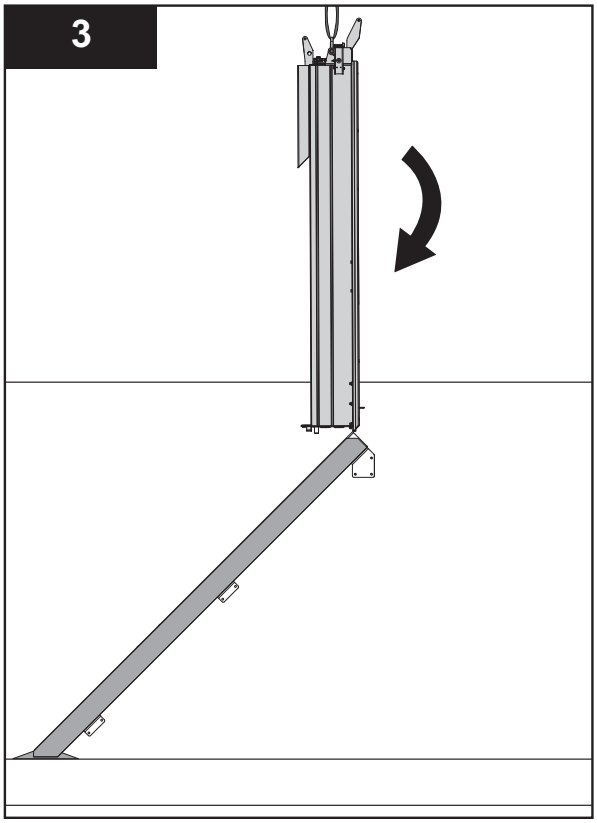
Note: *Either UV Bank A or UV Bank B can be installed first. The following procedure shows Bank B installed first.*

Install:

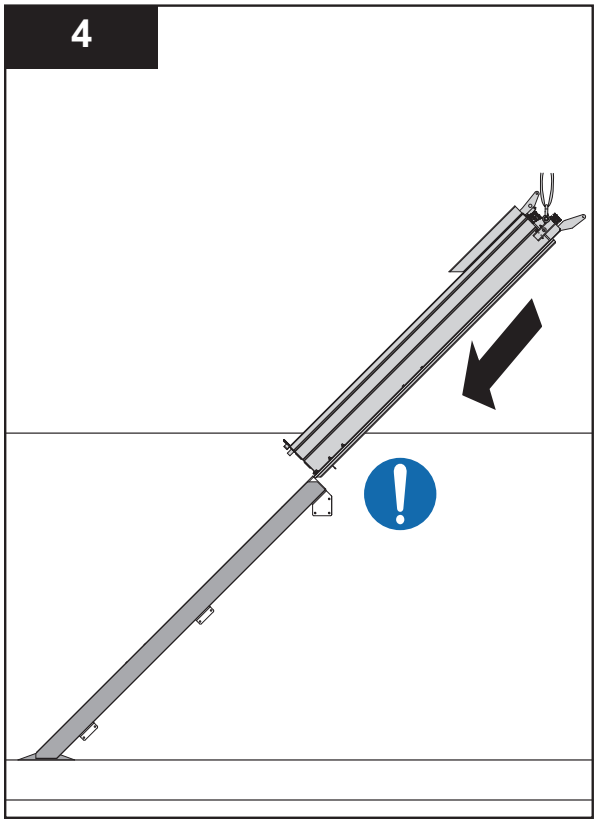




Note: *Retain the lock pin and bushings for later use.*

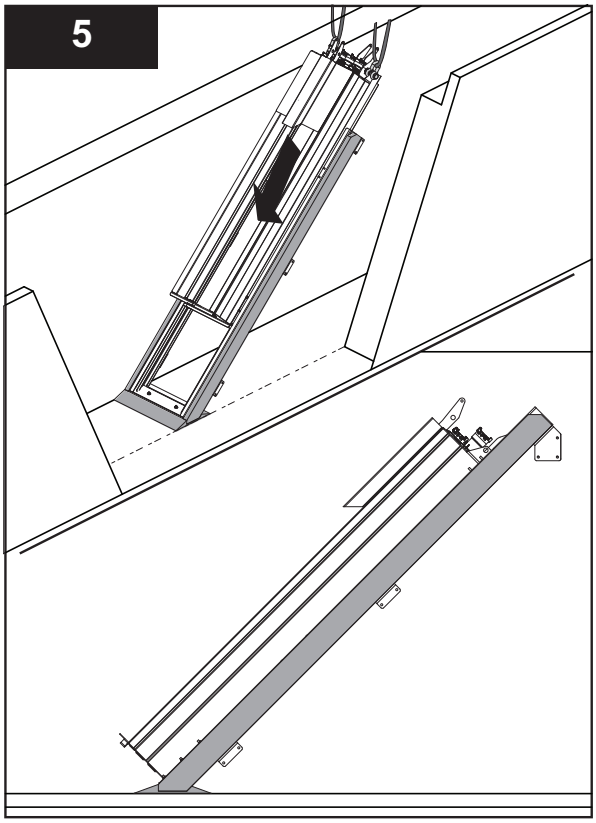


Note: *Once the UV Bank touches the frame, begin to lower the crane boom to allow the UV Bank to slide into the track.*



Notes: *1) Ensure that the guide rails line up with the slots in the channel mounting frame.*
2) Do not damage the UV Bank seal during installation.

5



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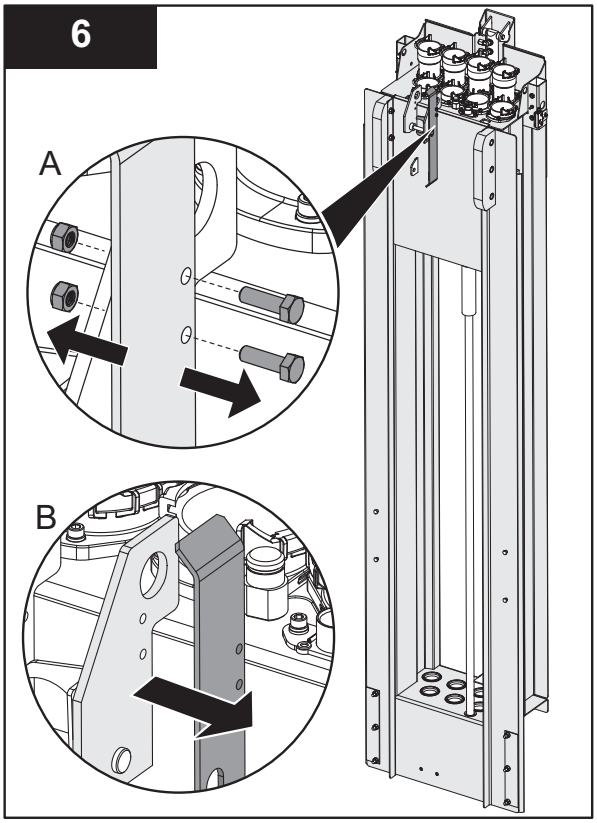
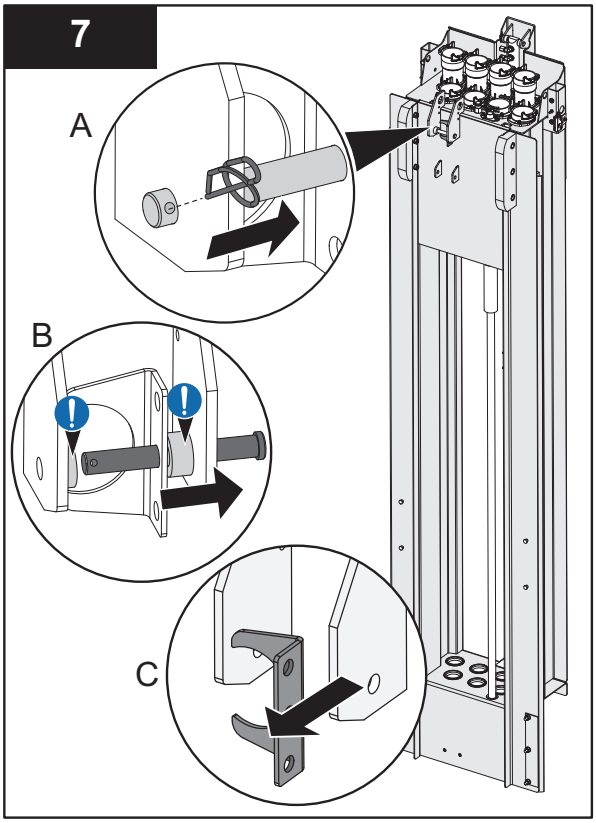


Note: *Retain the guide bracket and mounting hardware for later use.*

7



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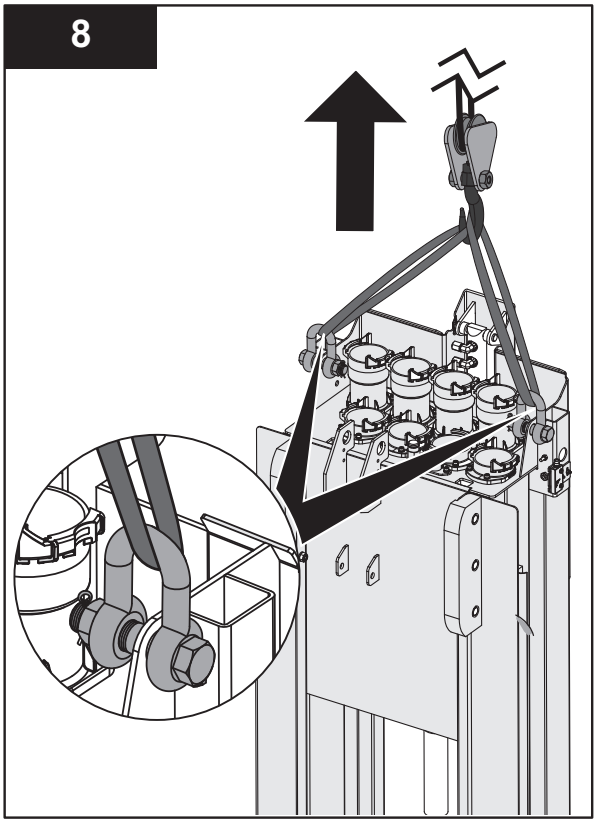
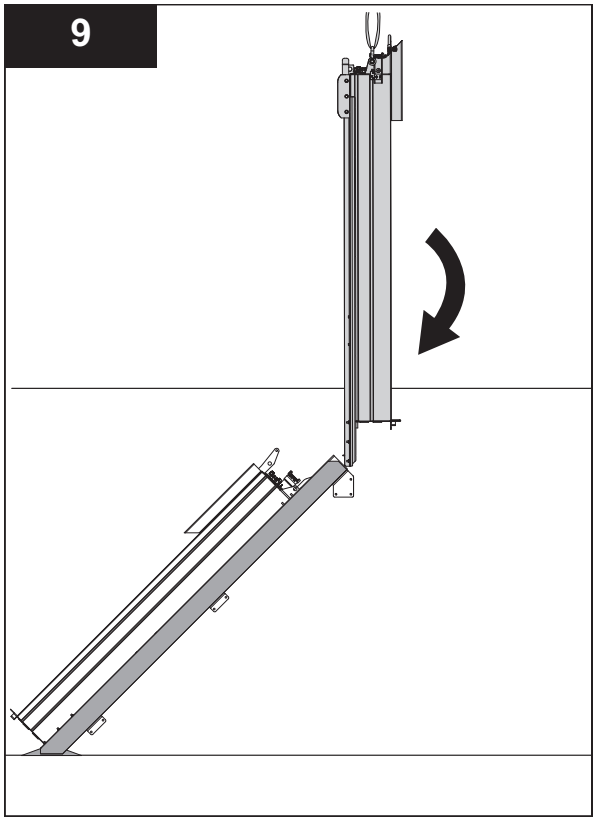


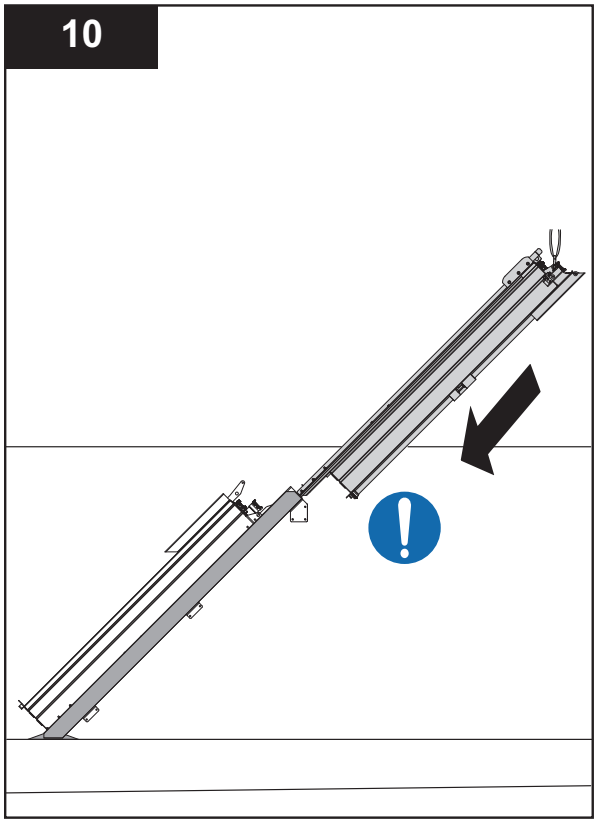
Note: *Retain the lock pin and bushings for later use.*

9



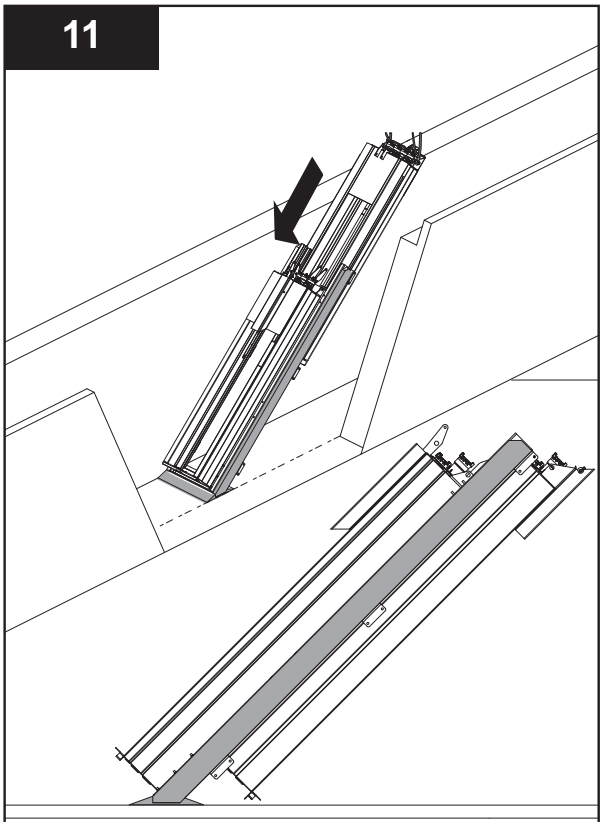
Note: *Once the UV Bank touches the frame, begin to lower the crane boom to allow the UV Bank to slide into the track.*

10



Notes: *1) Ensure that the guide rails line up with the slots in the channel mounting frame.*
2) Do not damage the UV Bank seal during installation.

11



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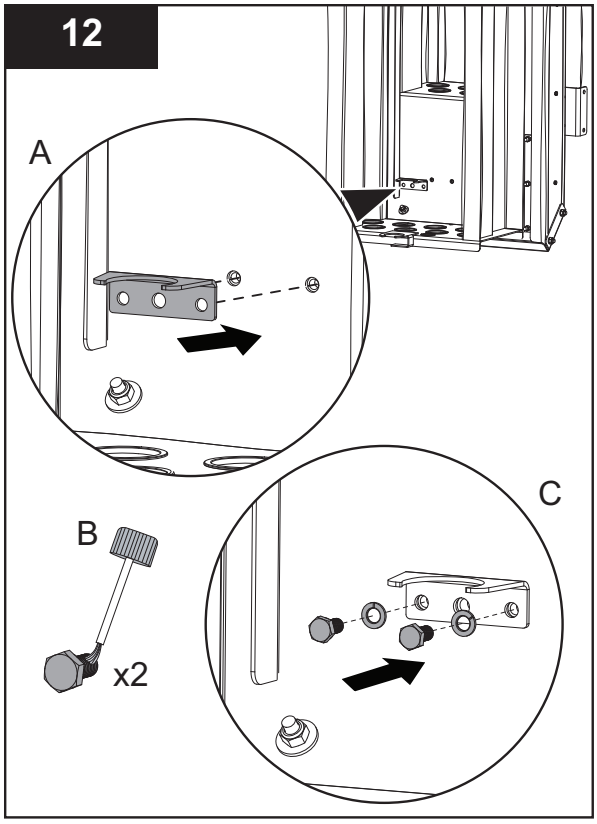
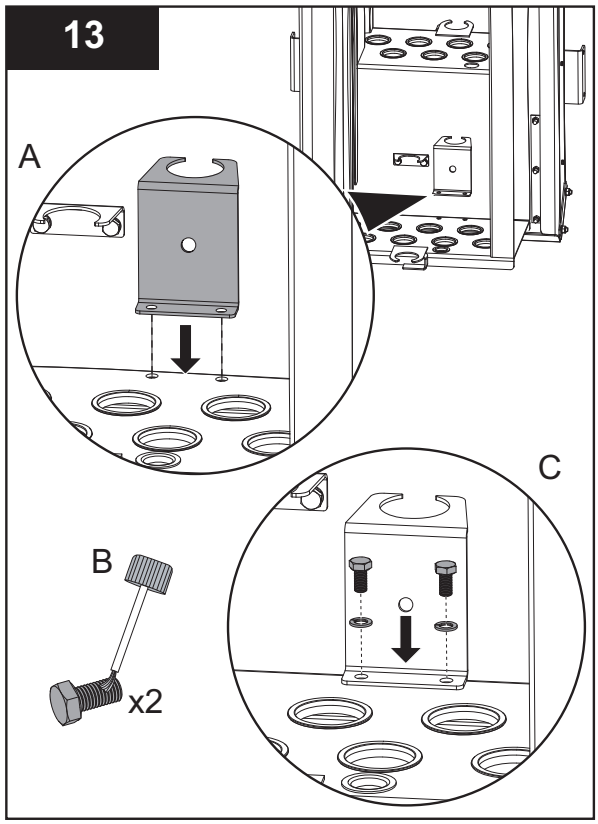


Note: *Install Bank Lift Cylinder Brackets.*

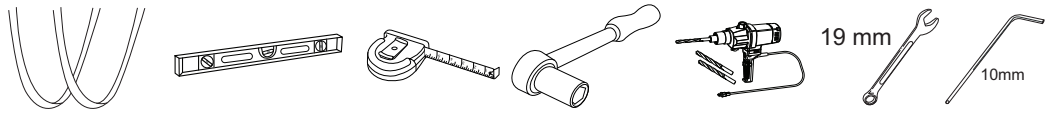


7.1.10 UV Bank Support Assembly

Prerequisites:

- Install UV Bank. Refer to Section 7.1.9.1.

Tools:

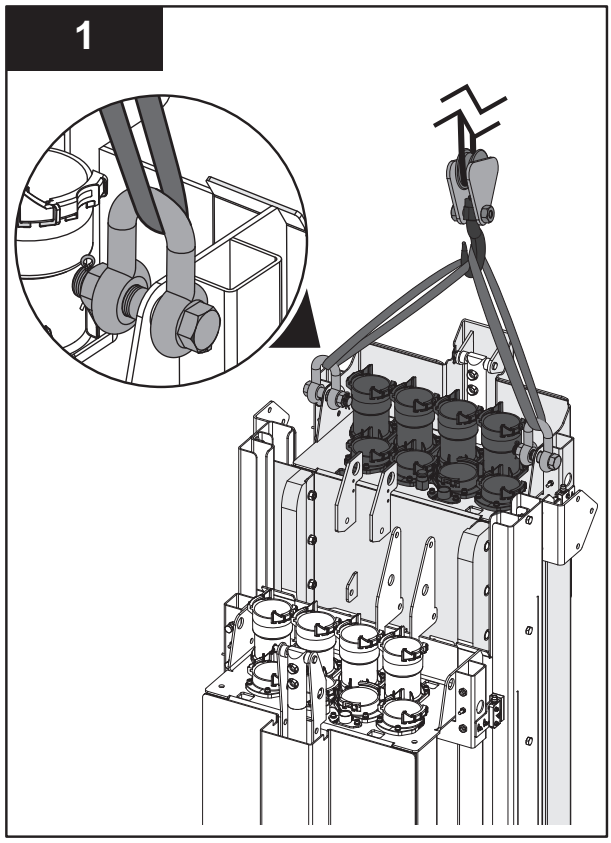


- Hoist Ring (x2)

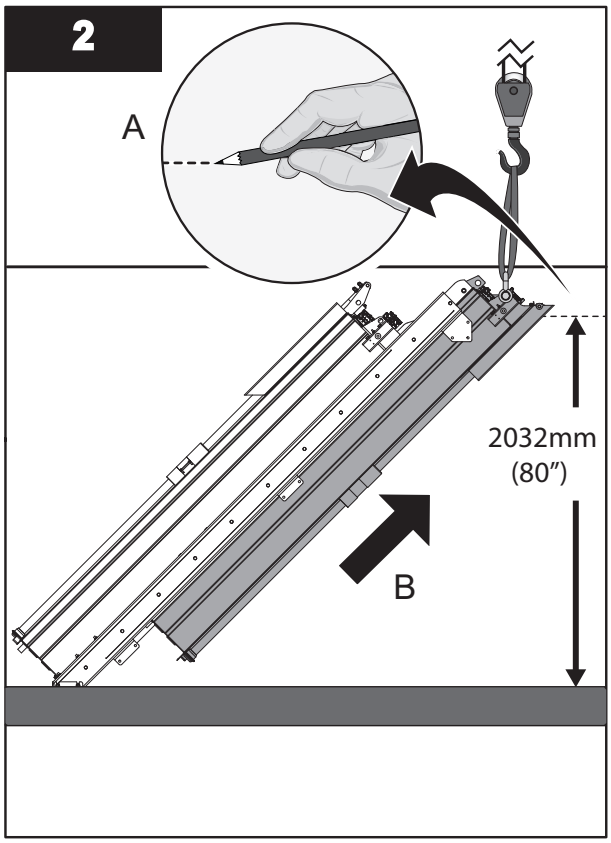
Materials:

- Anchors (by others)

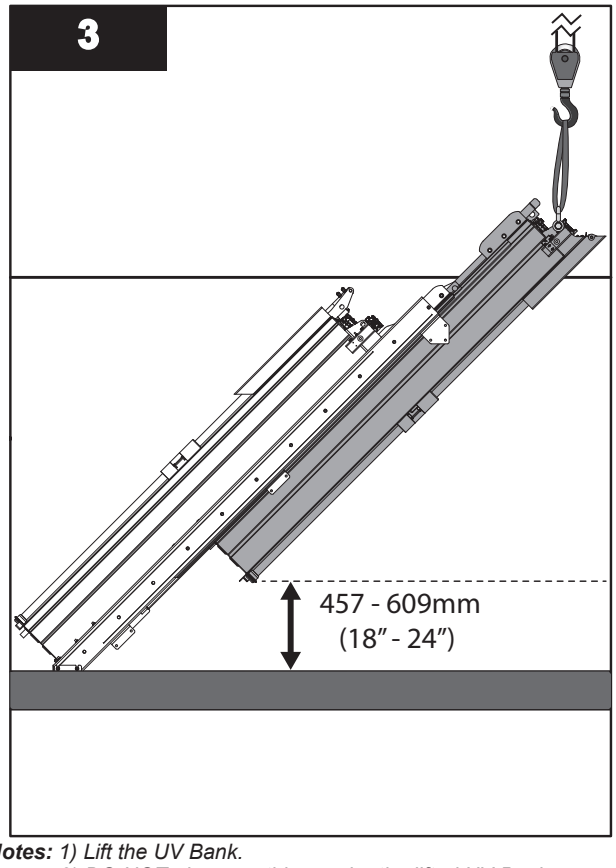
Procedure:



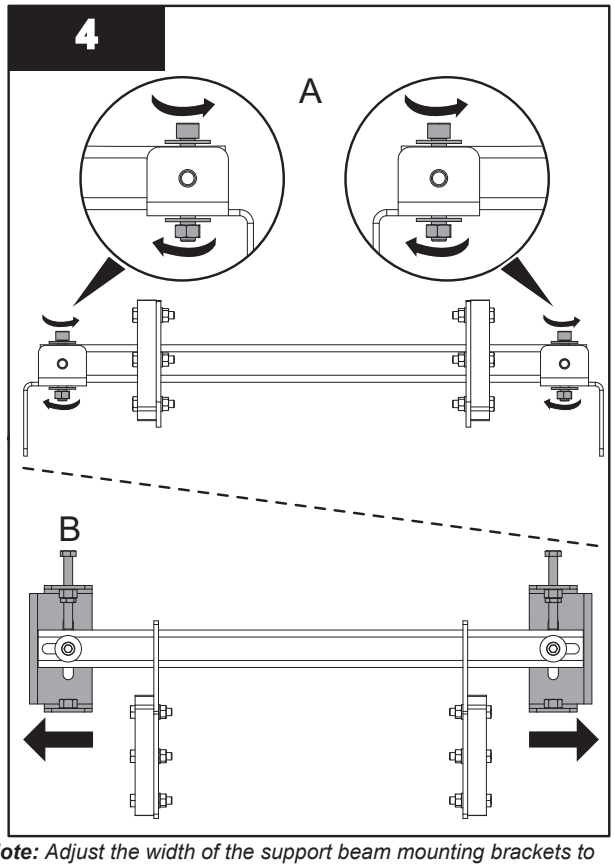
Note: *Use a lifting device to raise the UV Bank*



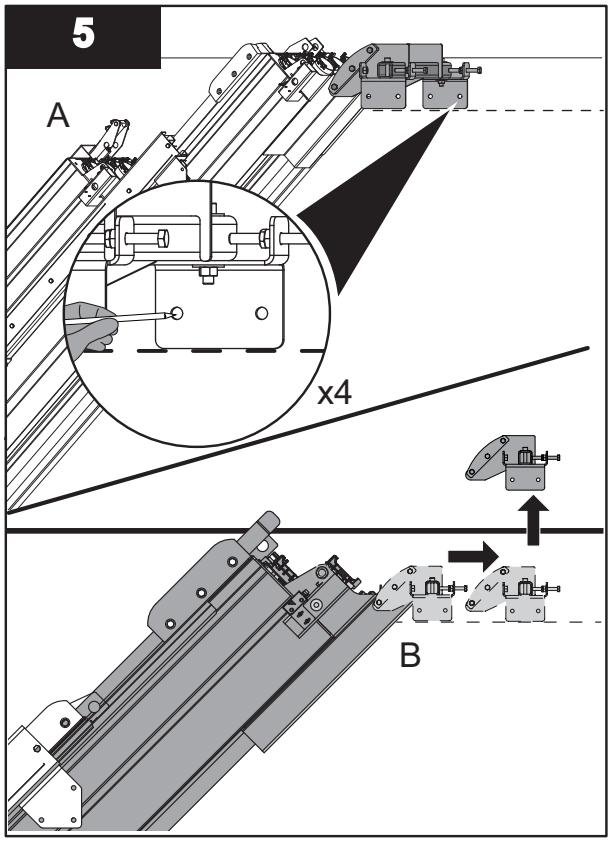
Note: *Measure from base of Channel Frame. Mark a line on the channel wall.*



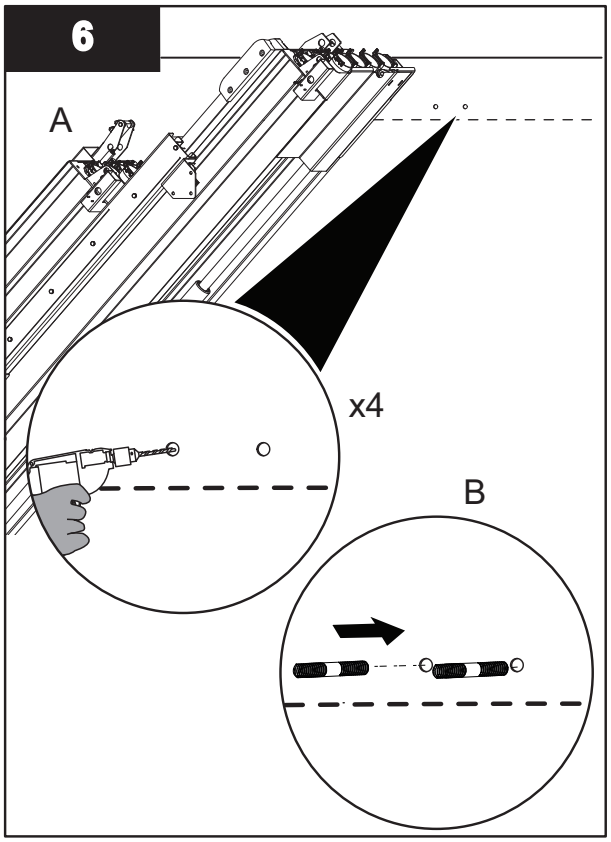
Notes: *1) Lift the UV Bank.*
2) DO NOT place anything under the lifted UV Bank.

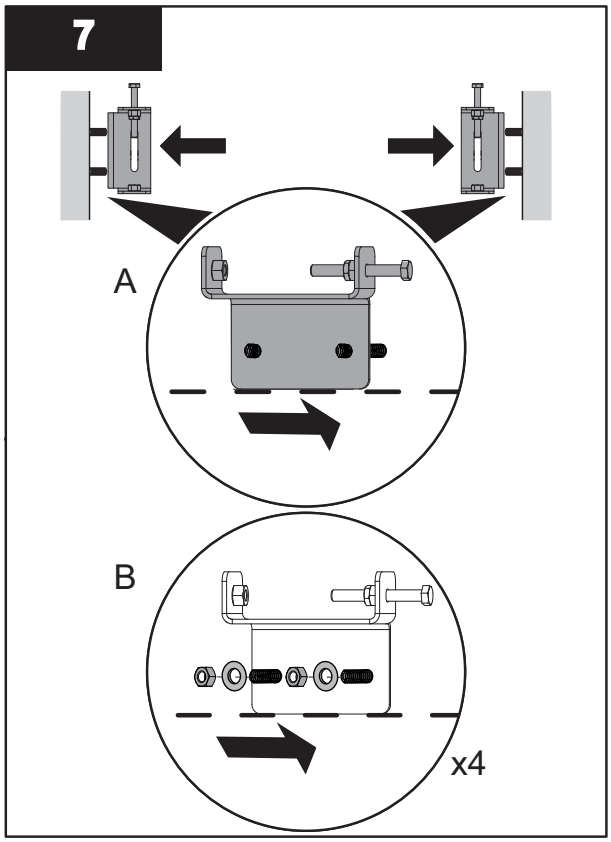


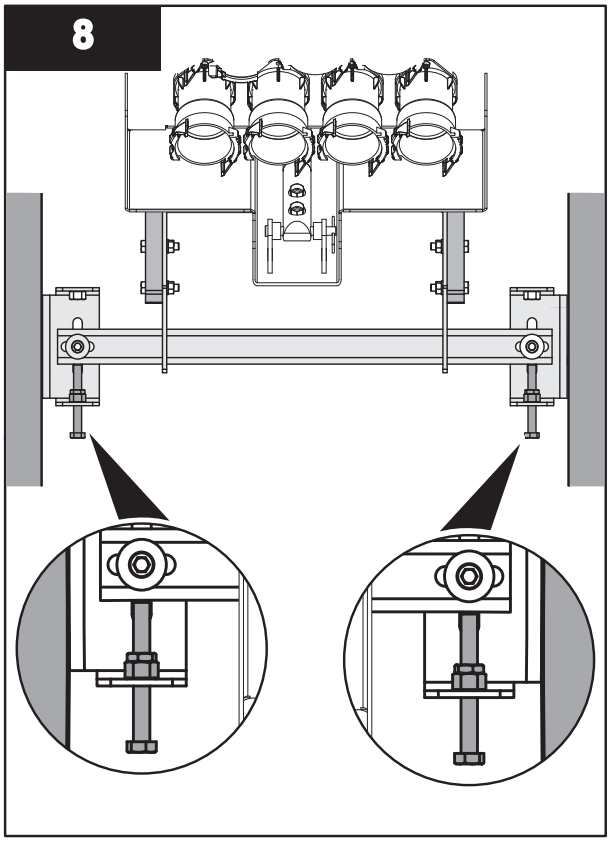
Note: *Adjust the width of the support beam mounting brackets to match the width of the UV Channel.*



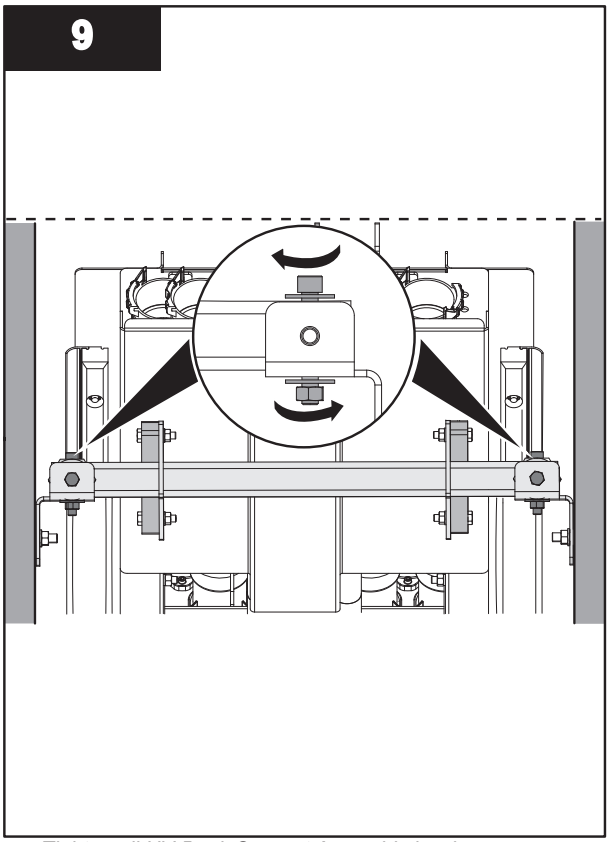
Note: *Push the Support Assembly flush to the lifted UV Bank. Make sure the bottom of the brackets are aligned with the marked line in step 2.*







Note: *Adjust the tension hardware until the wear pads align with the UV Bank.*



Note: *Tighten all UV Bank Support Assembly hardware.*

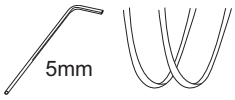
7.1.11 Lift Cylinder

7.1.11.1 Install Bank Lift Cylinders

Prerequisites:

- Install UV Bank. Refer to Section 7.1.9.1.

Tools:



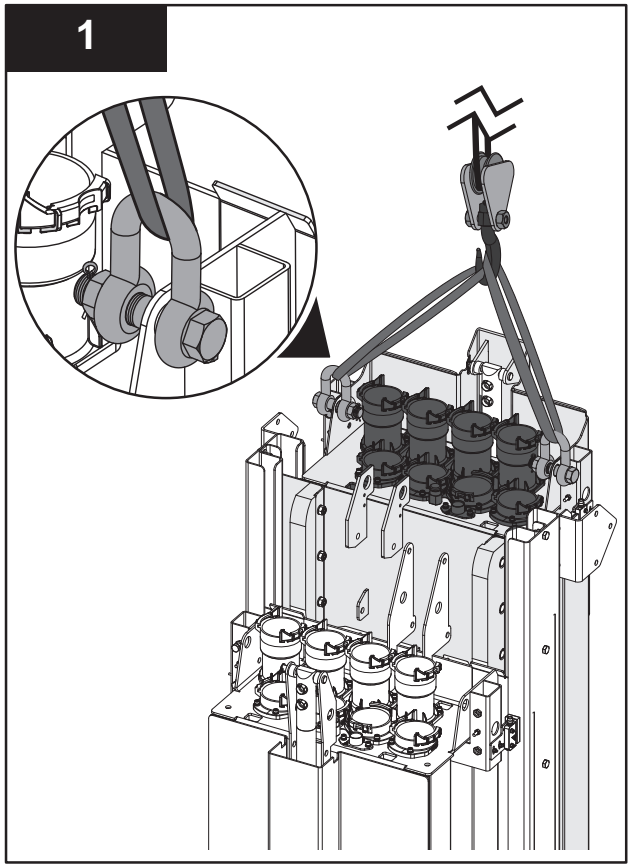
- Hoist Ring (x2)

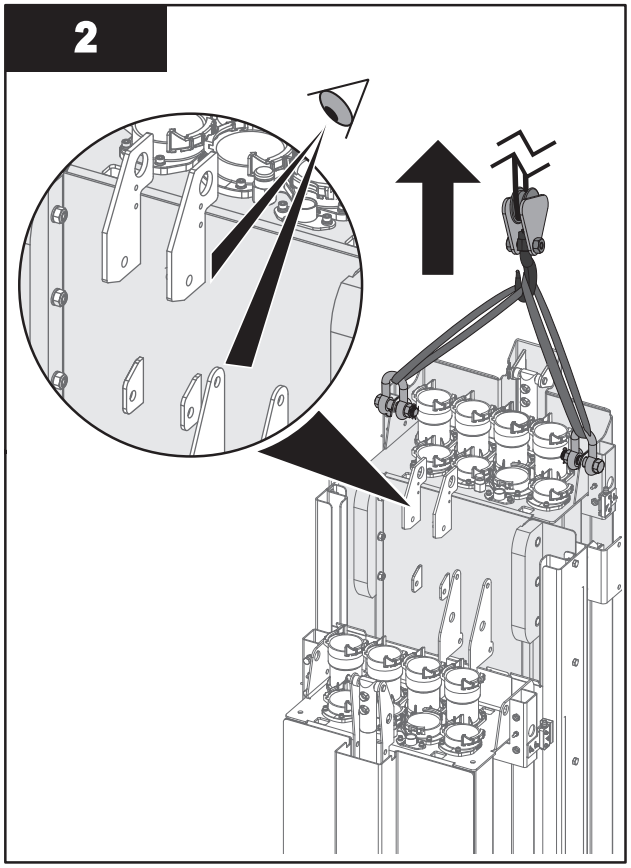
Materials:

- Lift Cylinder (provided)
- Guide bracket (provided)
- Guide bracket mounting hardware (provided)

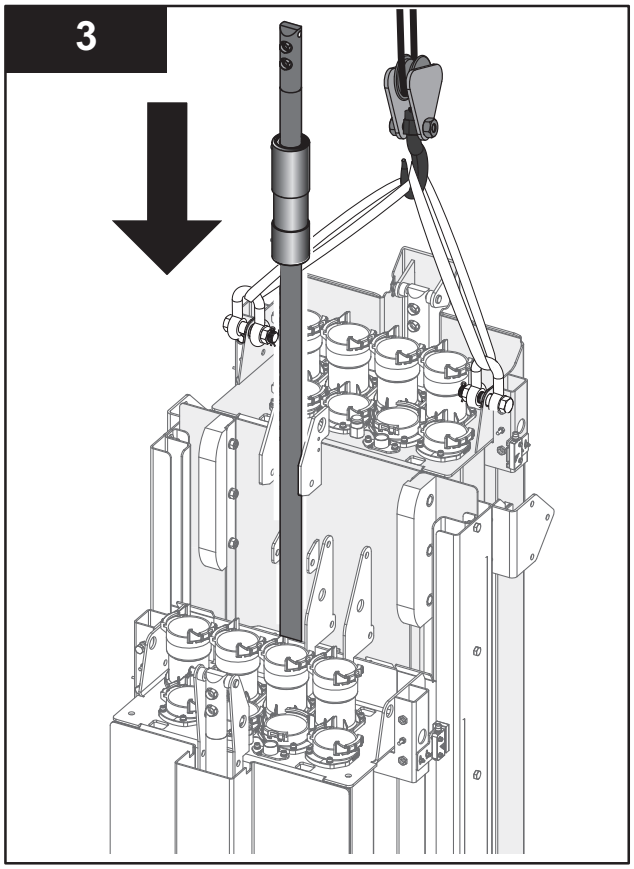
Note: *The Guide Bracket and mounting hardware were removed in Section 7.1.9.1 Step 6.*

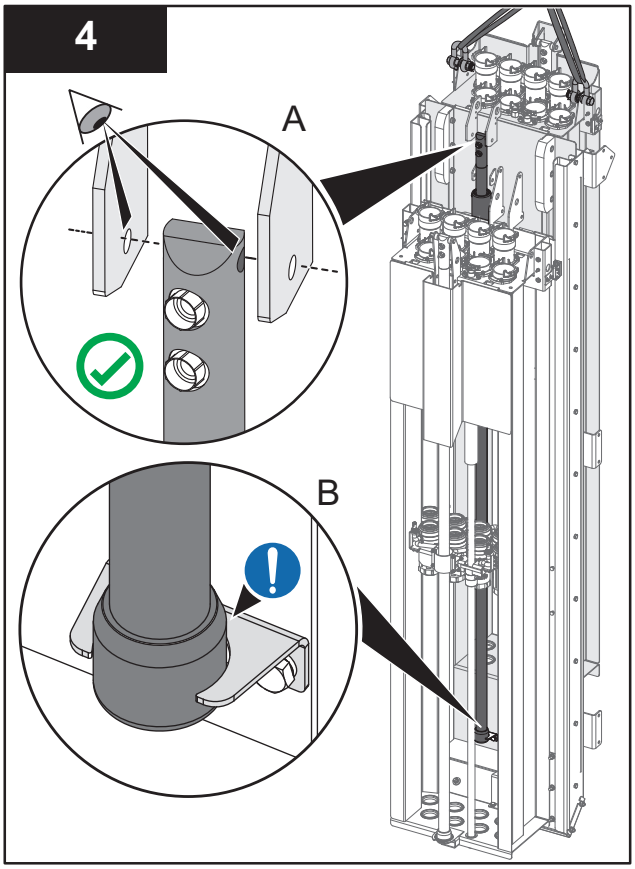
Procedure:



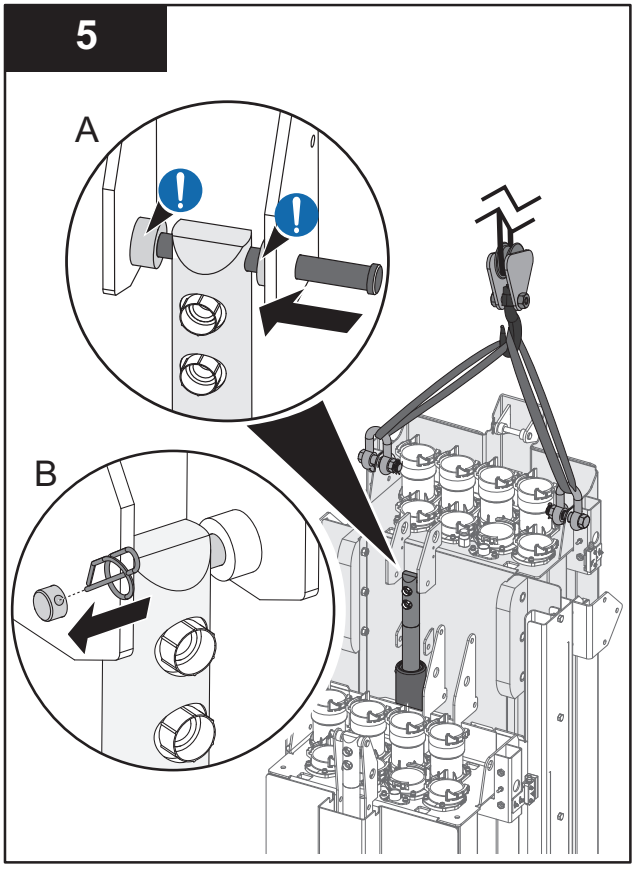


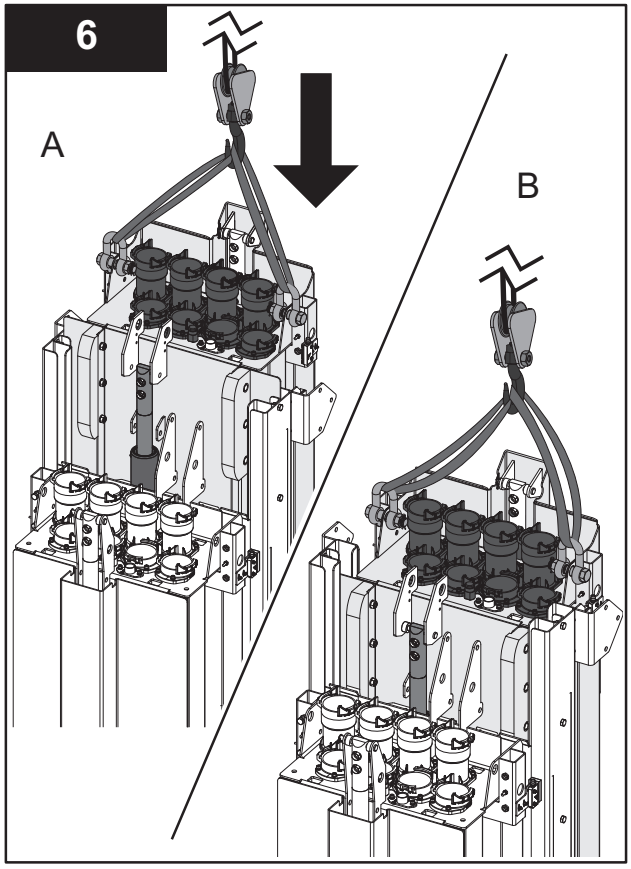
Note: *Use a lifting device to raise the UV Bank to gain access to the clevis pin bracket.*



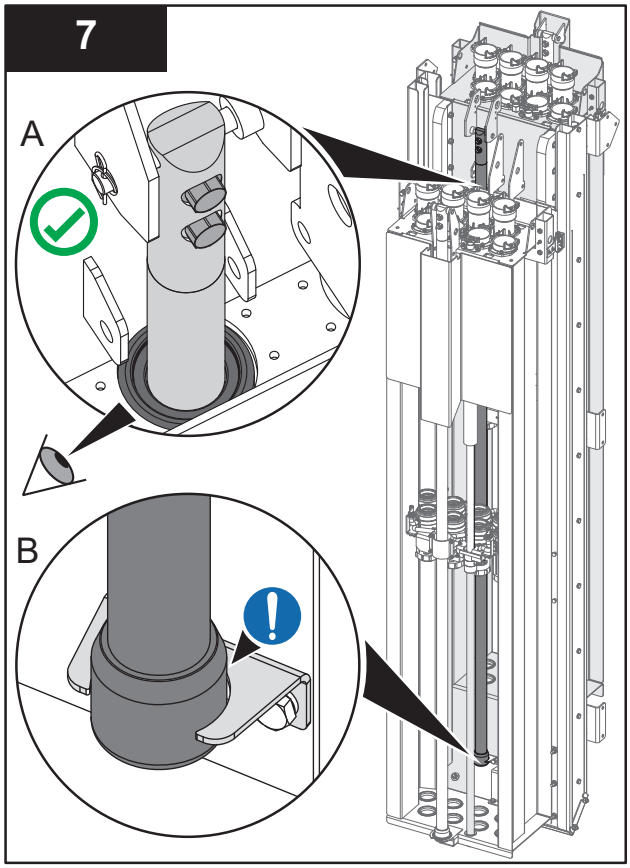


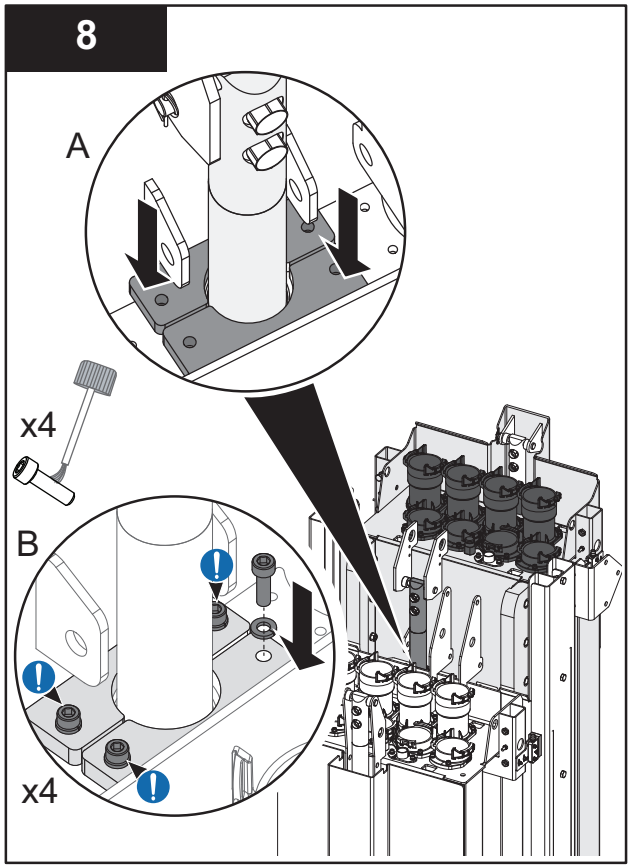
Note: *Make sure the bottom of the lift cylinder is properly seated in the bracket.*



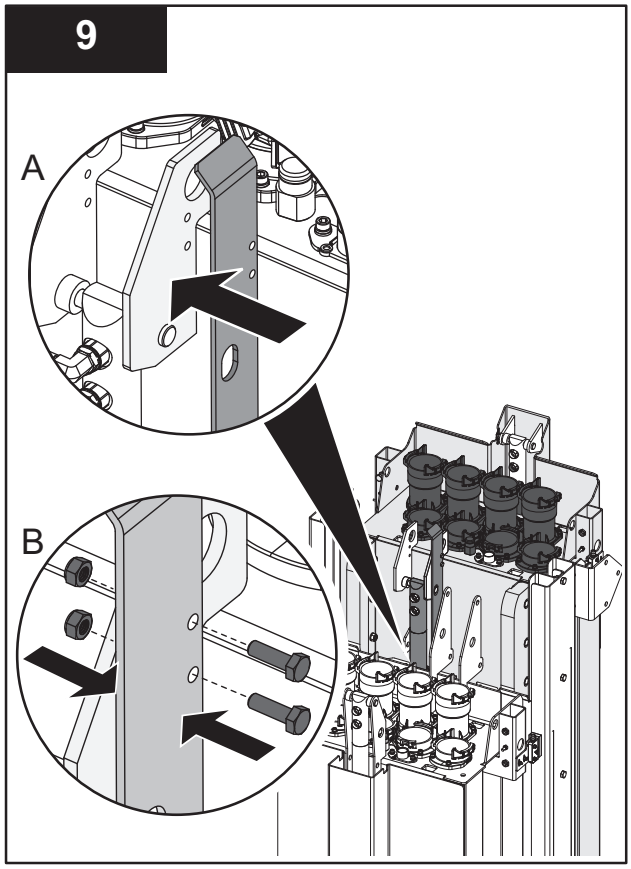


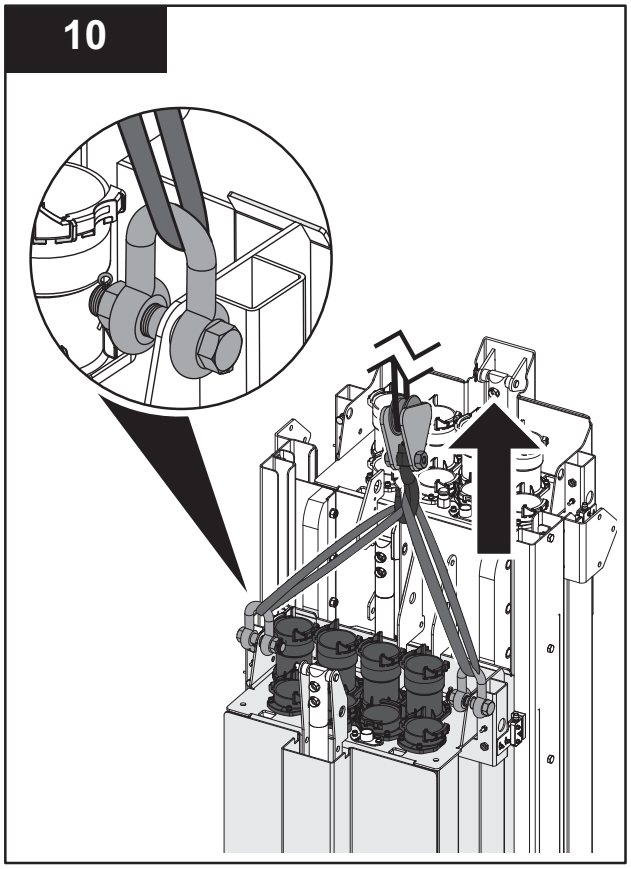
Note: *Lower the UV Bank down.*





Notes: *1) Make sure the cylinder follower is correctly seated in the Bank Frame Assembly.*
2) Make sure the bottom of the lift cylinder is properly seated in the bracket.


9
A
B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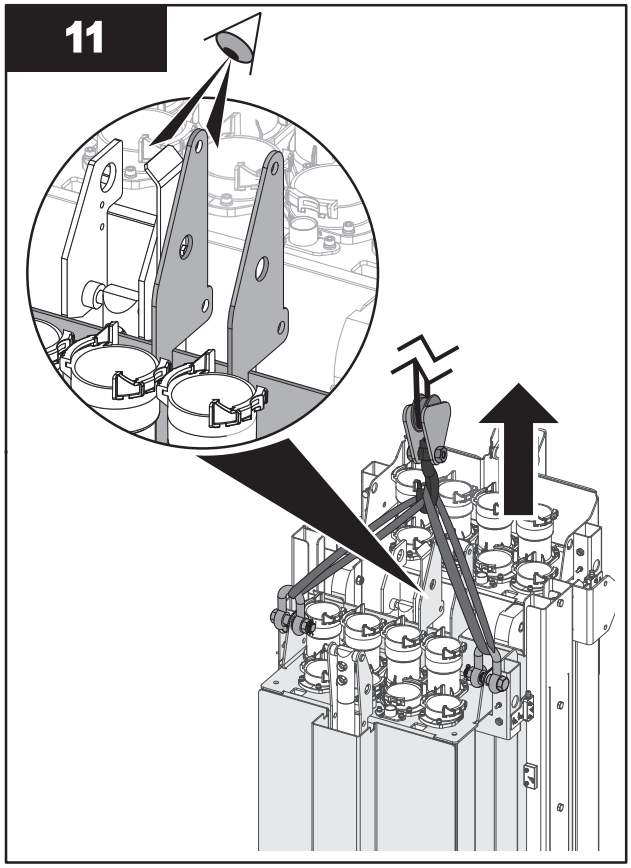
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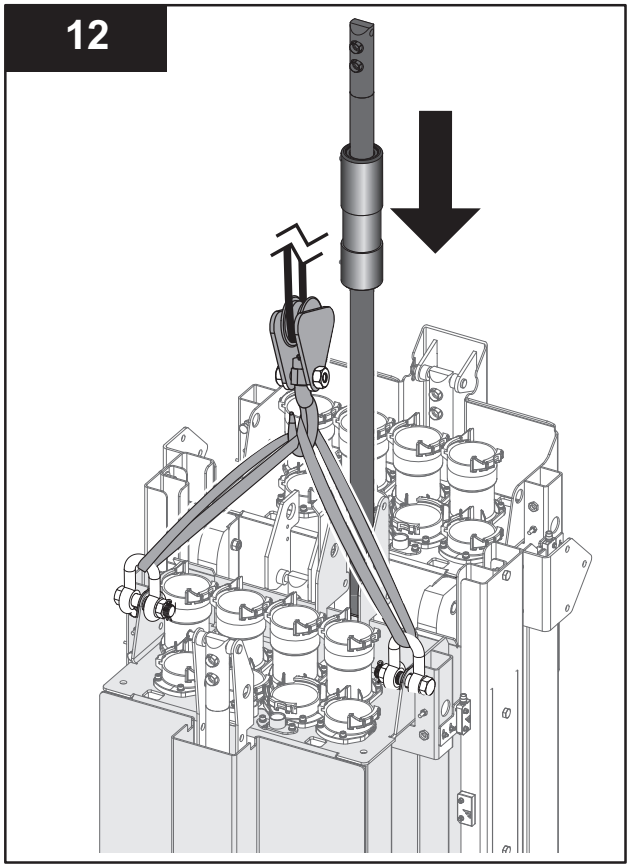
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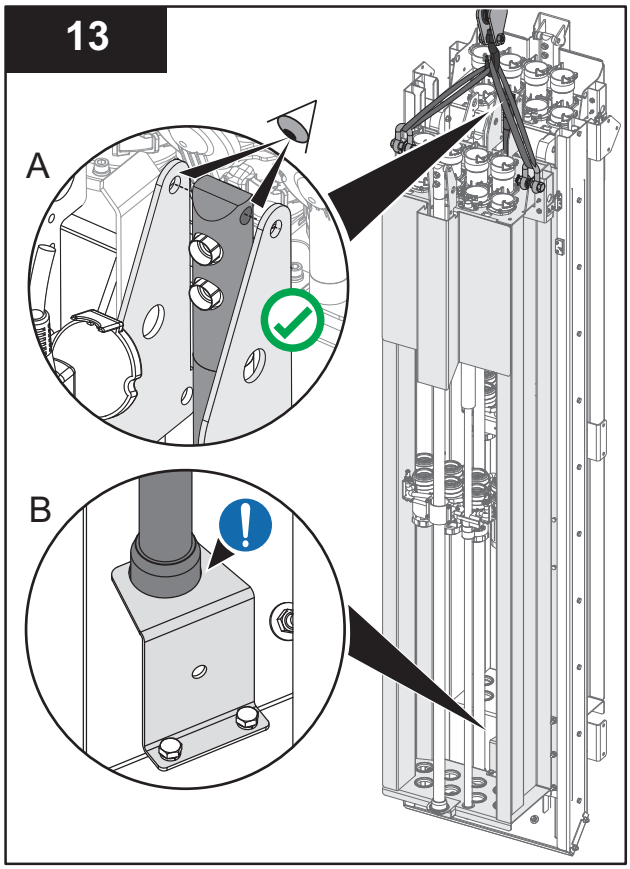
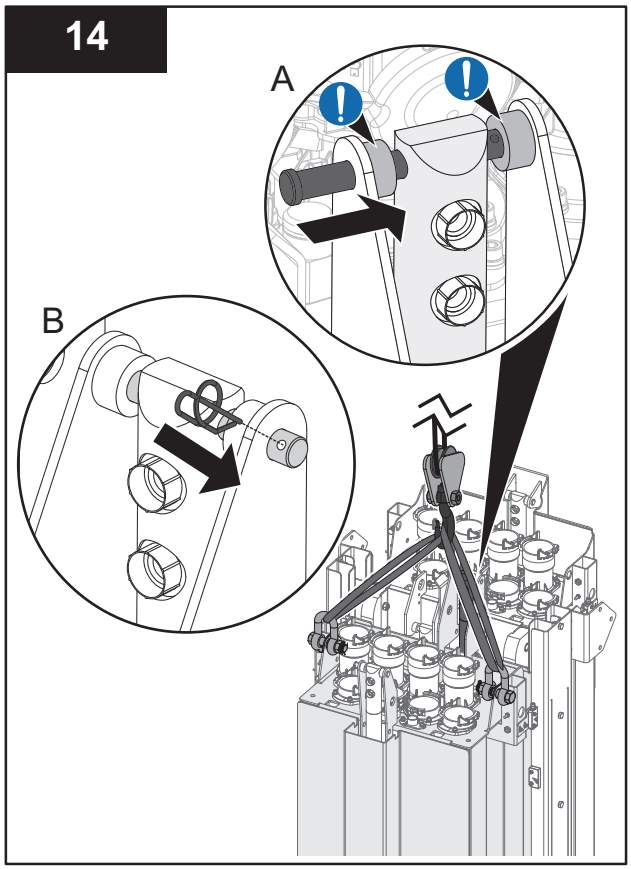
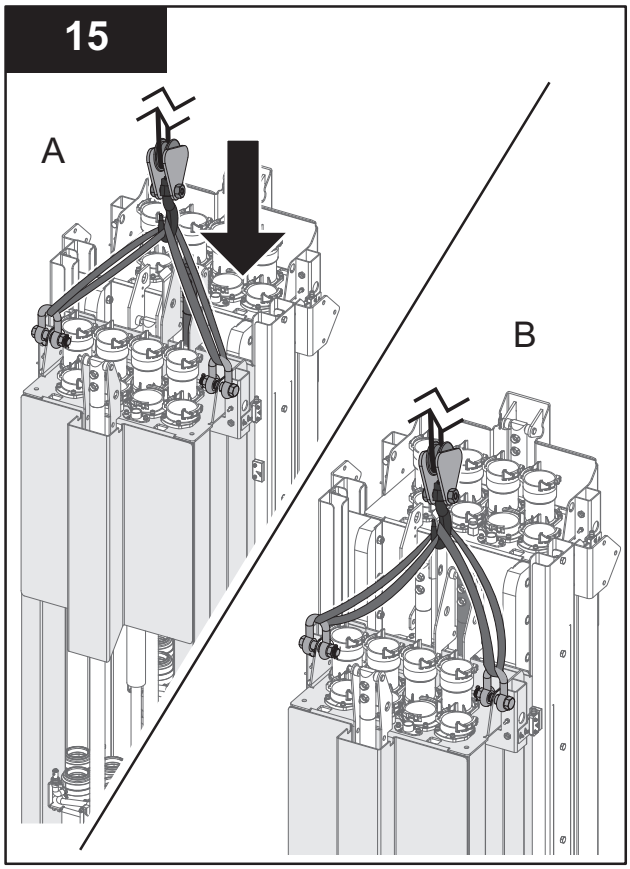
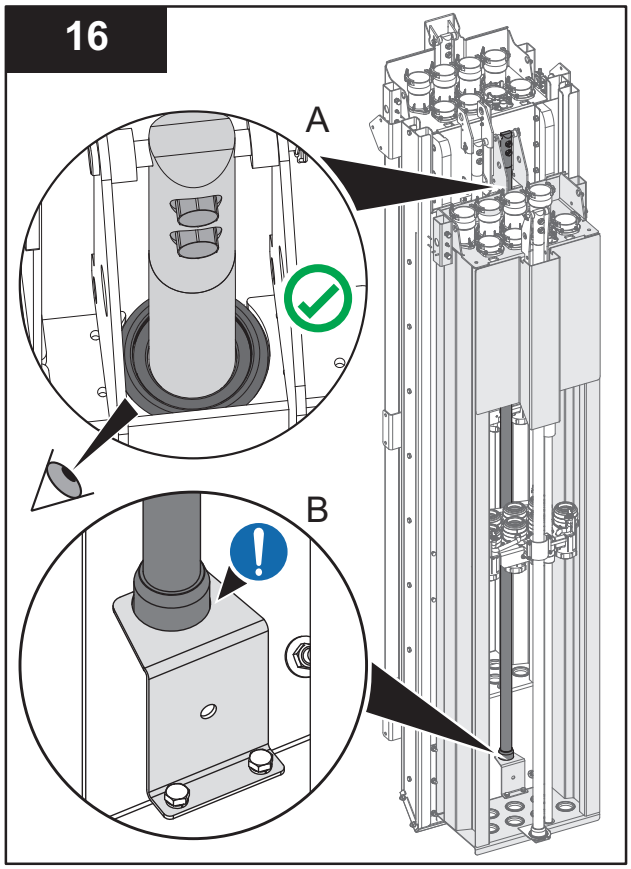


Note: *Make sure the bottom of the lift cylinder is properly seated in the bracket.*

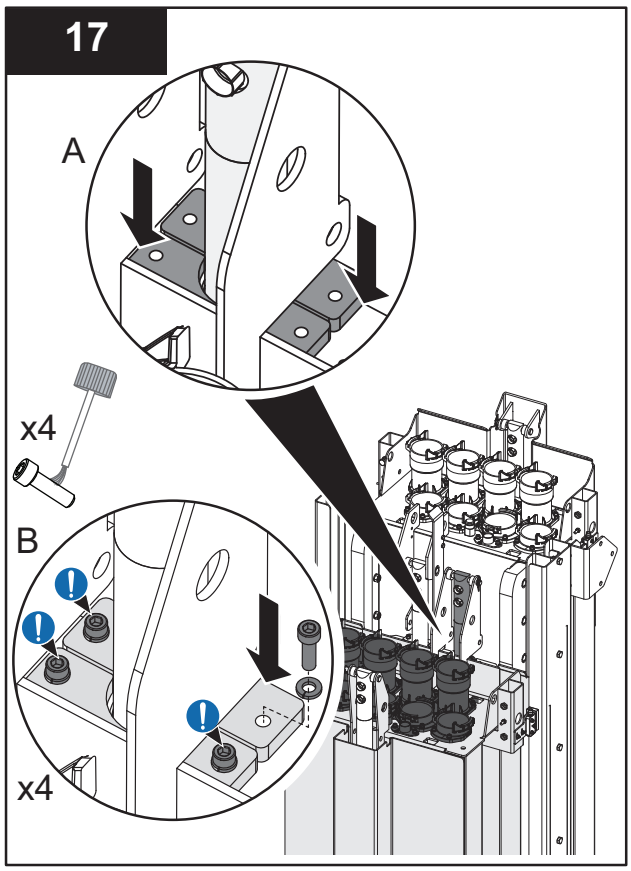


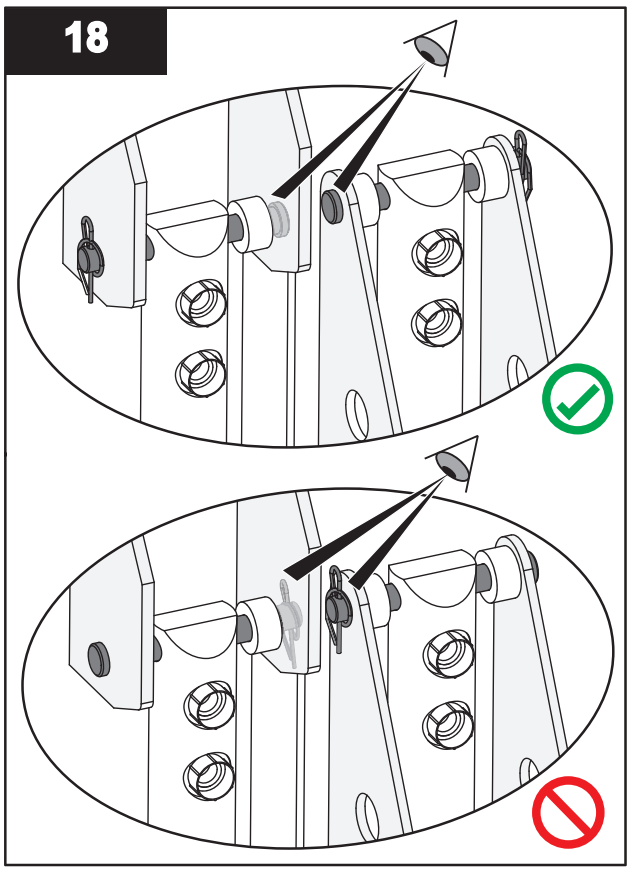


Note: *Lower the UV Bank down.*



Notes: *1) Make sure the cylinder follower is correctly seated in the Bank Frame Assembly.*
2) Make sure the bottom of the lift cylinder is properly seated in the bracket.





7.1.12 Cable Management

The cable management brackets organize the hydraulic hoses, lamp cables, bond wire, and UVI sensor cable and Bank In Place cable. One cable management bracket per UV Bank is required.

Cable management brackets may be supplied in left and/or right sided configurations. Refer to Figure 4 for left and right handed UV Bank designations. Refer to the project layout drawings for additional information regarding the cable management bracket location. Cable management brackets are provided in either standard channel depth or deep channel depth (Figure 5). Follow the Cable Management Assembly - Figure 5 and match project details.

Refer to DC000601-017 for installation guidelines for TrojanUV Solo Lamp Cable installation.

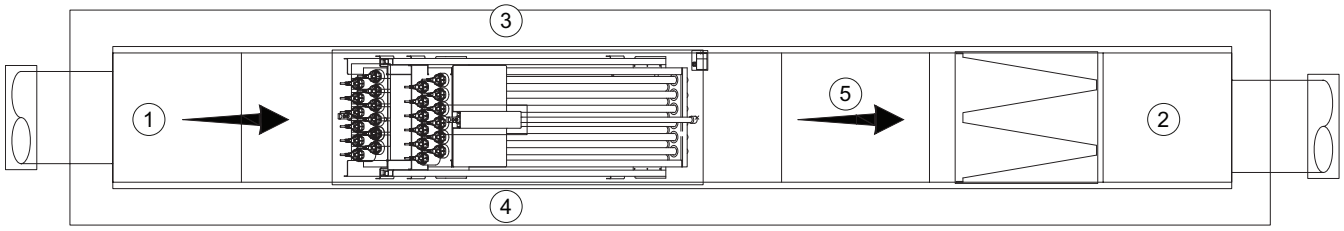


Figure 4 UV Bank Designation

1	Upstream of UV Bank(s)	**4**	Right side of UV Bank(s)
2	Downstream of UV Bank(s)	**5**	Effluent flow direction
3	Left side of UV Bank(s)		

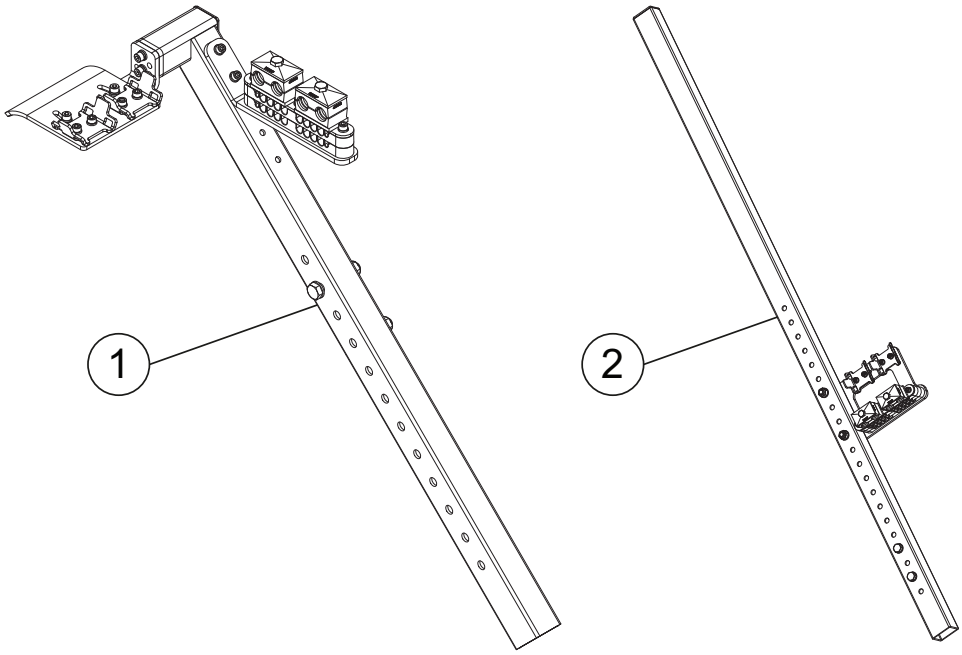


Figure 5 Cable Management - Assemblies

1	Standard Channel Bracket **(Right sided shown)** [Used for Channel Depths up to 233.7 cm (92 inches)]	**2**	Deep Channel Bracket **(Left sided shown)** [Used for Channel Depths greater than 233.7 cm (92 inches)]

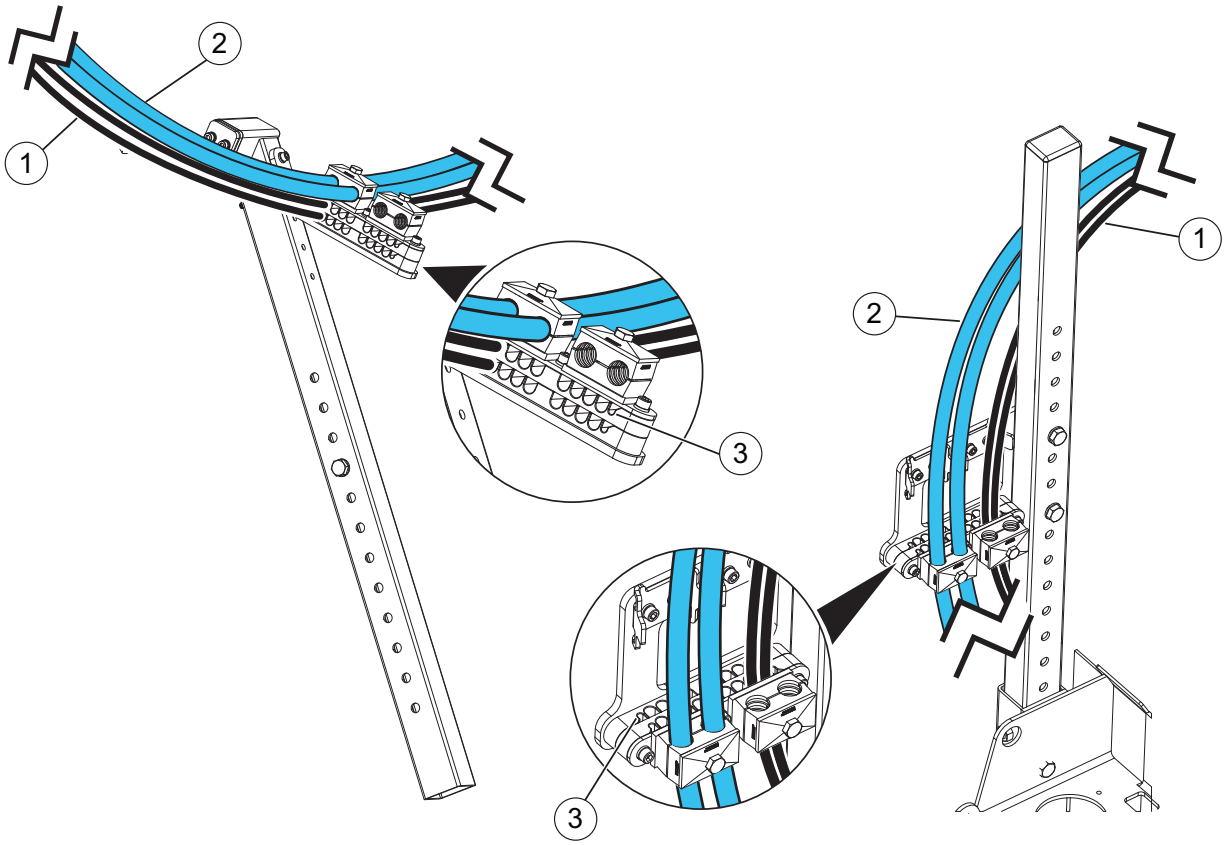


Figure 6 Lamp Cables and Hydraulic Hoses Routing

1	Lamp Cables	**3**	Field Wiring (i.e. UVI Sensor, Bank in Place, Bond Wiring)
2	Hydraulic Hoses		

Note: *Only a few Lamp Cables and Hydraulic Hoses are shown for demonstration purpose.*

7.1.12.1 Install Cable Management Assemblies on UV Bank

Prerequisites:

- Refer to the project layout drawings for installation location.
- Install UV Bank. Refer to Section 7.1.9.1.

Tools:

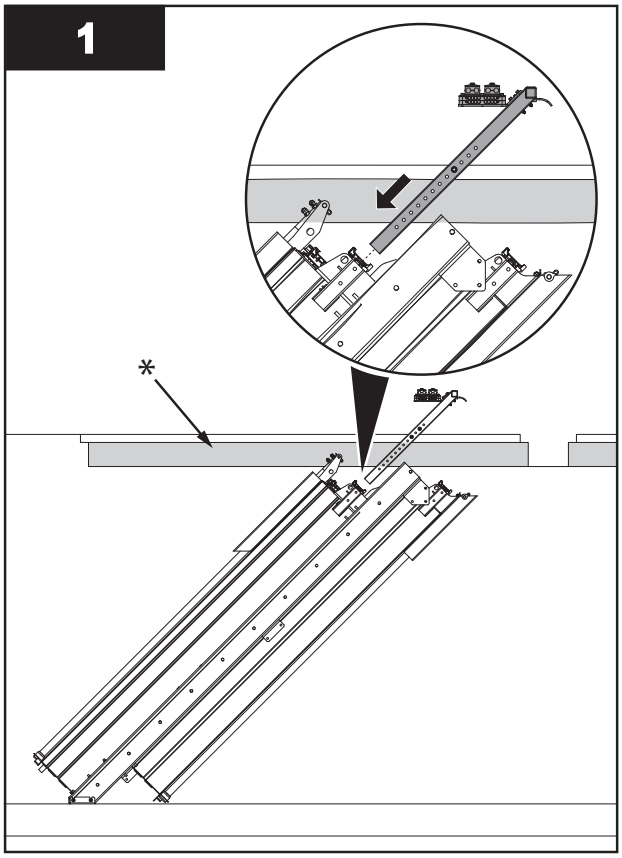
Materials:

- Bracket Mounting Hardware (provided)

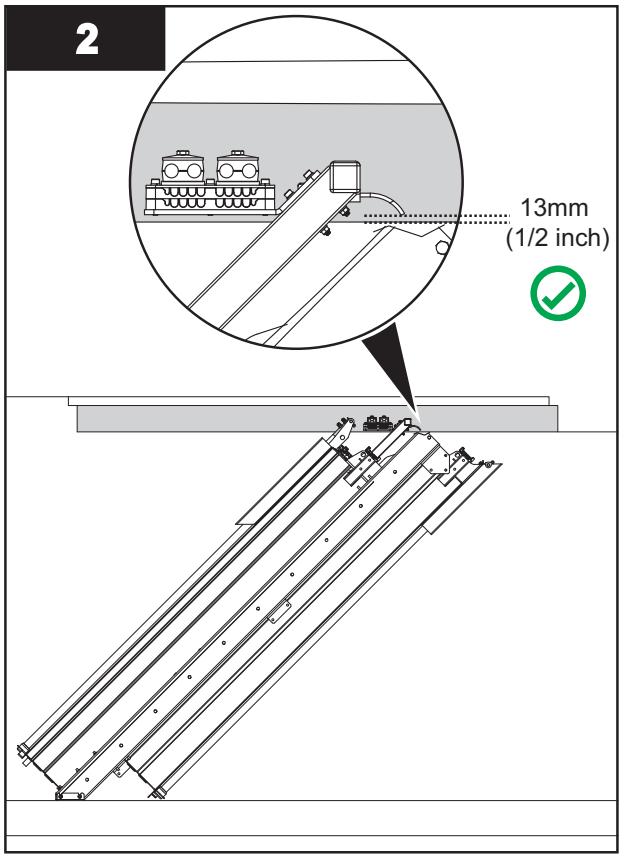
Procedure:

Note: *Follow the appropriate procedure for the Bracket Assembly type provided (i.e. Standard Channel or Deep Channel).*

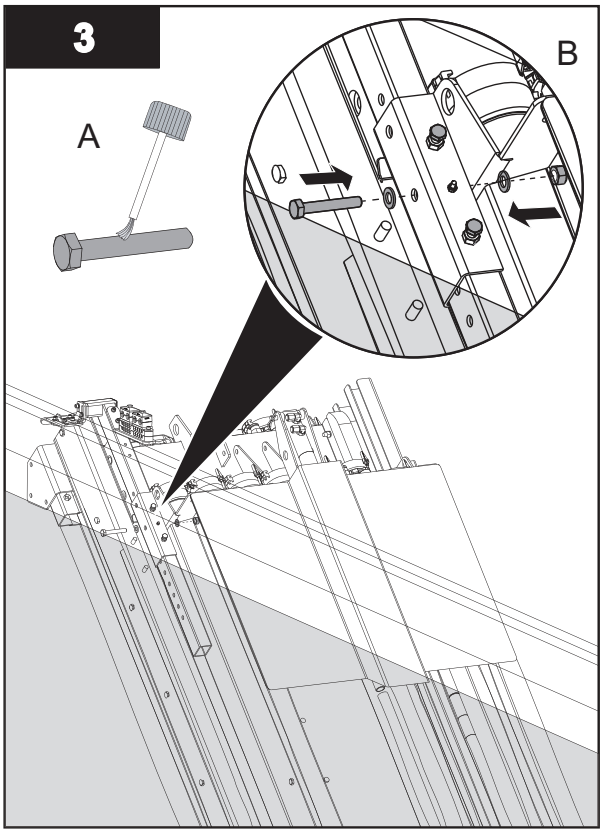
Standard Channel Bracket Assembly

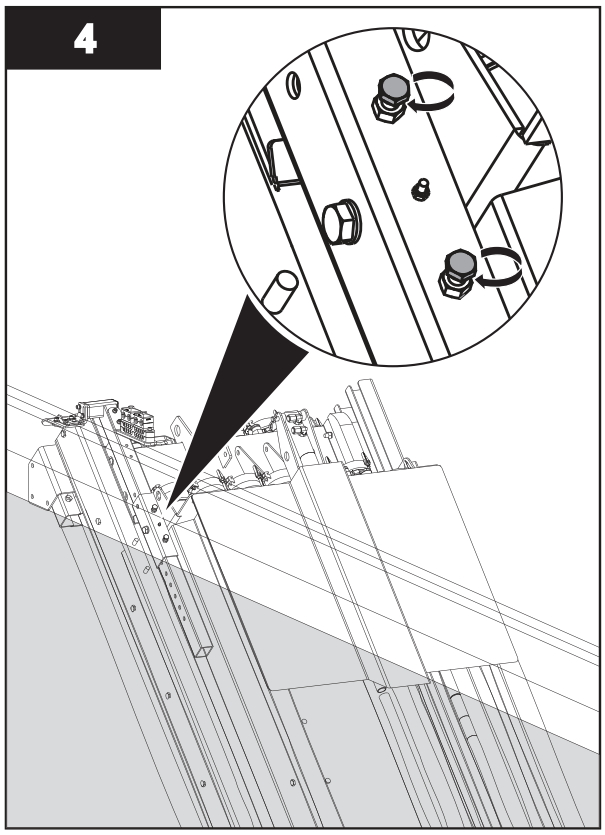


* *Staging Area (Wireway)*



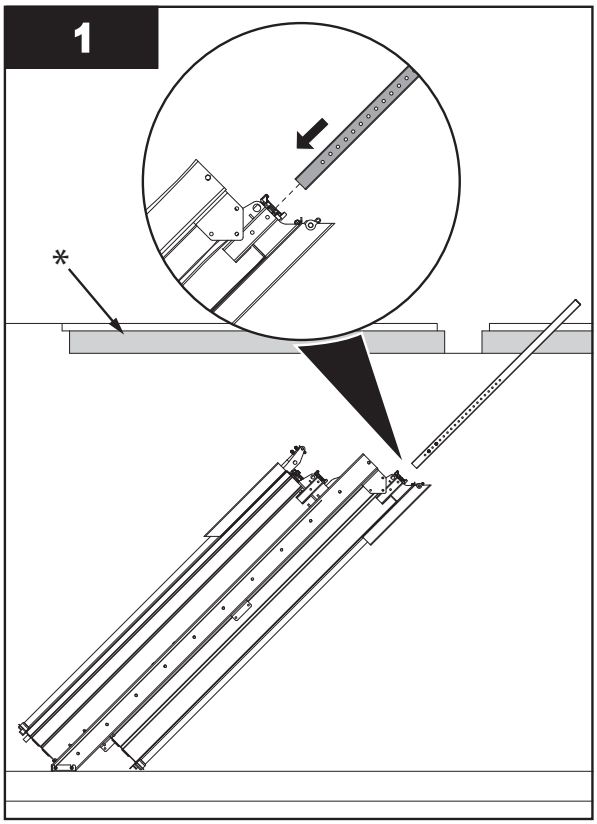
Note: *Adjust bracket arm up or down.*



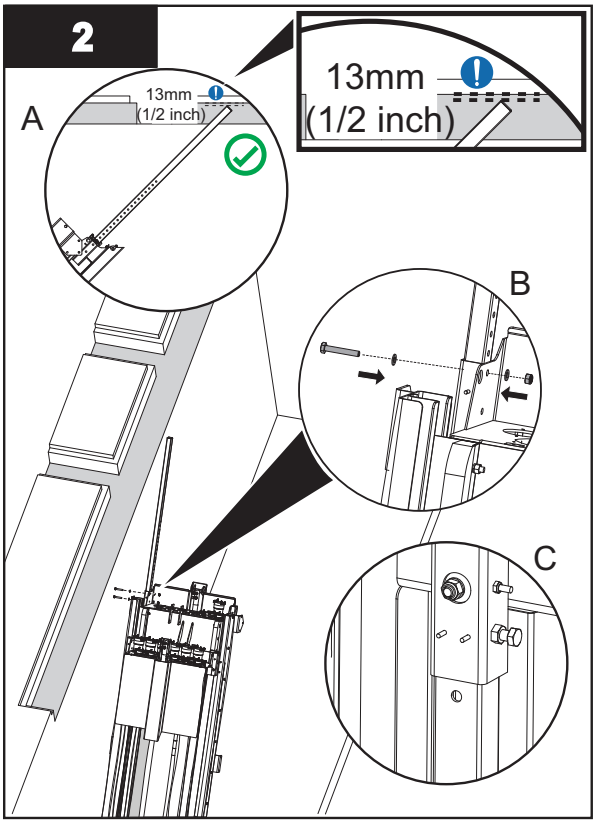


Note: *Tighten Jam Nuts/Bolts to secure Cable Management Assembly.*

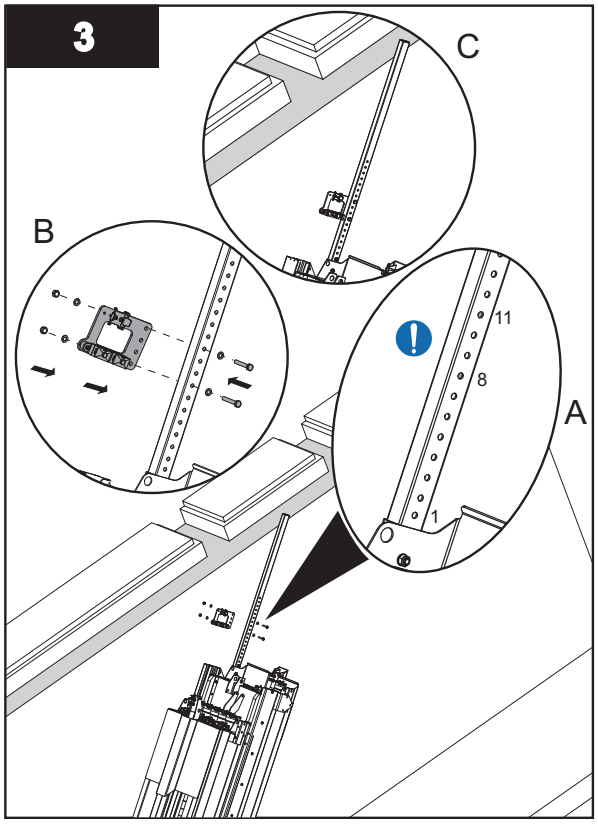
Deep Channel Bracket Assembly



** Staging Area (Wireway)*



Note: *Distance to be minimum 13mm (1/2 inch) below underside of grating.*



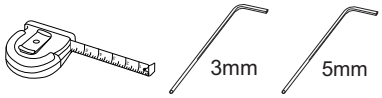
Notes: *1) Secure the bracket onto the 8th and 11th holes as shown above the first exposed hole.*
2) Bracket installation may be done later, when the UV Bank is lifted.

7.1.13 Bank in Place Sensor

Prerequisites:

- Lift UV Bank down.
- Lockout Tag Out devices as required. Refer to Section 4.
- Install partial grating as per site requirements.

Tools:

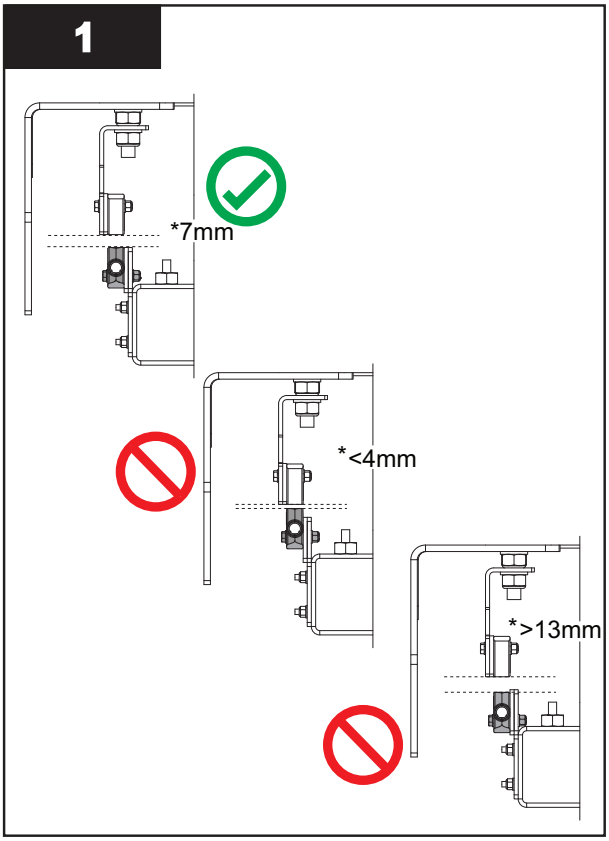


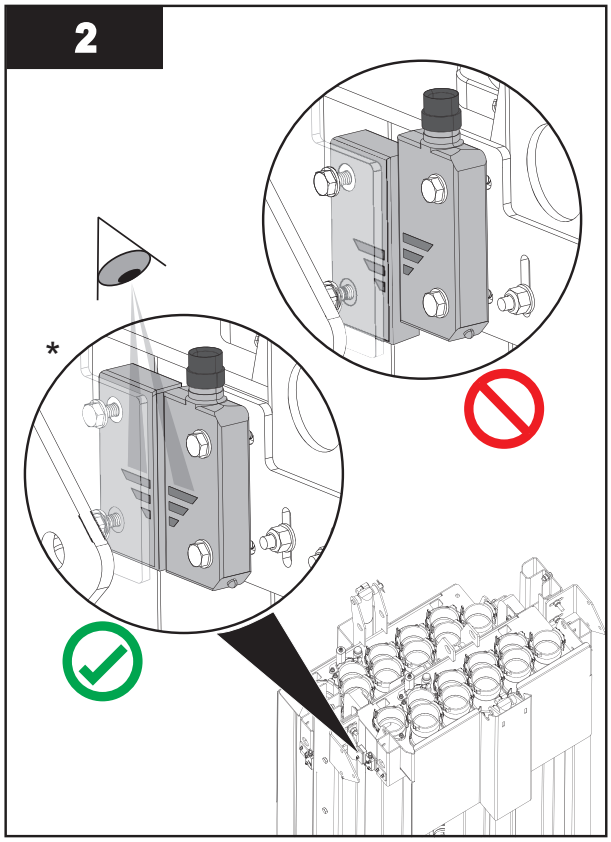
Materials:

Procedure:

NOTICE
The Bank In Place Sensors and the spacers are shipped attached to the UV Banks and Bank Frame. Adjust as required.

Bank A Side Installation

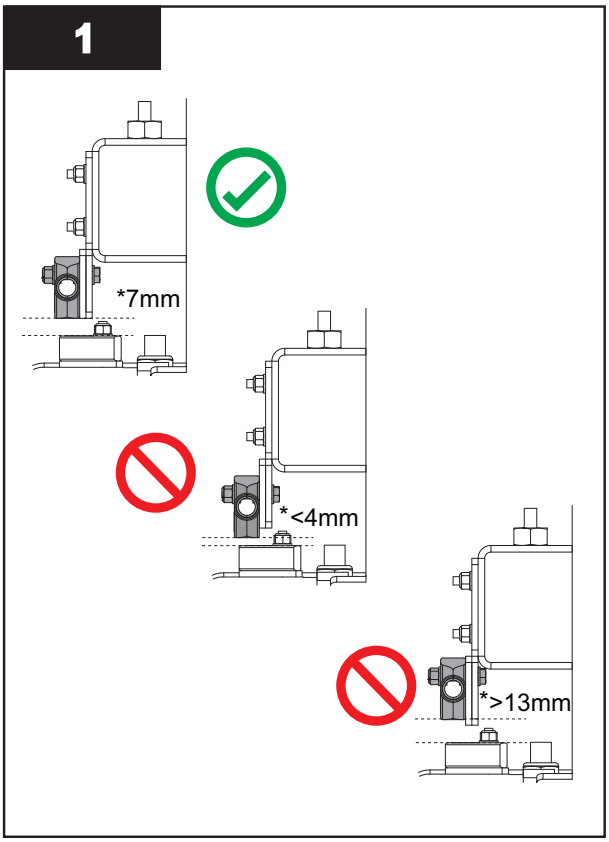


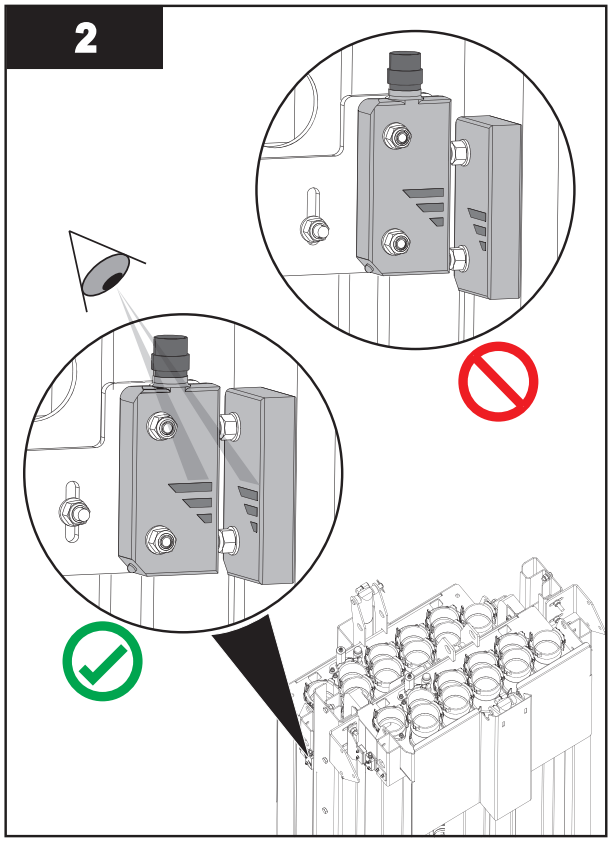


Note: *Adjust and align sensor to ensure there is a 7mm gap between sensors.*

** Sensor bracket is opaque.*

Bank B Side Installation





Note: *Adjust and align sensor to ensure there is a 7mm gap between sensors.*

7.1.14 Level Sensor

One low level sensor is located in each channel between the level controller and the UV bank that is farthest downstream. Additionally, a high level sensor may be provided (project dependent) and is installed upstream of the most upstream UV bank in a channel.

Prerequisites:

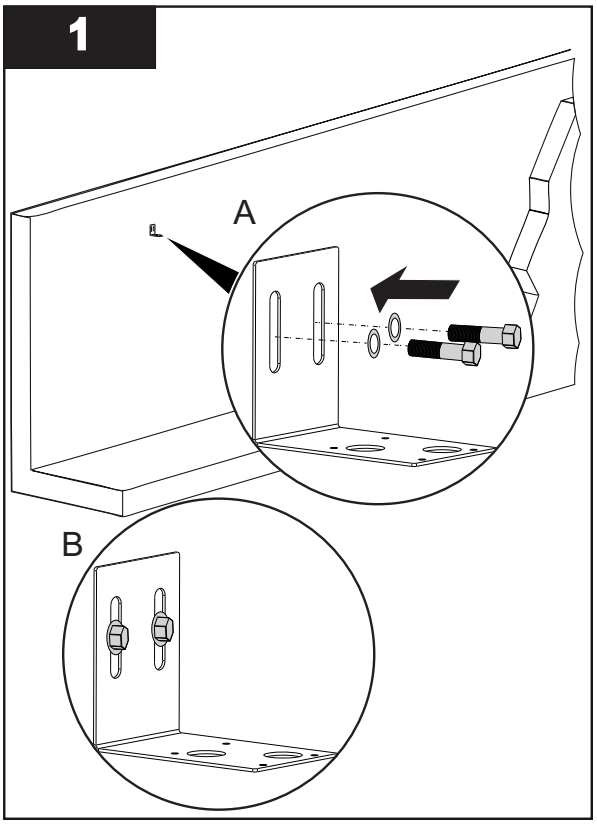
- Lockout tag out - PDC compartment. Refer to Section 4.
- Isolate the Inlet Valve or Gate.
- Refer to the layout drawings provided by Trojan Technologies for installation location.

Tools:

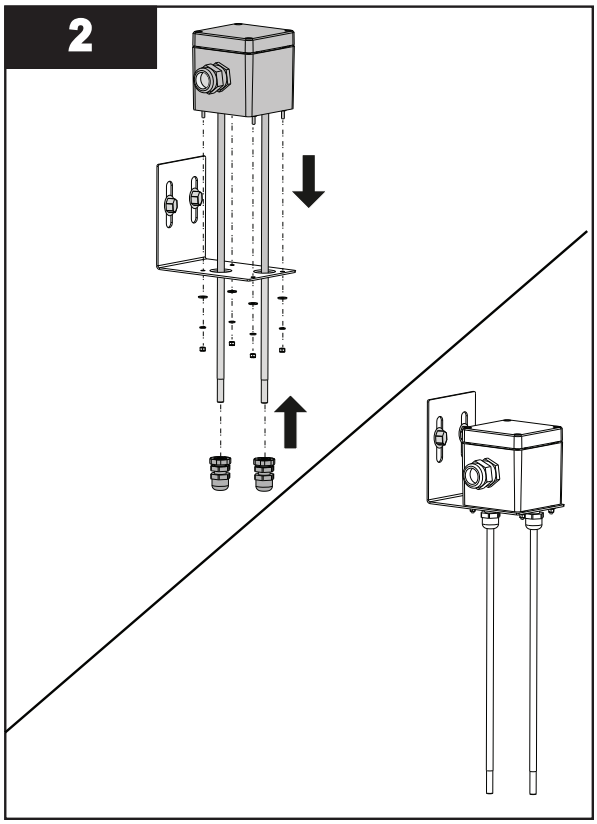
Materials:

- 1/4 inch Anchor hardware (by others)

Procedure:



Note: *Position the level sensor top wall mounting bracket in the location and elevation specified in the project layout drawings. Ensure that the bracket is plumb with the channel wall.*



Note: *The Level Sensor Rods must be cut to the proper length by the Trojan Startup Technician.*

Note: *All openings created on the cabinets MUST be filled with equipment marked with the same type rating, as the enclosure (Ex: Cable Strain Reliefs).*

7.1.15 Additional Equipment

7.1.15.1 Water Level Controller

For systems supplied with a water level controller, refer to the layout drawings provided by Trojan Technologies for the location of the water level controller. Refer to **DC450101** for Water Level Controller installation instructions.

7.1.15.2 UV Transmittance Controller and Sensor

For systems supplied with a UV Transmittance Controller and Sensor, refer to the layout drawings provided by Trojan Technologies for the location of the UVT instrument. Refer to the manufacturer's manual for installation instructions.

7.2 Wiring, Cables and Hoses

7.2.1 Scope of Work - Electrical Installation Contractor

Table 4 is a general overview of installation tasks required for the UV System interconnect wiring, cables and hose connections. For a complete list of tasks to be completed before system start-up can be initiated, refer to the Start-up Checklist provided by Trojan Service.

NOTICE

DO NOT energize the equipment prior to the Trojan Service Technician arriving on site for system start-up.

Trojan Technologies personnel must install the UVI Sensors, UV Sensor Housing, lamp sleeves and UV lamps in the UV bank.

DO NOT move the wiper, install the UVI sensor, UV Sensor Housing, lamp sleeves and UV lamps, a Trojan Technologies associate will do the initial install when contacted for the system start up.

Table 4 Wiring, Cables and Hose Scope of Work - Installation Contractor

Connection Task:	The following items must be installed first in order to complete the wiring and hose connections:	Standard connections to be made:	Optional Connections[1]:	Include in Spiral Wrap or Cable Track (as applicable):
SCC Wiring	SCC (Section 7.1.4) PDC (Section 7.1.5) HSC (Section 7.1.6)	Incoming Power Communication Bond Wire (Panel)	Flow High Level Sensor SCADA Weir Gate Inlet Gate UV Transmittance Meter Ultrasonic Level Sensor Discrete Alarms etc.	--
PDC Wiring	SCC (Section 7.1.4) PDC (Section 7.1.5) HSC (Section 7.1.6)	Incoming Power Communication Bond Wire (panel)	--	--
	UV Bank (Section 7.1.9) Bank In Place Sensor (Section 7.1.13) Cable Management Assembly (Section 7.1.12)	Bond Wire (from UV Banks) UVI Sensor Cables Lamp Cables	--	Yes
HSC Wiring	SCC (Section 7.1.4) PDC (Section 7.1.5) HSC (Section 7.1.6)	Incoming Power Communication Bond Wire (panel)	--	--
Level Sensor Control Box Wiring	PDC (Section 7.1.5) Level Sensor Control Box (Section 7.1.7) Low Level Sensor (Section 7.1.14)	Incoming Power Bond Wire (panel) Low Level Sensor Wiring	High Level Sensor	--

Table 4 Wiring, Cables and Hose Scope of Work - Installation Contractor

Connection Task:	The following items must be installed first in order to complete the wiring and hose connections:	Standard connections to be made:	Optional Connections[1]:	Include in Spiral Wrap or Cable Track (as applicable):
Hydraulic Hoses	HSC (Section 7.1.6) UV Bank (Section 7.1.9) Cable Management Assembly (Section 7.1.12)	Hydraulic Hoses	--	Yes
UV Bank Wiring	PDC (Section 7.1.5) UV Bank (Section 7.1.9) Bank In Place Sensor (Section 7.1.13) Cable Management Assembly (Section 7.1.12)	Lamp Cables Bond Wire (to PDC)	--	Yes

[1] Refer to the project layout drawings and electrical drawings for a complete list of site specific wiring connections.

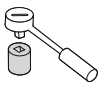
7.2.2 Scope of Work - Trojan Start up Technician

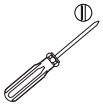
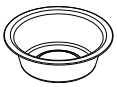
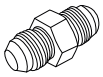
The following connection tasks are to be completed by a Trojan Startup Technician.

Table 5 Wiring, Cables and Hose Scope of Work - Trojan Start up Technician

Task:
Inspect panel and device connections
Initiate power to panels and devices
Bleed the Hydraulic Hoses

7.2.3 Tools and Materials

Symbols	Description	Symbols	Description
	Wrench - Open		Crimping Tool
	Socket Wrench and Socket		Power Drill with Bits
	Adjustable Wrench		Heat Gun
	Funnel		Hydraulic Fluid

Symbols	Description	Symbols	Description
	Hex Key		Slotted Screwdriver
	Lint-free Cloth (Kimwipes®)		Lifting Straps (properly rated for equipment load)
	Wrench - Combination		Pliers - Needlenose
	Shallow Bowl		JIC Straight Union
	Bucket		Tray to catch oil

7.2.4 SCC Electrical Connections

Prerequisites:

- Mount the SCC. Refer to Section 7.1.4.1.
- Use appropriately rated cable and strain reliefs as per the Electrical and Layout Drawings provided by Trojan Technologies.
- Lockout Tag Out devices as required. Refer to Section 4.
- Refer to Electrical Wiring Diagram, Interconnect Drawing and Layout Drawings provided for additional information.

Tools:

Materials:

- Electrical Drawings, Electrical Interconnect Drawings (provided)
- Project Layout Drawings (provided)

Procedure:

1. Locate the locations for the incoming power connections and field connections.

   Notes: *1) Power connections are made on the top of the panel, above the main disconnect.*

   2) Field connections are made on the underside of the panel.

2. Open SCC panel door, put a cloth over equipment inside SCC enclosure to protect from metal filings.
3. Drill holes for incoming power and field wiring.
4. Carefully remove the protective cloth without dropping metal filings inside the SCC. Remove all metal filings from SCC.
5. Install the power and all applicable field wiring. Obey all local codes for main incoming power supplies and applicable field wiring.

   Note: *All openings created on the cabinets MUST be filled with equipment marked with the same type rating, as the enclosure (Ex: Cable Strain Reliefs).*

7.2.5 PDC Electrical Connections

Prerequisites:

- Mount the PDC. Refer to Section 7.1.5.1.
- Use appropriately rated cable as per the Electrical and Layout Drawings provided by Trojan Technologies.
- Lockout Tag Out devices as required. Refer to Section 4.
- Refer to Electrical Wiring Diagram, Interconnect Drawing and Layout Drawings provided for additional information.

Materials:

- Ferrules (4 required per lamp cable) (provided)
- M6 Nut
- Project Layout Drawings (provided)
- Electrical Drawings, Electrical Interconnect Drawings (provided)
- Instruction, TrojanUV Solo Lamp Cable Installation Guideline, Document Number **DC000601-017**
- Instruction, Lamp Cable Routing in PDC, Document Number **DC340601-007**
- Temporary Routing Cable Labels (not provided)
- Cable Labels (provided)

Procedure:

1. Incoming Power - is recommended to be on the top of the panel, above the main disconnect or on the side of the panel on the same side as the main disconnect.

2. Lamp Cabling and Field wiring - open the PDC door and locate the strain reliefs on the bottom of the PDC. (Figure 7).

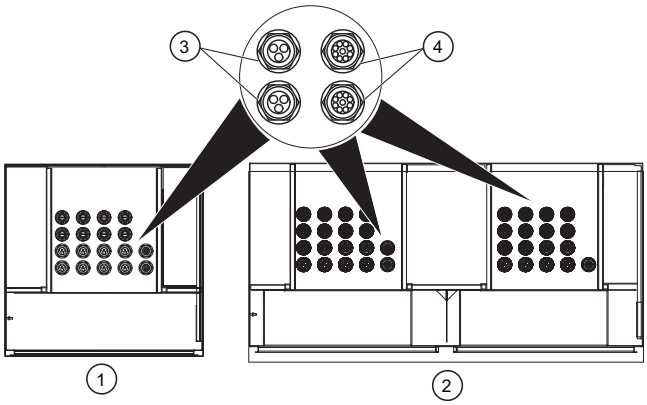


Figure 7 PDC Cable Connections

1	Single Door PDC*	**3**	Reserved for Lamp Cables
2	Double Door PDC*	**4**	Reserved for UVI sensor, low level sensor and bank in place sensor and Bond Wire

* Inside bottom view, when looking in through the door. Conduit strain relief configuration may vary depending on site requirements. Refer to project electrical drawings for additional information.

3. Install the lamp cabling **(Refer to DC000601-017 and DC340601-007)**.
4. Install the bond wire and all applicable field wiring. Obey all local codes applicable field wiring.

   Notes: *1) One Lamp Cable allowed per Strain Relief opening (maximum 3 Lamp Cables per Strain Relief). Plug unused strain relief openings with plugs provided.*

   2) All openings created on the cabinets MUST be filled with equipment marked with the same type rating, as the enclosure (Ex: Cable Strain Reliefs).

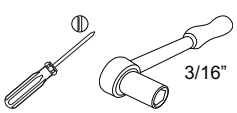
   3) Use the ferrules provided for terminating within the PDC. ***Label each end of the lamp cable,*** *with provided cable labels.*
5. Repeats steps 1 through 4 for each PDC.

7.2.6 HSC Electrical Installation

Prerequisites:

- Mount the HSC. Refer to Section 7.1.6.1.
- Use appropriately rated cable as per the Electrical and Layout Drawings provided by Trojan Technologies.
- Apply Lockout Tag Out devices as required. Refer to Section 4.
- Refer to Electrical Wiring Diagram, Interconnect Drawing and Layout Drawings provided for additional information.

Tools:



- Hydraulic Knock out

Materials:

- Electrical Drawings, Electrical Interconnect Drawings (provided)
- Project Layout Drawings (provided)

Procedure:

1. Locate label on Gland Plate:
   - Green (Left side is for low voltage connections)
   - Red (Right side of gland plate is for high voltage connections)
2. Remove gland plate to be drilled on site, noting the orientation of the plastic washers (Figure 8).
3. Use the hydraulic knockout device to add holes to the HSC aluminum gland plate for incoming power feed and all applicable field wiring. Ensure the orientation of conduit holes for power and control wiring match the label.
4. Install the power feed and all applicable field wiring. Include a local disconnect. Obey all local codes for main incoming power supplies.

   Note: *All openings created on the cabinets MUST be filled with equipment marked with the same type rating, as the enclosure (Ex: Cable Strain Reliefs).*
5. Reinstall gland plate, torque nuts noting orientation of plastic washers (Figure 8).

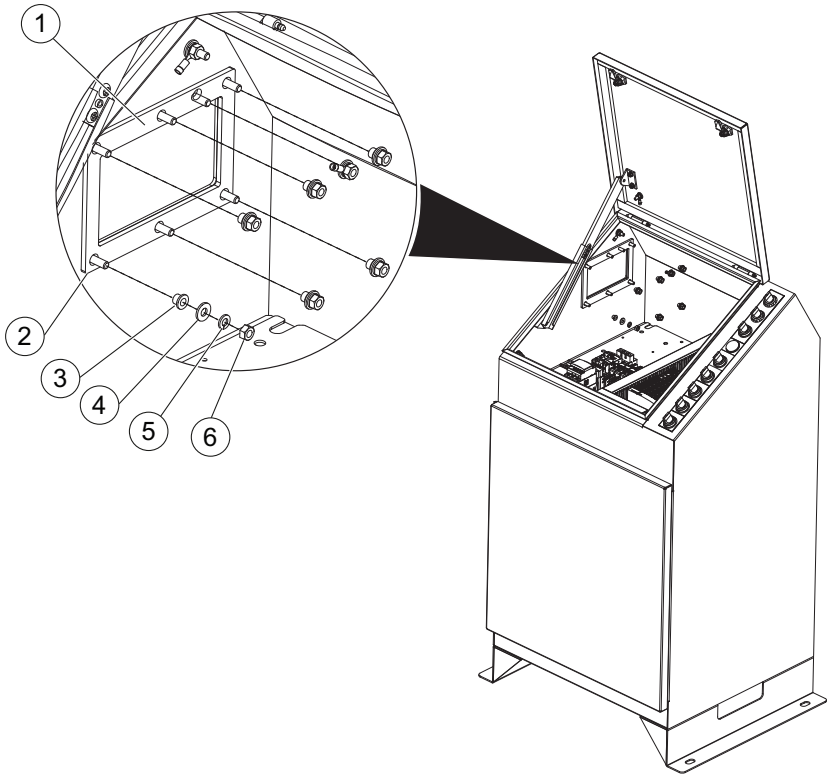


Figure 8 HSC - Gland Plate Assembly

1	Gasket	**4**	Flat Washer
2	Gland Plate	**5**	Splitlock Washer
3	Plastic Washer	**6**	Hex Nut

7.2.7 Level Sensor Wiring

Prerequisites:

- Install Level Sensor Control Box. Refer to Section 7.1.7.
- Lockout tag out - Level Sensor Control Box. Refer to Section 4.
- Refer to Electrical Wiring Diagram, Interconnect Drawing and Layout Drawings provided for additional information.

Materials:

- Electrical Interconnect Drawings, provided

Procedure:

1. Route and connect the Level Sensor wiring from the Level Sensor to the Level Sensor Control Box.

7.2.8 Hydraulic Hose - Cylinder Connections

7.2.8.1 Connect the Hydraulic Hoses to the Lift and Wipe Cylinders

Prerequisites:

- Install HSC. Refer to Section 7.1.6.1.
- Lockout Tag Out devices as required. Refer to Section 4.
- Install Cable Management Assemblies. Refer to Section 7.1.12.1.

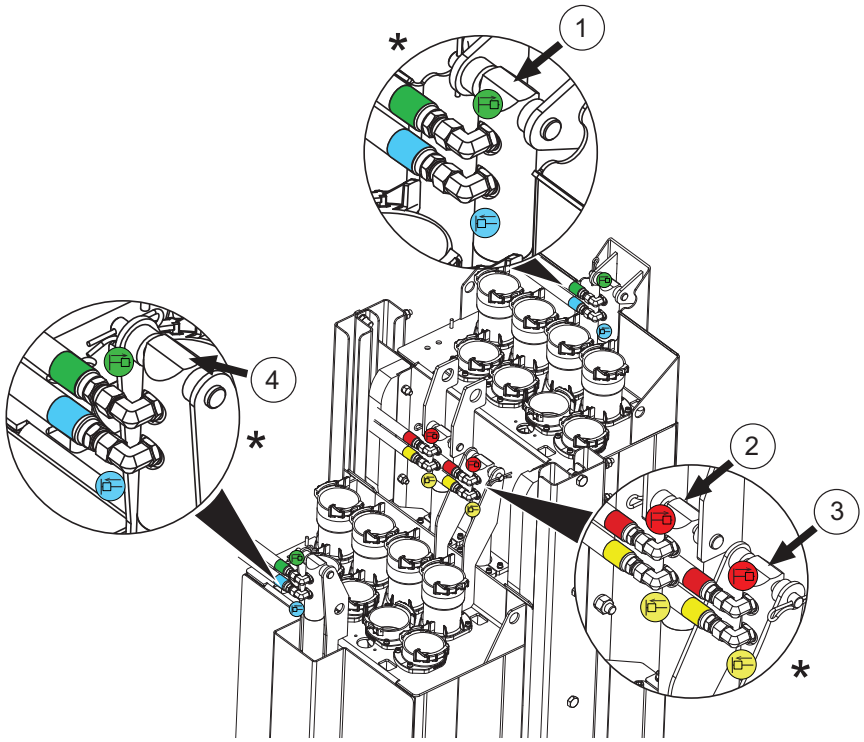


Figure 9 Hydraulic Hose Connections

1	Bank A or Bank C Wipe Cylinder	**3**	Bank B or Bank D Lift Cylinder
2	Bank A or Bank C Lift Cylinder	**4**	Bank B or Bank D Wipe Cylinder

** Hydraulic hoses can be routed to either the left or right side of the cylinders. Route the hydraulic hoses toward the cable trough.*

Tools:

Materials:

- Plastic hose fitting plug (Shipped attached to hydraulic hoses)

  Note: *Remove the hose fitting plugs and set aside for later use.*
- Hydraulic Hoses
- Colored Bands - cut to 25mm (1 inch) length

Procedure:

1. Route Hydraulic Hose from the UV Bank to the appropriate HSC. Refer to Layout Drawing. Refer to Table 6 for recommended hose installation order.

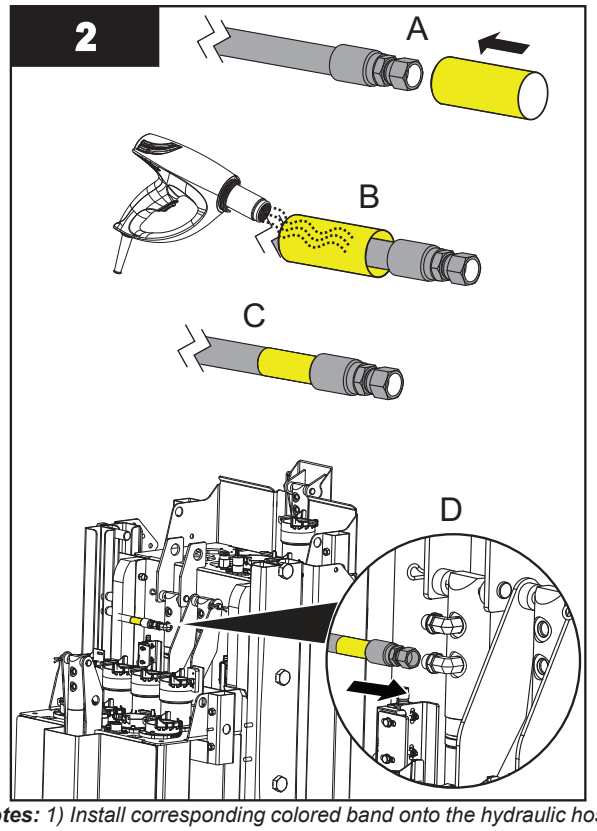
Notes: *1) Make sure the pre-crimped end of the hydraulic hose is at the UV Bank side.*

2) Refer to Section 7.1.12 for Hydraulic Hose Routing in Cable Management Assemblies.

Table 6

Connect hoses in order:	Bank / Cylinder Connection Point	Corresponding HSC Connection Point
First	Bank A Lift Cylinder, Retract*	HSC - Lift, Retract*
Second	Bank A Wipe Cylinder, Retract*	HSC - Wipe, Retract*
Third	Bank B Lift Cylinder, Retract*	HSC - Lift, Retract*
Fourth	Bank B Wipe Cylinder, Retract*	HSC - Wipe, Retract*
Fifth - continue with Bank C* and so on		

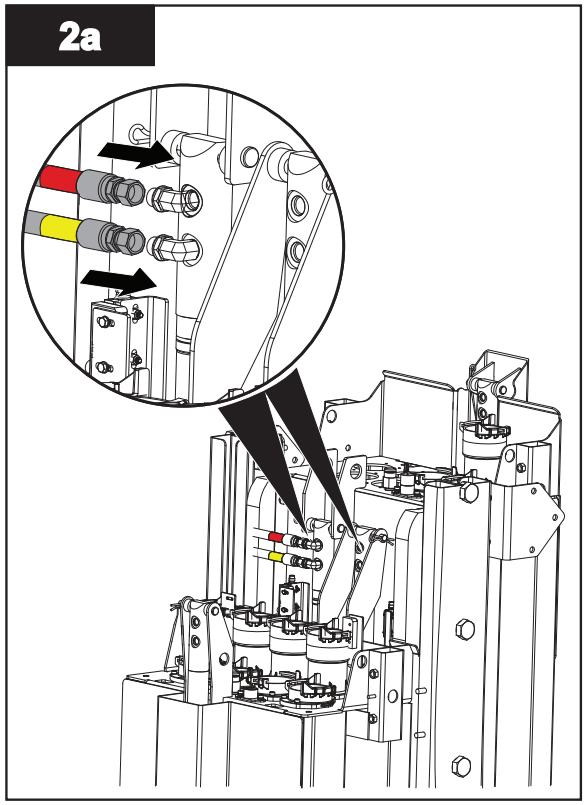
* Refer to Figure 9 for connection locations.



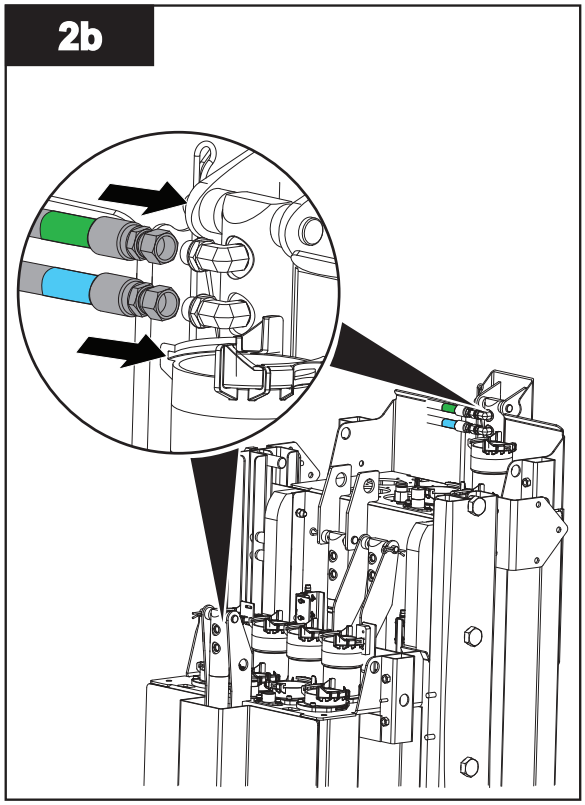
Notes: *1) Install corresponding colored band onto the hydraulic hose (Refer to Figure 9).*
2) Temporarily mark opposite end of hose.
3) Route the hose to the corresponding HSC.

Notes: *1) Ensure that the hose is not kinked, twisted or bent and that there is enough slack while the hoses are in use.*
2) Number of connections depends on the site requirements.

Example - Lift Cylinder Circuit



Example - Wipe Cylinder Circuit



7.2.9 Cable and Wire Routing

Prerequisites:

- Install PDC. Refer to Section 7.1.5.
- Lockout Tag Out devices as required. Refer to Section 4.

7.2.9.1 Bond Wire(s)

Procedure:

1. Install a bond wire onto the UV Bank and route the bond wire to corresponding PDC. Refer to Layout Drawing and Figure 10.

   Note: *Each UV Bank is required to have a dedicated bond wire.*

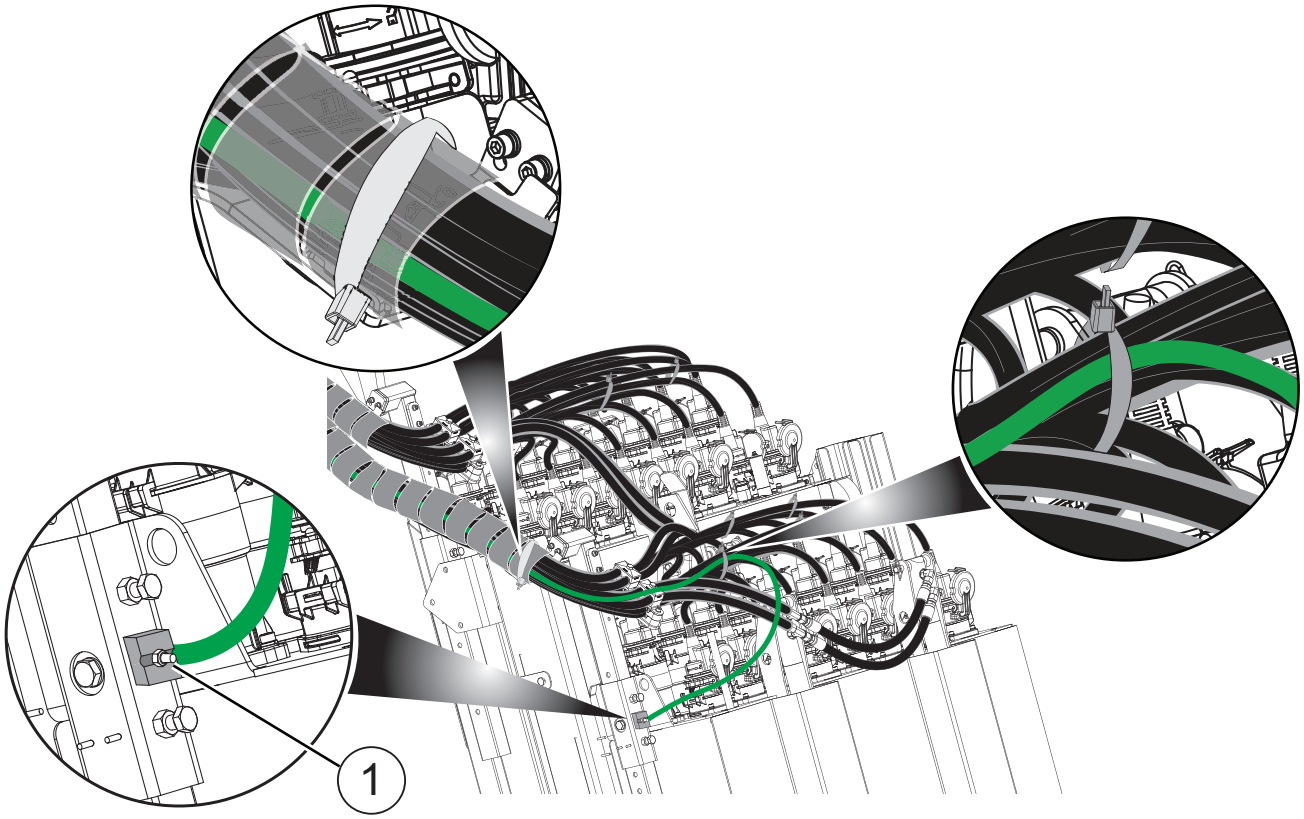


Figure 10 Bonding Post

1	Bonding Post

Note: *Cable spiral wrap is to be installed at a later time.*

7.2.9.2 Field Wire(s)

Procedure:

1. Route all field wiring (i.e. Bank in Place Sensor, UVI Sensor) to the PDC. Refer to UV Layout Drawing.
2. Repeat step 1 for all field wiring connections to appropriate PDC.

7.2.9.3 Lamp Cables

Procedure:

1. Route a lamp cable from the UV Bank to the PDC. Refer to Layout Drawing.

   Note: *It is recommended to install temporary cable labels at each end of the Lamp Cables, for example on Bank 1A, Lamp Cable 1, attach a label to each end indicating Bank1-1A or similar.*

2. Repeat step 1 for each Lamp Cable.

7.2.10 Install Lamp Cables and Hydraulic Hoses in Bracket Assemblies

Prerequisites:

- Install Cable Management Assemblies. Refer to Section 7.1.12.1.
- Install Hydraulic Hoses. Refer to Section 7.2.8.

Materials:

- Cable Ties
- Cable Spiral Wrap or Cable Track
- **TrojanUV Solo Lamp Cable Installation Guideline Instruction, document number DC000601-017.**

Procedure:

1. Route Lamp Cables, Hydraulic Hoses, UV Bank in Place, UV Intensity Sensor Cable and Bond Wire into Bracket Assemblies.
2. If cable track is supplied, skip the remainder of this section and proceed to Section 7.2.11. Hydraulic hose connections at HSC will be completed in Section 7.2.13.

   If Spiral Wrap is supplied, wrap around the following:

   a. UV Bank Lamp Cables

   b. UV Bank Hydraulic Hoses

   c. UV Bank in Place Sensor, UV Intensity Sensor and Bond Wire.

NOTICE

A maximum of twelve (12) Lamp Cable per spiral wrap bundle allowed.
Where there is greater than twelve (12) UV Lamps per UV Bank, split the Lamp Cables into two (2) separate spiral wrap bundles.

3. Refer to Figures (Figure 11 and Figure 12).

Cable Routing through Standard Bracket Assemblies - Spiral Wrap

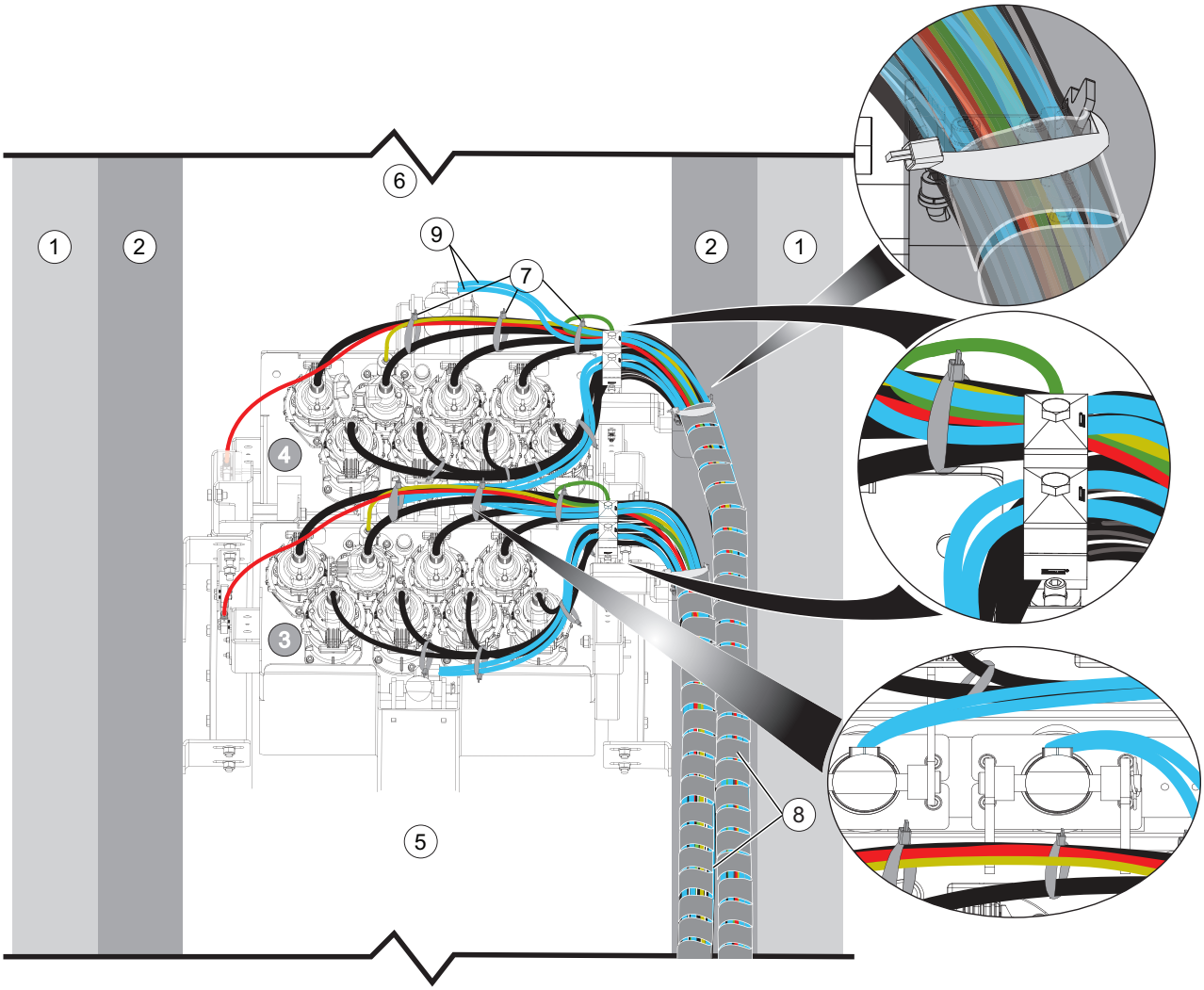


Figure 11 Cable Routing through Standard Bracket Assemblies - Spiral Wrap

1	Top of UV Channel Wall	**2**	Cable Trough*
3	Bank A	**4**	Bank B
5	Upstream	**6**	Downstream
7	Cable Ties	**8**	Cable Spiral Wrap
9	Hydraulic Hose**		

** One (1) cable trough per UV Channel is required. Cable trough is recommended to be located on the same side of the UV Channel as the PDC's.*

***Add enough hose slack to allow movement when removing lamp and/or lamp sleeve below hose.*

Cable Routing through Deep Channel Bracket Assemblies - Spiral Wrap

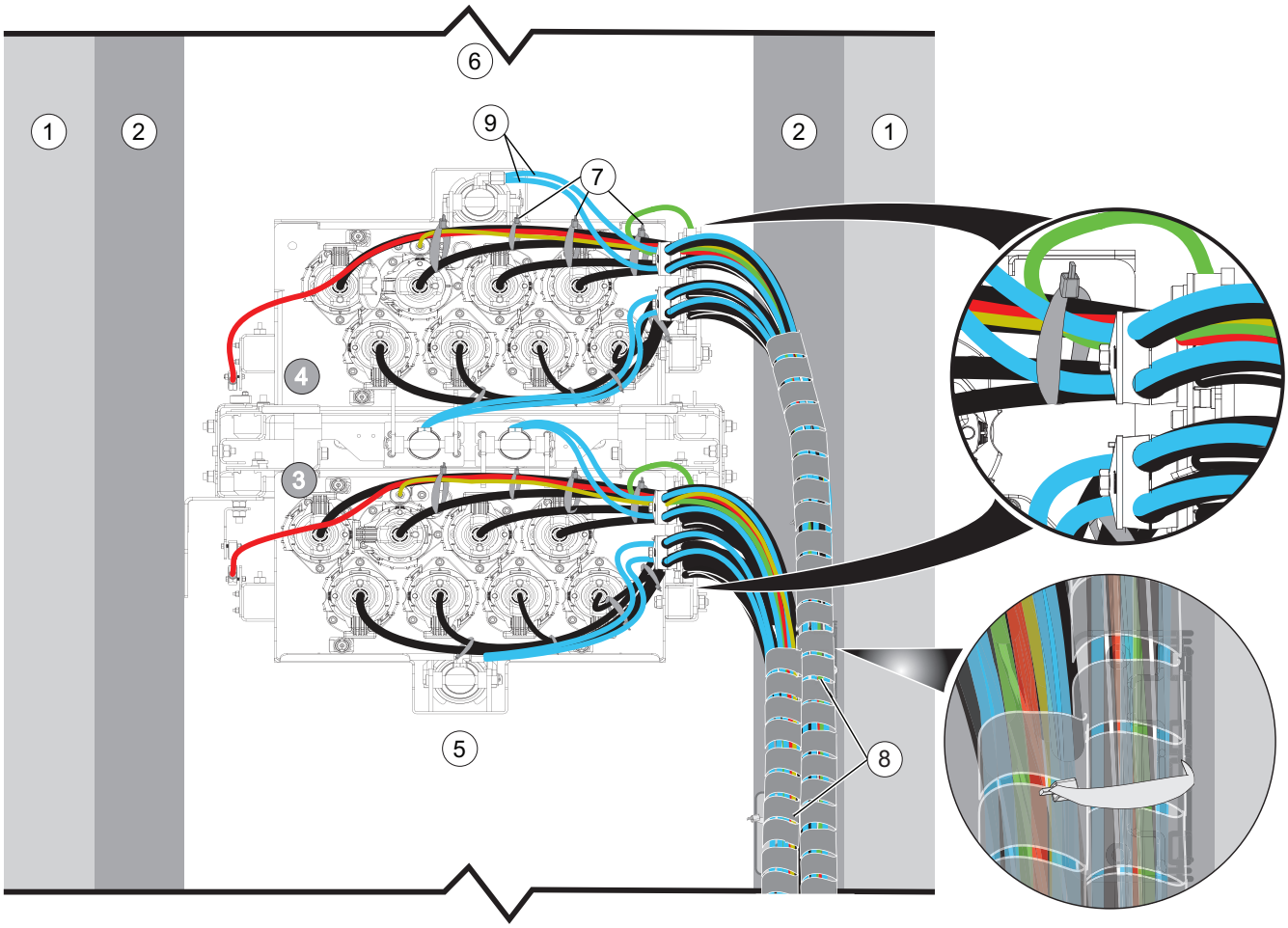


Figure 12 Cable Routing through Deep Channel Bracket Assemblies - Spiral Wrap

1	Top of UV Channel Wall	**2**	Cable Trough*
3	Bank A	**4**	Bank B
5	Upstream	**6**	Downstream
7	Cable Ties	**8**	Cable Spiral Wrap
9	Hydraulic Hose**		

** One (1) cable trough per UV Channel is required. Cable trough is recommended to be located on the same side of the UV Channel as the PDC's.*

***Add enough hose slack to allow movement when removing lamp and/or lamp sleeve below hose.*

7.2.11 Cable Trough Cable Management - Cable Track

The Cable Track can be installed on one side of the UV Channel or both sides of the UV Channel. Refer to project layout drawing for Cable Track installation location.

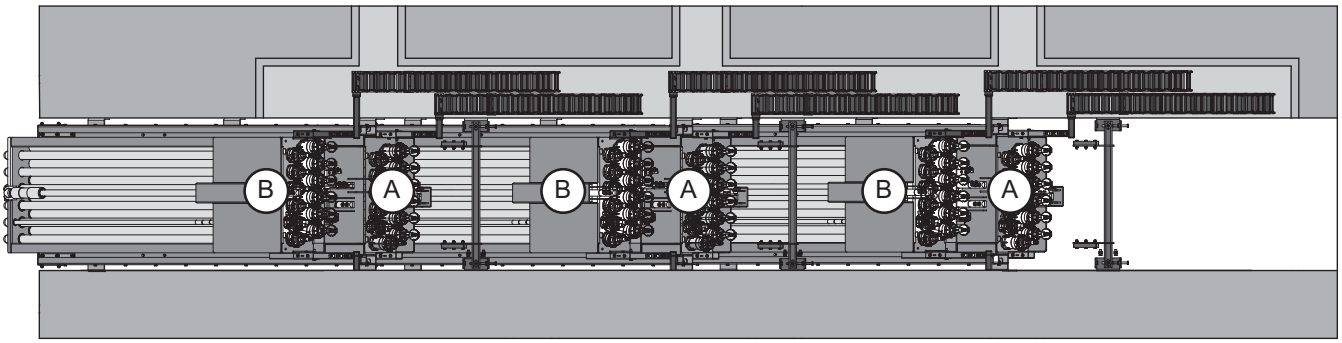


Figure 13 Cable Track Installation on One Side of UV Channel

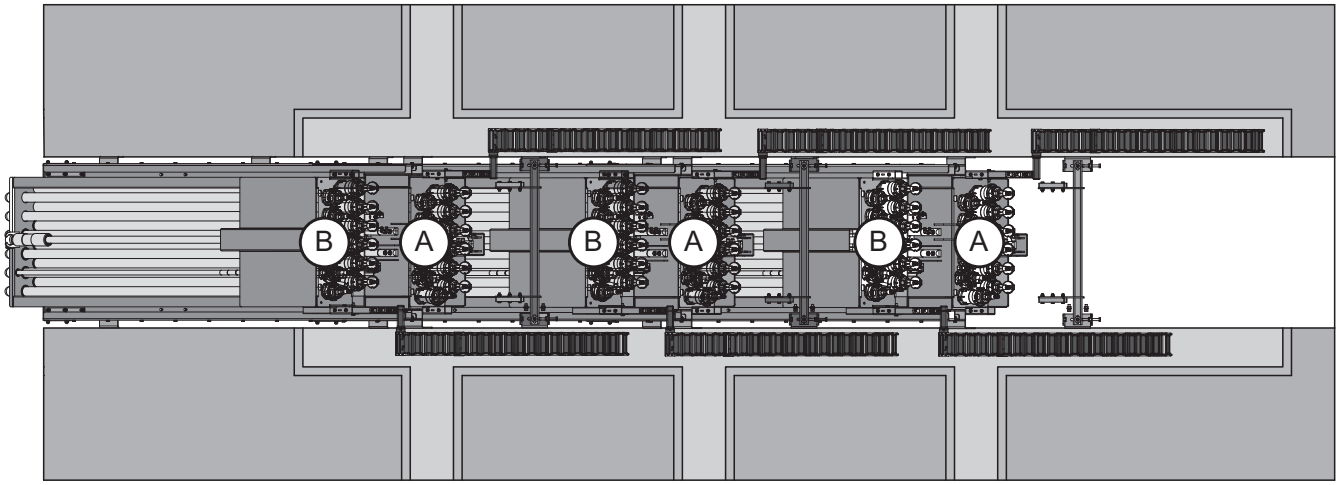


Figure 14 Cable Track Installation on Both Sides of UV Channel - Method A

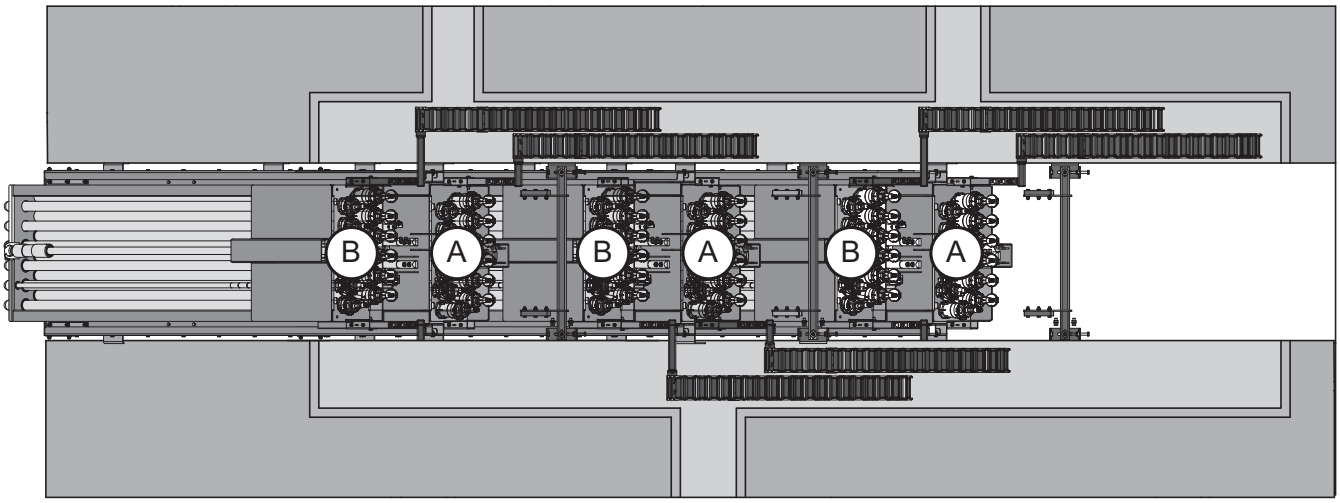


Figure 15 Cable Track Installation on Both Sides of UV Channel - Method B

Cable Routing through Cable Track

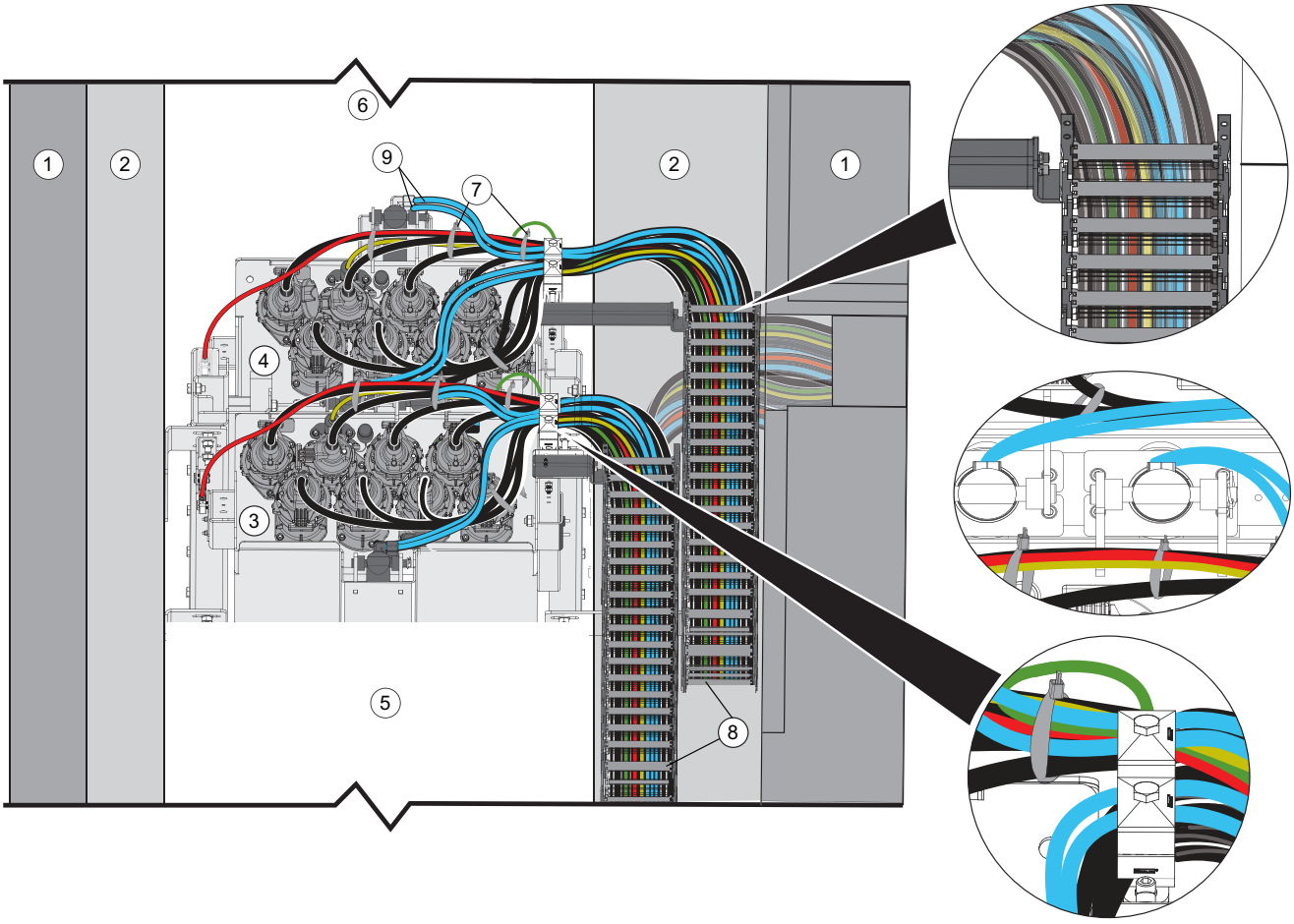


Figure 16 Cable Routing through Cable Track

1	Top of UV Channel Wall	**2**	Cable Trough*
3	Bank A	**4**	Bank B
5	Upstream	**6**	Downstream
7	Cable Ties	**8**	Cable Track
9	Hydraulic Hose**		

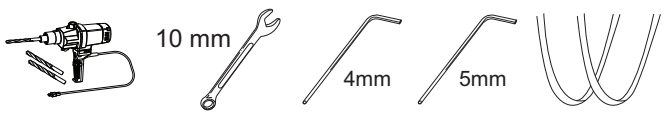
** One (1) cable trough per UV Channel is required. Cable trough is recommended to be located on the same side of the UV Channel as the PDC's.*

***Add enough hose slack to allow movement when removing lamp and/or lamp sleeve below hose.*

Prerequisites:

- Install Cable Management Assemblies. Refer to Section 7.1.12.1.
- Install Lamp Cables and Hydraulic Hoses in Bracket Assemblies. Refer to Section 7.2.10.

Tools:



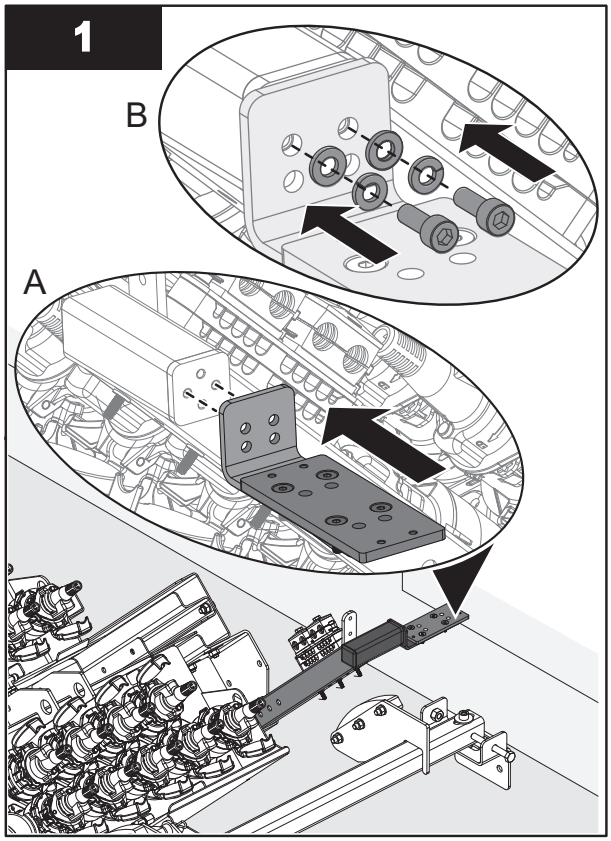
- Hoist Ring (x2)

Materials:

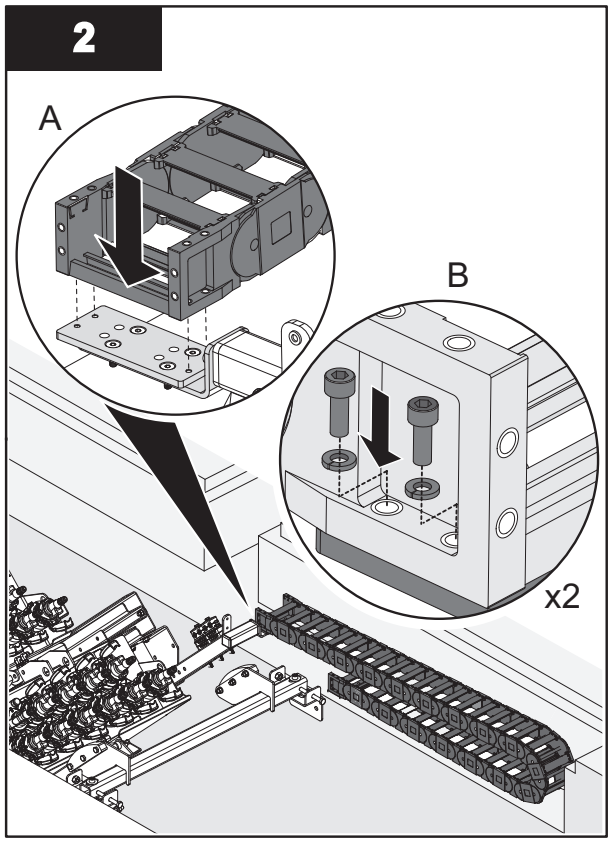
- Cable Track
- Cable Track Mounting Brackets
- Mounting Hardware

Procedure:

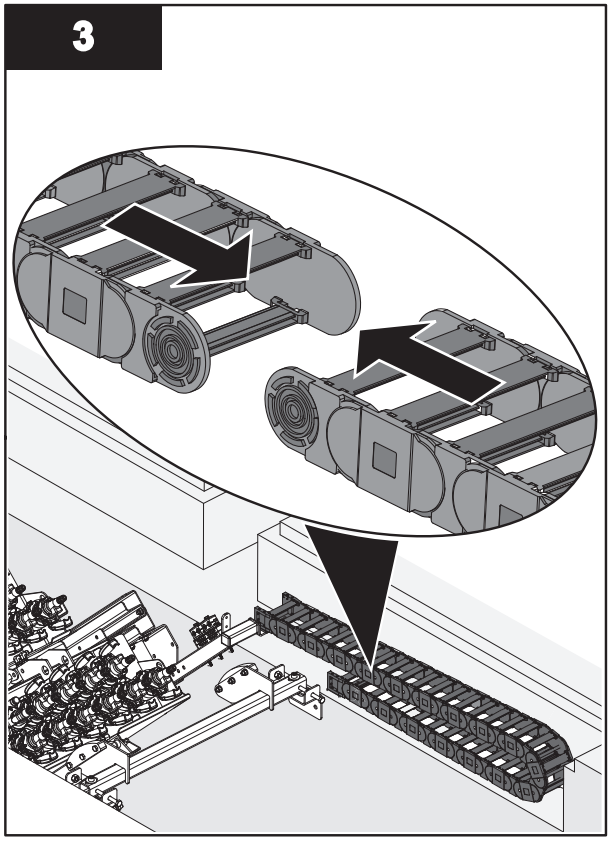
Install:



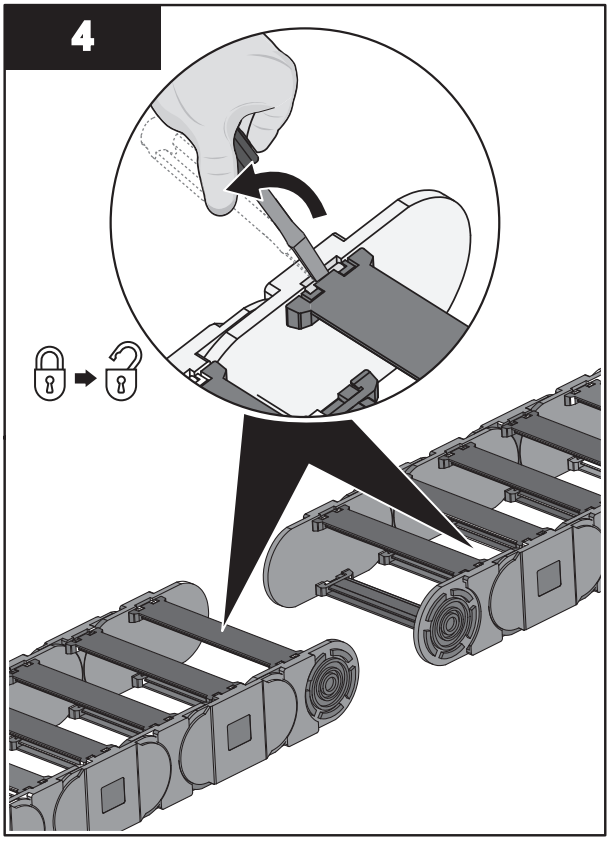
Note: *Install Cable Track mounting bracket to the cable management assembly.*



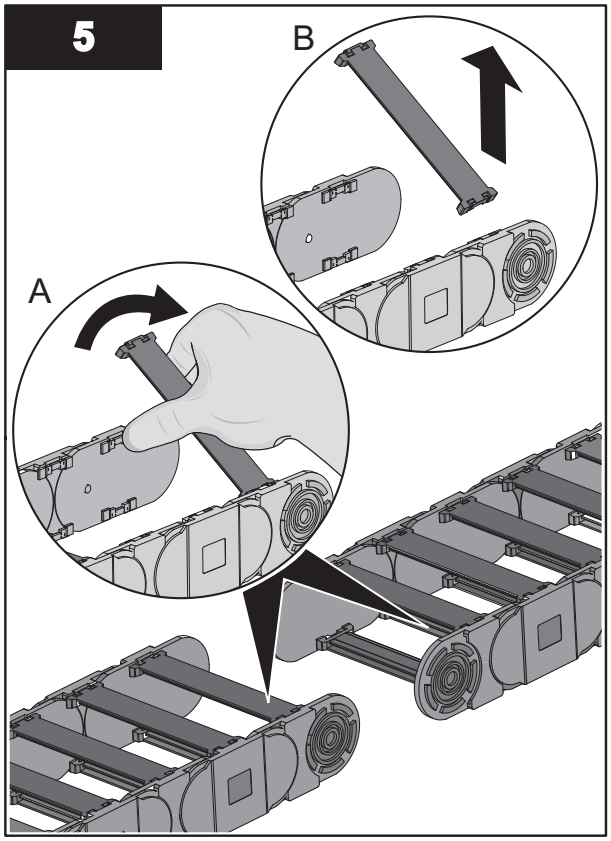
Note: *Position the cable track in the cable trough as per the project layout drawings.*



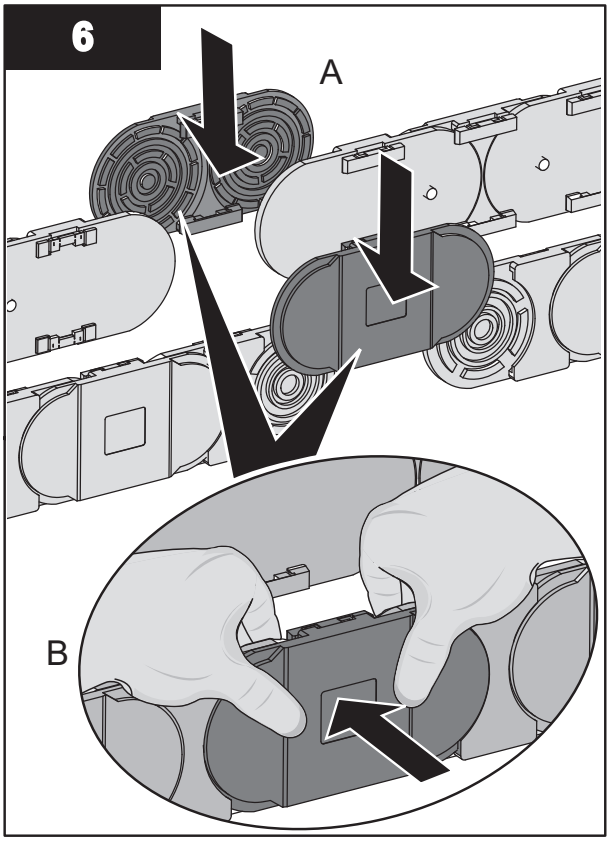
Note: *Position the chain links as shown.*



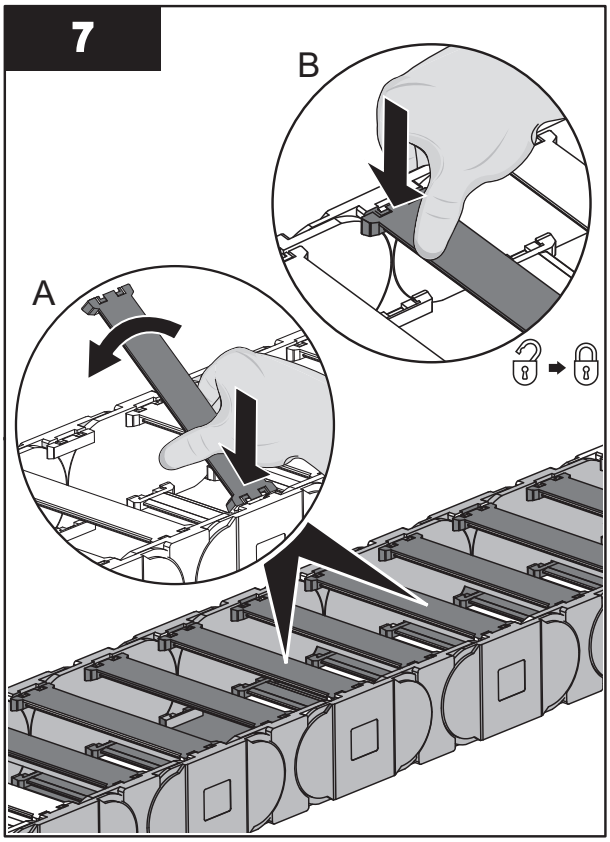
Note: *Pry open the cross bars using a screwdriver as shown.*



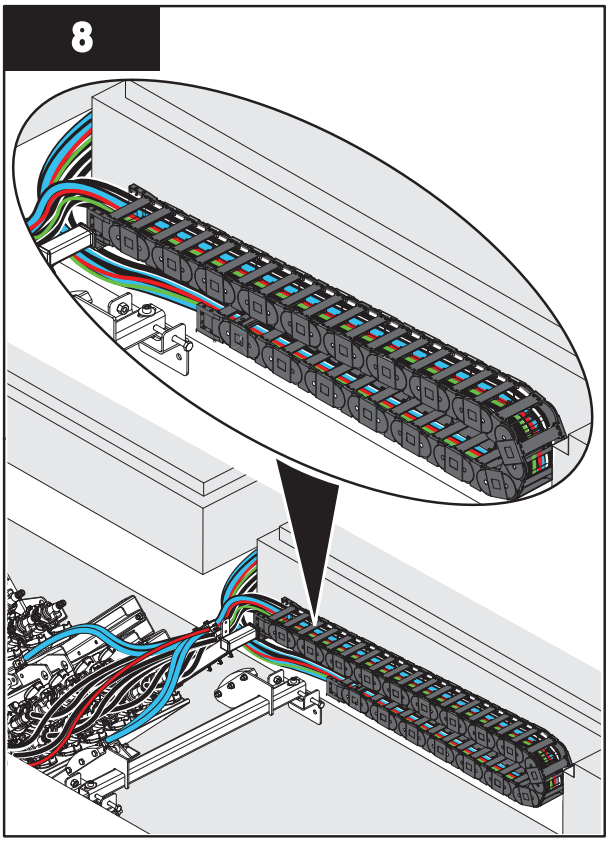
Note: *Retain the cross bars for later use.*



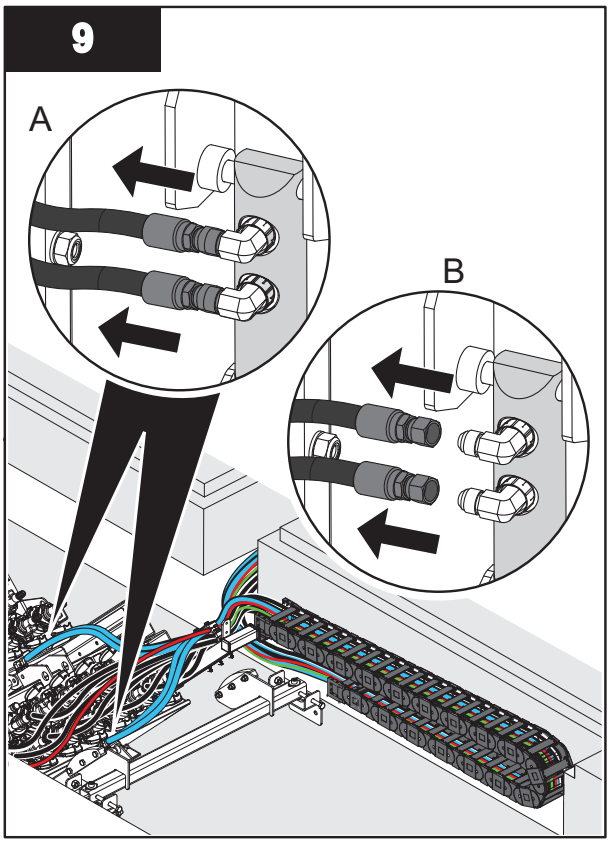
Note: *Press the side plates together to join the chain links.*



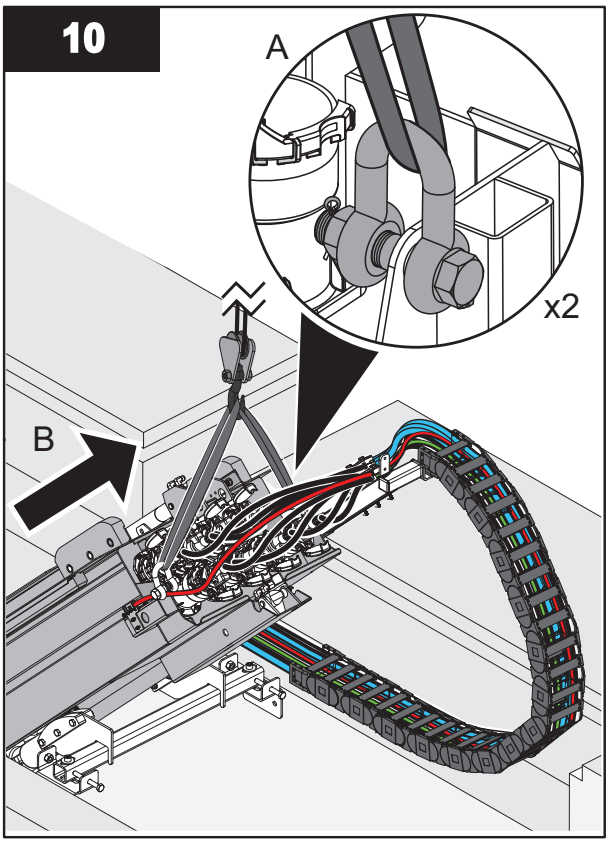
Note: *Install the cross bars.*



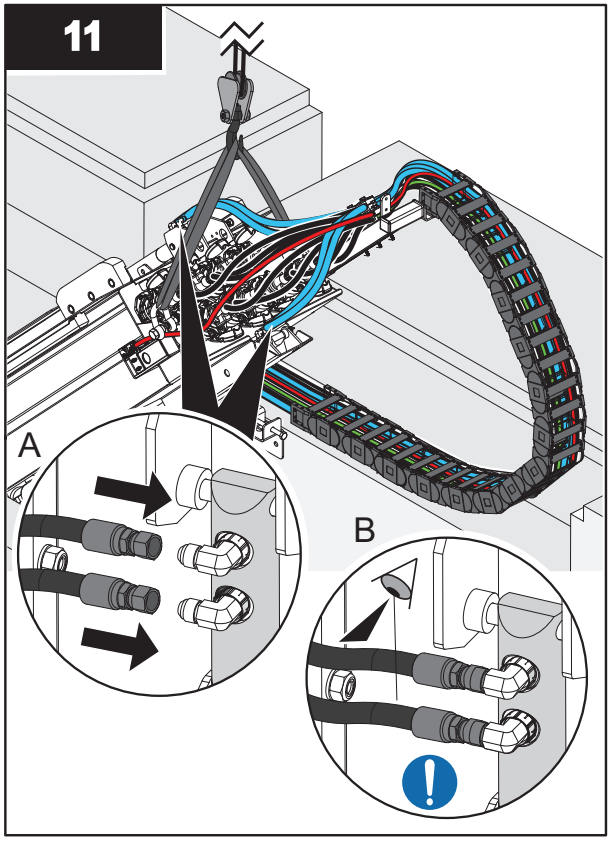
Note: *Route the cables though the Cable Track as shown.*



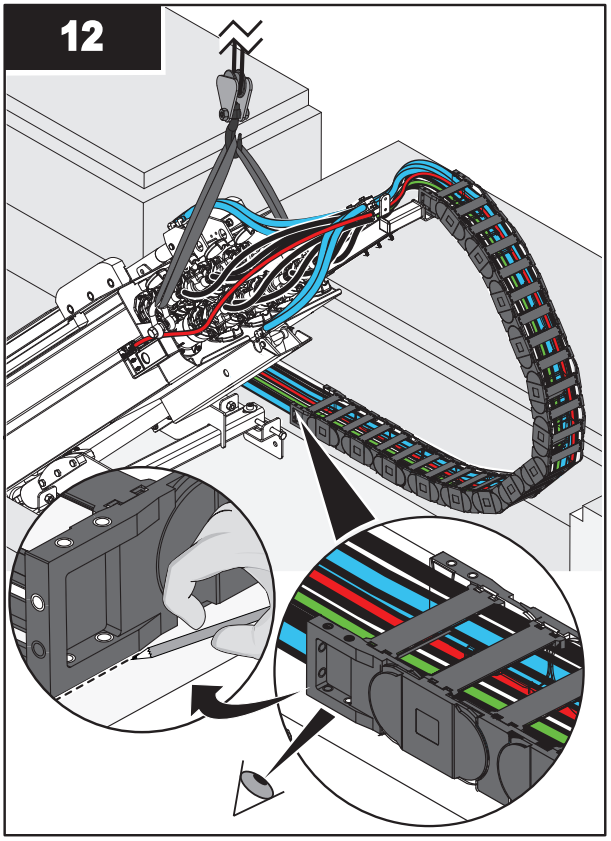
Notes: *1) Disconnect the hoses from the Hydraulic Cylinders.*
2) A small amount of hydraulic fluid may drain from the cylinder fittings, take precautions to avoid spills. Clean up spills.



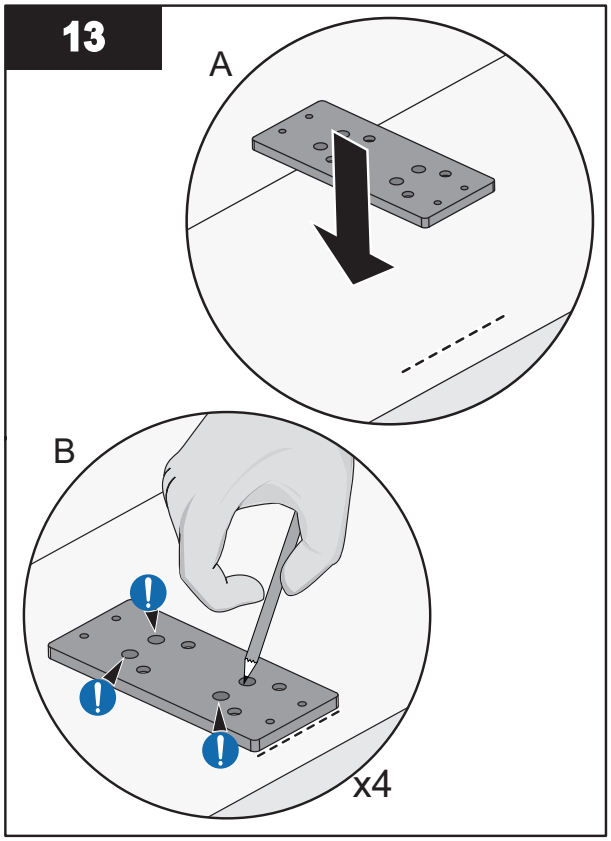
Note: *Use a lifting device to raise the UV Bank.*

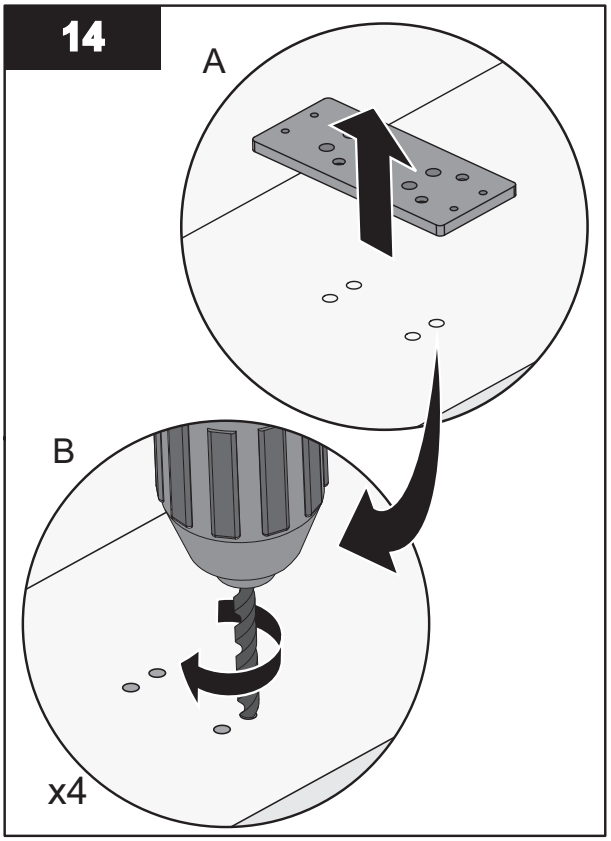


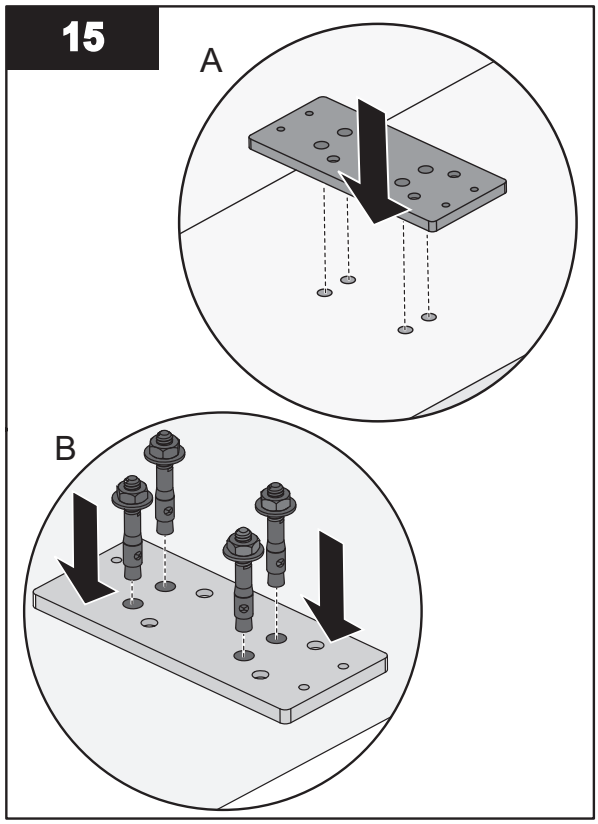
Notes: *1) Connect the hoses to the Hydraulic Cylinders.*
2) Inspect the hydraulic hose and hose connections to ensure there is enough hose slack to allow movement.



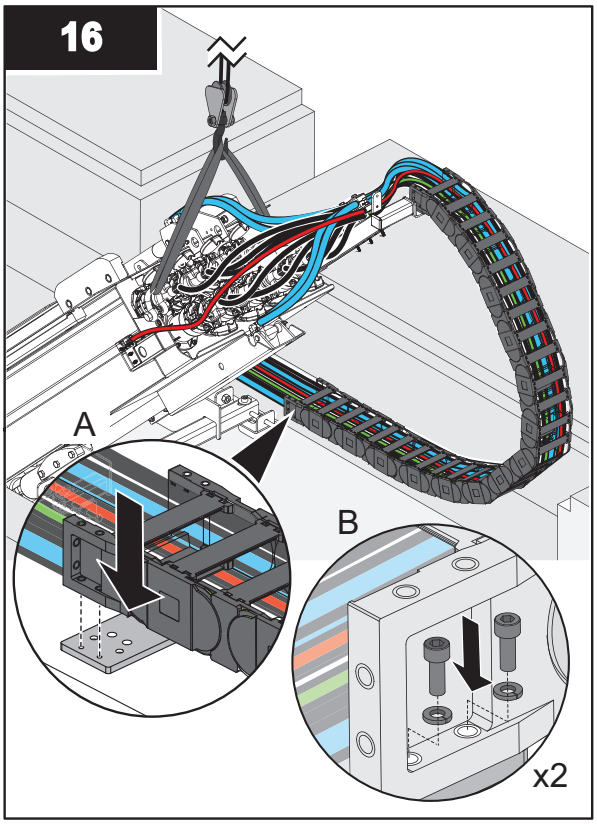
Note: *Mark the position of the cable track mounting bracket.*



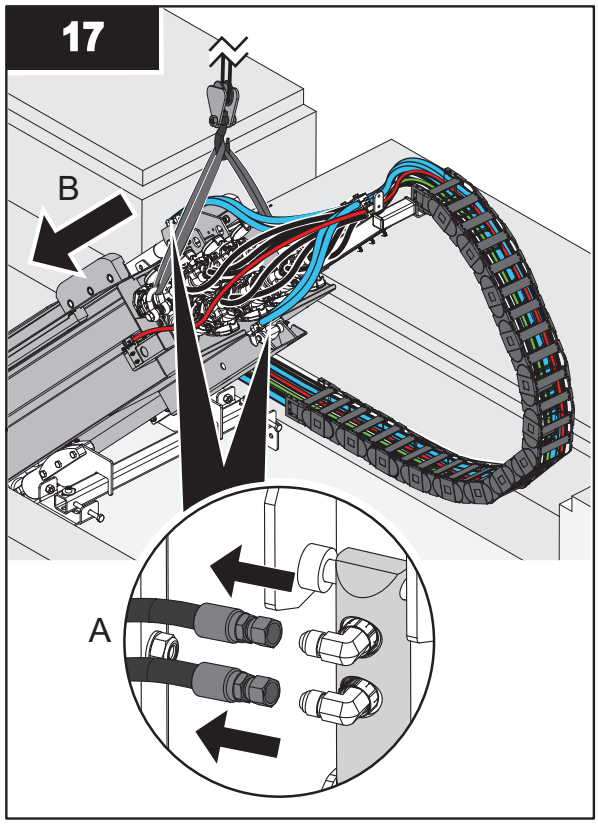




Note: *Install and anchor the mounting plate on the concrete.*



Note: *Install Cable Track mounting bracket to the mounting plate.*



Notes: *1) Disconnect the hoses from the Hydraulic Cylinders.*
2) A small amount of hydraulic fluid may drain from the cylinder fittings, take precautions to avoid spills. Clean up spills.
3) Lower the UV Bank down.

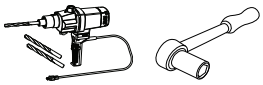
7.2.12 Cable Trough Cable Management - Spiral Wrap

Note: *If Cable Track is supplied, skip this section and proceed to Section 7.2.13.*

Prerequisites:

- Install Cable Management Assemblies. Refer to Section 7.1.12.1.
- Install Hydraulic Hoses. Refer to Section 7.2.8.
- Install the Lamp Cables. Refer to Section 7.2.9.3.

Tools:



Materials:

- Cable Ties (By others)

Procedure:

- For Standard Channel Bracket Assemblies – refer to Figure 17 and Figure 19.
- For Deep Channel Bracket Assemblies – refer to Figure 18 and Figure 19.

With a Standard Channel Bracket Assembly:

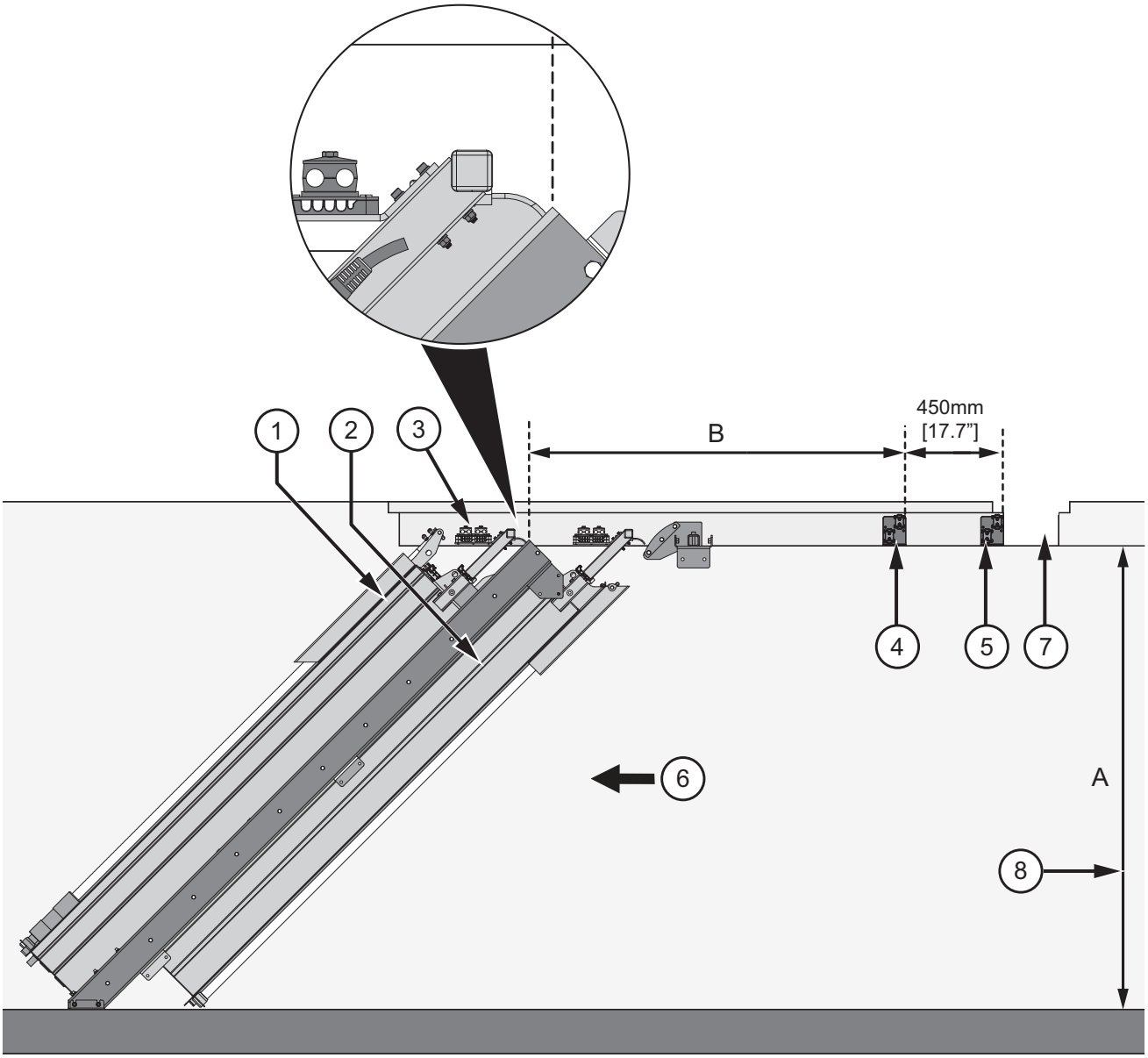


Figure 17 Section View

1	UV Bank B	**5**	UV Bank A - Trough Bracket
2	UV Bank A	**6**	Flow Direction
3	Cable Management Assembly	**7**	Cable Trough
4	UV Bank B - Trough Bracket	**8**	Trough Height, from floor (Table 7)

Table 7 Standard Channel Bracket Installation Location

Dimension A			Dimension B		
Inches	**feet**	**mm**	**Inches**	**feet**	**mm**
84	7'-0"	2134	68	5'-8"	1734
85	7'-1"	2159	69	5'-9"	1753
86	7'-2"	2184	70	5'-10"	1778
87	7'-3"	2210	71	5'-11"	1803

Table 7 Standard Channel Bracket Installation Location (continued)

Dimension A			Dimension B		
Inches	feet	mm	Inches	feet	mm
88	7'-4"	2235	72	6'-0"	1829
89	7'-5"	2261	73	6'-1"	1854
90	7'-6"	2286	74	6'-2"	1880
91	7'-7"	2311	75	6'-3"	1905
92	7'-8"	2337	76	6'-4"	1937

With a Deep Channel Bracket Assembly:

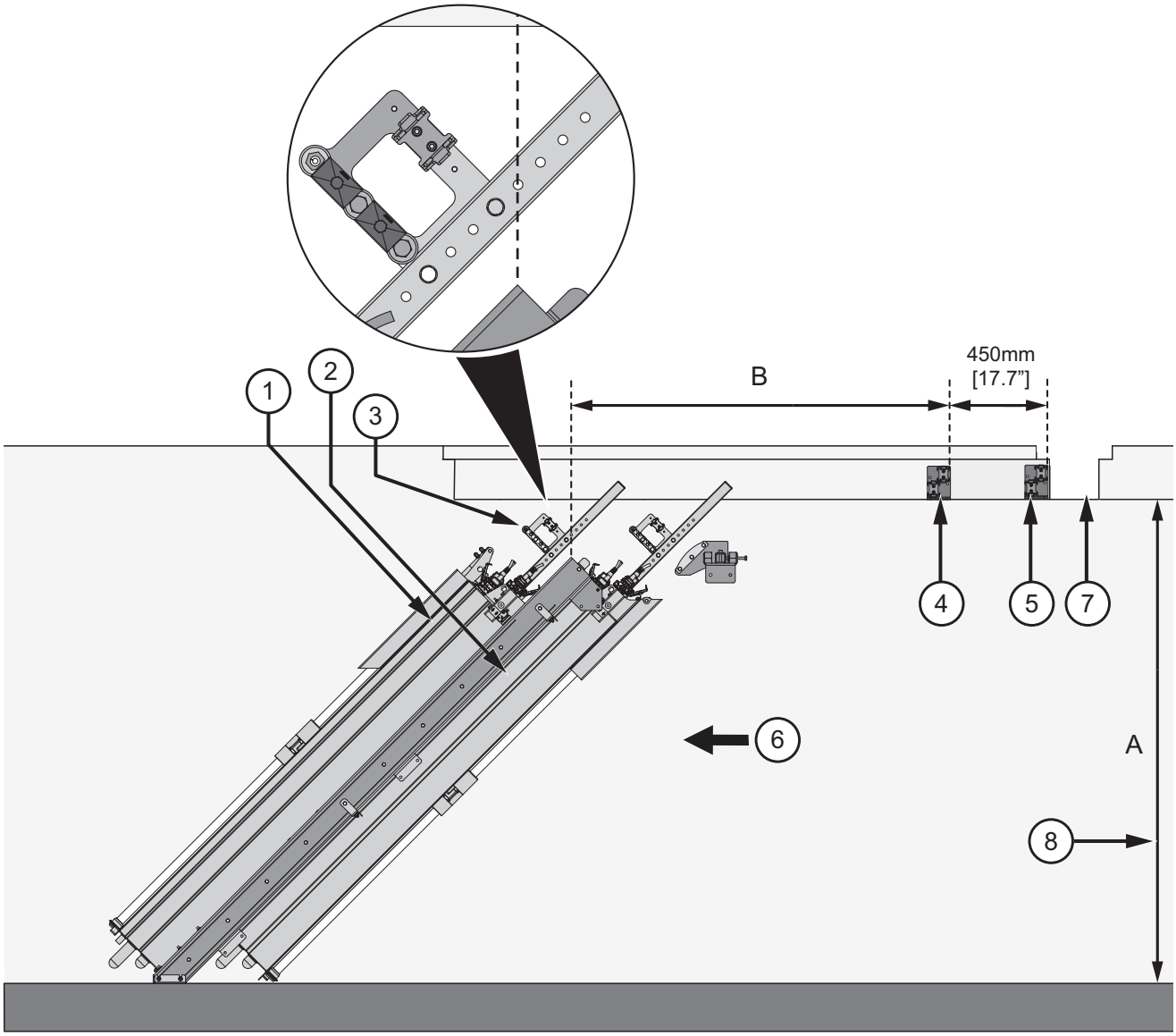


Figure 18 Section View

1	UV Bank B	**5**	UV Bank A - Trough Bracket
2	UV Bank A	**6**	Flow Direction
3	Cable Management Assembly	**7**	Cable Trough
4	UV Bank B - Trough Bracket	**8**	Trough Height, from floor (Table 8)

Table 8 Deep Channel Bracket Installation Location

Dimension A			Dimension B		
Inches	feet	mm	Inches	feet	mm
93	7'-9"	2362	76	6'-4"	1937
94	7'-10"	2388	76	6'-4"	1937
95	7'-11"	2413	76	6'-4"	1937
96	8'-0"	2438	75	6'-3"	1905
97	8'-1"	2464	74	6'-2"	1880
98	8'-2"	2489	73	6'-1"	1854
99	8'-3"	2515	72	6'-0"	1829
100	8'-4"	2540	71	5'-11"	1803
101	8'-5"	2565	70	5'-10"	1778
102	8'-6"	2591	69	5'-9"	1753
103	8'-7"	2616	68	5'-8"	1727
104	8'-8"	2642	67	5'-7"	1702
105	8'-9"	2667	66	5'-6"	1676
106	8'-10"	2692	65	5'-5"	1651
107	8'-11"	2718	64	5'-4"	1626
108	9'-0"	2743	63	5'-3"	1600
109	9'-1"	2769	62	5'-2"	1575
110	9'-2"	2794	61	5'-1"	1549
111	9'-3"	2819	60	5'-0"	1524
112	9'-4"	2845	59	4'-11"	1506

With Standard OR Deep Channel Bracket Assembly:

Note: *Ensure that there is an offset between UV Bank B and UV Bank A brackets (Figure 19) to allow for the UV Bank B cable bundle to pass freely behind UV Bank A Bracket (item 5).*

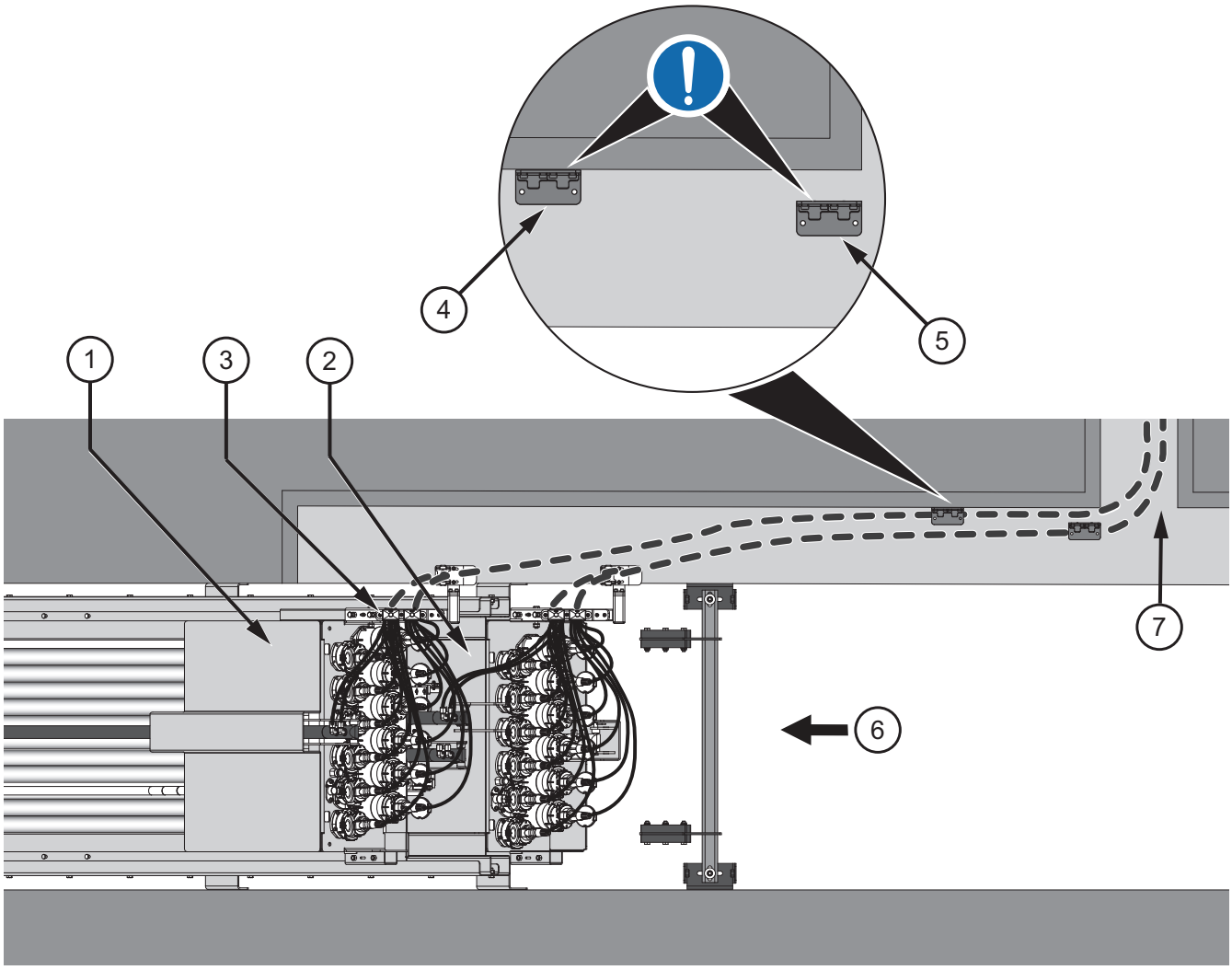
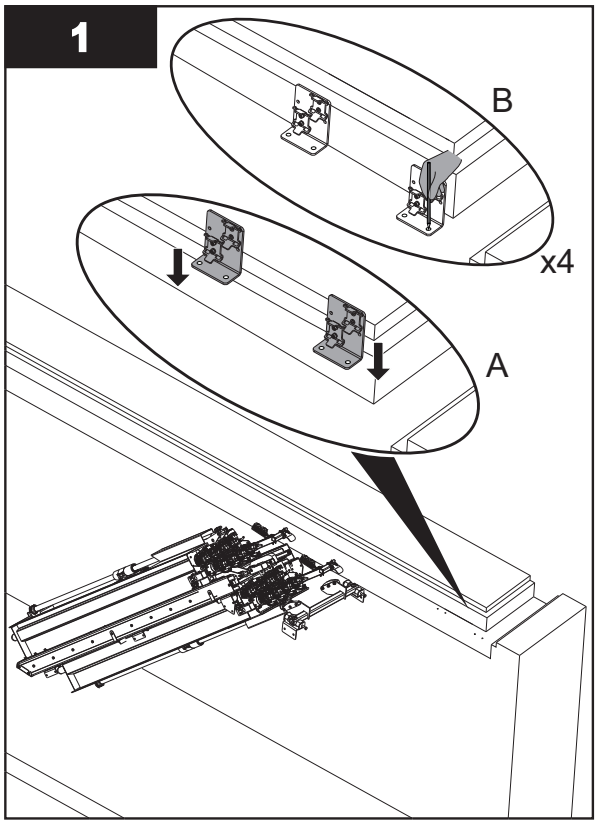
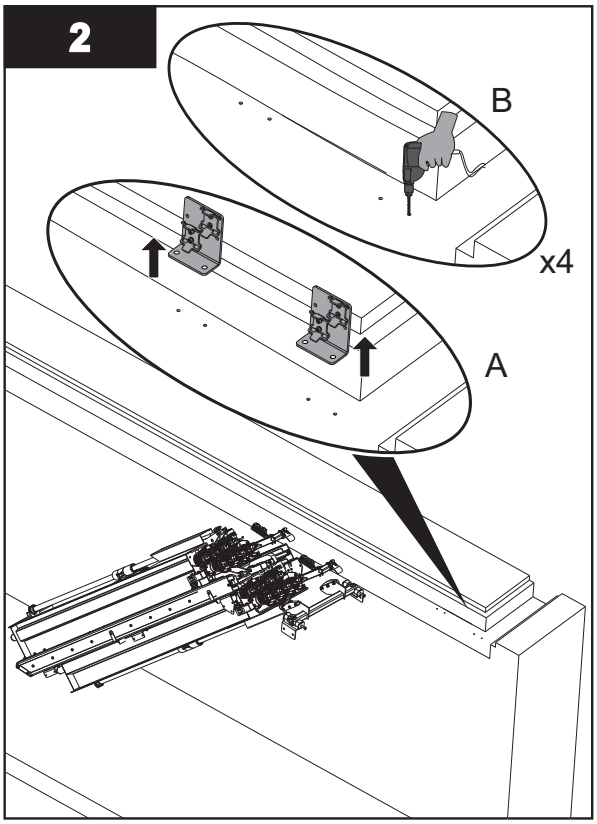


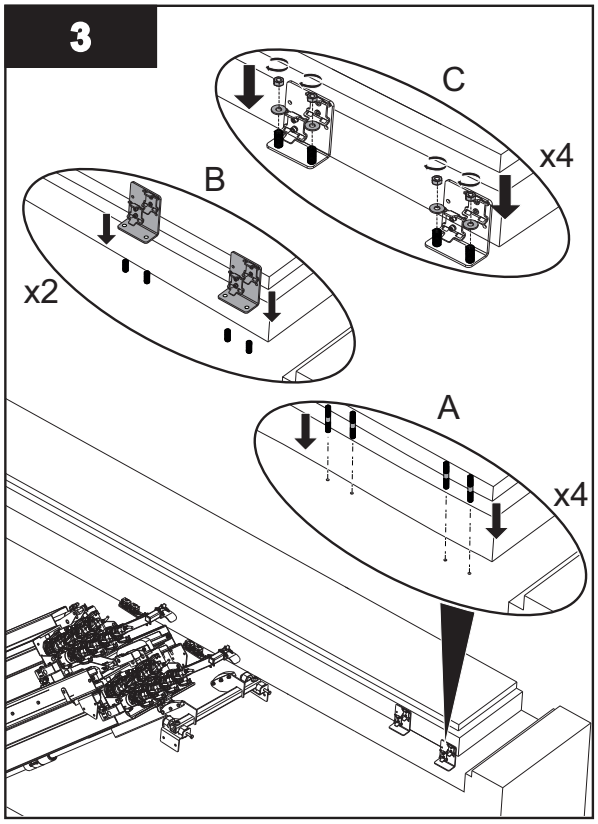
Figure 19 Plan View

1	UV Bank B	**5**	UV Bank A - Trough Bracket
2	UV Bank A	**6**	Flow Direction
3	Cable Management Assembly	**7**	Cable Trough
4	UV Bank B - Trough Bracket		

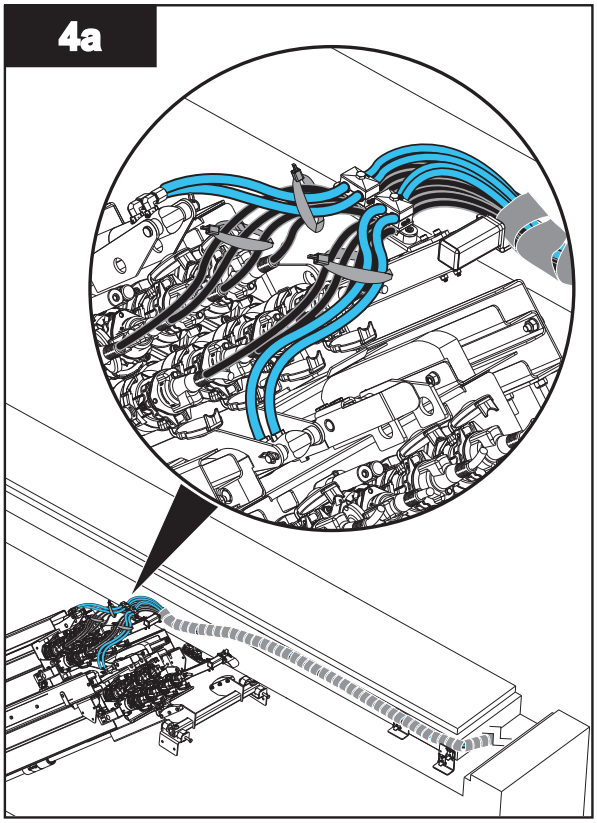
Note: *Lamp Cables, Ground Wire, Bank In Place Cable, and Hydraulic Hoses are not shown in some illustrations for clarity.*



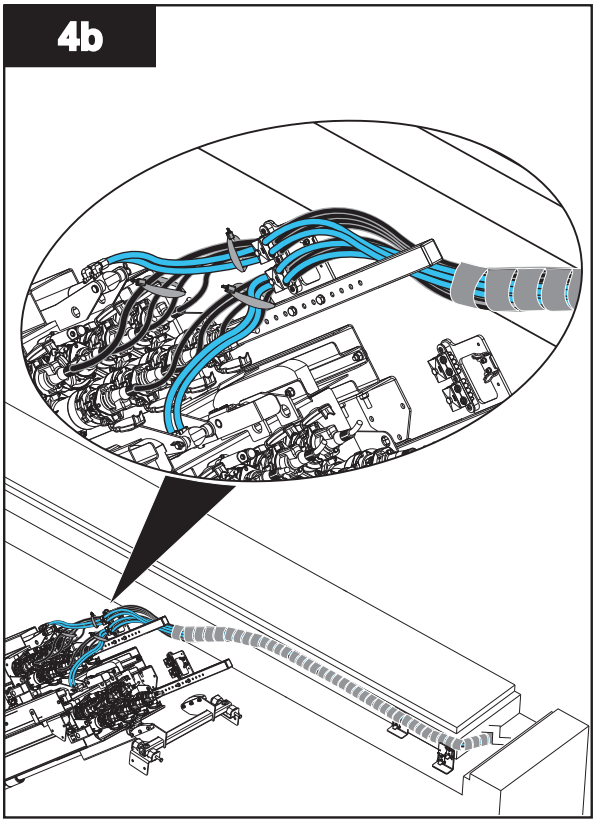


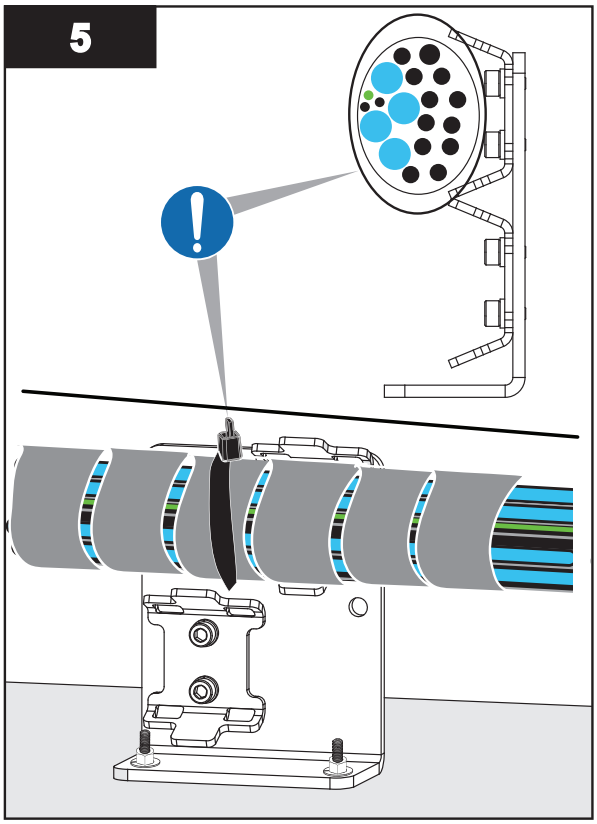


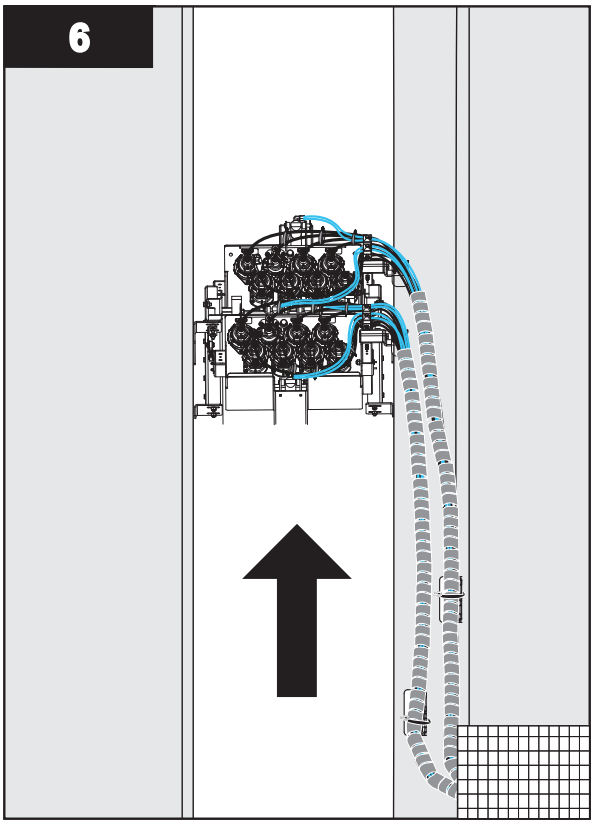
Standard Cable Management Arm



Deep Channel Cable Management Arm







Notes: *1) Repeat steps for remaining cable bundles.*
2) Install Cable Tie as shown to tie down the cable and hose bundle to the bracket.

7.2.13 Hydraulic Hose - HSC Connections

7.2.13.1 Hydraulic Hose Fittings and Connections

Each HSC is able to provide lift and wipe functions for up to four (4) UV Banks. Refer to the site layout drawings and electrical drawings provided to determine the number of UV Banks that the HSC will provide lift and wipe functions for.

Prerequisites:

- Install HSC. Refer to Section 7.1.6.1.
- Lockout Tag Out devices as required. Refer to Section 4.
- Install Cable Management Assemblies. Refer to Section 7.1.12.1.

Tools:

Materials:

- **Field Connect Hose Fittings Instruction, document number DC000601-019.**

  Note: *Connect the field connect end of the hose to the HSC. Connect the pre-fit end of the hose to the hydraulic cylinders on the UV Bank.*

Procedure:

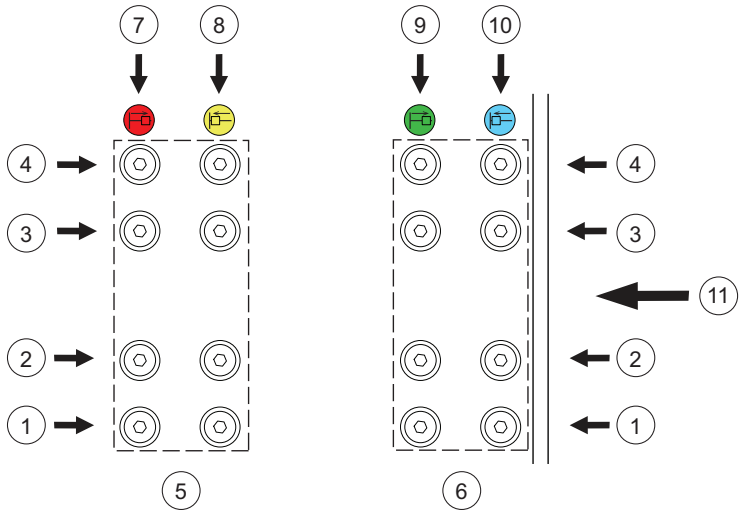


Figure 20 Hydraulic Hose Connections at HSC

1	Bank A	**7**	Lift Extend = Red color
2	Bank B	**8**	Lift Retract = Yellow color
3	Bank C	**9**	Wiper Extend = Green Color
4	Bank D	**10**	Wiper Retract = Blue Color
5	Lift Circuits	**11**	Front of HSC
6	Wiper Circuits		

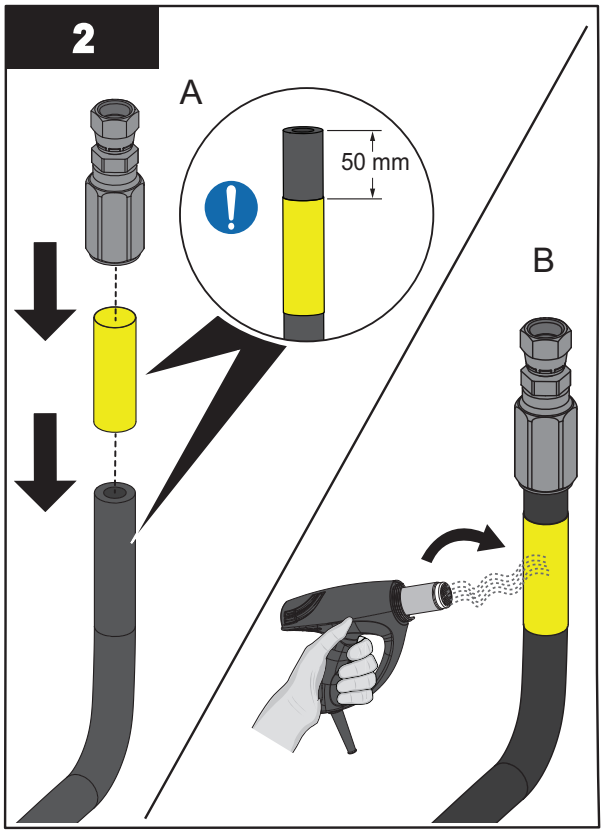
Refer to Table 9 for recommended hose installation order.

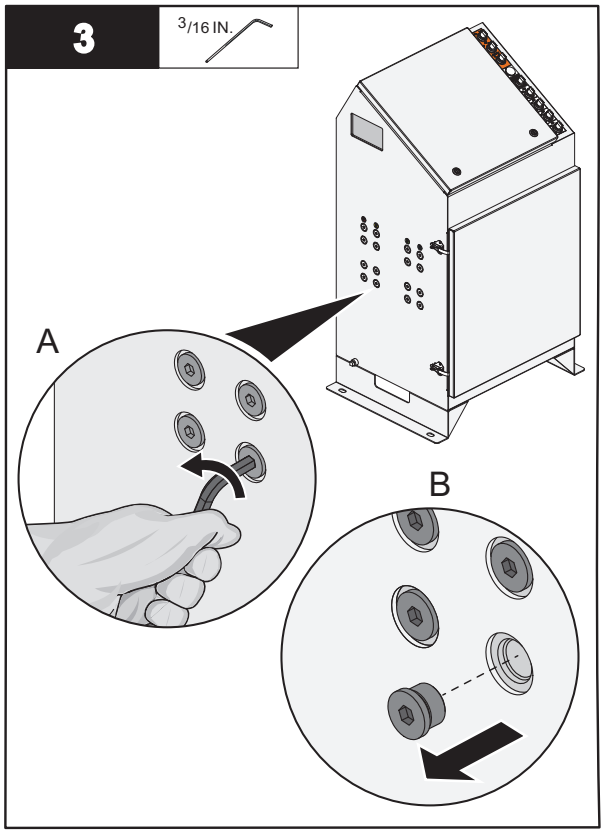
Table 9

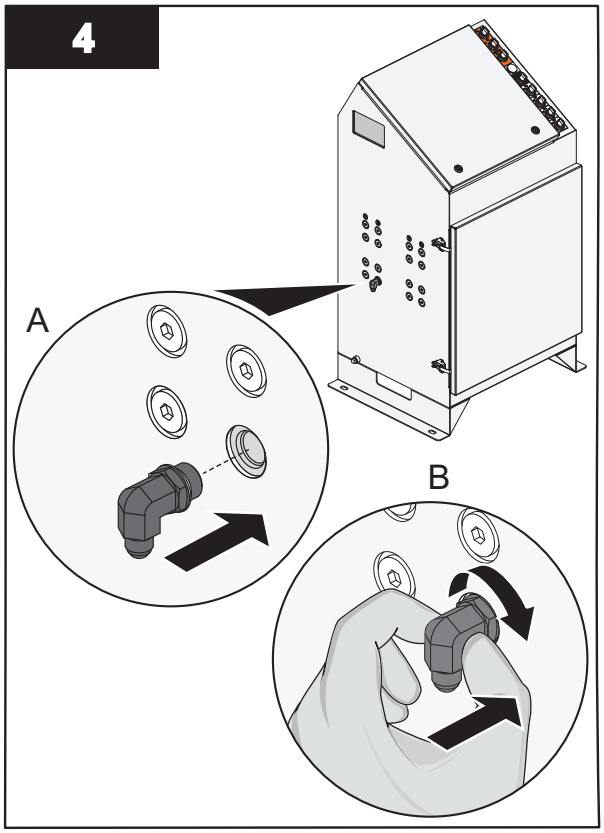
Connect hoses in order:	Bank / Cylinder Connection Point	Corresponding HSC Connection Point
First	Bank A Lift Cylinder, Retract*	HSC - Lift, Retract*
Second	Bank A Wipe Cylinder, Retract*	HSC - Wipe, Retract*
Third	Bank B Lift Cylinder, Retract*	HSC - Lift, Retract*
Fourth	Bank B Wipe Cylinder, Retract*	HSC - Wipe, Retract*
Fifth - continue with Bank C* and so on		

* Refer to Figure 20 for connection locations.

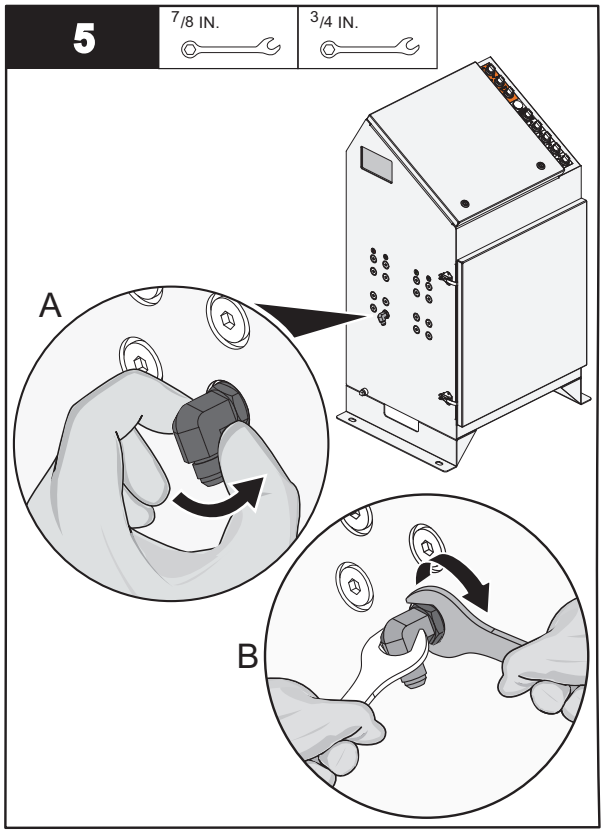
1. Install Field Connect Hose Fittings onto the first hose. **Refer to DC000601-019**.



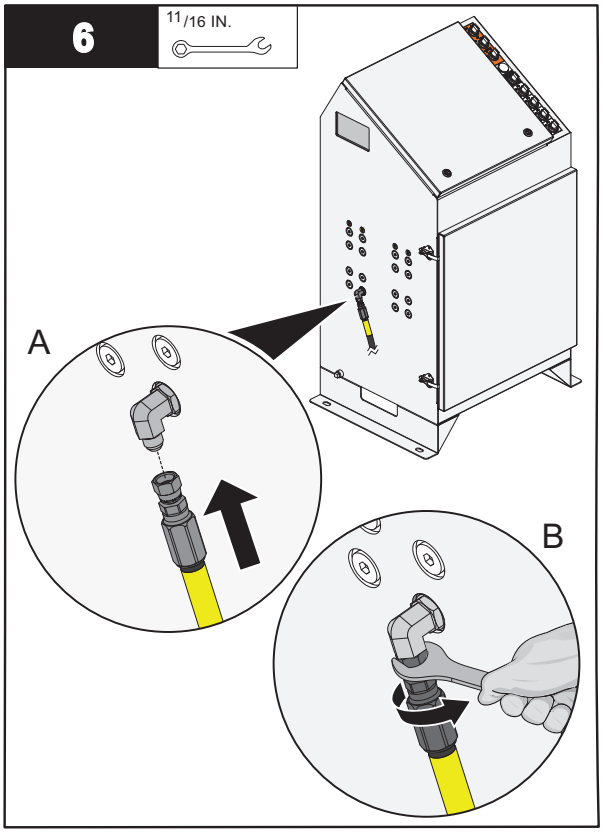




Note: *Fully thread the elbow fitting into the hole.*



Note: *Orientate fitting so that the hoses will not interfere with each other. Tighten the lock nut while maintaining elbow orientation.*



7. Repeat steps 1 to 6 for remaining hydraulic hoses until complete.

⚠ DANGER

Obey all warning and caution statements. Refer to Section 2.

Read and understand this Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

8.1 Hydraulic System Center

The hydraulic system is operated remotely from the System Control Center (SCC) HMI or locally from HSC control panel.

8.1.1 HSC Overview

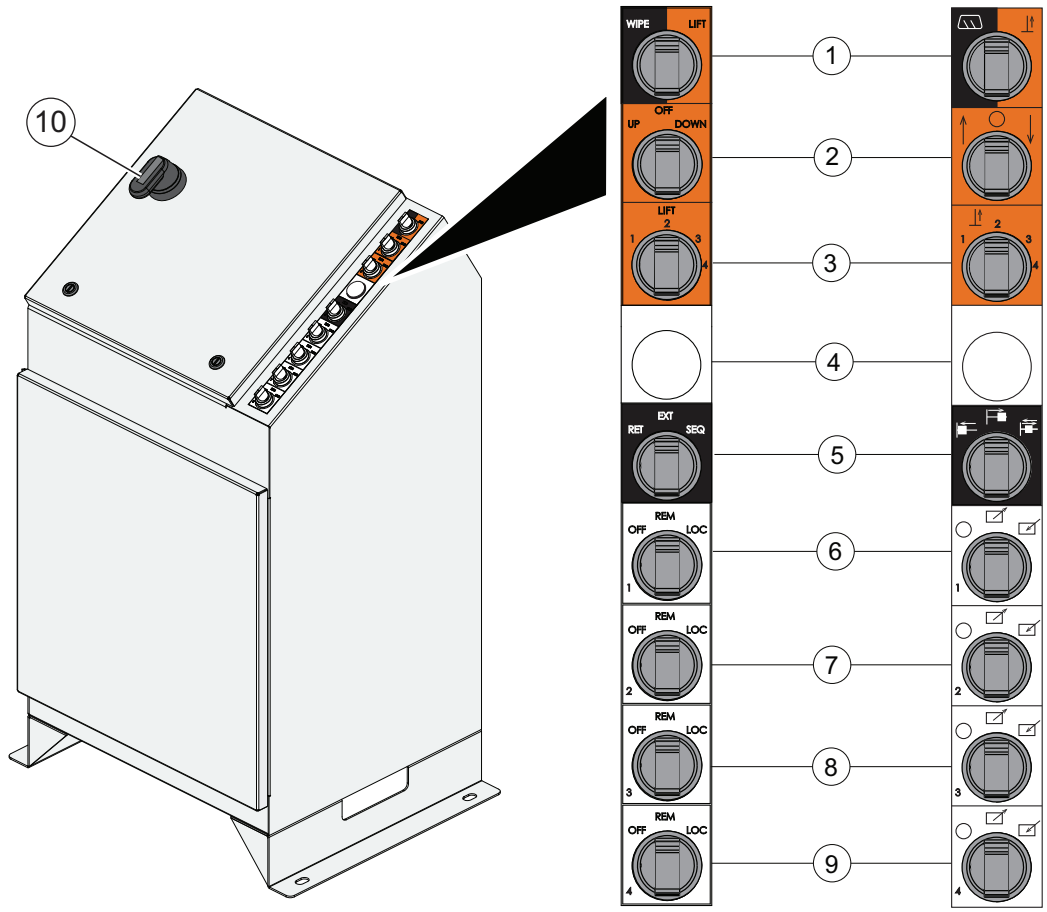


Figure 21 Hydraulic System Center

Item No	Description	Icon	Function
1	HSC Operation Switch	WIPE	Begins wiping operation.
		LIFT	Begins lifting operation. The pump turns ON and waits for an input from the Lift Operation Switch.

Item No	Description	Icon	Function
2	Lift Operation	UP 	The chosen UV Bank will be lifted up.
		OFF 	Lifting will stop.
		DOWN 	The chosen UV Bank will be lowered down.
3	Lift UV Bank Selection		Select the UV Bank to lift or lower.
4	Blank Cap		N/A
5	Wiper Operation Switch	RET 	It applies to wipers and functions when any wiper is switched from OFF to LOC position. ***Note:*** *Once a function has been performed, switch item 6, 7, 8 or 9 to OFF before selecting another Extend or Retract function.* Wiper will move from the lower end (bottom of the UV Bank) to the Home position (top of the UV Bank).
		EXT 	Wiper will move from the Home position (top of the UV Bank) to the lower end (bottom of the UV Bank).
		SEQ 	Wiper will extend and retract if wiper is at Home, otherwise wiper will retract back to Home position and perform a full cycle of wiping.
6, 7, 8, 9	UV Bank (1, 2, 3, 4) Wiper Group Mode Switch	OFF 	Wiper disabled or wiping will be stopped if the wiper is wiping before it is switched to OFF.
		REM 	Wiper operates in Remote mode. In this mode, wiper can: • Perform a manual wipe upon receiving wiping command from HMI. • Wipe automatically under control of internal wiping cycle timer.
		LOC 	When wiper is switched from OFF to LOC, wiper will start the specified wiping operation depending on the Wiper Operation Switch position.
10	Disconnect Handle (optional)	--	Turn the disconnect handle to the OFF position to disconnect power to the HSC. To energize the HSC, turn the disconnect handle to the ON position.

8.1.2 Bank Locking Plates

Install the Bank Locking Plates after the UV Bank has been lifted. Steps A to D detail how to properly install a Bank Locking Plate.

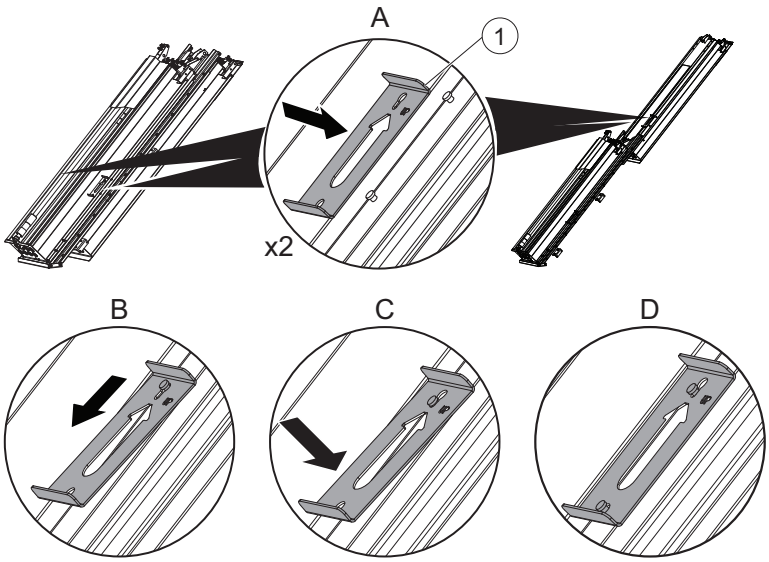


Figure 22 Locking Plate

1	Locking Plate

8.1.3 Lift the UV Bank Up/Down

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Remove Grating section(s).
- Verify there are no obstructions in lift area.
- Ensure all personnel are clear of UV Bank while manually operating the lifting function.
- To lift a UV Bank down, remove the Bank Locking Plates (Figure 22).

NOTICE

To avoid equipment damage, make any necessary adjustments to lamp cables prior to the lifting operation.

Never perform maintenance on the UV Bank until all locking plates are in place.

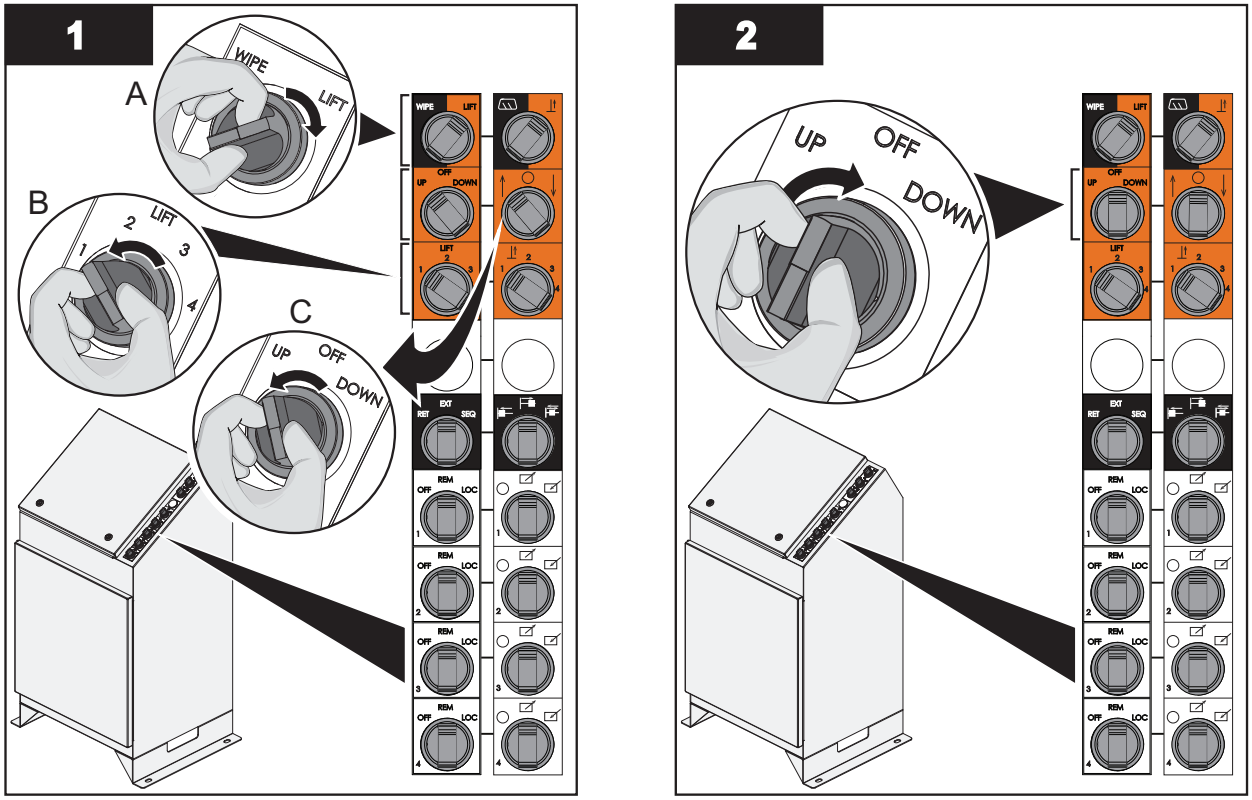
If the UV Bank cannot raise to the level required to install the bank locking plates – lower the bank to its home position and contact Technical Assistance Center for troubleshooting assistance.

Materials:

- Bank Locking Plates

Procedure:

Lift the UV Bank Up:

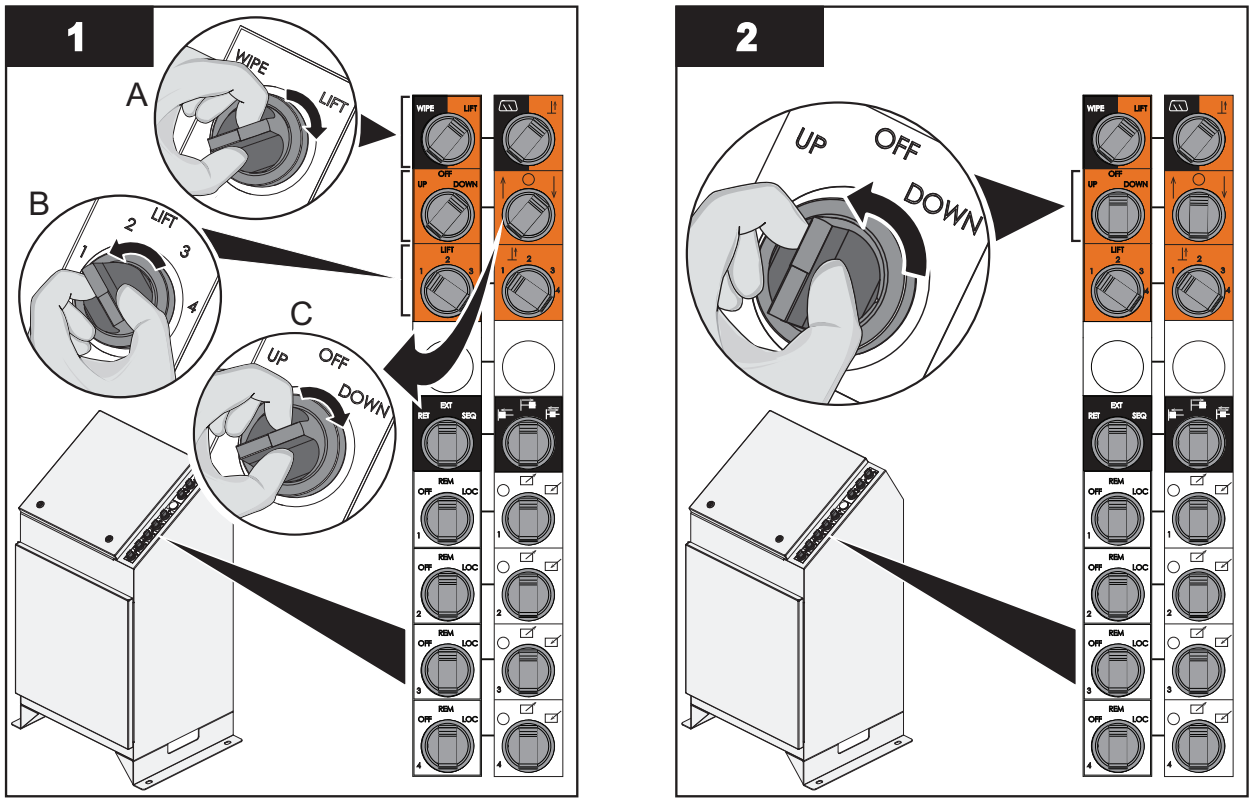


Notes: *1) Bank 1 switch operation is shown as an example only. Select the required UV Bank using the Lift UV Bank Selection Switch.*

2) Turn and hold the Lift Operation selector switch until the UV bank is fully lifted and the HSC pump turns off.

3. Install the Bank Locking Plate on the Lifted UV Bank (Figure 22).
4. Adjust grating around lifted UV bank to eliminate openings to channel.

Lift the UV Bank Down:



Notes: *1) Bank 1 switch operation is shown as an example only. Select the required UV Bank using the Lift UV Bank Selection Switch.*
2) Turn and hold the Lift Operation selector switch until the UV bank is fully lifted down and the HSC pump turns off.

3. Adjust grating around lifted UV bank to eliminate openings to channel.

8.1.4 Wiper Control

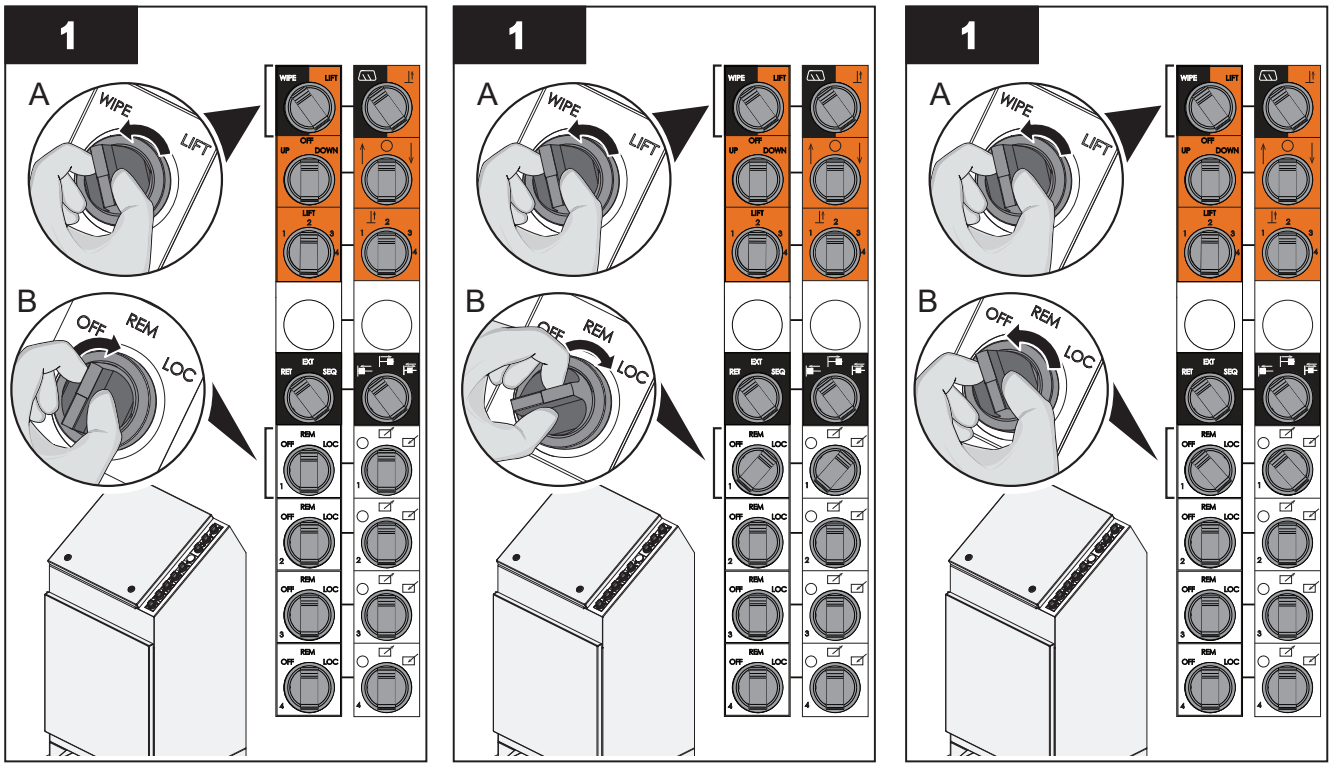
The normal operating position for the wiper control switches is REMOTE (REM) and RETRACT (RET).

8.1.4.1 Wiper Control Modes

Wiper Control Mode	Definition	Refer to:
REMOTE	HSC wiping function is remotely controlled by the SCC.	Wiper Remote Control
LOCAL[1]	HSC wiping function is locally controlled.	Wiper Local Control
OFF[1]	HSC wiping function is locally disabled.	Wiper Off

[1] *Used for service purposes only*

Wiper Remote Control | Wiper Local Control | Wiper Off



Note: *Bank 1 switch operation is shown as an example only. Select appropriate UV Bank Wiper Group Mode Switch.*

8.1.5 Operate the Wiper in Local Control Mode

Prerequisites:

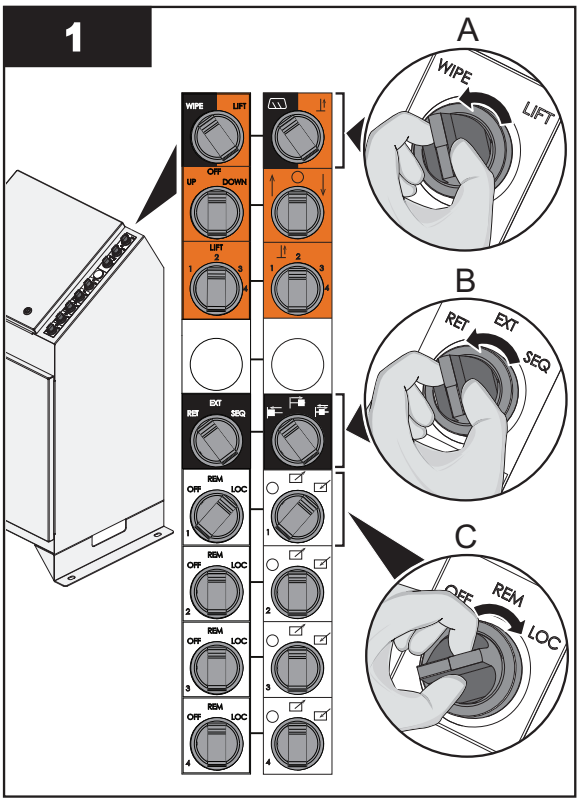
- **If the UV Bank is in Lifted Up Service position:** Wet the Lamp Sleeve at the wiper seals (top and bottom) with water.
- Ensure all personnel is clear of UV Bank while manually operating the wiping function.
- Make sure the HSC disconnect switch (if present on HSC), is in the ON position.

Materials:

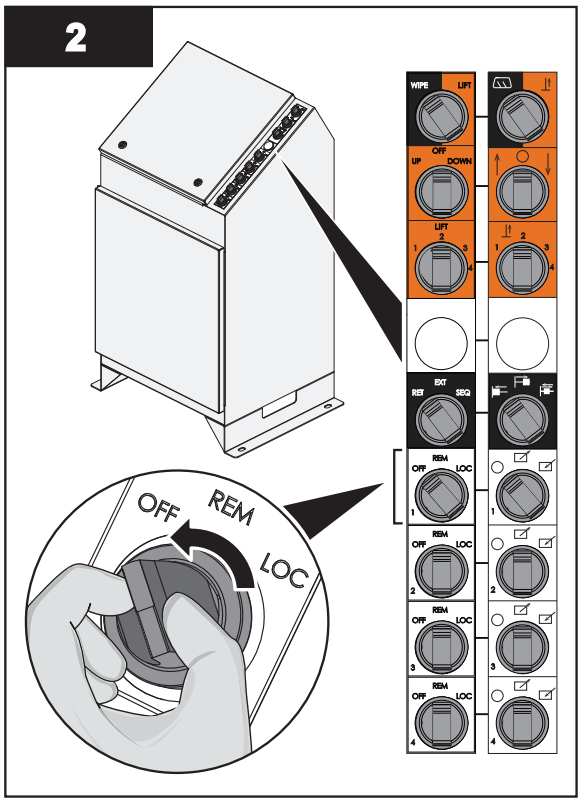
Procedure:

Note: *Upon completion of manual wipe procedures return the selector switches to REMOTE (REM) and RETRACT (RET).*

Retract (Home) the Wiper:

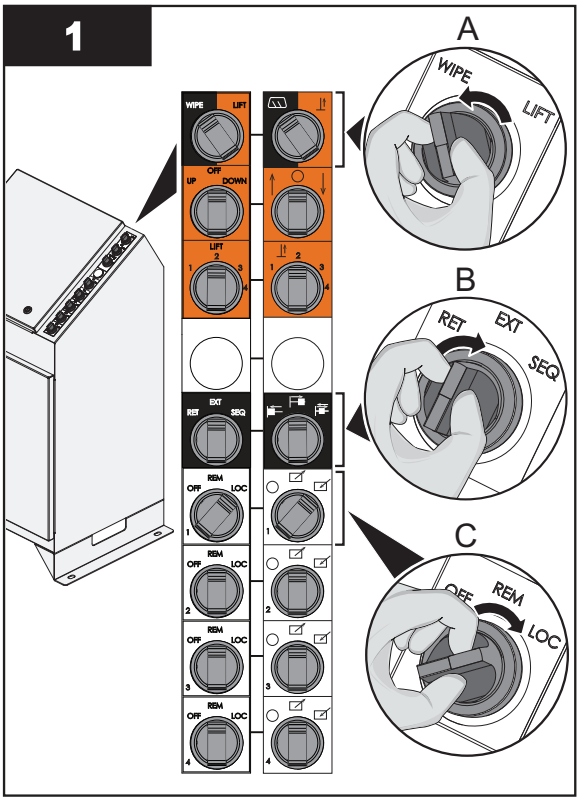


Note: *Bank 1 switch operation is shown as an example only. Select appropriate UV Bank Wiper Group Mode Switch.*

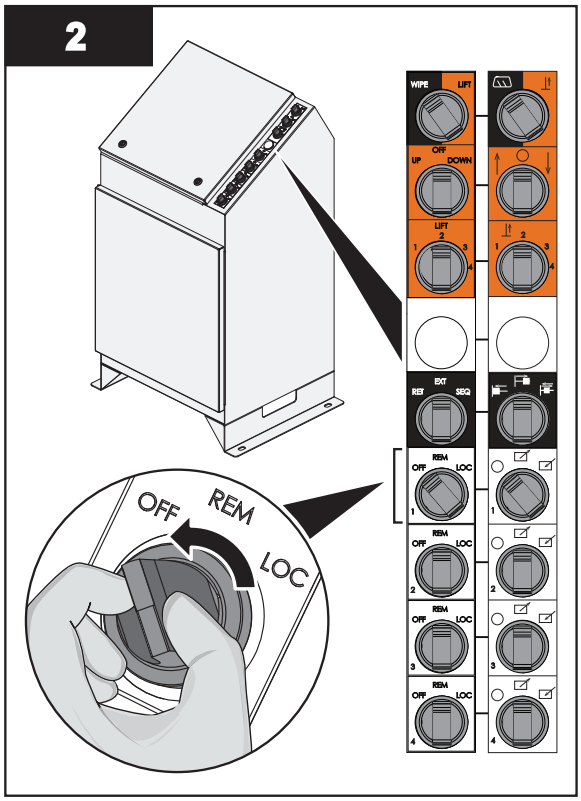


Notes: *1) Turn the Wiper Group Mode Switch to the OFF position after the wiper plate reaches the top of the UV Bank or after the hydraulic pump has timed off.*
2) DO NOT allow the wiper plate to contact the baffle during travel.

Extend the Wiper:

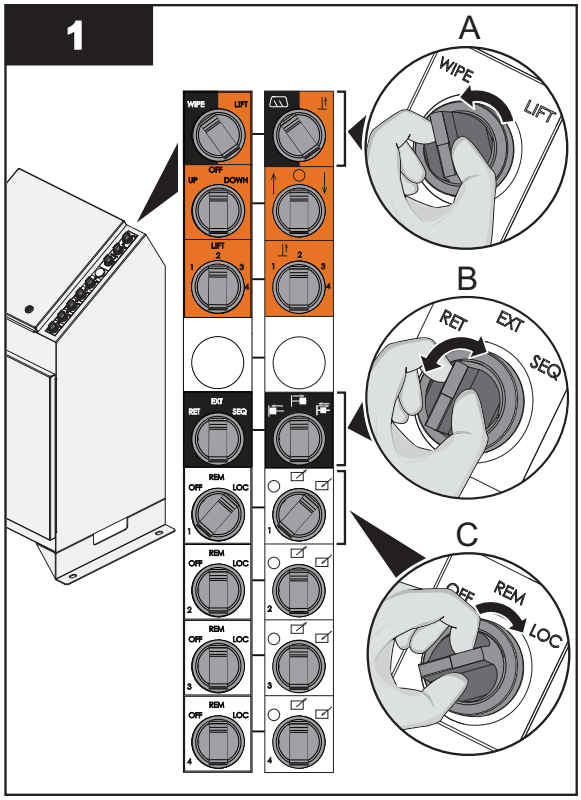


Note: *Bank 1 switch operation is shown as an example only. Select appropriate UV Bank Wiper Group Mode Switch.*

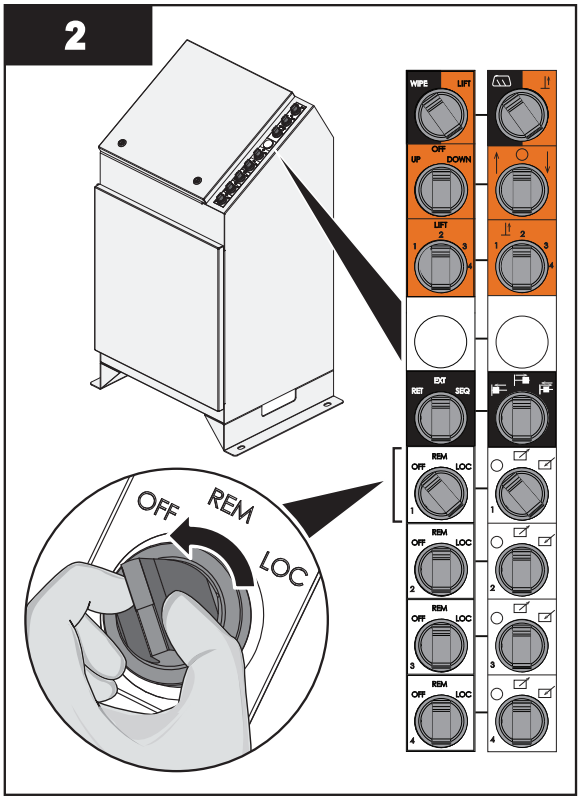


Note: *Turn the Wiper Group Mode Switch to the OFF position after the wiper plate reaches the bottom of the UV Bank or after the hydraulic pump has timed off.*

Move the Wiper to 1/2 way:

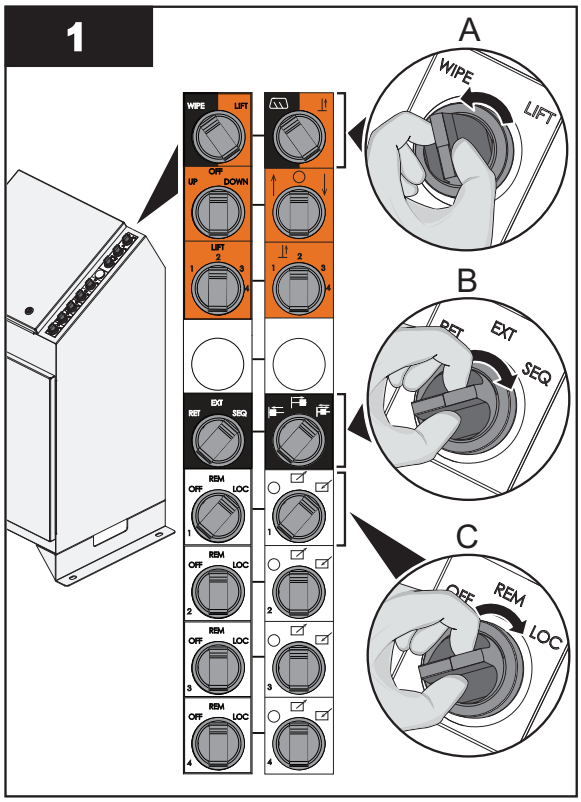


Notes: *1) Bank 1 switch operation is shown as an example only. Select appropriate UV Bank Wiper Group Mode Switch.*
2) Turn the Wiper Operation Switch to EXT if in the Home Position or RET if in the fully extended position.

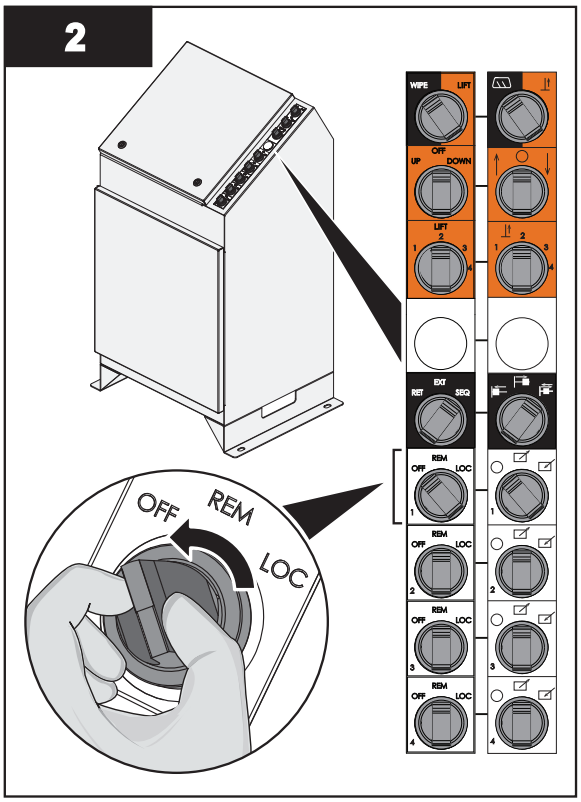


Note: *Turn the Wiper Group Mode Switch to the OFF position after the wiper plate reaches 1/2 way along the sleeve.*

Sequence the Wiper:



Note: *Bank 1 switch operation is shown as an example only. Select appropriate UV Bank Wiper Group Mode Switch.*



Note: *Turn the Wiper Group Mode Switch to the OFF position after the wiper has completed a full cycle of wiping or after the hydraulic pump has timed off.*

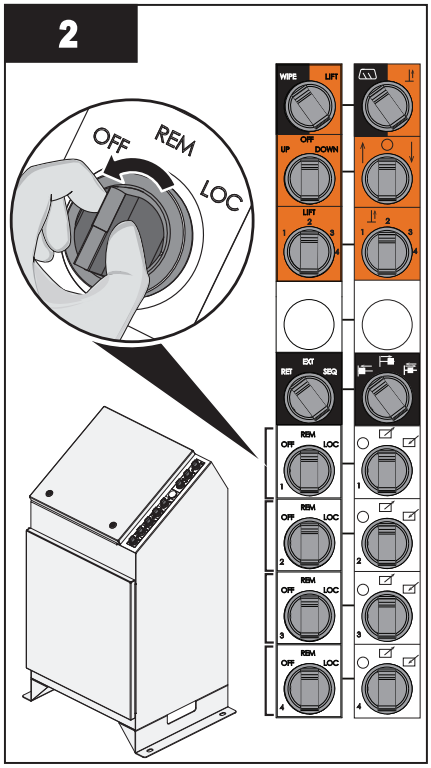
8.1.6 Reset HSC Latched Alarms

These HSC level alarms are latched and require the following procedure to unlatch:

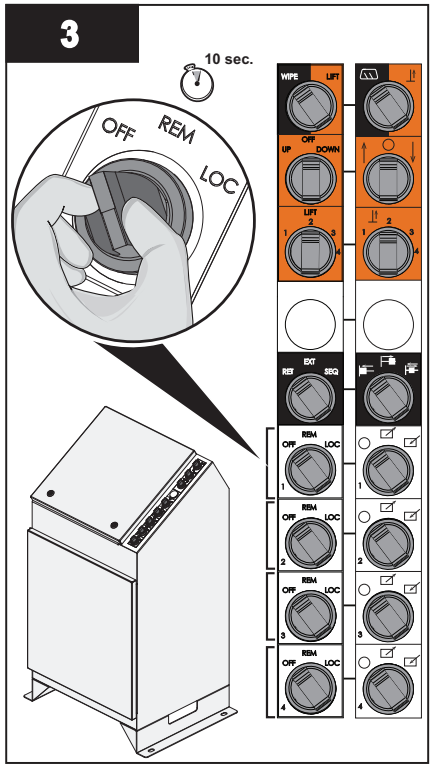
- HSC Hydraulic Tank Low Level
- HSC Pump Fault
- Wiper Position Unknown
- Wiper Group Jammed
- Wiper Travel Time Exceeded

Procedure:

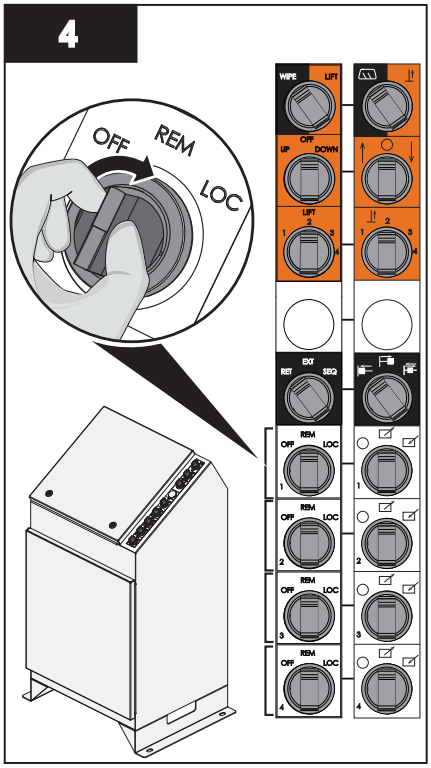
1. Resolve the cause of the latched alarm.



Note: *Turn all Bank Wiper Group Mode Switches on the HSC to the OFF position.*



Note: *Wait 10 seconds.*



Note: *Turn all Bank Wiper Group Mode Switches on the HSC to the REM position.*

8.2 Power Distribution Center

8.2.1 Enable PDC Remote Control

When PDC is in Remote control, SCC or SCADA controls the output of the PDC.

1. PDC disconnect ⟶ | or (ON).
2. PDC mode selector switch ⟶  or (REM).

8.2.2 Enable PDC Local ON

PDC output is set to 100% and will not be controlled by SCC or SCADA.

1. PDC disconnect ⟶ | or (ON).
2. PDC mode selector switch ⟶ | or (ON).

8.3 System Control Center

The SCC contains the control program for the UV system. The SCC is configured at the factory with inputs and outputs as required for each system. The manufacturer configures the functionality of each of the signals in the control strategy.

Daily operation includes monitoring the system functions, and may occasionally require the operator to manually initiate or control the processes.

8.3.1 Navigate the Human Machine Interface

The HMI for the controller uses touchscreen technology. Do not use the writing tips of pens or pencils or other sharp objects to make selections on the screen. Use only a clean, dry finger tip or the eraser tip of a pencil.

Table 10 User Interface Navigation (Main Level)

Icon	Screen	Description	Refer:
	Overview (Home)	An operational summary of all UV channels and UV Banks. Allows access to Priority Assignment screen and to manually enter flow and UVT values.	Section 8.3.2
	UV Channel Overview	Allows access to control slide gates. Allows access to control and display UV channel specific information. Allows access to the ***UV Bank Overview Screen***. Refer to Section 8.3.4	Section 8.3.3
	Wiper Overview	Allows access to control wiper/cleaning system.	Section 8.3.5
	Trends	Displays trend data for flow, UVT and dose.	Section 8.3.6
	Alarm Status	Displays the currently active alarms and allows access to Alarm History screen.	Section 8.3.7
	System Settings	Allows access to system configuration settings as allowed by current security level. Settings are organized in pages by function.	Section 8.3.8
	Information	Shows information about the control system hardware and software. It also allows access to change the clock time and other HMI maintenance functions.	Section 8.3.9

The icon turns to ‘negative’ when a related screen is open.

Figure 23 Home

1 Home - Overview	**2** Home - Negative Overview

	The UV channel icon displays a yellow warning indicator when any Minor alarm condition exists on a UV channel/UV Bank related device.
	The UV channel icon displays a red alarm indicator when any Major/Critical alarm condition exists on a UV channel/UV Bank related device.

	The wiper icon is visible if the wiper option (setting) is enabled. The wiper icon displays a yellow warning indicator when any Minor alarm condition exists on a wiper related device.
	The wiper icon displays a red alarm indicator when any Major/Critical alarm condition exists on a wiper related device.
 	The alarm icon displays a red circle indicator with a numeric value in the Center. The value represents the number of active alarms in the entire system. Greater than 100 alarms is displayed as “>>”. The indicator disappears when the number of active alarms is 0.

8.3.1.1 Screen Overview

Home screen (Section 8.3.2)		
DOSE	Shows UV dose output of all UV Banks currently in operation. The applied UV dose is calculated based on UVT, operating power levels of the UV Banks, flow, and lamp age.	
FLOW	Shows the current total system flow value used for dose pacing. The Flow/Manual Flow selector above the currently displayed flow value will toggle the current flow signal source between the configured input instrument source, and a manually entered value.	
UVT(%)	Displays the current UVT value used for dose pacing. If required, the UVT can be manually entered.	
Fault Reset	Resets Not Enough Healthy UV Channels.	
UV Channel Screen (Section 8.3.3)		
Inlet Gate Selector	Inlet Gate status and control screen	
UV Bank Selector	Navigate into UV Bank overview screen	
	Lamp Driver Display	Driver Information display. Resets each individual lamp hours
	UV Bank Mode Selection	Changes UV Bank operation mode
	UV Bank Priority	Changes UV Bank priority
	Override UV Bank Info	Overrides UV Bank Lamp Hours, UV Bank Hours, UV Bank Cycles
	Reference Sensor	Check the duty sensor to a reference sensor
UV Channel Priority Selector	Changes UV Channel / UV Bank priority	
Outlet Gate Selector	Outlet Gate status and control screen	
Wiper Screen (Section 8.3.5)		
Health	Displays current wiper system health condition	
Wiper detail	Displays detailed wiper information	
	Wipe UV Bank	Performs wiping action on current bank
Wipe all	Performs wiping action on all banks if condition allows	
Trending (Section 8.3.6)		
Display	Displays trending of flow, dose and UVT in past 8 hours	
Change Scale	Changes maximum and minimum of Y axis on trending window	
Alarm (Section 8.3.7)		
Active Alarm display	Displays all active alarms	
History Alarm display	Displays a list of historical alarms	

Settings (Section 8.3.8)	
General Settings	General settings for the system
Wiper Settings	Wiper control settings
Flow Settings	Settings for default and low flow set point
UVT Settings	Settings for default and low UVT alarm set point
Intensity Settings	UVI sensor settings
Dose Settings	Settings for dose requirement
Time Delay Settings	Time delay for alarms
UV Channel Settings	UV Channel fill, open and close delay, inlet travel time
Water Level Settings	Maximum and minimum water level settings
Outlet Gate Settings	Settings for outlet weir gate

8.3.1.2 System Status and Health

The system status is displayed in the top left hand corner of all main level screens. The system status will display either **ON** or **OFF** and includes a graphical icon to indicate the health of the system.

Icon	Icon Color	System Health
	Green	Healthy
	Yellow	Unhealthy with minor alarm(s) active
	Red	Unhealthy with critical/major alarm(s) active

8.3.1.3 Login

The SCC Operator Interface is configured with security access restrictions.

Level	User / User Name	Access	Password
1	No Login	User may view all unrestricted data.	Not required
2	Operator	User may view all unrestricted data and enter process data, control process equipment and adjust process control setpoints. The password protection can be removed by placing the “Operator Login Required” system setting to “No”.	11111
3	Maintenance	User has access to configuration of process control strategies and displays.	Password is provided to approved trained personnel

To login:

1. Press LOGIN ⟶ User Button⟶ Input User Name ⟶ (↵)
2. Press PASSWORD ⟶ Input Password ⟶ (↵)

Notes: *1) The Login button displays ‘LOGIN’ when no user is logged in.*

2) The Logout displays the name of the current logged in user. Pressing it logs the user out.

8.3.2 Home Screen

The Home Screen displays:

- On restart of the HMI
- When a user logs out
- After the inactivity time-out expires (30 min)

Figure 24 Home Screen

Item	User / User Name	Button/Text	Description/Action	Refer:
1	UVT Bar Graph and Override Button	UVT	If the device input type is set to anything other than manual, a grey gradient button will be displayed. If the device input type is set to manual, a white box appears, this allows the user to change the manual value. *Value can be manually overridden (Section 8.3.2.3).* The bar graph dynamically displays the full scale value of the device set in the Settings Screens. The realtime values are displayed to the right of the graph. The grey indicator arrow below the graph indicates alarm setpoints. If the bar position moves to the left of the arrow, an alarm will be triggered.	*Section 8.3.2.1*
2	Flow Bar Graph and Override Button	Flow		
3	RED (Dose) Bar Graph	T1, MS2 etc.	The bar graph dynamically displays the dose calculated by the PLC. The realtime value is displayed to the right of the graph. The red text to the left of the RED bar graph, indicates the type of microbe selected (i.e. T1, MS2 etc.) for use in dose equations. The grey indicator arrow below the graph indicates the RED target. If the bar position moves to the left of the arrow, an alarm will be triggered.	
4	Channel Navigation Buttons	Channel 1 Open	The status and health of each UV Channel in the system is displayed on the gradient push button. Push to navigate to the Channel Overview Screen (Section 8.3.3).	*Section 8.3.2.2*
5	Not Enough Healthy Channels Reset		NOT ENOUGH HEALTHY CHANNELS RESET blue pushbutton displays whenever a latched Not Enough Healthy UV Channels alarm is determined by the PLC. Reset to unlatch the alarm.	*Section 8.3.2.4*

8.3.2.1 Bar Graph

Bar Color	Icon	Icon Color	Description
Green	--	--	Value is within design parameters.
Red		Yellow	Value has dropped below the design low setpoint or exceeded the design high setpoint. A Minor Alarm is active.
Red		Red	Value has dropped below the design low setpoint or exceeded the design high setpoint. A Major Alarm is active

8.3.2.2 Channel Navigation Buttons

Icon	Channel Status
Open	Channel is Open
No icon	Channel is Closed
	Channel is Opening
	Channel is Closing

Icon	Icon Color	Channel Health
No icon	No icon	Healthy
	Yellow	Minor alarm present (Yellow)
	Red	Major alarm present (Red)

8.3.2.3 Override Flow and UVT Settings

Manual/override of Flow and UVT values

The *Flow* and *UVT* values can be overridden by the operator based on the input device type that was selected in the Settings Screens.

Calculated

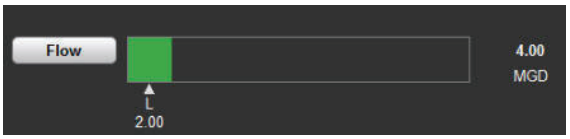


Figure 25 Calculated Value

The button to the left of the Flow and UVT graph is shown as a button if the respective input type of the device is set to anything other than *Manual*. The button is a grey gradient when the value is not overridden. The numeric display to the right of the graph appears as white text on a black background when the override is off. (Figure 25).

Manual

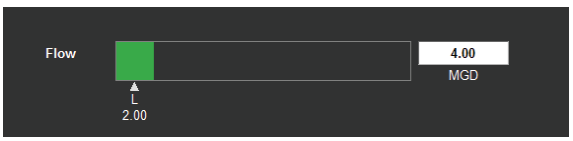


Figure 26 Manual Value Entry Field

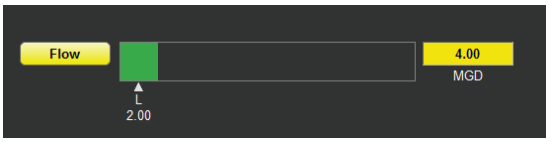


Figure 27 Manual Value Entered

A white box appears behind the value indicating that the input type of the device is set to *Manual*. The operator can press this box to change the value (Figure 26).

The button is a yellow gradient when the value is overridden. The numeric display to the right of the graph appears as black text on a yellow background when the override is on (Figure 27).

8.3.2.4 Not Enough Healthy UV Channels Reset

1. Push NOT ENOUGH HEALTHY CHANNELS RESET ⟶ YES or NO

8.3.3 UV Channel Overview Screen

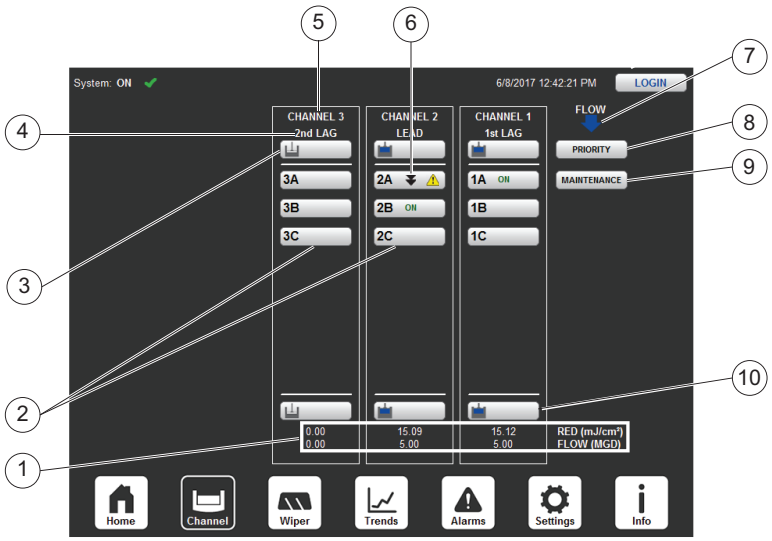


Figure 28 UV Channel Overview Screen

1	Displays current measured FLOW and RED (dose)	**6**	Channel Status Indicator
2	Navigates to Bank Overview Screen	**7**	Indicates direction of effluent flow
3	Inlet Gate Control Button (Section 8.3.3.2)	**8**	UV Channel Priority button (Section 8.3.3.1)
4	Assigned Channel Priority Display	**9**	UV Channel Maintenance button (Section 8.3.3.4)
5	UV Channel	**10**	Outlet Gate Control Button (Section 8.3.3.3)

Low Level Alarm and Warning Indicators

In the event of low water conditions, the following text “LOW WATER” will display at the bottom of each UV Channel in yellow (warning) or red (alarm) color.

Channel Status Indicators

There are four states used to represent the current state of the channel.

Note: *Channel coming online and Channel going offline are only available if inlet gates are present.*

Icon	Description
ON	The channel is in operation
▲▲	The channel is coming online
▼▼	The channel is going offline
No Icon	The channel is off

8.3.3.1 Change UV Channel Priority

The Priority button is displayed for systems with more than one UV Channel and allows the operator to change the priority of the Channel.

The Channel priority is default set to AUTO sort with a user defined auto sort interval. When the operational hours have elapsed, the controller will automatically resort the priority of the UV Channels. Optionally, a user may choose to manually assign channel priorities.

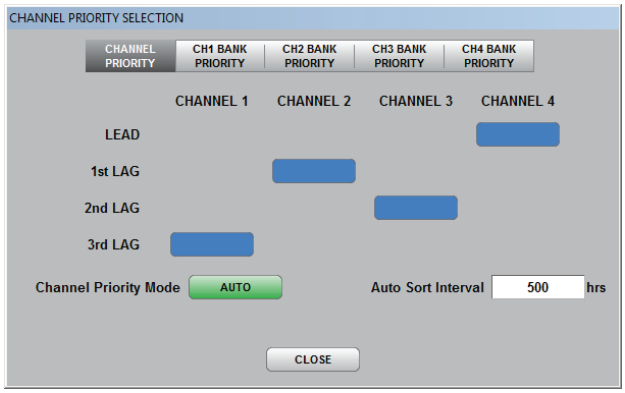


Figure 29 Channel Priority in Auto Mode

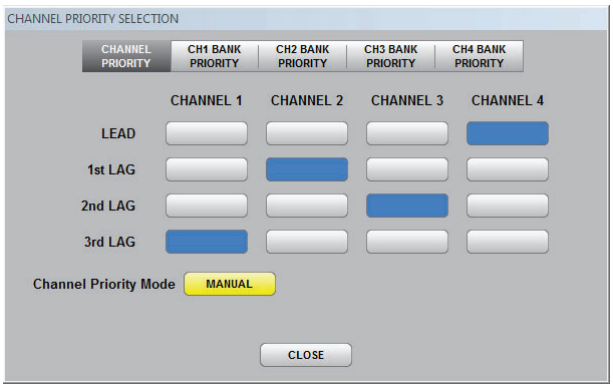


Figure 30 Channel Priority in Manual Mode

Value	Description
AUTO	When the Auto Sort Interval has expired, the priority of the UV Channels will automatically be sorted based on channel runtime hours.
MANUAL	UV Channel priority is manually assigned.
Auto Sort Interval	Frequency to automatically sort UV Channel.

Manually assign Channel Priority

1. Press PRIORITY (Figure 28, Item 8).
2. Press the desired channel to set priority. The selection will turn blue which indicates the priority has been assigned.

   Note: *UV Channels must have unique priority assignments. If unique assignments are not selected, a "PRIORITY SELECTIONS ARE NOT UNIQUE" alert will be displayed on the Channel Priority screen.*
3. ACCEPT or CANCEL.

   Note: *ACCEPT and CANCEL pushbuttons appear after a change has been made.*

8.3.3.2 Inlet Gate Control

Inlet gates may be automatically controlled via the SCC or Plant SCADA. If the gates are automatically controlled, a gate icon will be displayed on the UV Channel Overview Screen (Figure 28, Item 4).

The Inlet Gate button displays the gates current status and health.

Icon	Description
	Gate is open or flow is present (Blue)
	Gate is closed or no flow is present (Grey)
	Gate is opening
	Gate is closing

Icon	Description
No icon	Healthy
	Minor alarm present (Yellow)
	Major alarm present (Red)

To change the inlet gate control to Auto or Manual Control Mode:

1. Press the Inlet Gate button.
2. Select either AUTO or MANUAL control mode button as required.

To change the inlet gate control into Local Control Mode:

1. Go to the actuator on the inlet gate and change control to LOCAL.

   Note: *The inlet gate control pop-up screen will display an "INLET GATE IN LOCAL" status.*

To manually open or shut the inlet gate:

1. Put Inlet Gate into MANUAL control mode.
2. Press OPEN or SHUT as required.
3. Press CLOSE button.

To reset an inlet gate latched alarm:

1. Press the Inlet Gate button.
2. Press FAULT RESET button.
3. Press CLOSE button.

8.3.3.3 Outlet Gate Control

Outlet gates may be automatically controlled via the SCC or Plant SCADA. If the gates are automatically controlled, a gate icon will be displayed on the UV Channel Overview Screen (Figure 28, Item 10).

The Outlet Gate button displays the gates current status and health.

Icon	Description
	Gate is open or flow is present (Blue)
	Gate is closed or no flow is present (Grey)
	Gate is opening
	Gate is closing
No icon	Healthy
	Minor alarm present (Yellow)
	Major alarm present (Red)

To change the outlet gate control to Auto or Manual Control Mode:

1. Press the Outlet Gate button (Figure 28, Item 10).
2. Select either AUTO or MANUAL control mode button as required.

To change the outlet gate control into Local Control Mode:

1. Go to the actuator on the inlet gate and change control to LOCAL.

   Note: *The outlet gate control pop-up screen will display an "OUTLET GATE IN LOCAL" status.*

To manually raise or lower the outlet gate:

1. Put Outlet Gate into MANUAL control mode.
2. Press RAISE or LOWER as required.
3. Press CLOSE button.

To reset an outlet gate latched alarm:

1. Press the Outlet Gate button.
2. Press FAULT RESET button.
3. Press CLOSE button.

To toggle the gate position display (between % OPEN or Inches or cm)

1. Press the Outlet Gate button.
2. Press the gate position toggle button to change between %OPEN and in or cm.

8.3.3.4 Maintenance Mode

When a UV Channel is set to MAINTENANCE mode, the UV controller will:

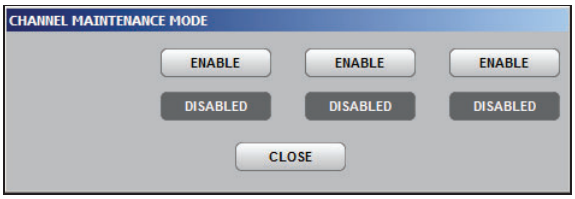
- Close all gates in the associated UV Channel
- Turn off all UV Banks in the associated UV Channel.

The UV Channel will then be removed from any dose pacing and all alarms to SCADA from associated UV Channel will be muted except for the “Channel X Maintenance Mode Enabled” Minor alarm.

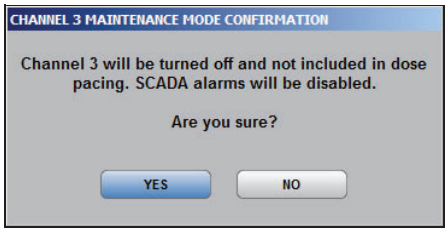
Note: *UV Banks and gates can still be operated locally in Maintenance Mode.*

To Enable Maintenance Mode:

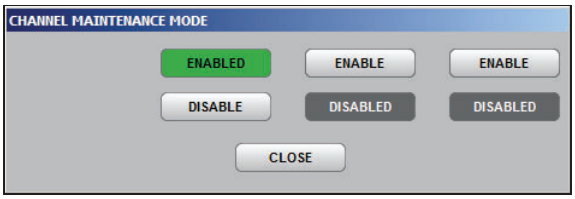
1. Select the “MAINTENANCE” button on the UV Channel Overview Screen (Figure 28, Item 9).
2. Channel Maintenance Mode Pop-up screen, select ENABLE on the required channel.



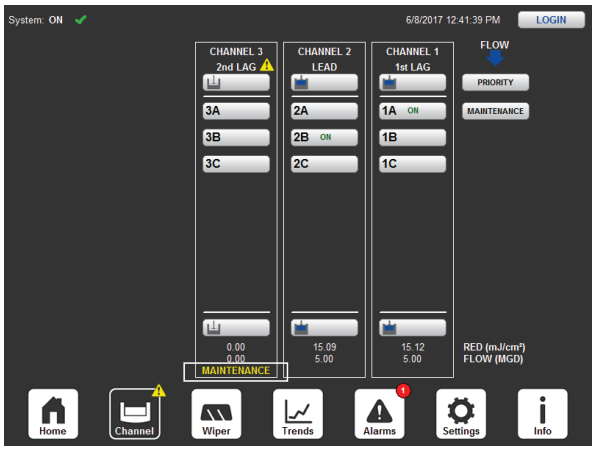
3. Channel x Maintenance Mode Confirmation pop-up screen, select “YES” to proceed or “NO” to cancel.



4. When a UV Channel is enabled for maintenance:
   a. ENABLED button on the Channel Maintenance Mode pop-up will be colored green.



b. The UV Channel Overview screen will display the channel currently enabled for Maintenance by displaying “MAINTENANCE” at the bottom of the Channel display.



To Disable Maintenance Mode:

1. At any time, press the “DISABLE” button. The UV Channel will be resume normal operations.

8.3.3.5 Offline Mode

This mode is used by approved service personnel. It is used primarily during start-up when the UV Channels being started up need to be staggered over a longer period of time.

Note: *This screen is not intended to be used as a maintenance mode. The system must be shut down properly or not yet installed in the UV Channel(s).*

The user must login to OEM level to enable this function.

When a UV Channel is set to OFFLINE mode, the UV Controller will:

- Mask graphics for the offline UV Channel(s)
- Mask alarms for the offline UV Channel(s)
- Disable communications to the Prosoft Communication Card.
- Enable a ‘Channel x In Offline Mode’ alarm.

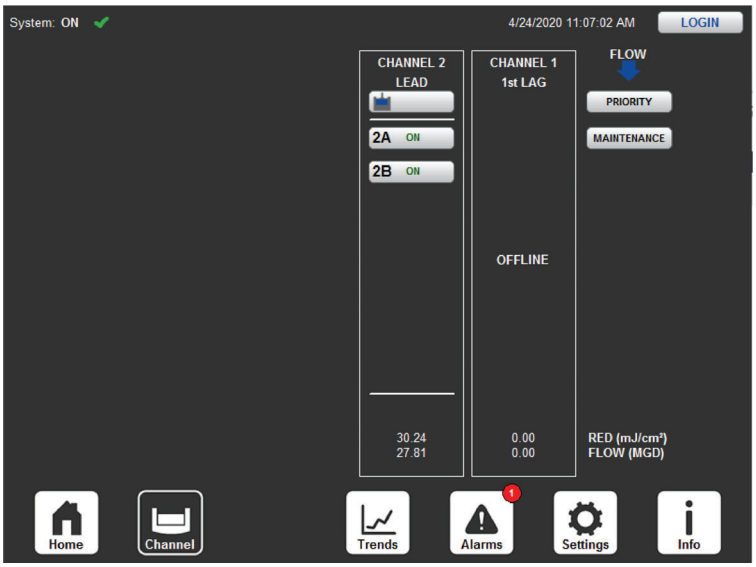


Figure 31 UV Channel Offline Mode

8.3.4 UV Bank Overview Screen

UV Channel Overview screen ⟶ UV Bank number.

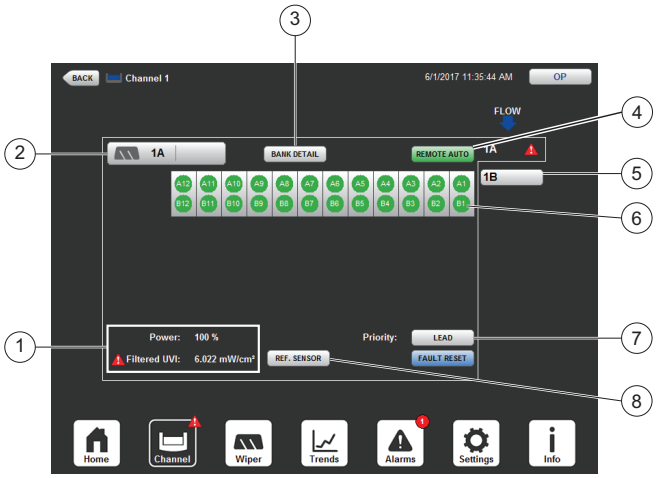


Figure 32 UV Bank Overview Screen

1	Bank Parameters	**5**	Bank Navigation Buttons
2	Wiper Quick Switch Button (Section 8.3.4.6)	**6**	UV Lamp and Driver Button
3	Bank Details	**7**	Bank Priority Button
4	Bank Mode Button (Section 8.3.4.1)	**8**	Reference Sensor Button

Low Level Alarm and Warning Indicators

In the event of low water conditions, the following text “LOW WATER” will display beside the Bank Mode Button (Figure 32) in yellow (warning) or red (alarm) color.

Bank Not In Place Alarm Indicator

In the event of the UV Bank not fully lifting down into the Bank Frame, the following text “NOT IN PLACE” will display beside the Bank Mode Button (Figure 32) in red (alarm) color.

8.3.4.1 Change UV Bank Mode

1. Press the Bank Mode Button ⟶ REMOTE OFF or REMOTE ON or REMOTE AUTO (from the Remote Mode pane) (Figure 32, Item 4).

8.3.4.2 Lamp Driver and UV Lamps Status

Lamps and Lamp Drivers are displayed in the physical arrangement of the UV Bank.

UV Lamps

The circles represent the UV Lamps and are named according to the label designation on the physical lamp.

The lamp circle changes color based on the status of the UV Lamp.

Icon	Icon Color	UV Lamp Status
	Black	Off and healthy
	Black and red	Off and unhealthy with major/critical alarm(s)
	Black and purple	Disabled; lamp off and cool down timer is counting down
	Black and green	Disabled; lamp off and cool down timer is expired

Icon	Icon Color	UV Lamp Status
A1	Black and yellow	Off and unhealthy with minor alarm(s).
A1	Magenta	Re-igniting
A1	Red	On and unhealthy with major/critical alarm(s)
A1	Green	On and healthy
A1	Yellow	On and healthy with minor alarm(s).

Lamp Drivers

The gradient rectangle push-button that surrounds a pair of lamps (or 1 lamp if it is a half driver) displays the status of each lamp driver.

Icon	Border Color	Lamp Driver Status
A1 B1	Red	Major Alarm
A1 B1	Yellow	Minor Alarm
A1 B1	None	Healthy

Press the *Driver* push-button to display additional details about the respective driver/lamp(s) (Section 8.3.4.3).

8.3.4.3 Lamp Driver Detail Screen

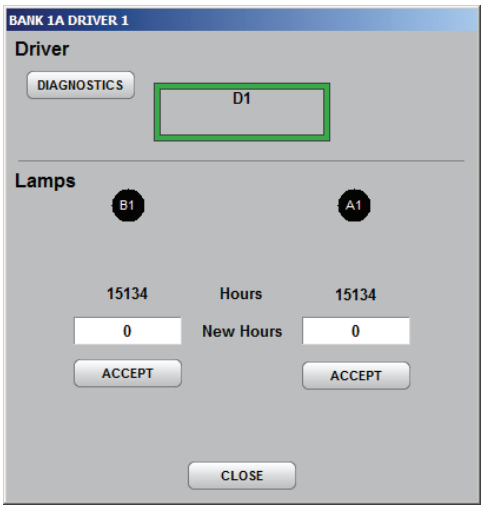


Figure 33 Lamp Driver Detail Screen

The lamp driver identification is displayed in the center of a rectangle. The border color of the lamp driver changes based on the lamp driver status:

Border Color	Alarm	Lamp Driver Status
Green	None	Healthy
Yellow	Minor Alarm	Minor Alarm
Red	Major Alarm	Major or Critical Alarm
Red	Comm. Failure	Communication Failure between BCB and Lamp Driver or between the SCC and BCB

8.3.4.4 Reset Lamp Driver Fault

A blue gradient Fault Reset pushbutton will appear whenever there is an alarm on the lamp driver.

To reset the faults:

a. Bank Overview Screen ⟶ RESET.

8.3.4.5 Reset Bank Fault

A blue gradient Fault Reset pushbutton will appear whenever there is a latched alarm on the bank.

To reset the faults:

a. Bank Overview Screen ⟶ RESET

b. Reset all faults in Bank xx pop up ⟶ YES or NO

8.3.4.6 Wiper Quick Switch Button

Selecting this button will navigate to a Wiper Detail screen for the wiper group associated with the currently displayed bank (Section 8.3.5.1).

8.3.4.7 Override Operating Hours of Individual Lamp

When a new lamp is installed (OP1 Login required):

1. From UV Bank Overview (Section 8.3.4), select the UV lamp that needs to be overridden.
2. Input New Hours ⟶ Push ACCEPT⟶CLOSE.

8.3.4.8 Enable / Disable Individual UV Lamp

1. From the Lamp Driver Detail Screen (Figure 33), select either ENABLED or DISABLED button.

   Note: *Only one UV Lamp per UV Bank can be disabled at one time.*

2. If Lamp was previously:

   a. *ENABLED* - Select DISABLE⟶CLOSE.

   Notes: *1) Only one UV Lamp per UV Bank can be disabled at one time.*

   2) A Lamp cool down timer will initiate if disable function was successful.

   b. *DISABLED* - Select ENABLE⟶CLOSE.

   Note: *For lamp status definitions (Section 8.3.4.2).*

8.3.4.9 Turn off all UV Lamps in UV Bank

1. From Local - Refer to Section 5.2.2.
2. From Remote - Enable PDC Remote Control (Section 8.2.1) → At the HMI → Press the Bank Mode Button (Figure 32, Item 4) → REMOTE OFF.

8.3.4.10 Bank Parameter - Power %

Displays the current UV Bank power level.

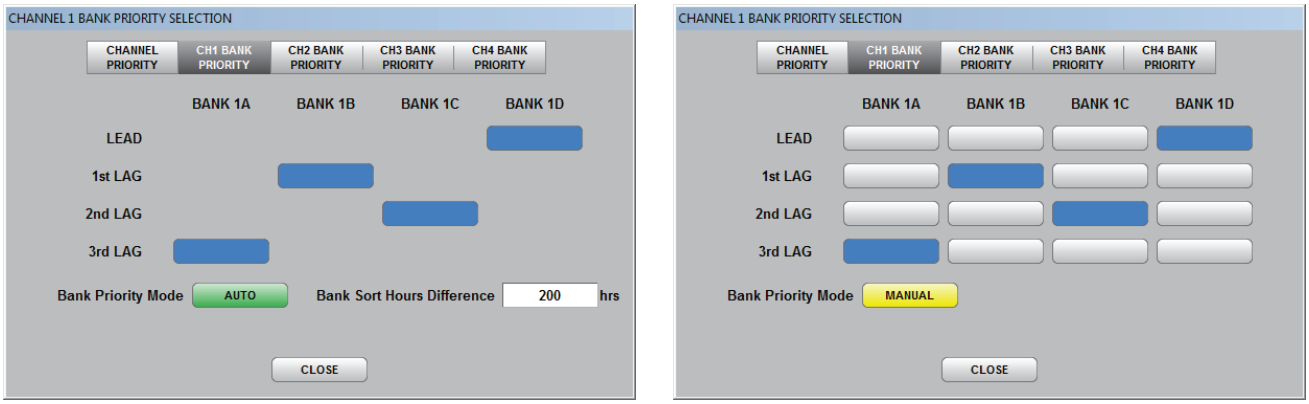
8.3.4.11 Bank Parameter - UV Intensity

The UVI value is displayed if the *UVI Option* is enabled in settings.

Button	Description / Action
RESET	Displays when a latched UVI fault is present
REF. SENSOR	Initiates a Reference Sensor Procedure. • For Analog UVI Sensors, refer to instruction DC000601-013. • For Digital UVI Sensors, refer to instruction DC000601-051.
	Displays when: • Lamp B2 is on with a minor fault(s) or no faults • Bank is in operation • Bank wiping is not in progress • Bank is communicating with SCC

8.3.4.12 Change UV Bank Priority

The Priority button is displayed for systems with more than one UV Bank.



Value	Description
AUTO	Will automatically sort the priority of the UV Bank based on runtime hours, mode, and health.
MANUAL	UV Bank priority is manually assigned.
Bank Sort Hours Difference	UV Banks will automatically sort if the difference in bank lamp hours between two UV Banks (within the same UV Channel) exceeds the preset value.

1. Press the bank priority button (Figure 32, Item 7).
2. Press the pushbuttons to set priority. The selection will turn blue which indicates the priority has been assigned.

   Note: *UV Banks must have unique priority assignments. If unique assignments are not selected, a "PRIORITY SELECTIONS ARE NOT UNIQUE" alert will be displayed on the Bank Priority screen.*

3. ACCEPT or CANCEL.

   Note: *ACCEPT and CANCEL pushbuttons appear after a change has been made.*

8.3.4.13 Display and Override Bank Details

The Bank Details Screen allows selected values to be overridden providing that the user is logged in as OP1 or higher.

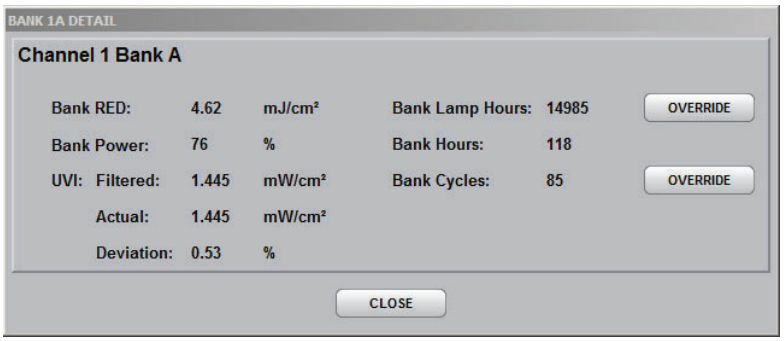


Figure 34 Bank Details

Bank Details Screen Display

Value	Definition	Description / Actions
Bank RED (mJ/cm^2)	Displays the calculated UV Dose	Display only
Bank Power (%)	Displays the calculated Bank Power	
UVI Filtered (mW/cm^2)	Displays the UV Intensity used in the dose calculation	
UVI Actual (mW/cm^2)	Displays the UV Intensity measured by the sensor	
Deviation (%)	Displays the difference between the expected UV Intensity and the measured UV Intensity	
Bank Lamp Hours	Displays the lamp hours in the UV Bank	Override permitted
Bank Hours	Displays UV Bank runtime	Display only
Bank Cycles	Displays the number of times the UV Bank has turned ON	Override permitted

Bank Lamp Hours Override

1. Bank Overview Screen ⟶ BANK DETAILS.
2. Bank Lamp Hours ⟶ OVERRIDE (Figure 34)
3. Input Lamp Hours ⟶ ACCEPT
4. Lamp Hours Confirmation Pop-up ⟶ YES / NO ⟶CLOSE

Bank Cycles Override

1. Bank Overview Screen ⟶ BANK DETAILS.
2. Bank Cycles ⟶ OVERRIDE (Figure 34)
3. Input Bank Cycles ⟶ ACCEPT ⟶CLOSE

8.3.5 Wiper Overview Screen

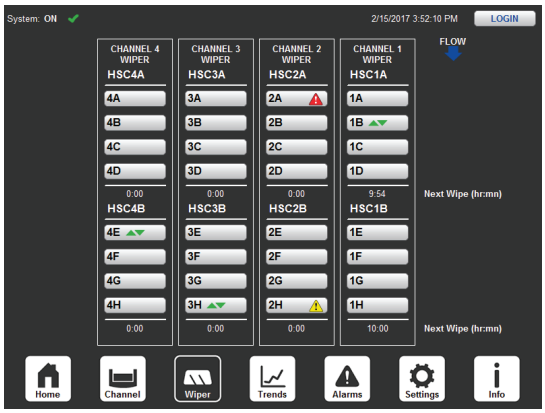


Figure 35 Wiper Overview Screen

Pressing a wiper status button (i.e. 1B) navigates the user to the Wiper Detail Screen for the respective UV Bank (Section 8.3.5.1).

Low Level Alarm and Warning Indicators

In the event of low water conditions, the following text “LOW WATER” will display at the bottom of each channel in yellow (warning) or red (alarm) color.

Wiper Status and Health

Icon	Icon Color	Status	Health
No icon	No icon	Stationary	Healthy
	Green	Moving	
	Yellow		Minor alarm active
	Red		Critical/Major alarm active

WIPE ALL - Visible when there are no conditions that would prevent a wipe of all UV Banks.

Status and health of each wiper in the system are displayed on a push-button.

The time remaining until the next auto wipe procedure is displayed for each UV channel.

8.3.5.1 Wiper Detail Screen

Displays information related to the current selected wiper.

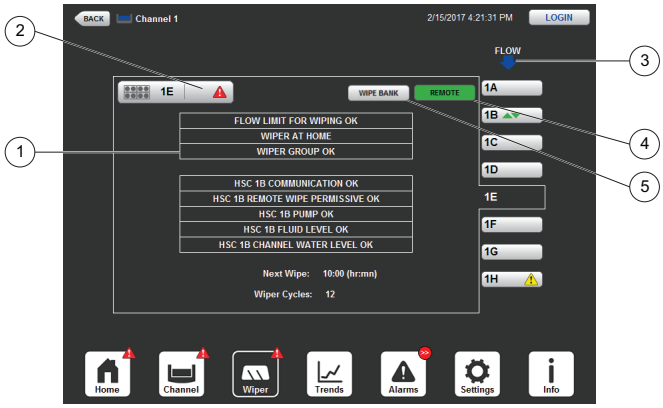


Figure 36 Wiper Detail Screen

1	Wiper Event Status and Alarms	**4**	Wiper Mode
2	UV Bank Status & Health (Quick Switch Button)	**5**	Manual Wipe
3	Flow Direction		

Wiper Mode

The Wiper Mode is determined by the physical HSC switch positions (Figure 36). For HSC local mode (Section 8.1.4) .

Icon	Icon Color	Description / Action
LOCAL OFF	Yellow Green	HSC wiper group is set to “OFF”.
LOCAL RETRACT		HSC wiper group is set to “LOC” and cylinder is retracting.
LOCAL EXT		HSC wiper group is set to “LOC” and cylinder is extending.
LOCAL SEQ		HSC wiper group is set to “LOC” and a sequence wiping is on.
IN LIFT		HSC is set to lift mode.
REMOTE		HSC wiper group is set to wipe and Remote mode.

UV Bank Status and Health (Quick Switch)

A *Quick Switch* push-button contains the status and health information of the wiper at current UV Bank (Wiper Status and Health).

Icon	Icon Color	Status	Health
No icon	No icon	UV Bank is off	Healthy
	Black	UV Bank is in Warm-up	
		UV Bank is Timing off	
ON	Green	UV Bank is in Operation.	
	Yellow		Unhealthy with minor alarm(s) active
	Red		Unhealthy with critical/major alarm(s) active

Wiper Event Status and Alarms

Refer to Section 10 for wiper event status and alarm listings.

Manual Remote Wipe

1. Press WIPE BANK.

   Note: *The function is only available when there is no wiping action or alarms on any bank in the same HSC.*

8.3.6 Trending Screen Overview

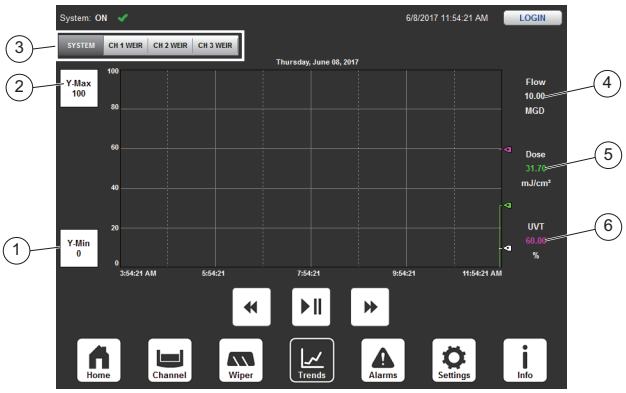


Figure 37 Trend - System With Weir

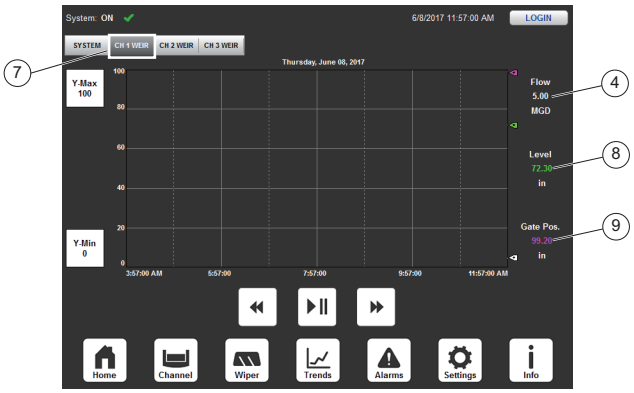


Figure 38 Trend - Weir

1	Y-Min Button	**6**	UVT Value
2	Y-Max Button	**7**	Weir Trend Button Selected
3	Navigation Bar (Toggle between System Trends and Weir Gate Trends)*	**8**	Level Value
4	Flow Value	**9**	Gate Position Value
5	Dose Value		

*Navigation Bar is only displayed when a weir gates are present and controlled by Trojan. Each UV Channel with a weir gate will have a Trend Screen

8.3.6.1 Change Scale of Trending Plot

1. Press the Y-Min ⟶Input the required value⟶ ENTER symbol.
2. Press the Y-Max ⟶Input the required value⟶ ENTER symbol.

8.3.7 Alarm Screen Overview

Alarm Banner

A red alarm banner appears at the top of the screen when an incoming alarm occurs. The alarm banner stays open until the user closes the window.

Figure 39 Alarm Banner

Active Alarms

The *Active Alarms* tab displays the alarms that are active in the system.

Alarm History

The *Alarm History* tab displays all the alarms that have occurred in the system with a date/time stamp.

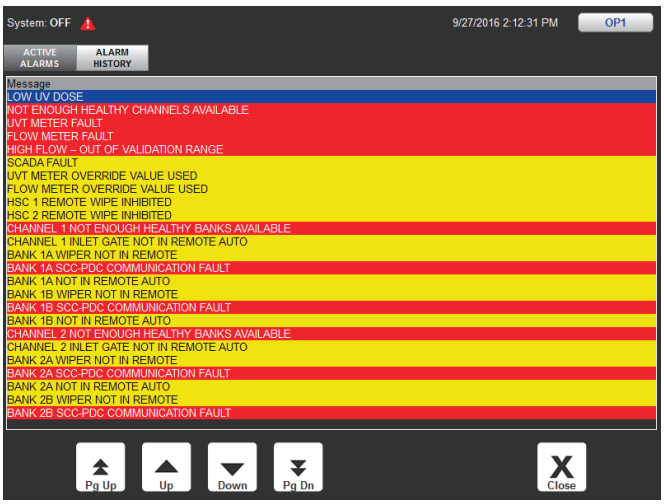


Figure 40 Active Alarms

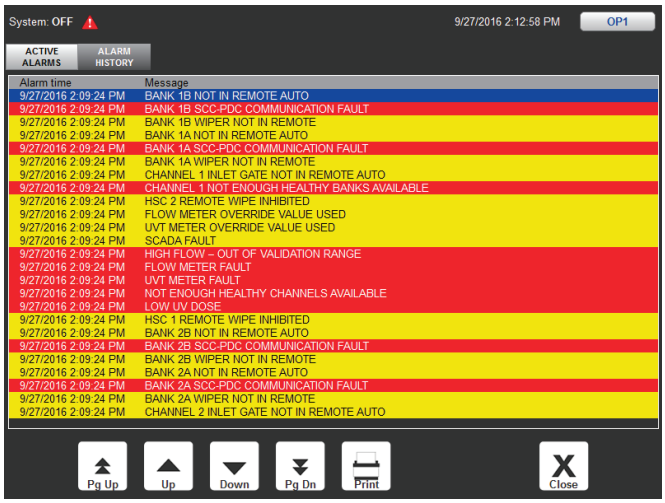


Figure 41 Alarms History

8.3.7.1 Alarm Color Code

Alarm Color	Description
Yellow	Minor Alarm
Red	Critical / Major Alarm
Blue	Selected Alarm

8.3.8 Settings

The user must be logged in at OP1 level or higher to access the Settings Screens. Press the white text boxes to enter new setting values or to pop-up setting options.

8.3.8.1 General Settings

Figure 42 General Settings

Parameter	Units	Definition
UPS Option	Enabled / Disabled	Enabled if a UPS is available, disabled if no UPS is available.
Min. Number of Channels	Whole Number	The minimum number channels requested to run in automatic.
Min. Number of Banks/Channel	Whole Number	The minimum number banks requested to run in automatic.
Add Bank Capacity Threshold	%	A user adjustable “Add Capacity Threshold” (default 95%) will be applied to the calculation so that additional UV Banks will be required once the % Capacity threshold has been reached.”
Add Bank Capacity Deadband	%	A user adjustable “Add Capacity Threshold” (default 5%) will be applied to the calculation when reducing the required number UV Banks per channel, once the (Add Bank Capacity Threshold - Add Bank Capacity Deadband) it has been reached.”
Operator Login Required	Yes / No (default No)	A user adjustable setting to specify if security login is required.
Resend Bank Settings	RESEND	Manually resend UV Bank settings to each BCB.

8.3.8.2 Wiper UV Bank Settings

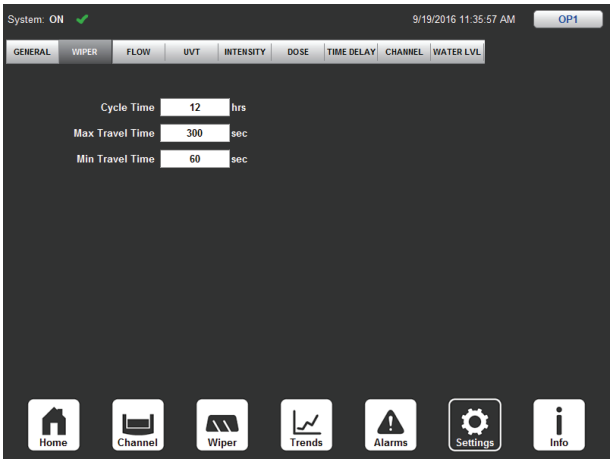


Figure 43 Wiper UV Bank Settings

Parameter	Units	Definition
Cycle Time	Hours	Set the frequency for wiper cycles.
Max Travel Time	Seconds	The maximum allowable wiper travel time, if exceeded an alarm will be triggered.
Min Travel Time	Seconds	The minimum allowable wiper travel time, if wipe is completed prior to this time, a wiper jammed fault will be triggered.

8.3.8.3 Flow Settings

Figure 44 Flow Settings

Parameter	Units	Definition
Flow Units	m^3/hr, m^3/day, GPM, L/s, MGD	A user adjustable setting for displayed flow units.
Flow Meter Full Scale	Flow Units	Maximum scale (20mA) calibration value used to measure the flow through the UV system.
Flow Default Value	Flow Units	The flow value that is used for auto pacing during designated fault conditions.
Low Flow Alarm Setpoint	Flow Units	Set the level to initiate a low flow alarm timer.
Low Flow Alarm Delay	Minutes	Setpoint for the low flow alarm timer.

8.3.8.4 UVT Settings

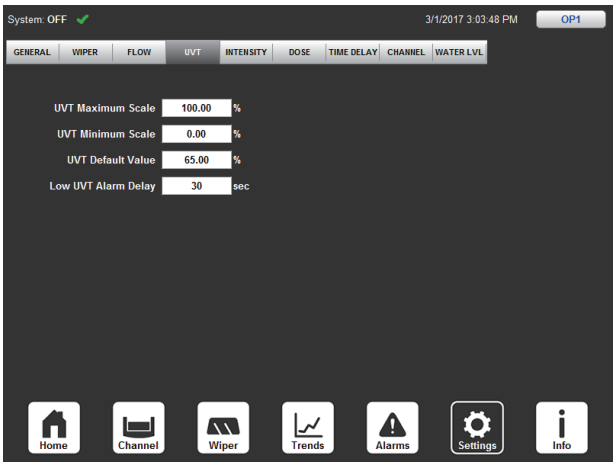


Figure 45 UVT Settings

Parameter	Units	Definition
UVT Maximum Scale	%	Maximum scale (20mA) calibration value used to measure the UVT in the UV system.
UVT Minimum Scale	%	Minimum scale (4mA) calibration value used to measure the UVT in the UV system.
UVT Default Value	%	Full scale calibration value for the UVT signal used for auto pacing if there is a UVT signal fault.
Low UVT Alarm Delay	Seconds	Set the low UVT alarm time delay

8.3.8.5 Intensity Settings

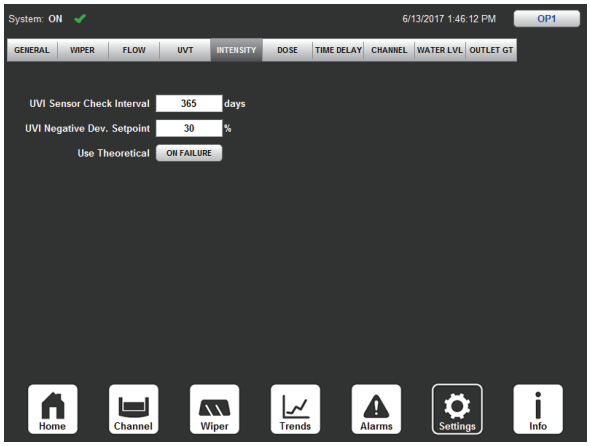


Figure 46 Intensity Settings

Parameter	Units	Definition
UVI Sensor Check Interval	Days	Recommended time between reference sensor checks.
UVI Negative Deviation Setpoint	%	A user adjustable value for the allowable percentage below the calculated UVI expected value.
Use Theoretical	Never	Only use the real sensor value for dose pacing. If the sensor fails that bank will be unhealthy and rotated out if another bank is available.
	On Failure	If the analog signal of the sensor fails, use the theoretical for dose pacing. Sensor alarms will be treated as minor.
	Always	Always use the theoretical value for dose pacing. Sensor alarms will be treated as minor and will only be used for troubleshooting and maintenance purposes.

8.3.8.6 Dose Settings

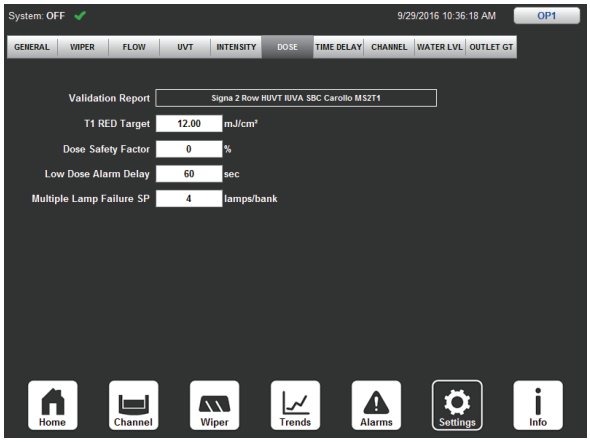


Figure 47 Dose Settings

Parameter	Units	Definition
Validation Report	---	Displays the selected dose validation report.
RED Target	mJ/cm^2	Determines the set point for UV dose control of the auto pacing routine. The auto pacing routine will modulate UV bank power level and bring UV banks and channel in and out of operation as required to maintain this set point.
Dose Safety Factor	%	Allowed additional dose each UV Bank will target above the required RED Target.
Low Dose Alarm Delay	Seconds	The set time for a low dose event to correct before an alarm is triggered.
Multiple Lamp Failure SP	Lamps/Bank	The number of lamp failures in a UV Bank required to trigger a multiple lamp failure alarm.

8.3.8.7 Time Delay

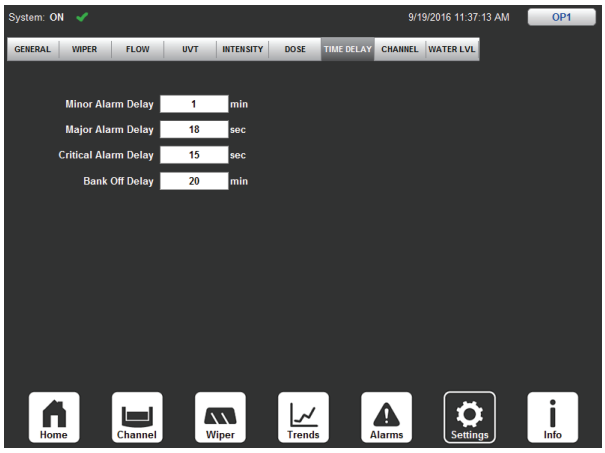


Figure 48 Time Delay

Parameter	Units	Definition
Minor Alarm Delay	Minutes	Time delay for minor alarms.
Major Alarm Delay	Seconds	Time delay for major alarms.
Critical Alarm Delay	Seconds	Time delay for critical alarms.
Bank Off Delay	Minutes	Minimizes UV bank on/off cycling. Determines the amount of time that the auto pacing routine must call for a UV bank to turn off before it will de-energize. While this timer is running, a UV bank will be operated at minimum power.

8.3.8.8 Channel Settings

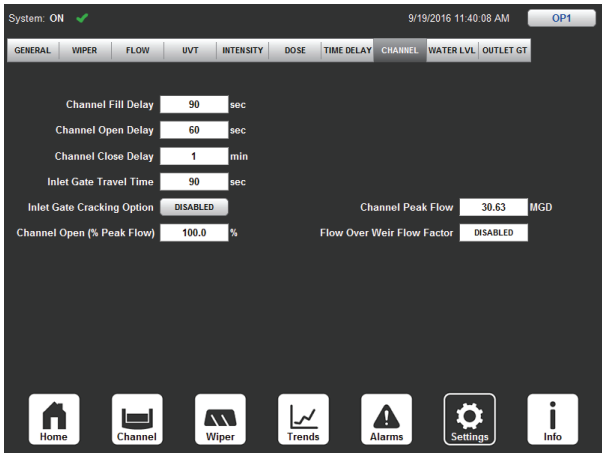


Figure 49 Channel Settings

Parameter	Units	Definition
Channel Fill Delay	Seconds	Time allowed for an empty channel to fill to the level switch before a Channel Low Level alarm is triggered. Channels that operate in the low level alarm condition are not considered “healthy” and will not be available to the auto pacing routine.
Channel Open Delay	Seconds	Time delay before a channel will remain closed to allow for the UV Banks to warm up, providing there is not a low water level event.
Channel Close Delay	Minutes	Time delay before a channel that is no longer required is closed and taken out of operation.
Inlet Gate Travel Time	Seconds	The maximum time required for the inlet slide gate to complete its travel from a fully open or closed position. This set point is used to determine how long to wait when a gate is commanded to move before checking for alarm conditions.
Inlet Gate Cracking Option	Enabled / Disabled	Allows for controlled filling of the UV Channel.

Parameter	Units	Definition
Channel Open (% Peak Flow)	%	The percentage of the channel peak flow setpoint that will trigger additional channels to be brought online. - multichannel or inlet gates must be present.
Channel x Peak Flow	GPM	Designed peak flow for each UV Channel
Flow Over Weir Flow Factor	Enabled / Disabled	Enables the PLC to apply a flow factor based on the channel flow over the weirs; used to calculate the flow through each channel. Available to systems configured with automatic outlet weir gates.

8.3.8.9 Water Level Settings

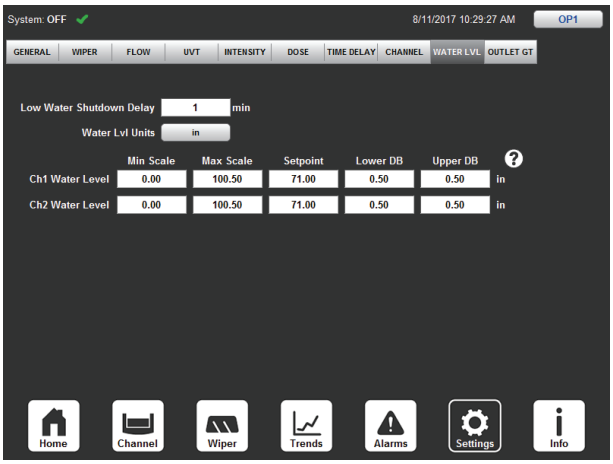


Figure 50 Water Level Settings

Parameter	Units	Definition
Low Water Shutdown Delay	Minutes	The time delay between a low water level warning and a low water level alarm that will shut down the UV Bank. A low water level warning occurs after the minor delay time.
Water Lvl Units	---	Displays the preferred units for water level.
ChX Water Level Max Scale	cm, in	Maximum scaled (20mA) calibration value used to measure the level in the UV channel.

8.3.8.10 Outlet Gate Settings

The Outlet Gate Settings screen is displayed for systems configured with automatic outlet gates.

Figure 51 Outlet Gate

Parameter	Units	Definition
Flow Balancing	Enabled / Disabled	A system that is configured to flow balance will compensate both for imperfections within civil works as well as flow tendencies toward one channel. These effects are able to be compensated for by calculating a dynamic offset of the water level set-point in each channel
Flow Balancing Gain	---	Gain value used to increase or decrease the effect of the calculated flow balancing compensation factor used to dynamically offset the water level set-point in each channel.
Weir Operation	4/20mA-Raised	The Weir Position analog signal associated with the weir in the fully raised position.
Weir Fully Raised	Inches	The elevation of the weir when fully raised relative to the channel floor beneath the analog water level sensor (same channel).
Weir Fully Lowered	Inches	The elevation of the weir when fully lowered relative to the channel floor beneath the analog water level sensor (same channel).
Weir Max. Position	Inches	Also known as the “Parked” position, this is the elevation of the weir considered to be fully closed, relative to the channel floor beneath the analog water level sensor (same channel).
Weir Safe Position	Inches	The elevation the weir, relative to the channel floor beneath the analog water level sensor (same channel), will be commanded to when a Water Level Signal Fault is active in the channel. This position is configured to prevent flooding in system when water level is unknown.
Weir Position Deadband	Inches	The weir gate position deadband applied when the weir gate is commanded to move to either the Max Position or Safe Position. Once inside this deadband, the weir gate will not be commanded to move.
Weir to AWLS Distance	Inches	The distance from the weir gate that the analog water level sensor has been installed.
Effective Weir Length	Inches	The effective weir gate width is the measured weir gate width less the diameter of each weir gate stem.
Channel Width	Inches	The width of the UV Channel at the analog water level sensor.
Total Travel	Seconds	The time taken for the weir gate to travel from the Fully Raised position to the Fully Lowered position.
Max. Position Delay	Seconds	The time delay from when the inlet gate starts closing to when the weir gate is commanded to Max position.
Max. Pulse Duration	Seconds	The maximum allowable weir pulse time when raising or lowering the outlet weir gate.
Outer Update Rate	Seconds	If the measured water level error is greater than the “Inner DB” limit and less than or equal to the “Upper DB” limit, the weir gate will be commanded to move for a calculated pulse duration and then wait for the “Update Outer” time period in order to measure the resultant water level effect.
Inner Update Rate	Seconds	If the measured water level error is outside of the Lower/Upper deadband range but is less than or equal to the “Inner DB” limit, the weir gate will be commanded to move for a calculated pulse duration and then wait for the “Update Inner” time period in order to measure the resultant water level effect.
Outer Deadband	Inches	If the water level error is greater than the “Outer DB” limit, the weir gate will move continuously until the measured water level error is less than the “Outer DB” limit at which time the gate will be commanded to move for a calculated pulse duration as described above.
Inner Deadband	Inches	

8.3.9 Information

Information is displayed on the Information tabs.

General

The General Information tab is used to display general Controller and project information. This information includes:

- Controller Data
- Firmware
- Status
- Mode
- Scan Time
- Memory Usage
- Project Number

Revision

The Revision Information tab displays the firmware revision levels of each controller board (BCBs, HSCs), the Controller and HMI.

The format for the revision levels are:

Controller/HMI: Product ID: Application ID: Major Revision: Minor Revision: Site Revision

BCBs/HSCs: Product ID: Application ID: Major Revision: Minor Revision

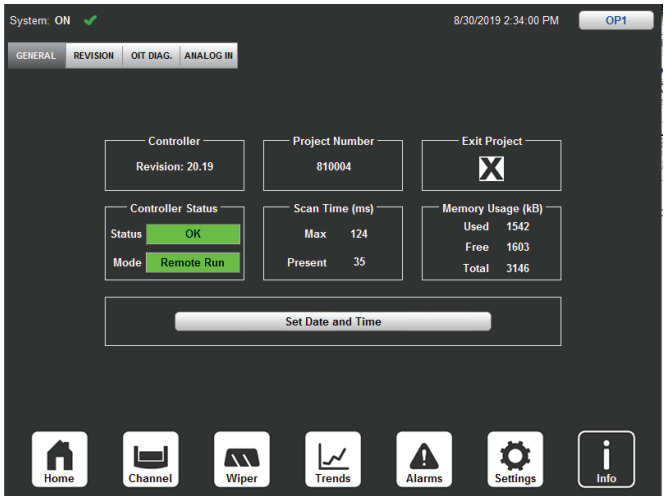


Figure 52 Info - General - OP1

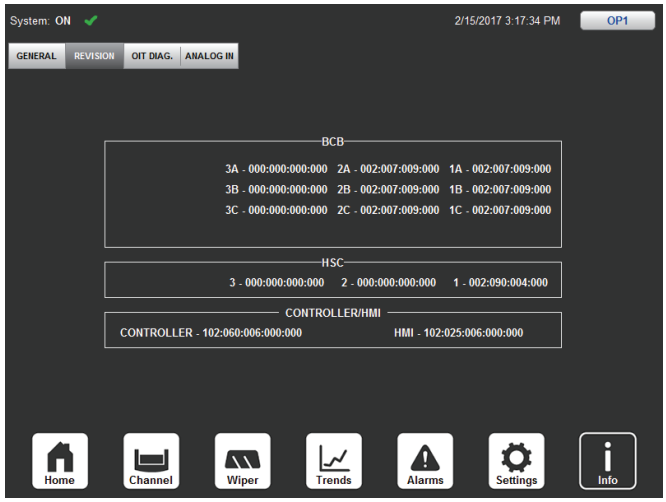


Figure 54 Revision

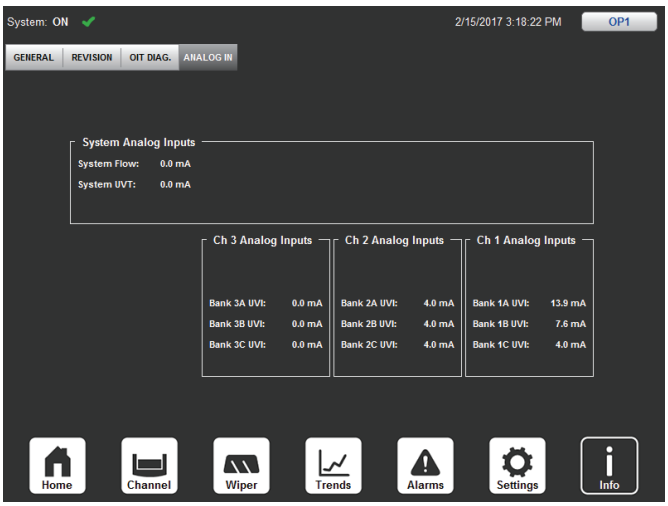


Figure 53 Analog Input

Figure 55 Flow Balancing

Set Date and Time

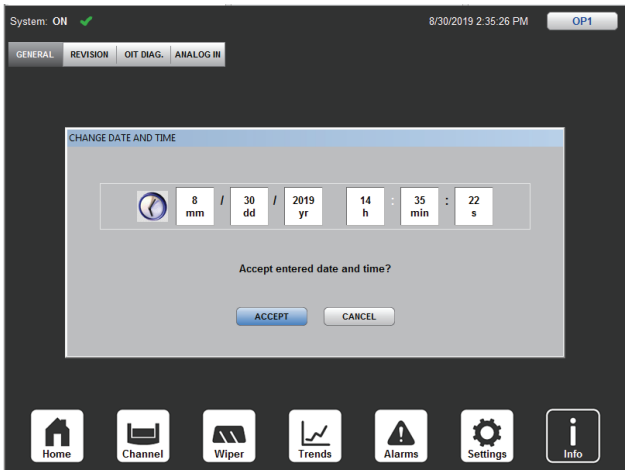


Figure 56 Date and Time Pop-Up

1. Info Screen ⟶ Select the 'GENERAL' tab (Figure 52) ⟶ Select 'Set Date and Time' to open the Date and Time Pop-up Screen (Figure 56).
2. Enter new Date and Time as required ⟶ Select Accept to save the changes.

OIT Diagnostics (Visible on Allen Bradley HMI only)

The OIT Diagnostics screen is used to provide a listing of diagnostic runtime data from the HMI. This will assist the user with troubleshooting the HMI.

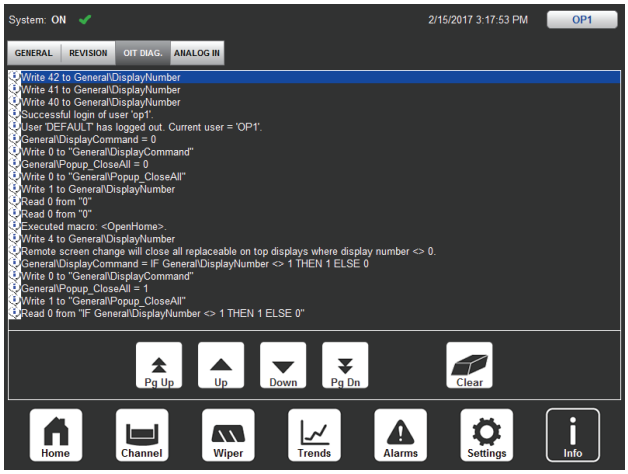


Figure 57 OIT Diagnostics

Service Information

Figure 58 Service Information (Allen Bradley)

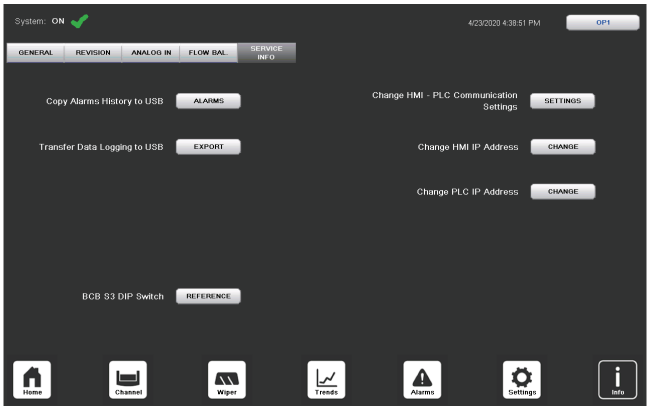


Figure 59 Service Information (Beijer)

Service Information - Change PLC IP Address

To change the PLC IP Address:

1. Login as OP1 or higher.
2. At the ‘Change PLC IP Address’ field, press ‘Change’.
3. Upon entering the screen, the PLC will initiate ‘Read Ethernet Settings’.
4. Enter a new address for any of the following:
   a. PLC IP
   b. Subnet
   c. Gateway
5. Press ‘Accept’ to apply the changes or ‘Close’ to cancel the changes or leave the page.

Notes: *1) If there is something wrong with the Write Message in the PLC (i.e. incorrect path, configuration) or if an invalid IP (or an incorrect Subnet vs Gateway) a "Write Error or Invalid Configuration" message will be displayed. The message will clear when a new and successful entry is made or if the user leaves and then returns to the page.*

2) If there is something wrong with the Read Message in the PLC (i.e. incorrect path, configuration) a ‘Read Error’ message will be displayed. This error message will require an edit in the PLC program.

Service Information - BCB S3 DIP Switch

This is a reference screen to help troubleshoot the Bank x BCB DIP Switch Mismatch Alarm.

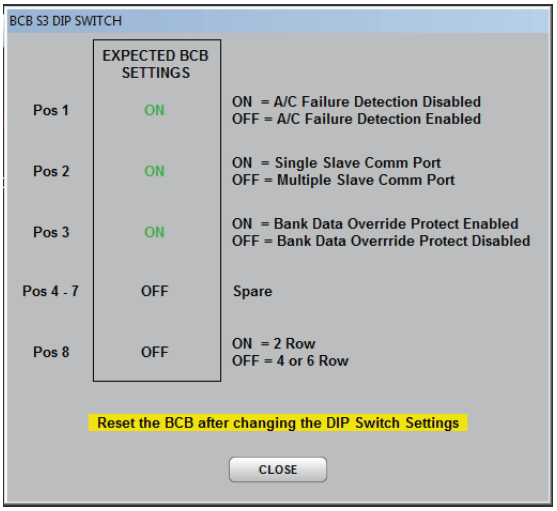


Figure 60 BCB S3 DIP Switch

To view the BCB S3 DIP Switch Settings:

1. Login as OP1 or higher.
2. At the BCB S3 DIP Switch field, press ‘Reference’ to open the BCB S3 DIP Switch pop-up screen (Figure 60).
3. If there is a **BCB S3 DIP Switch Mismatch Alarm** active, verify that the S3 DIP Switch settings on the BCB (located in the Power Distribution Center) match the (ON / OFF) settings shown on this screen.

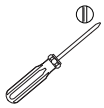
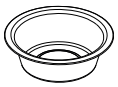
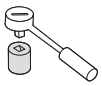
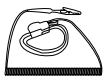
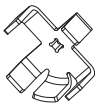
⚠ DANGER

Obey all warning and caution statements. Refer to Section 2.

Read and understand this Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

9.1 Tools and Materials

Symbols	Description	Symbols	Description
	Flat Screwdriver		Lint-free Cloth (Kimwipes®)
	Phillips Screwdriver		Clean Water
	Spray Bottle		Hand Pump Hose Assembly
	Shallow Bowl		Bucket
	Socket Wrench and Socket		ESD Wrist Strap
	Strap Wrench		Mild Soap and Water Solution
	Heat Gun		Crimping Tool
	Adjustable Wrench		Canister Body Tool
	Funnel		Hydraulic Fluid
	Pliers		Pliers - Needlenose
	ActiClean® Gel (or approved cleaning solution as per Table 13)		Anti-Seize
	Hex Key		Wrench - Combination

Symbols	Description	Symbols	Description
	Food Grade Grease		Grease Gun
	Water Hose		

9.2 Maintenance Schedule

Table 11 shows the maintenance schedule for the UV system.

Important Note: *Frequency and maintenance schedule may vary depending on water quality.*

Table 11 Maintenance Schedule

System component	Task	Monthly	Semi-Annually	Annually	Every 2 years	On removal	As necessary
UV Channel	Clean the UV channel around the UV system. Perform semi-annually for poor water quality conditions. Lift the UV Banks (Section 8.1.3). From the grating level, use a garden hose or pressure washer to clean the UV Channel.		X				
Water Level Sensor	Inspect the water level sensor(s) rods for debris, algae or damage. Clean the sensor rods as necessary. ***Note:*** *Do once every two weeks for poor water quality conditions.*	X					
HSC	Inspect the Hydraulic System Center (Section 9.8.1).	X					
	Replace the hydraulic fluid in the reservoir (Section 9.8.4).				X		
	Replace the hydraulic fluid filter element (Section 9.8.3).			X[1]			
	Replace hydraulic hose (Section 9.8.5).						X
	Replace the VCI Emitter.				X		
Power Distribution Center	Air filters to be flushed with warm running water with clean side up. If the accumulated dirt is oily, washing in a detergent bath is recommended followed by a warm water wash (Section 9.10.2).						X
	Replace a lamp driver (Section 9.10.1).						X
Lamp Sleeve Wiper	Add grease to the wiping cylinder(s) (Section 9.9.1). ***Note:*** *Grease the wiping cylinders when shutting down for extended periods of time and when starting up after extended periods of time (Section 5).*			X			
	Fill Wiping System (Section 9.7.2).		X				
	Flush Wiping System for seasonal winterization (Section 9.7.3).						X
	Replace the Wiper Seals, O-rings and Bushings (Section 9.7.4.1).				X		X
	Inspect all the wiper components that can be seen. Remove any debris and clean components as necessary.					X	
	Flush and clean entire cleaning system and replace ActiClean Gel (perform at the same time as replacing UV lamps at End of Lamp Life) or every 18 months. Perform annually for poor water quality conditions.						X

Table 11 Maintenance Schedule

System component	Task	Monthly	Semi-Annually	Annually	Every 2 years	On removal	As necessary
UV Bank	Inspect the UV Bank seal when the UV Bank is lifted into the service position. Ensure the seal is clean from debris. Inspect for cracks and ensure it is not damaged or worn.					X[2]	
	Clean UV Bank (Section 9.6.1).						X
	Inspect Floor Support Seals. Replace if damaged or worn (Section 9.6.2).					X	
UV Lamp	Replace a UV lamp. Reset lamp hours (Section 9.3.2). ***Note:*** *Replace the Lamp Plug O-Ring and desiccant pack whenever a UV Lamp is replaced.*						X[3]
Lamp Sleeve	Replace a lamp sleeve (Section 9.4.2). ***Note:*** *Replace the Lamp Plug O-Ring whenever a Lamp Sleeve is replaced.*						X
	Clean lamp sleeves manually (Section 9.4.3).						X
Lamp Plug	Inspect the lamp plug O-rings. Ensure the O-ring is not rolled or twisted and fits in the groove. Replace O-ring that is damaged or worn. ***Notes:*** *1) Replace the Lamp Plug O-Ring when a UV Lamp or a Lamp Sleeve is replaced.* *2) Pinch the O-ring with fingers to remove. Do not use a screwdriver as damage to the O-ring and O-ring groove may occur.*					X	
	Check sockets for corrosion (observed as a white discoloration or patina on the surface of the pin). Manually clean using contact cleaner. Ensure any debris is removed. It is recommended to apply a corrosion preventative compound.					X	
UVI Sensor	Replace the UVI sensor housing sleeve, desiccant pack and seals (Section 9.5.4).			X			
	Clean the UVI sensor housing sleeve with a mild acidic solution (Section 9.5.3).						X
	Replace the UVI Sensor Wiper O-rings and seals.				X		
	Inspect UVI Sensor Wiper O-rings and Fittings. Replace if damaged, worn or brittle (Section 9.5.6).		X			X	
	Inspect UVI Sensor Floor Bushing for damage or wear. Replace if required (Section 9.5.7).					X	

[1] Replace after 50 hours, annually thereafter.

[2] When UV Bank is lifted.

[3] Every 15,000 hours or if UV Lamp has failed.

Table 12 Daily Visual Walk-about Inspection Checklist

System component	Task
SCC	Check Alarm Status screen for new faults and record new alarms
	Check the Alarm History screen to get an overview of past faults
	Check the Overview screen(s) on the user interface to make sure that all the UV banks are in REMOTE AUTO.
ActiClean Cleaning System	Check the Wiper Control screen(s) on the HMI to make sure that all the wiper groups are in REMOTE AUTO.

9.3 UV Lamp

UV lamps contain mercury (Section 2).

9.3.1 Storage Requirements for Used UV Lamps

Put used UV lamps into the replacement UV lamp shipping container, or a similar container. It is preferable that the original packing materials be used where possible, or materials adequate to prevent breakage during storage and transportation.

Boxes of used UV lamps should be labeled as such and stored in a location where the potential for accidental breakage is minimized.

A UV lamp recycler may have specific procedures and UV lamp storage requirements. Consult with a UV lamp recycler to determine all applicable policies.

This component contains Mercury. Dispose according to Local, State, or Federal Laws.

9.3.2 Remove and Install a UV Lamp

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lockout Tag Out - PDC compartment for the associated UV Bank. Refer to Section 4.
- Wait 10 minutes to allow UV lamps to cool.

Tools:

- Lamp Plug Removal Tool (optional)

Materials:

- UV Lamp (if required)
- Lamp Plug O-Ring (if required)
- Lamp Desiccant Kit (if required)

Notes: *1) Use clean cotton gloves to remove and install the UV Lamp.*
2) Use protective gloves to remove broken UV Lamps.

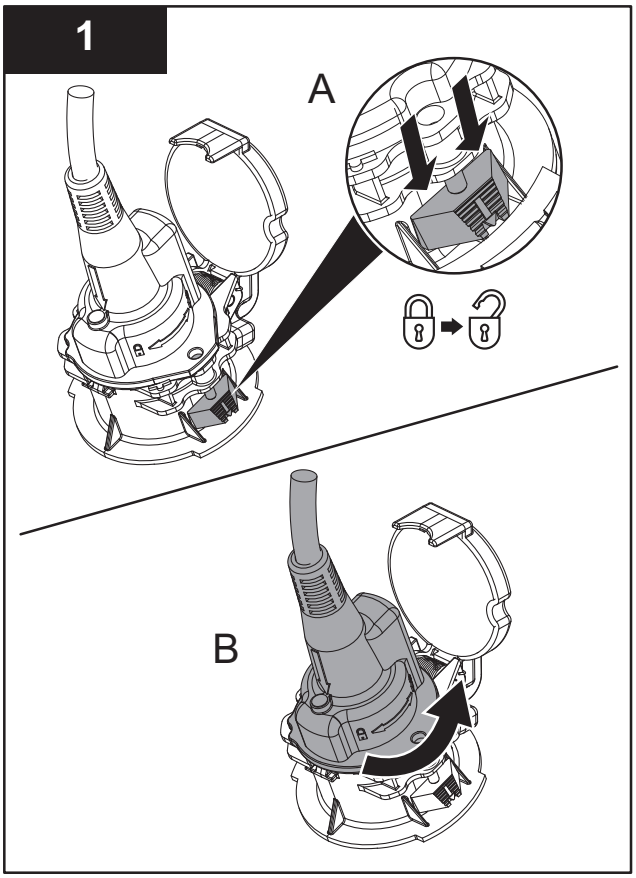
Procedure:

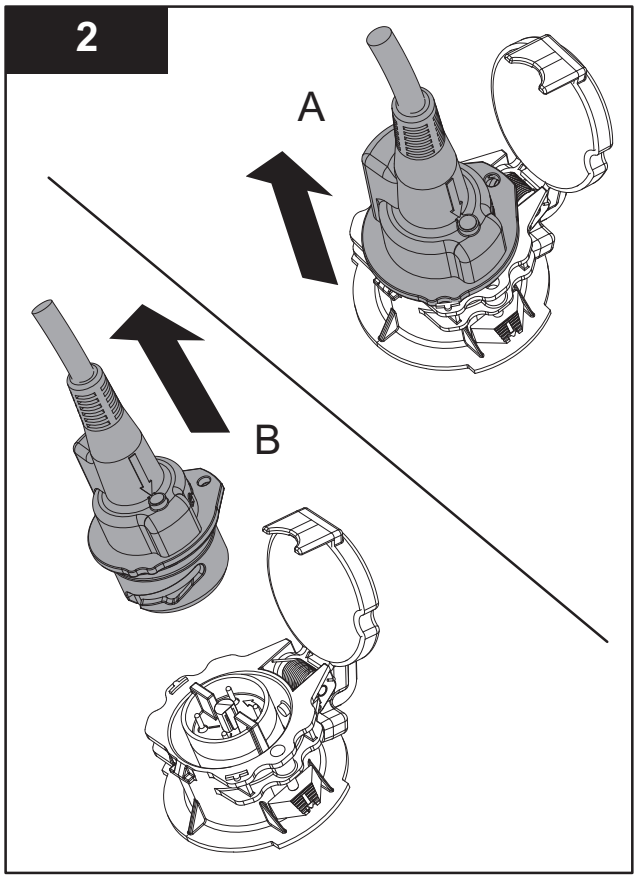
NOTICE

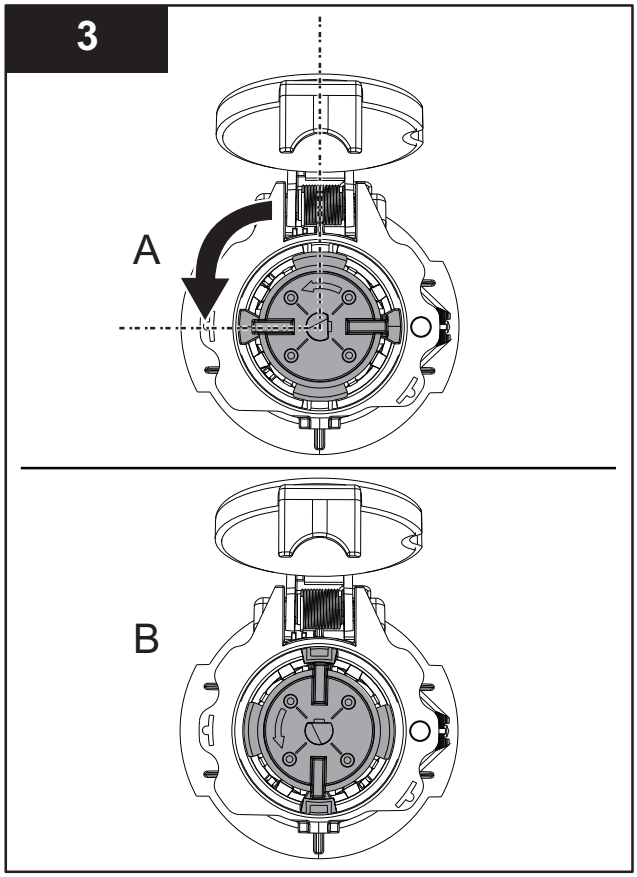
To prevent damage, precautions must be taken to keep the replacement UV Lamp dry from moisture (i.e. rain, snow, condensation etc.) when installing into the Lamp Sleeve.

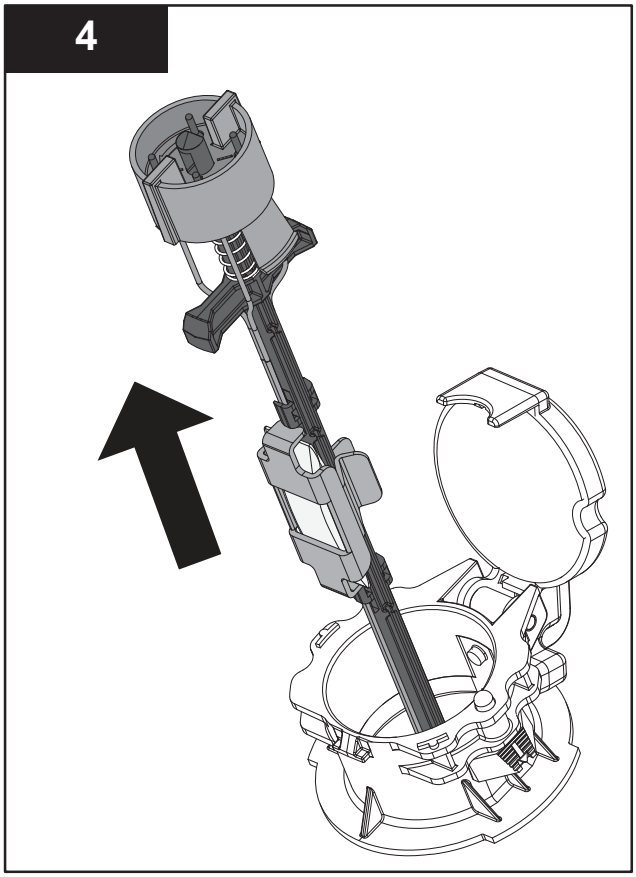
To prevent damage when installing, make sure that the lamp plug is fully latched.

Remove (without Lamp Plug Removal Tool):

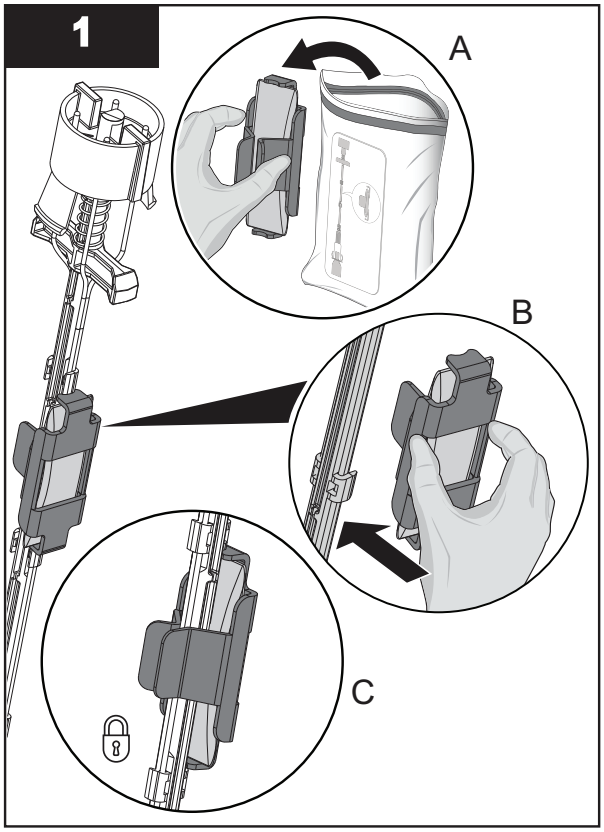


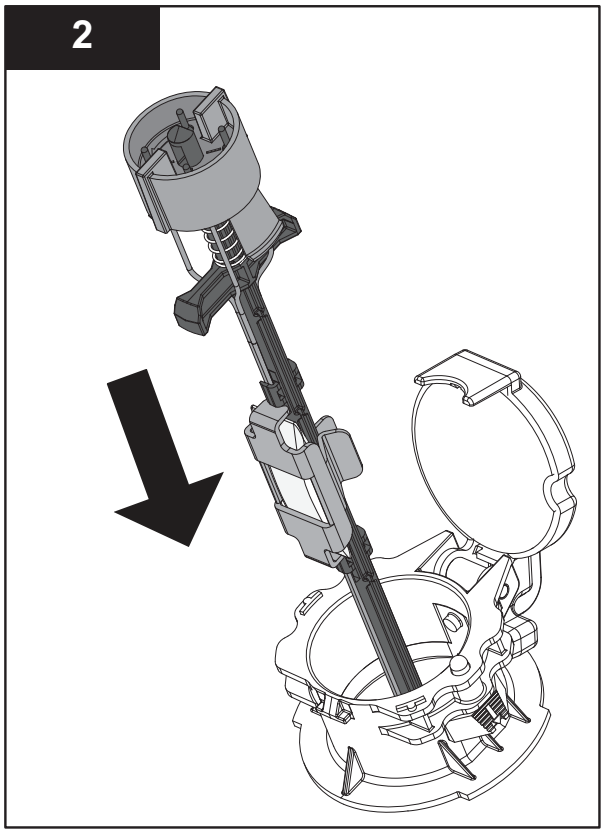




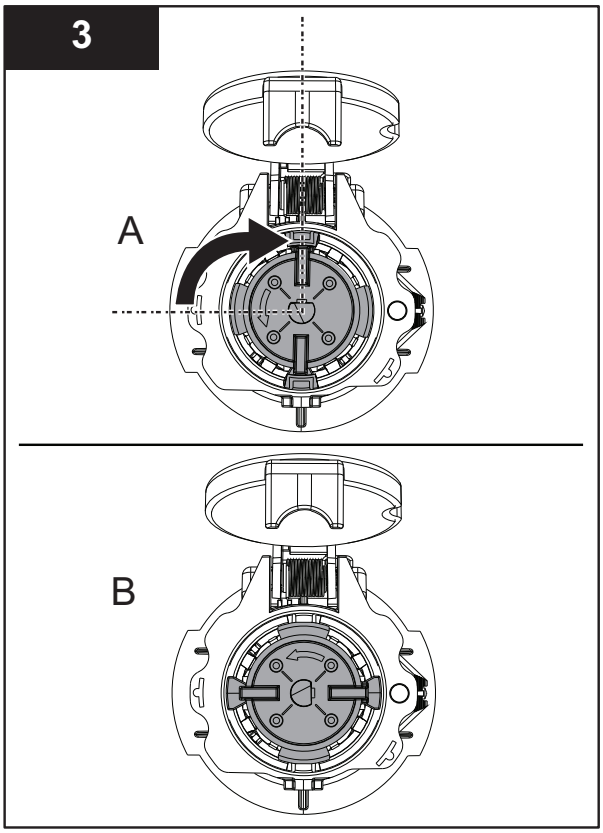


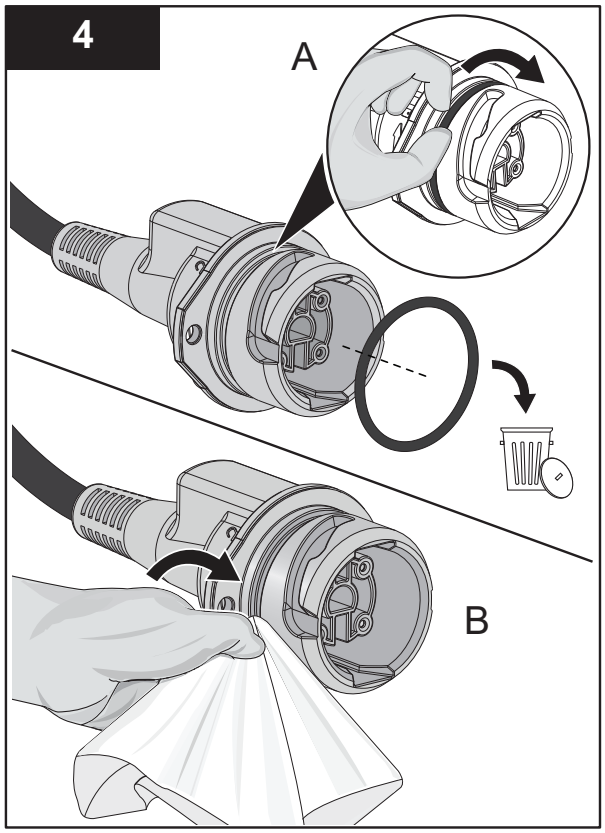
Install (without Lamp Plug Removal Tool):





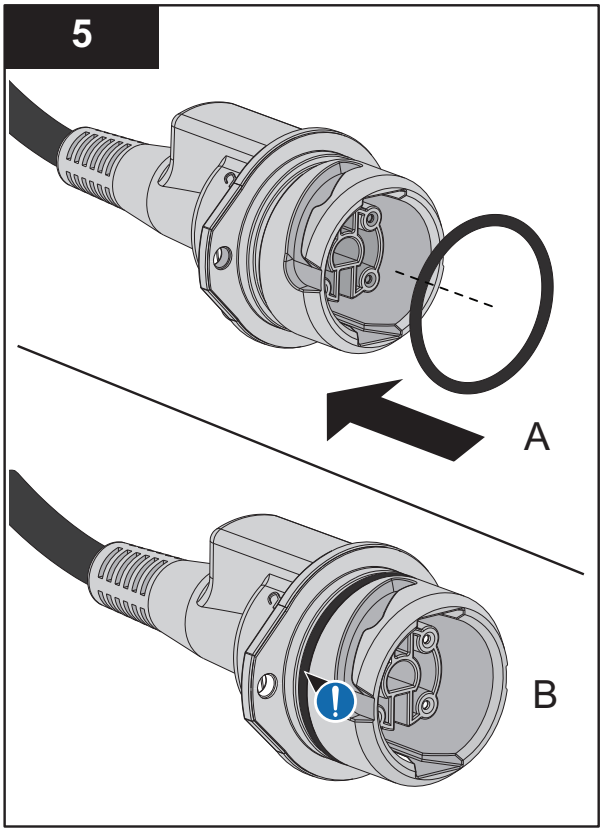
Note: *Install the Desiccant Pack Clip onto the UV Lamp Cross Bar as shown.*

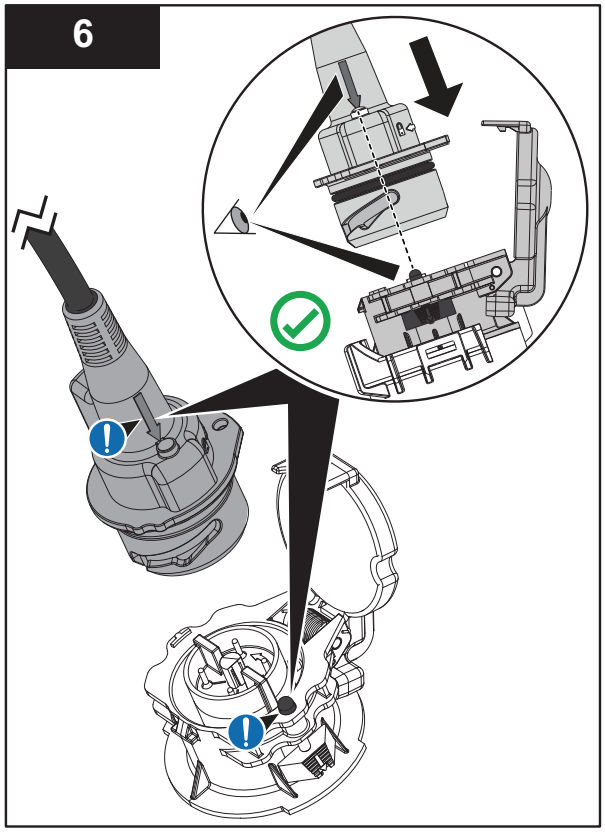


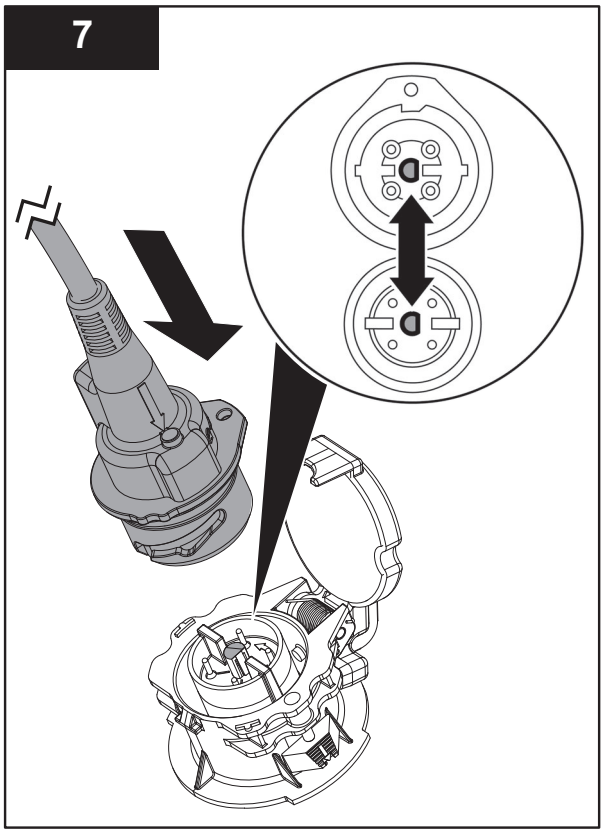


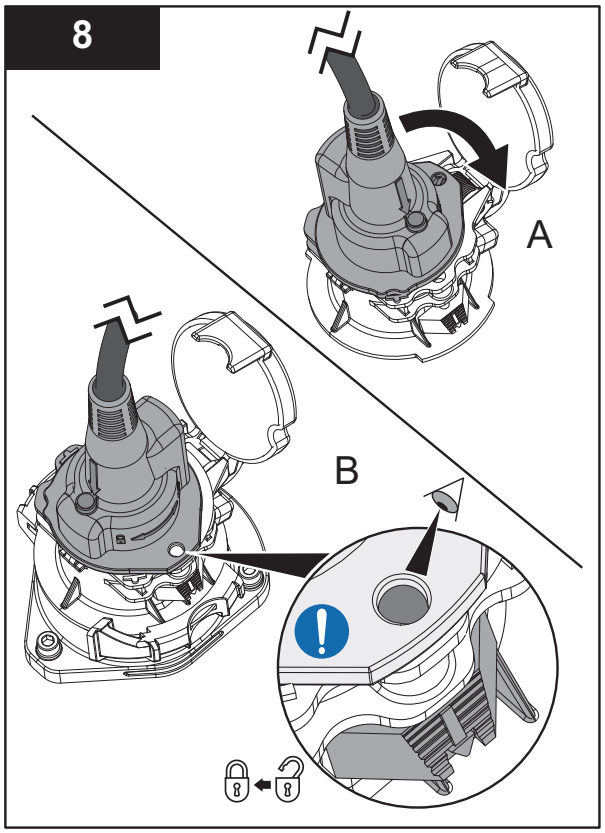
Notes: *1) Replace the Lamp Plug O-Ring when the UV Lamp is replaced.*

2) Use a dry clean lint free cloth to remove dirt and debris from the Lamp Plug and Lamp Plug O-Ring groove.





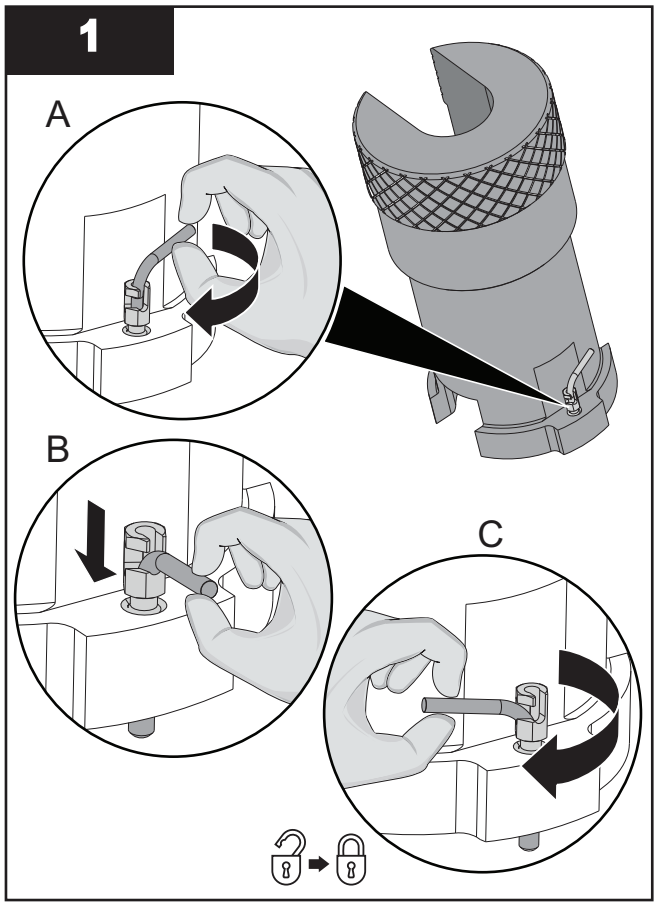


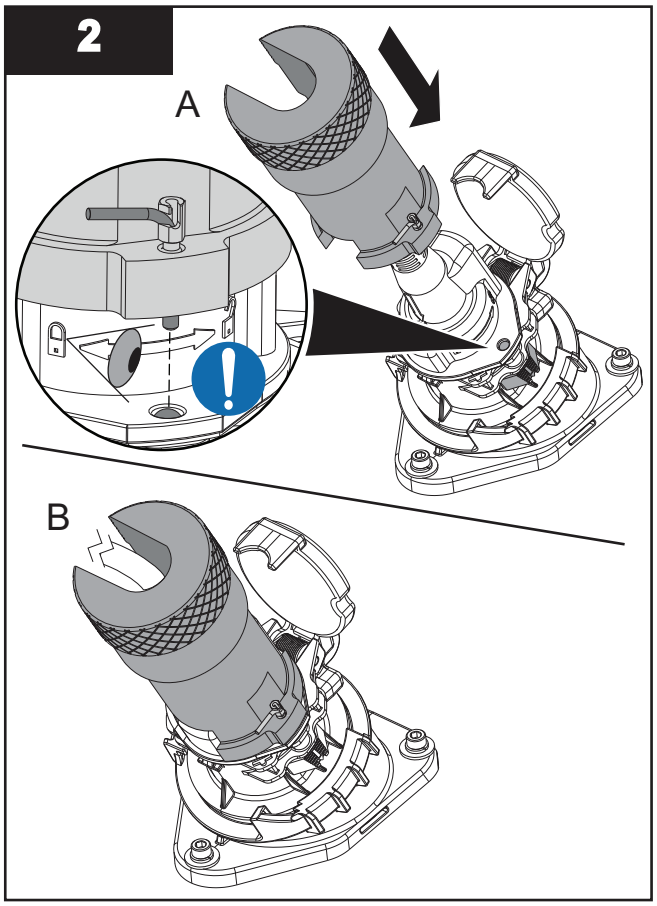


Note: *The locking pin will be visible when the lamp plug is correctly latched.*

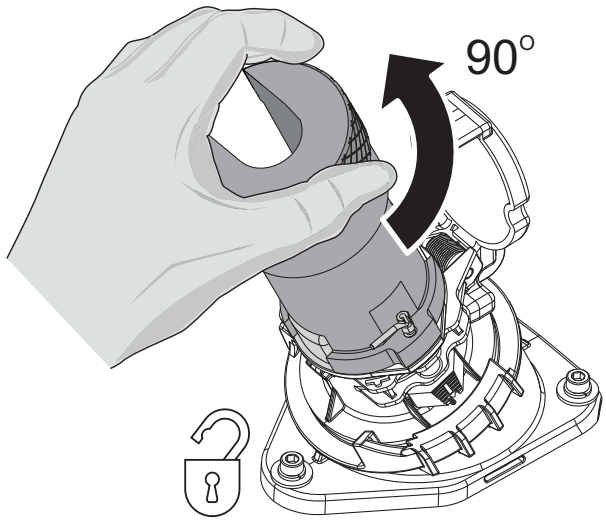
9. When installing a new UV Lamp, reset lamp hours (Section 8.3.4.7).

Remove (with Lamp Plug Removal Tool):





3



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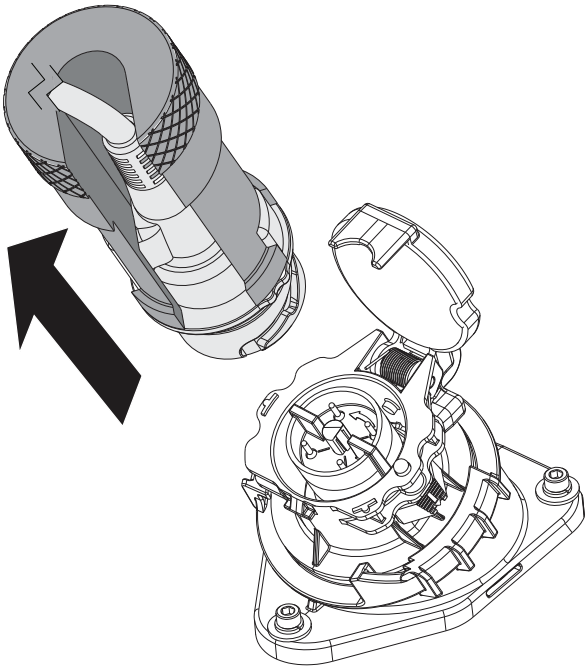
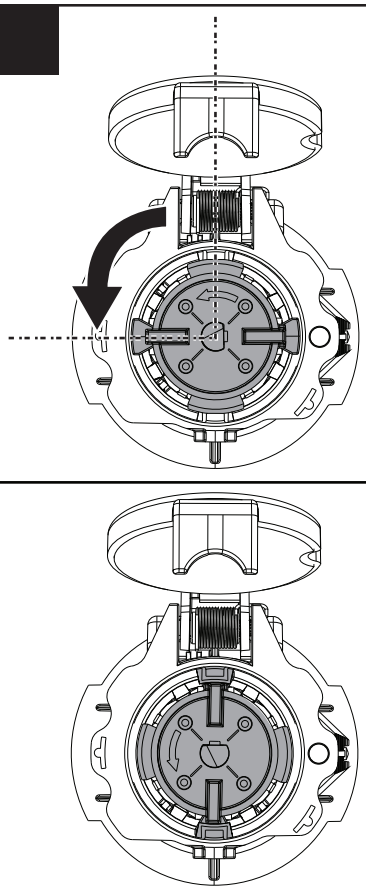
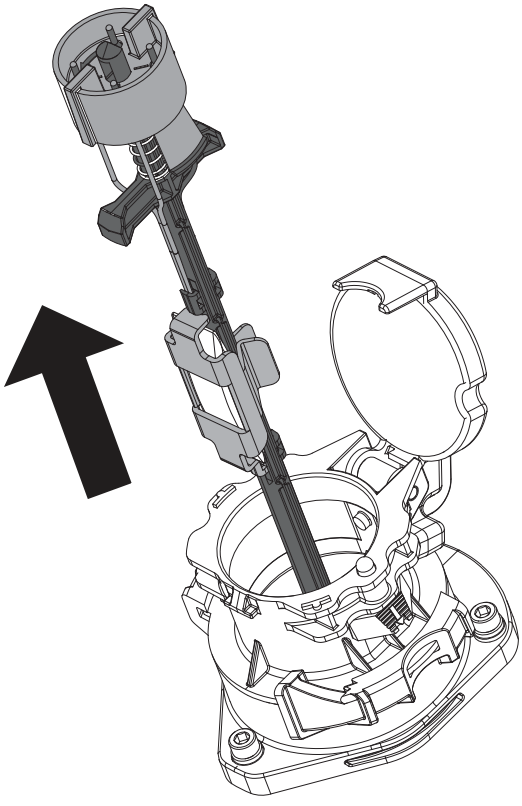


Note: *To prevent damage, DO NOT overturn.*

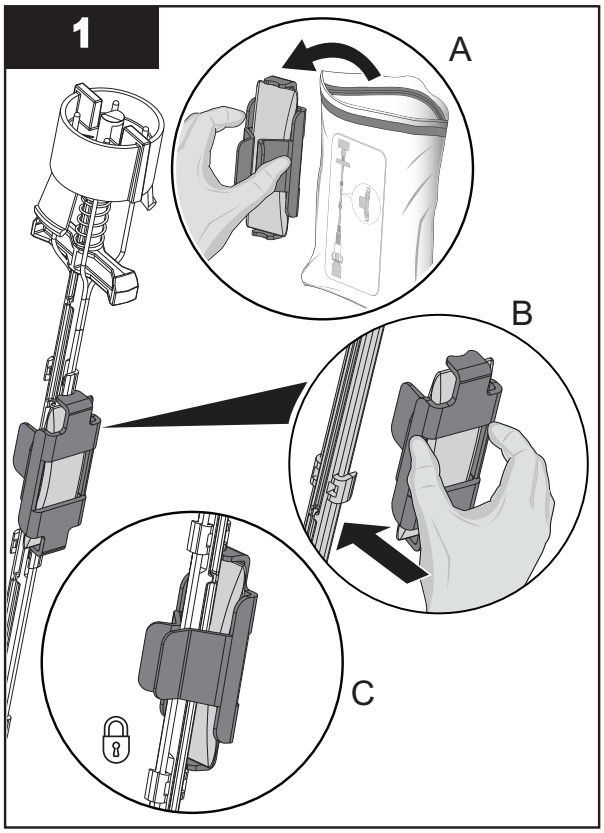
5

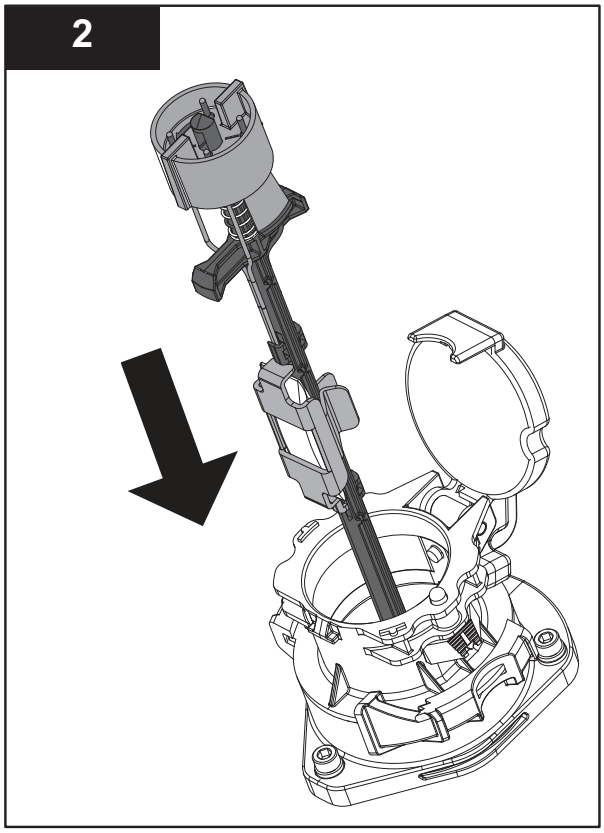


6

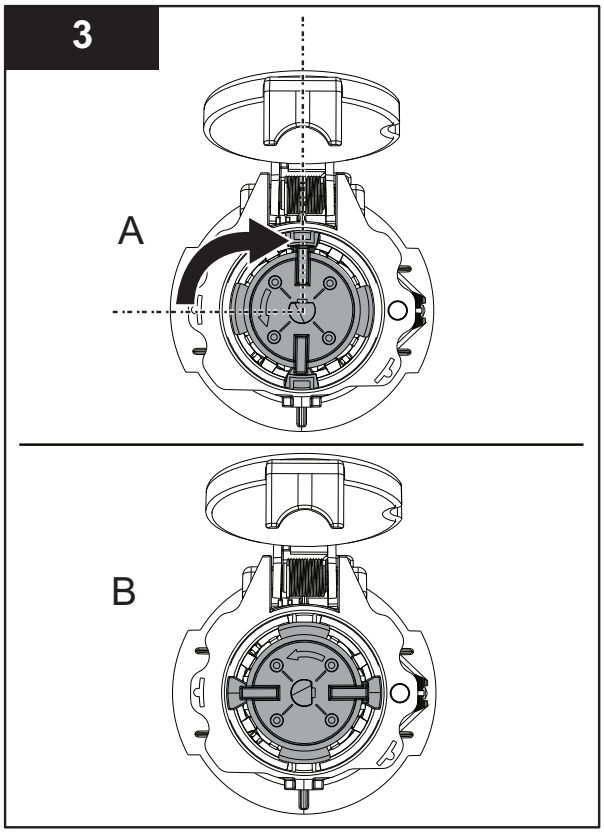


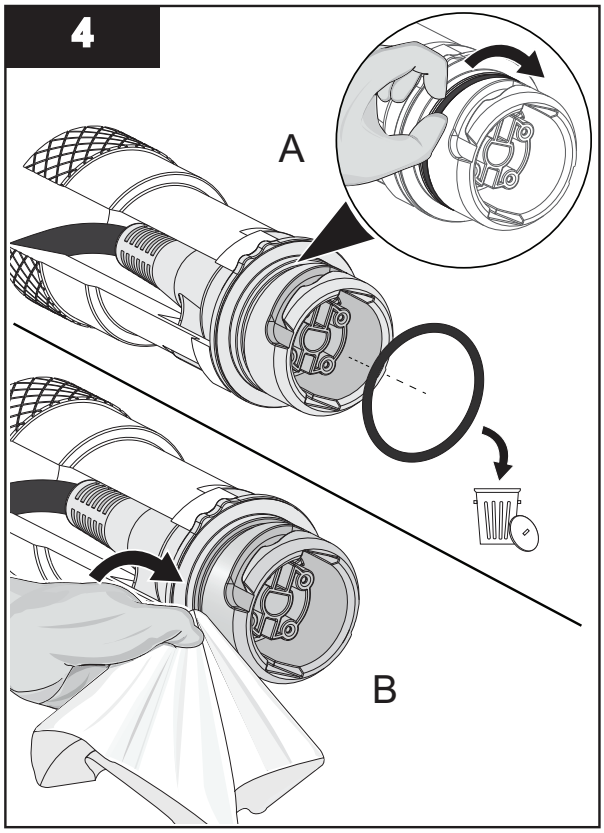
Install (with Lamp Plug Removal Tool):





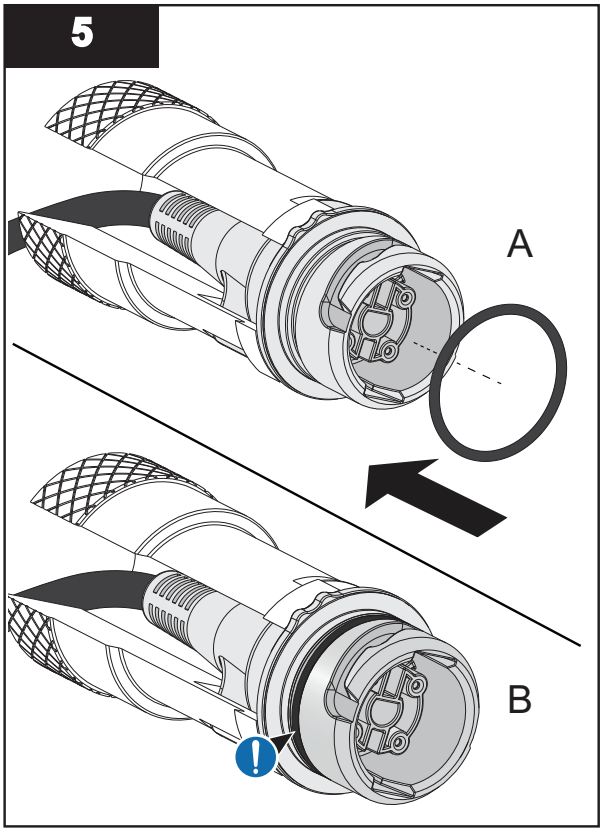
Note: *Install the Desiccant Pack Clip onto the UV Lamp Cross Bar as shown.*

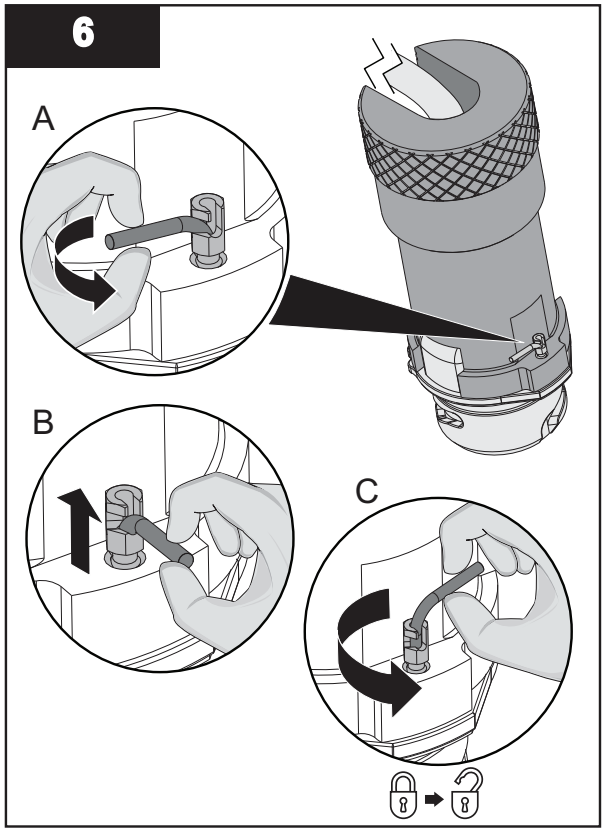


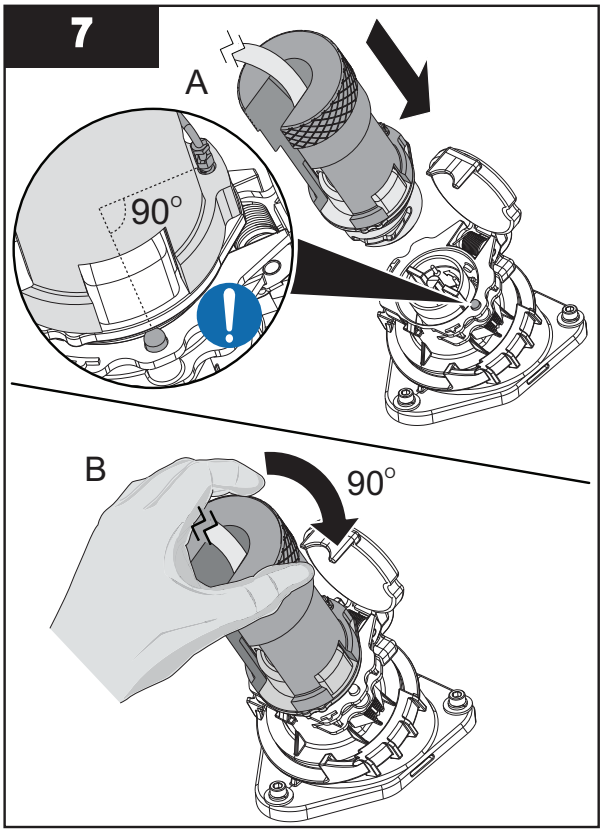


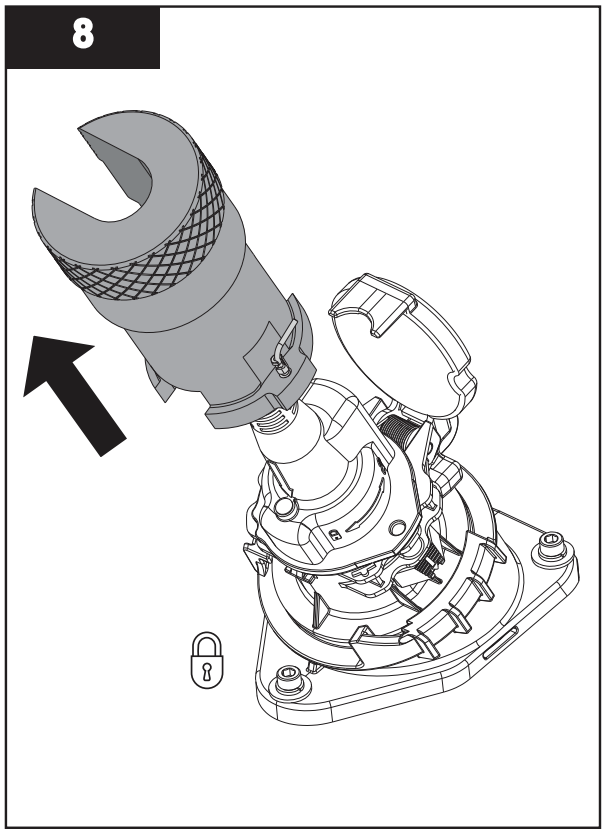
Notes: *1) Replace the Lamp Plug O-Ring when the UV Lamp is replaced.*

2) Use a dry clean lint free cloth to remove dirt and debris from the Lamp Plug and Lamp Plug O-Ring groove.









Note: *Align the tool with brass pin 90° Counter-clockwise to lamp pin*

9. When installing a new UV Lamp, reset lamp hours (Section 8.3.4.7).

9.4 Lamp Sleeve

9.4.1 Inspect the Lamp Sleeves

Make sure that lamp sleeves are clean internally and externally. Fouling will block UV and compromise treatment. Fouling can also result in higher UV lamp operating temperatures and reduce UV lamp efficiency.

Excessive moisture in the lamp sleeve can cause corrosion of the UV lamp shunt and pins, which results in shorter UV lamp life.

NOTICE

UV lamp failure due to corrosion is not covered by warranty.

Replace expired UV lamps. The frequency of UV lamp replacement varies due to:

- The temperature of the effluent
- The power level of the UV lamps (60–100%)
- The frequency of cycling UV lamps on and off (up to 10 cycles per day). The UV Bank timer specified in the control strategy will reduce the frequency of on/off cycles and preserve UV lamp life.

NOTICE

UV lamps cycled on and off more than 10 times in a 24–hour period will void the warranty.

9.4.2 Remove and Install a Lamp Sleeve

Remove a UV lamp sleeve to clean it, replace it or do other maintenance procedures. Replace a UV Lamp sleeve when it is damaged (i.e., scratches, cracks or other physical damage).

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).
- Move the Wiper to 1/2 way. Refer to Section 8.1.5.
- Lockout Tag Out - HSC and PDC compartment for the associated UV Bank. Refer to Section 4.
- Remove the UV lamp plug only. Refer to illustrated steps 1 and 2 in Section 9.3.2.
- Wait 10 minutes to allow UV lamps to cool.

Notes: *1) A Lamp Sleeve is easier to install and remove when wet. It is recommended to have a spray bottle with clean water to dampen if necessary.*

2) UV lamp sleeve cap must be closed when the sleeve is removed. Failure to apply cap could lead to contamination of the UV lamp sleeve and lamp.

3) UV lamp sleeve can be removed with or without lamp installed.

Tools:

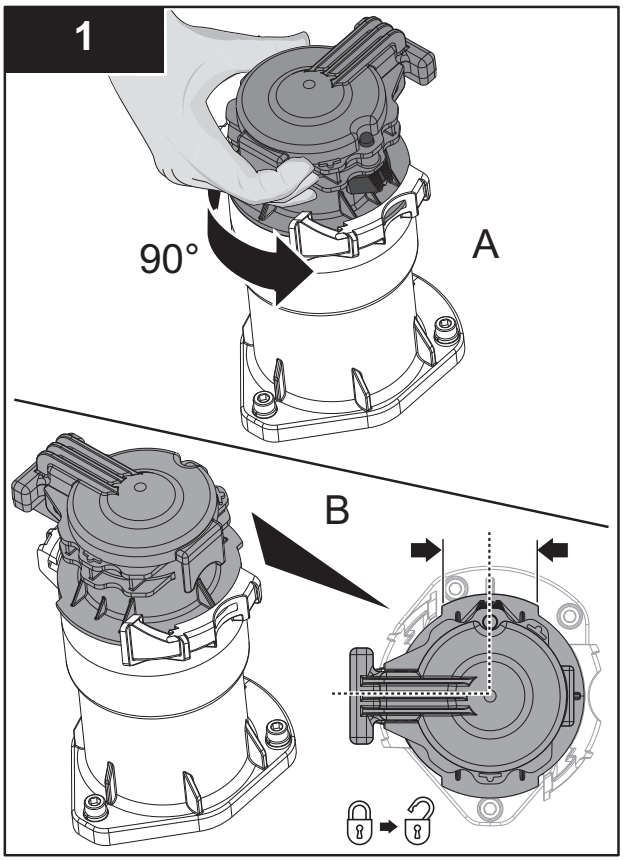
- None

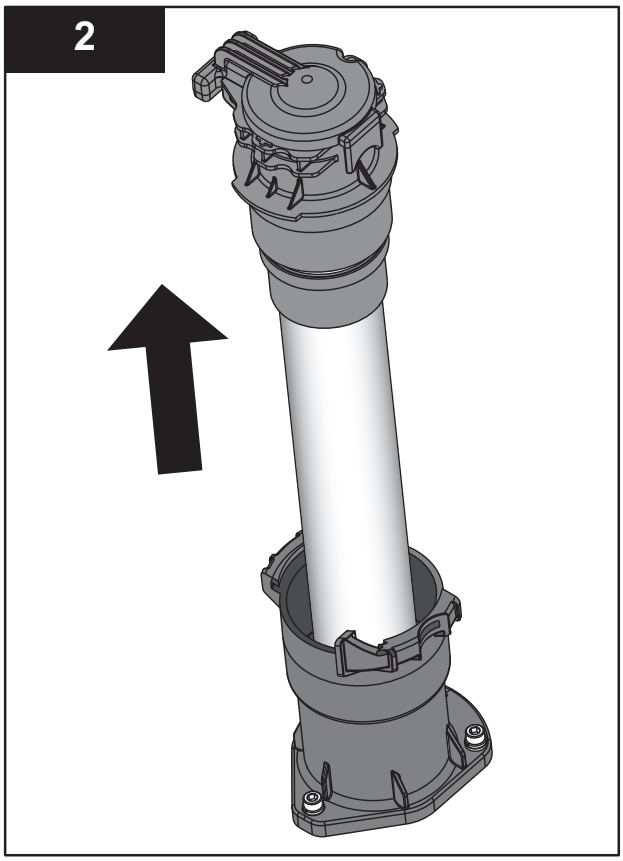
Note: *The Lamp Plug Removal Tool may be used, refer to Section 9.3.2.*

Materials:

Procedure:

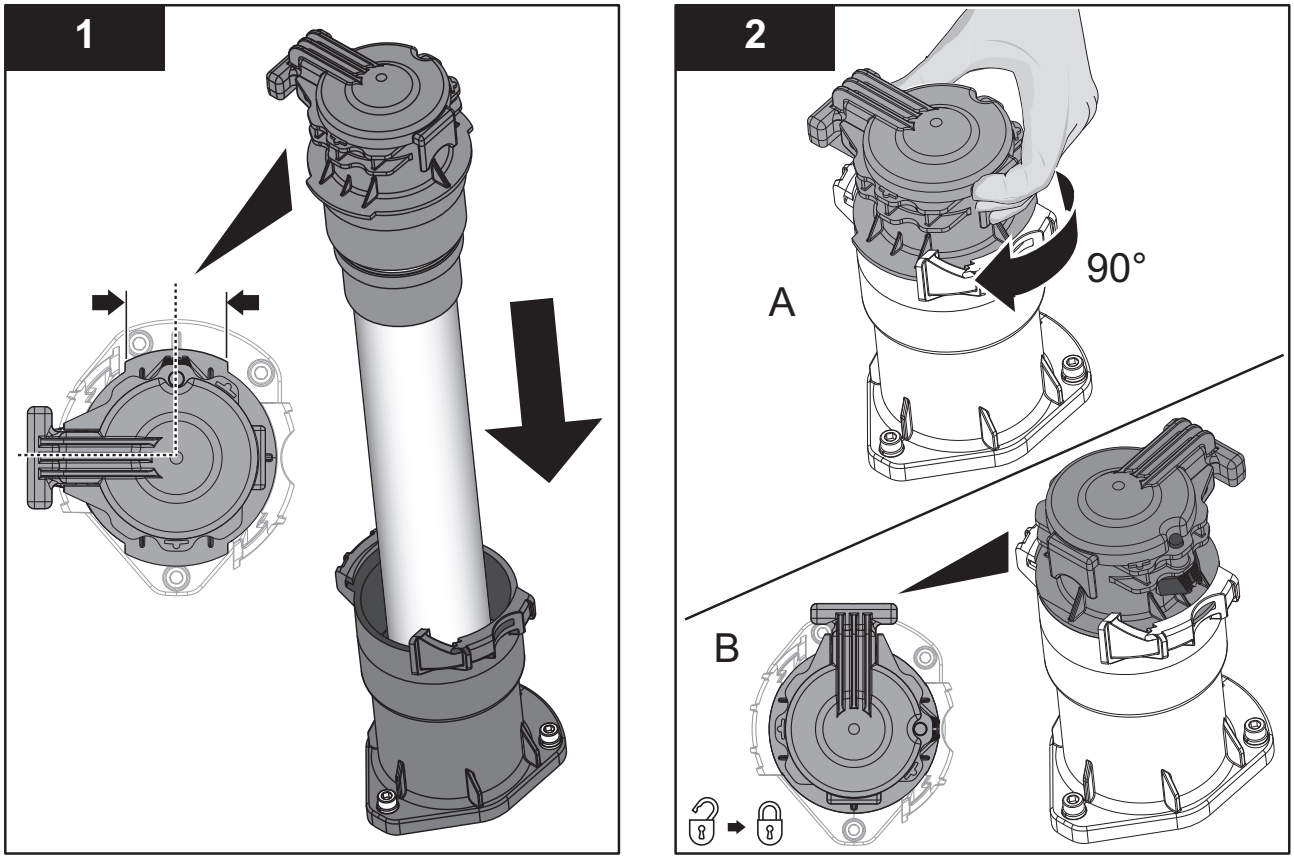
Remove:





Note: *Spray the sleeve to be removed and installed at the wiper canister with water.*

Install:



3. Refer to Figure 61 for correct lamp sleeve installation orientations.

   Note: *The orientation of the lamp sleeve, adjacent to the UVI Sensor is rotated 90º.*

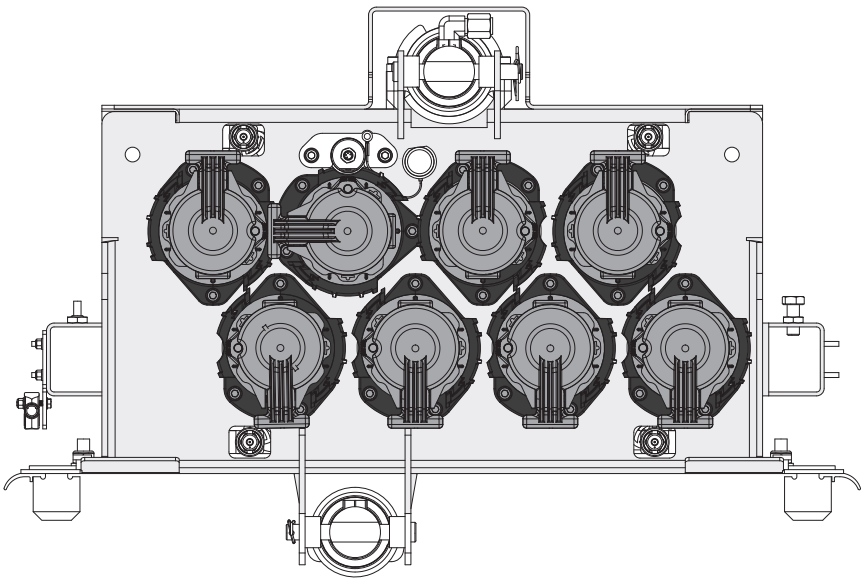
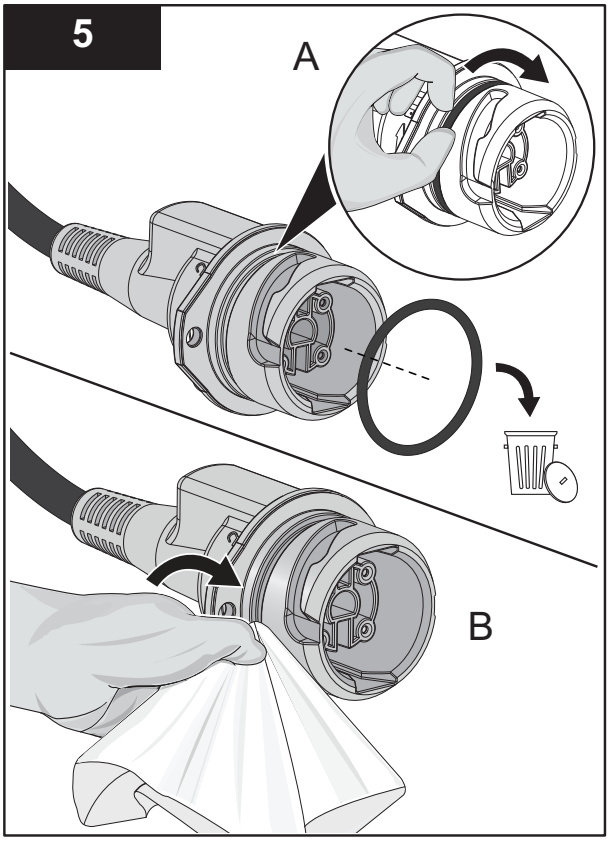
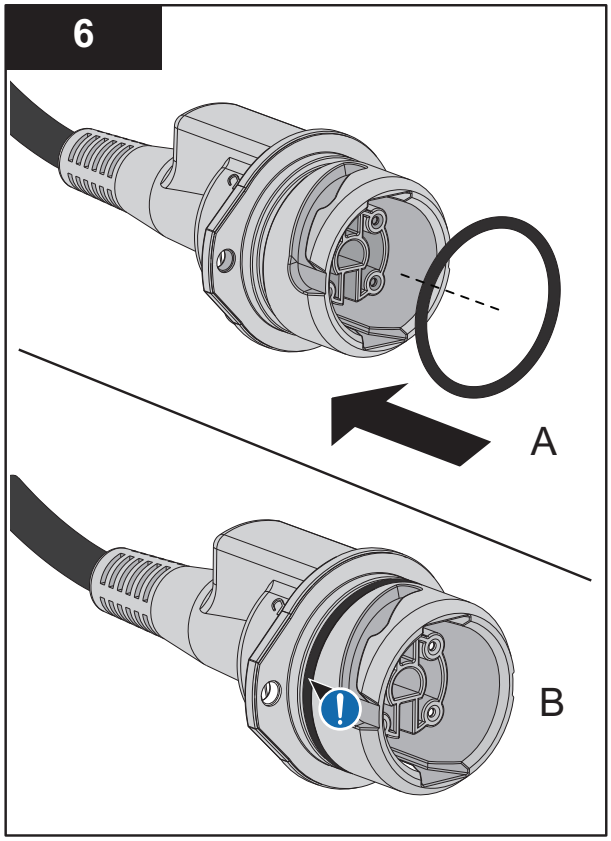


Figure 61 Lamp Sleeve Cover Orientation

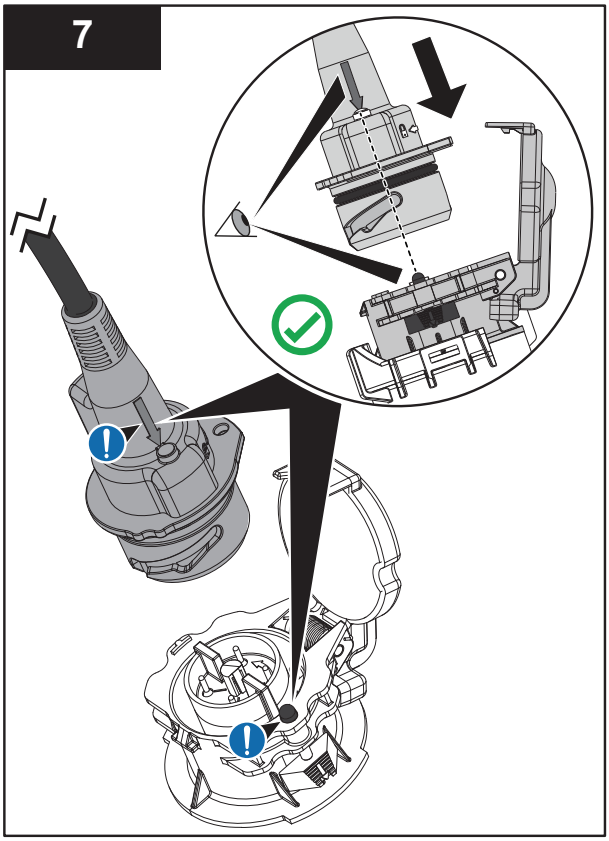
4. Install the UV Lamp, if previously removed. Refer to Section 9.3.2.

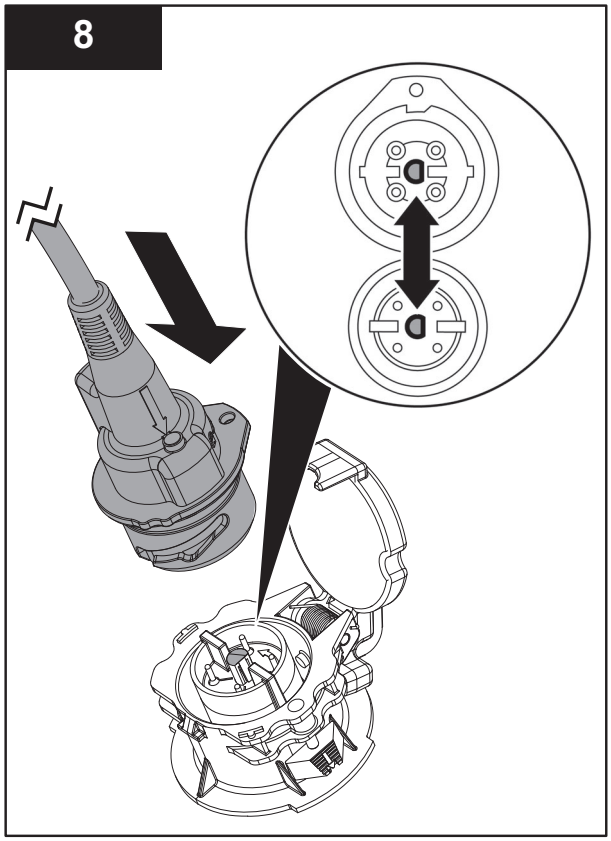


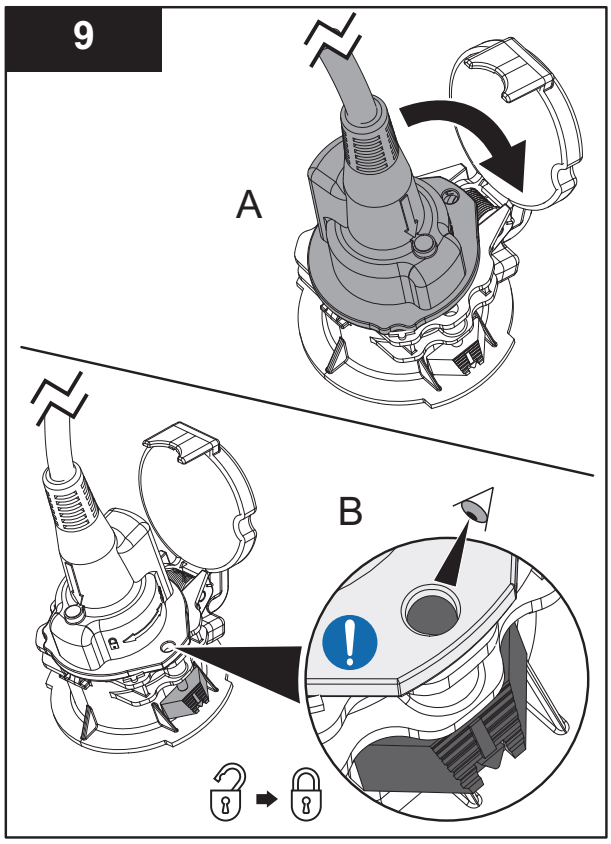


Notes: *1) Replace the Lamp Plug O-Ring when the Lamp Sleeve is replaced.*

2) Use a dry clean lint free cloth to remove dirt and debris from the Lamp Plug and Lamp Plug O-Ring groove.







Note: *The locking pin will be visible when the lamp plug is correctly latched.*

9.4.3 Clean Lamp Sleeves Manually

NOTICE

Do not use abrasive materials to clean a lamp sleeve. Abrasive materials will scratch and cause damage to the UV lamp sleeve.

Keep water and debris out of the UV lamp sleeves. Moisture can cause build-up in the UV lamp sleeves and corrosion of the lamp shunt and pins, which results in shorter UV lamp life. Use a lint-free cloth to remove water or debris.

Build-up on the UV lamp sleeves decreases the amount of UV light, and can result in higher UV lamp temperatures and decreased UV lamp efficiency.

Only use Trojan Technologies approved cleaning solutions on the Lamp and Sensor Sleeves. Use of unapproved chemicals may result in damage to the equipment. For a list of approved cleaning solutions refer to Table 13.

Table 13 Approved Cleaning Solutions and Dilutions Ratios

Solution	Dilution
ActiClean Gel	Not Required
20% Phosphoric Acid	2 parts ActiClean Gel to 1 part acid
40% Phosphoric Acid	5 parts ActiClean Gel to 1 part acid
75% Phosphoric Acid	10 parts ActiClean Gel to 1 part acid
80% Phosphoric Acid	12 parts ActiClean Gel to 1 part acid

Prerequisites:

- Remove Lamp Sleeve. Refer to Section 9.4.2.

Materials:

Procedure:

1. Clean the UV lamp sleeve with a mild acidic solution and a lint-free cloth. Move the cloth up and down the UV lamp sleeve.

   Note: *Clean up spills to avoid slipping and dispose ActiClean Gel as per site and country protocol.*

2. Rinse the UV lamp sleeve with clean water.
3. When service is complete, assemble the prerequisites in the reverse order of disassembly.

9.5 UVI Sensor

9.5.1 Remove and Install the UVI Sensor

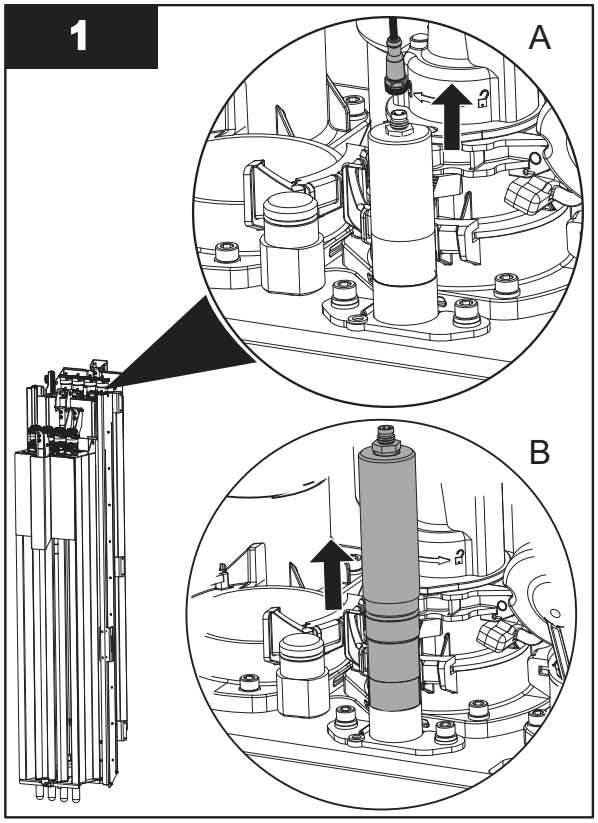
Prerequisites:

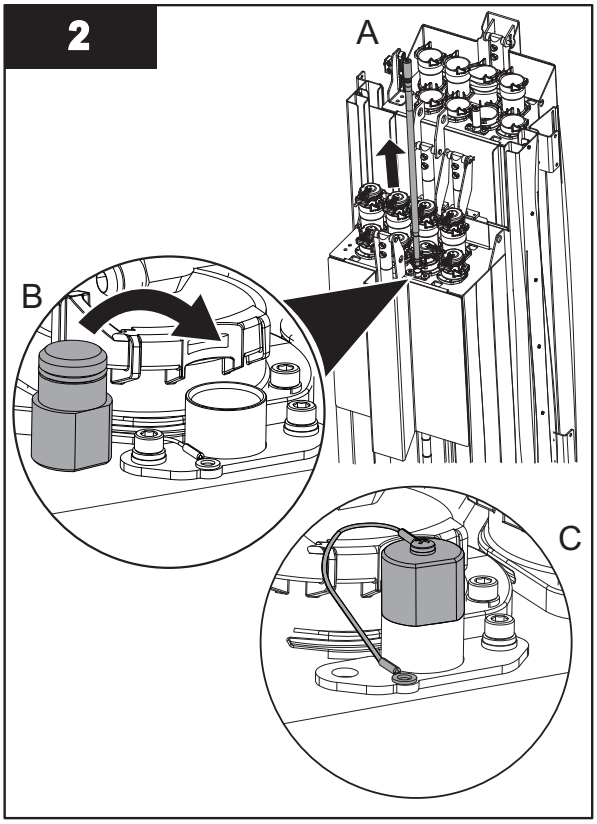
- Shutdown the UV Bank. Refer to Section 5.2.
- Lockout Tag Out - PDC compartment for the associated UV Bank. Refer to Section 4.

Materials:

Procedure:

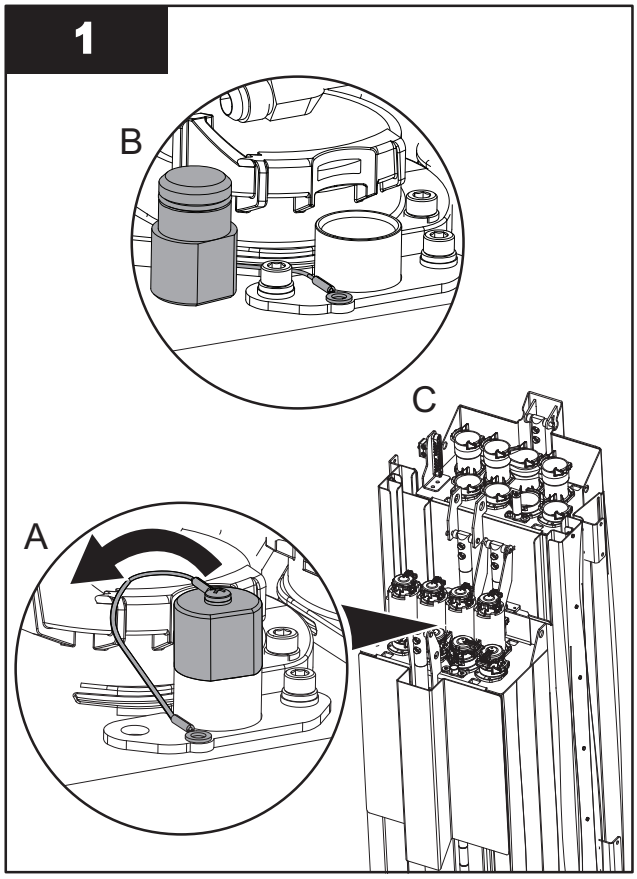
Remove:

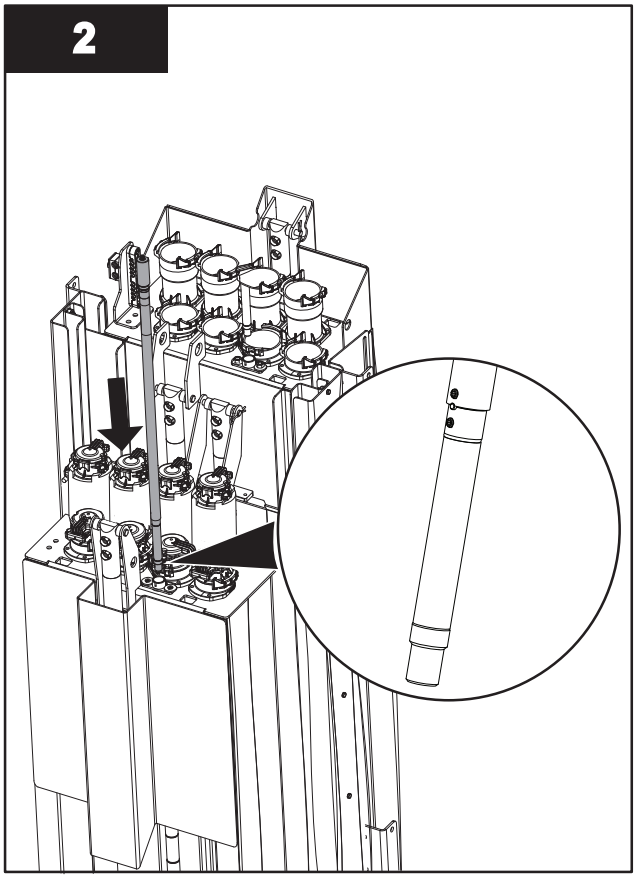


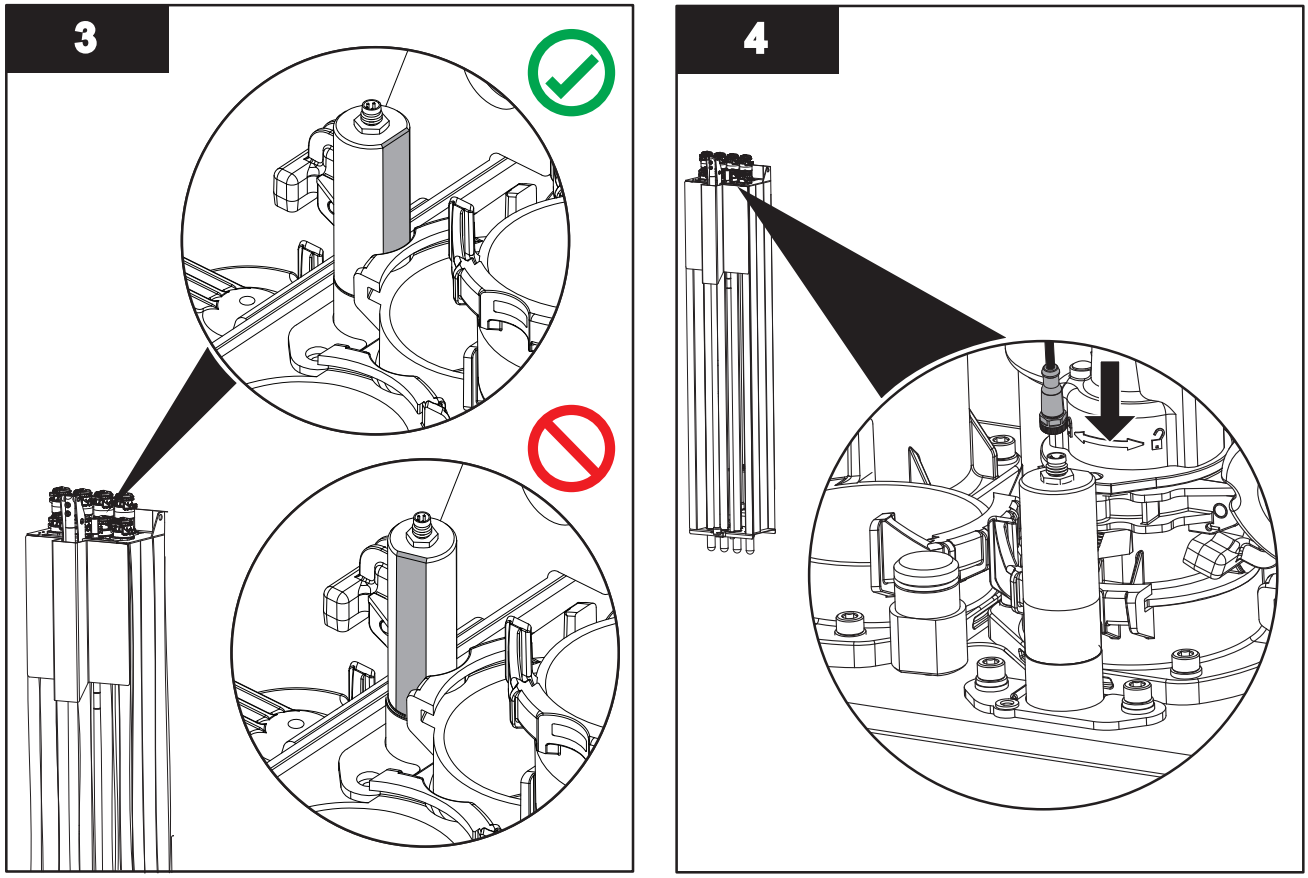


Note: *Repeat removal steps 1-2 for UVI Sensor on additional UV Banks if required.*

Install:







Note: *Rotate UVI Sensor until fully seated and is in proper orientation.*

9.5.2 Remove and Install UVI Sensor Housing

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).
- Manually Operate the Wiper - Move the Wiper to 1/2 Way. Refer to Section 8.1.5.
- Lockout Tag Out - HSC and PDC compartment for the associated UV Bank. Refer to Section 4.
- Remove the UVI Sensor. Refer to Section 9.5.1.

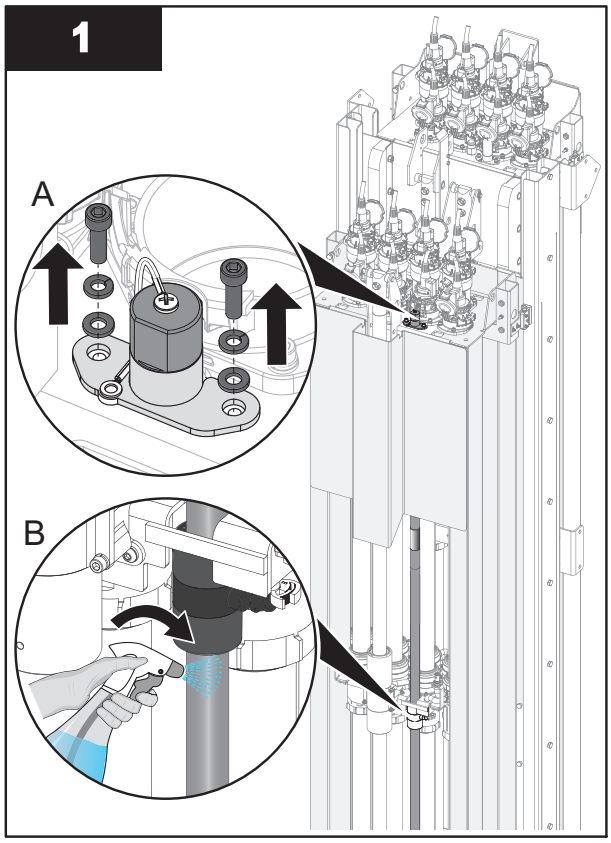
Tools:

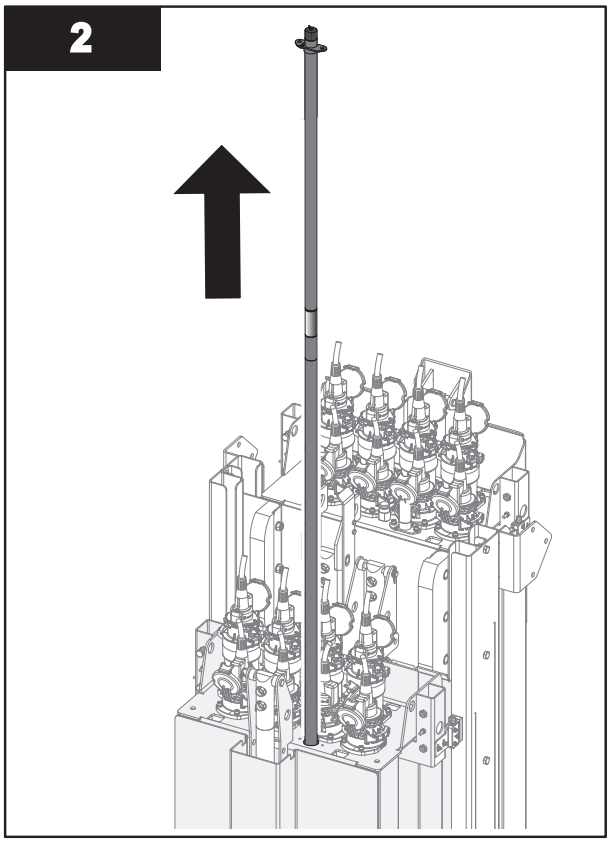
Materials:

- 2cm UVI Sensor Gauge (provided)

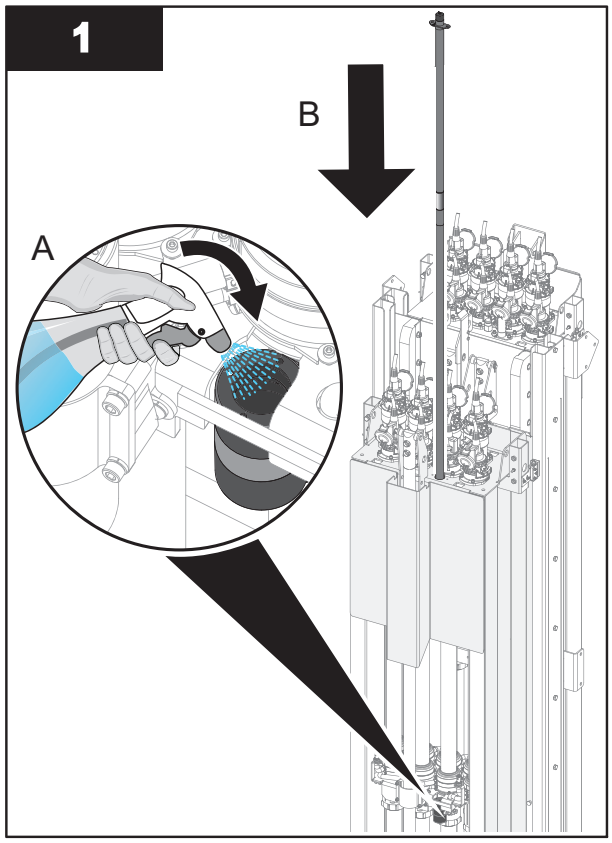
Procedure:

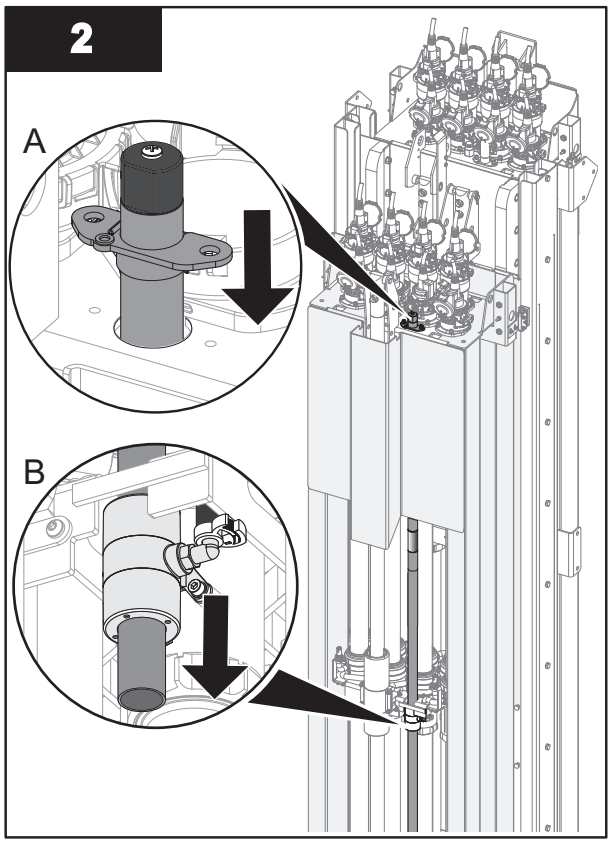
Remove:



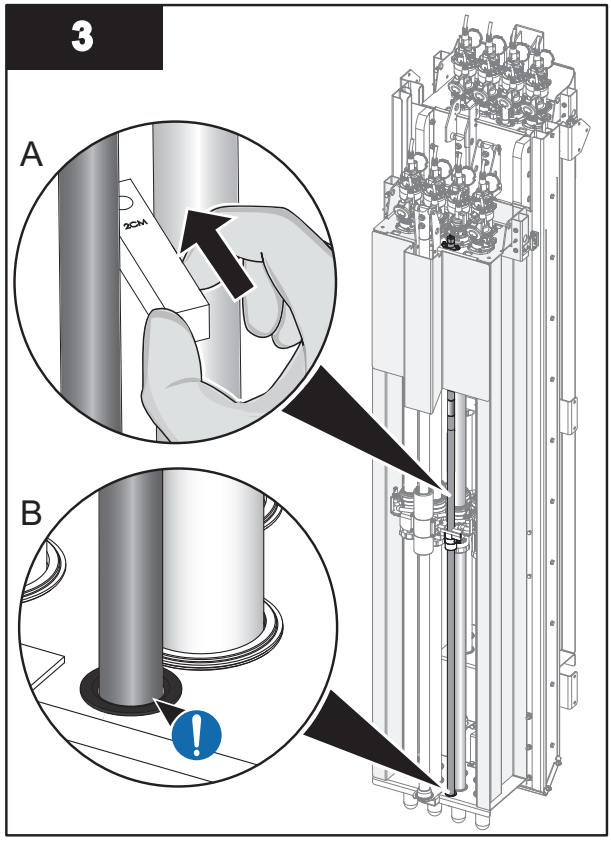


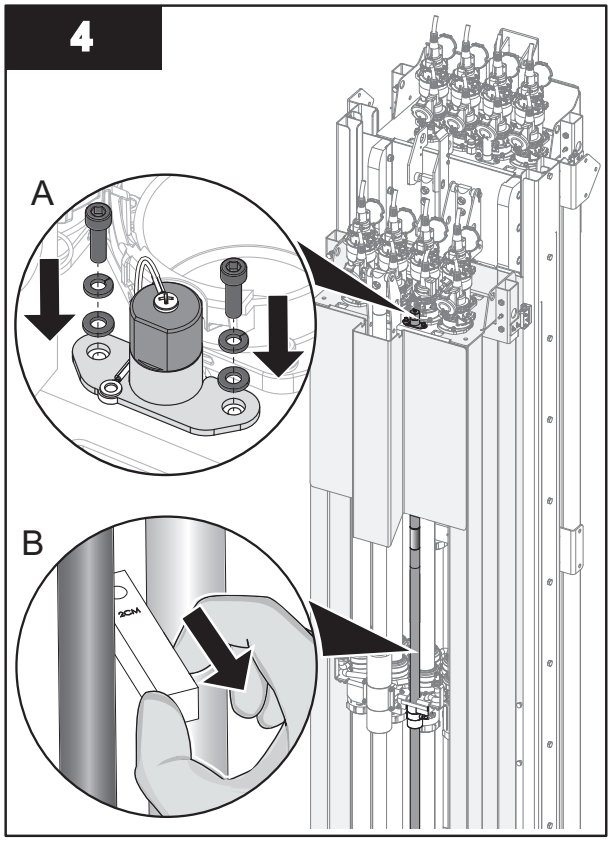
Install:





Note: *Wet the wiper canister interior with water.*





Note: *The gauge should fit snug between the UVI Sensor Housing Sleeve and the adjacent Lamp Sleeve.*

9.5.3 Clean the UVI Sensor Housing Sleeve

NOTICE

Do not use abrasive materials to clean the UVI Sensor Housing Sleeve. Abrasive materials will scratch and cause damage.

Clean the UVI Sensor Housing Sleeve with a mild acidic solution when a low UVI alarm or a low UV dose alarm is not resolved after the Sleeve is cleaned with the wiper.

Prerequisites:

- Remove the UVI Sensor Housing. Refer to Section 9.5.2.

Materials:

Procedure:

1. Wipe down the UVI Sensor Housing Sleeve with a mild acidic solution and a lint-free cloth (Refer to Table 13). Wipe up and down the length of the sleeve. Wipe until all the build-up on the sleeve is removed.

   Note: *Clean up spills to avoid slipping and dispose ActiClean Gel as per site and country protocol.*

2. Rinse the UVI Sensor Housing Sleeve fully with clean water.
3. Install the UVI Sensor Housing Sleeve (Section 9.5.2).

9.5.4 Remove and Replace UVI Sensor Housing Sleeve

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).
- Manually Operate the Wiper - Move the Wiper to 1/2 Way. Refer to Section 8.1.5.
- Lockout Tag Out - HSC and PDC compartment for the associated UV Bank. Refer to Section 4.
- Remove the UVI Sensor. Refer to Section 9.5.1.
- Remove the UVI Sensor Housing. Refer to Section 9.5.2.
- Clean the UVI Sensor Housing Sleeve. Refer to Section 9.5.3.

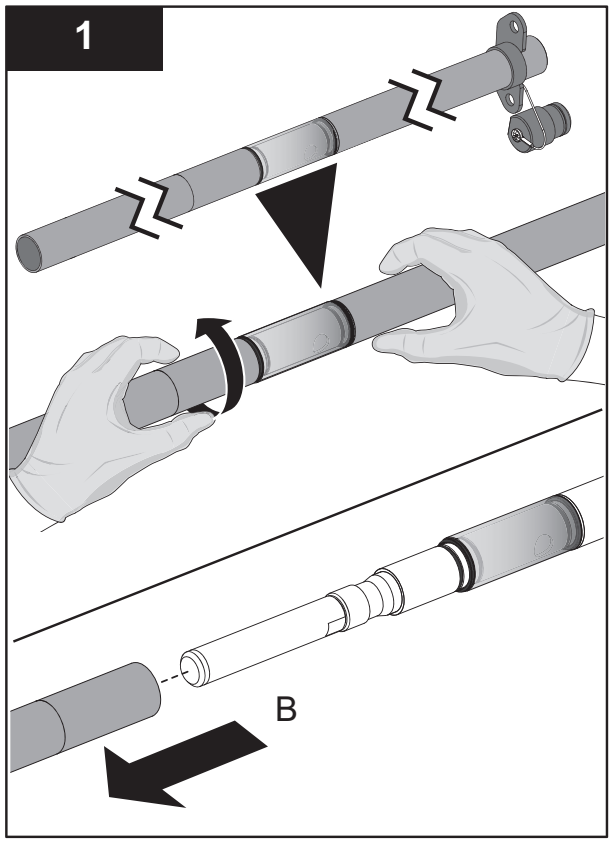
Tools:

Materials:

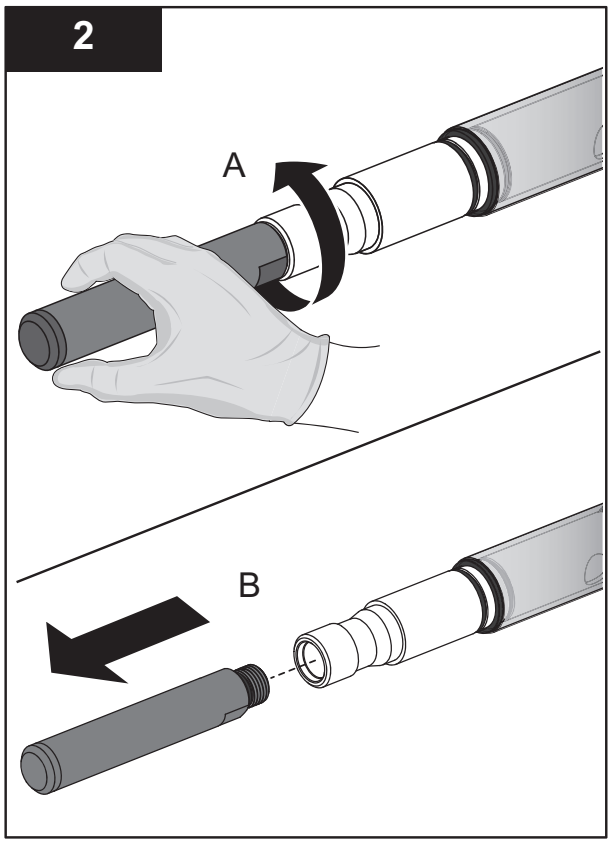
Note: *It is recommended to use clean Kevlar gloves to handle the quartz sleeve.*

- UVI Sensor Housing Replacement Kit
  - Two (2) Silicone Gaskets
  - Six (6) Silicone O-Rings
  - One (1) Quartz Sleeve
  - One (1) Desiccant Pack Holder

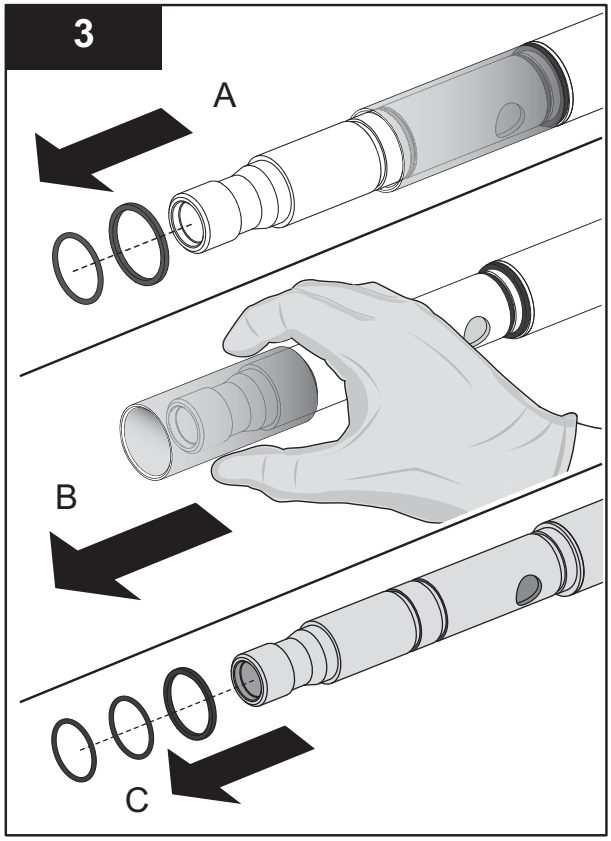
Procedure:



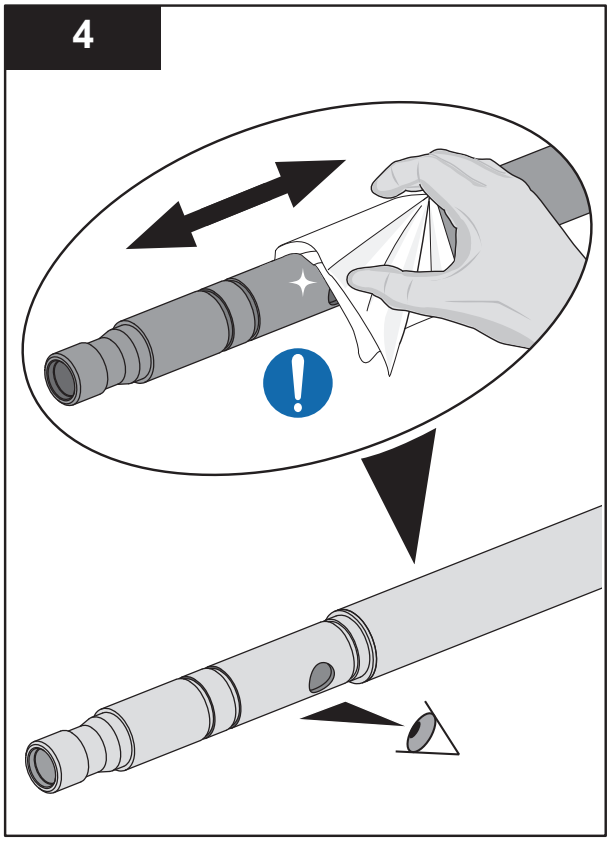
Note: *Twist the bottom section of UVI Sensor Housing to remove from the top section.*



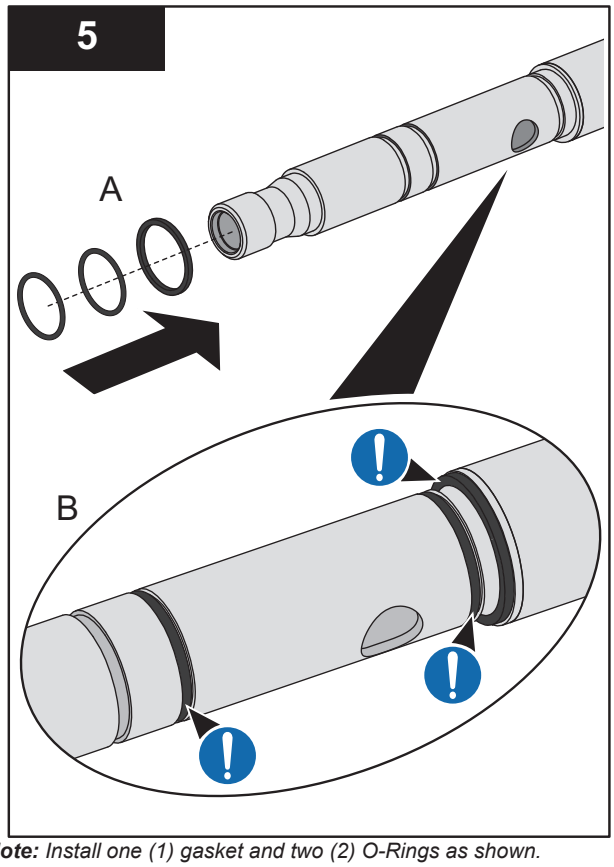
Note: *Remove the Desiccant Pack Holder from the end of the top section.*



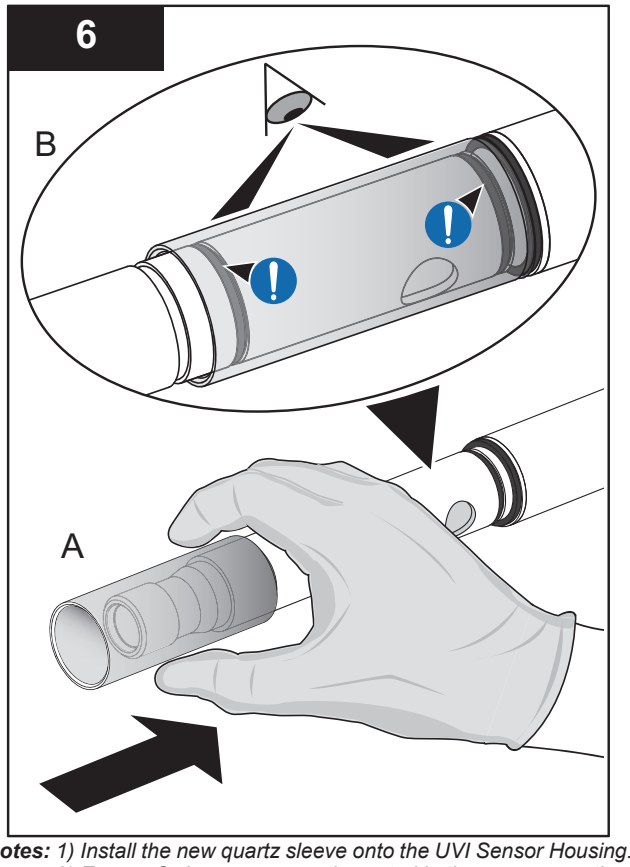
Note: *Remove the existing quartz sleeve, gaskets and O-Rings from the UVI Sensor Housing body.*



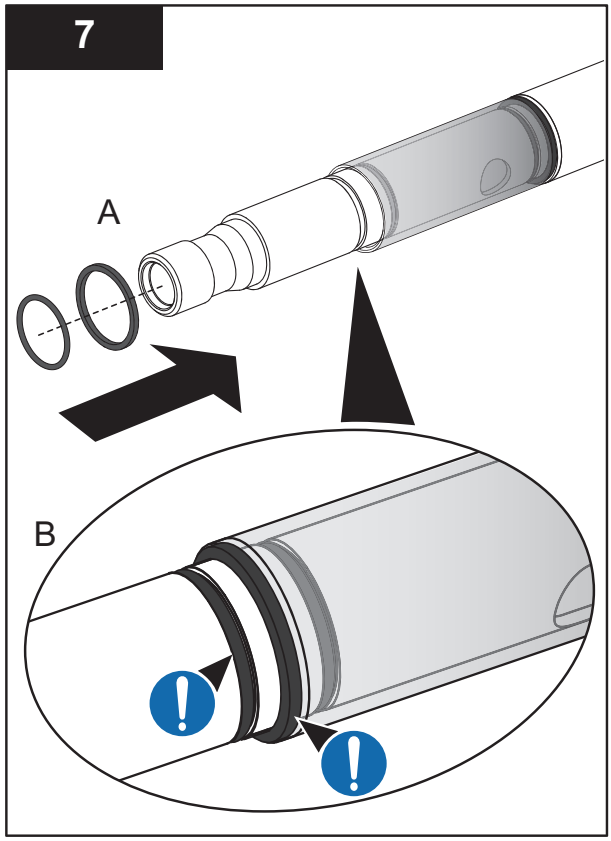
Note: *Ensure there is no moisture inside the UVI Sensor Housing.*



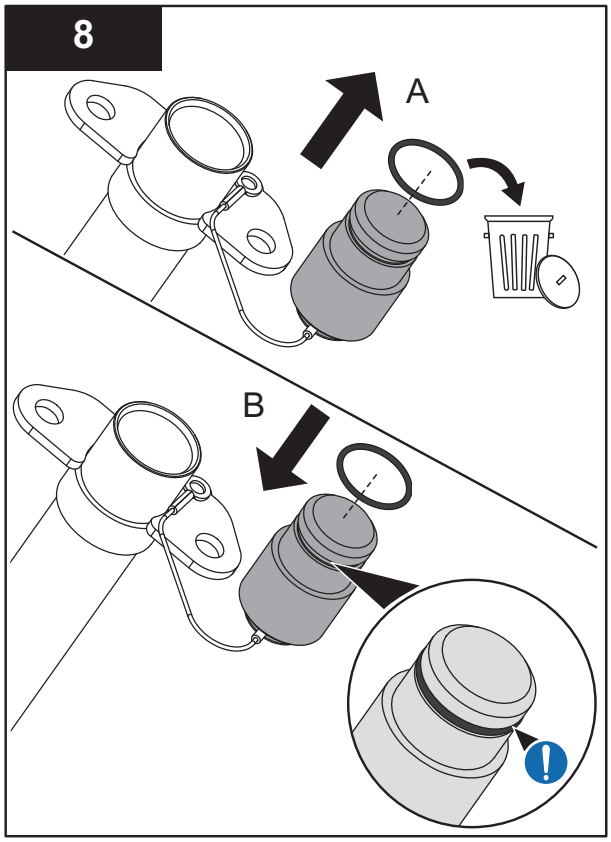
Note: *Install one (1) gasket and two (2) O-Rings as shown.*



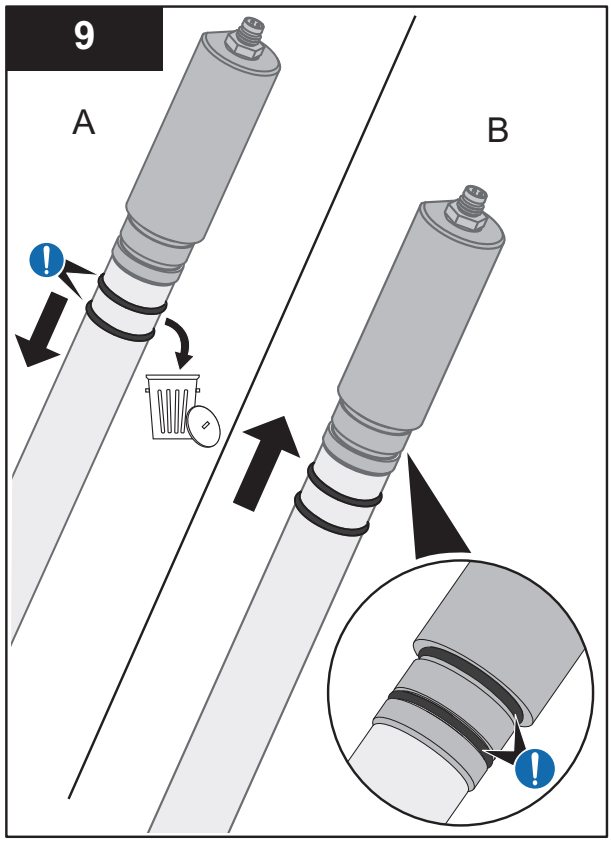
Notes: *1) Install the new quartz sleeve onto the UVI Sensor Housing.*
2) Ensure O-rings are correctly seated in the grooves on the UVI Sensor Housing body.



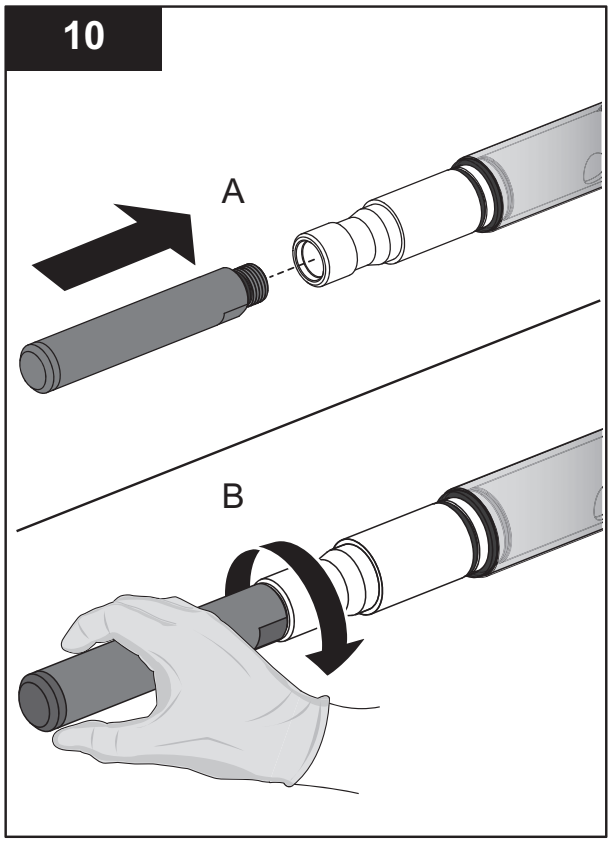
Note: *Install one (1) gasket and one (1) O-Ring as shown.*



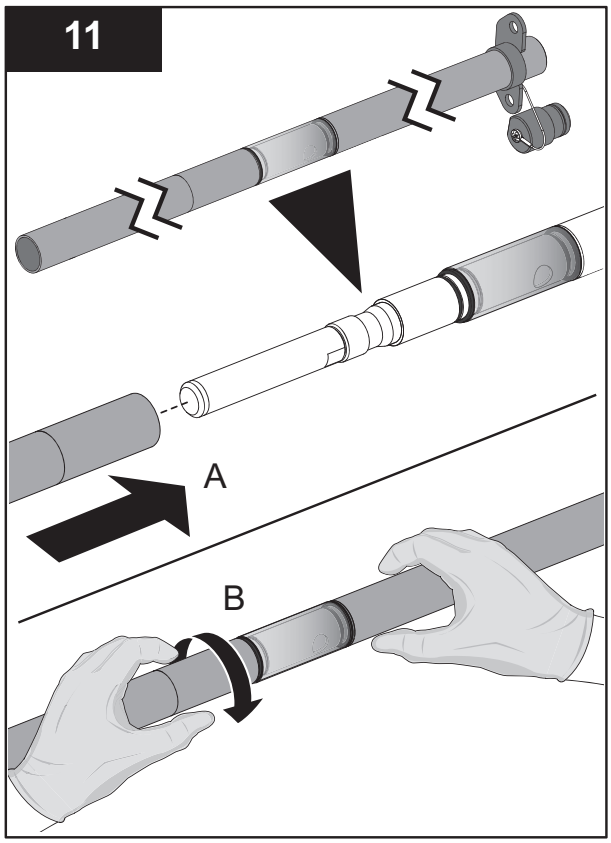
Note: *Replace the O-Ring on the UVI Sensor Port Plug.*



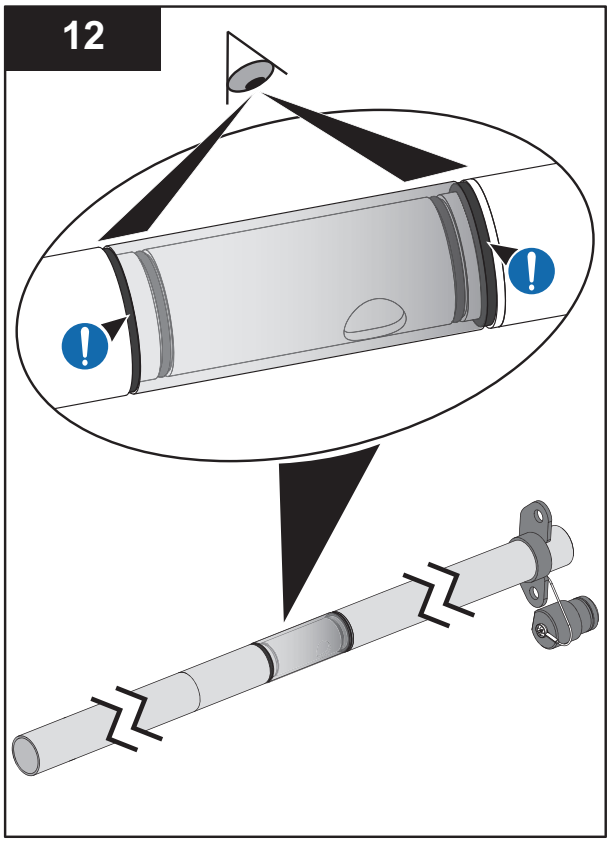
Note: *Replace the two (2) O-Rings on the UVI Sensor.*



Note: *Install the new Desiccant Pack Holder into the end of the top section of the UVI Sensor Housing.*



Note: *Install the top section of the UVI Sensor Housing into the bottom section.*



Note: *Make sure the gaskets are not pinched or bulged out.*

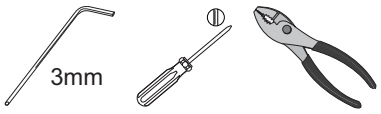
When service is complete, assemble the prerequisites in the reverse order of disassembly.

9.5.5 Remove and Install UVI Sensor Wiper

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).
- Move the Wiper to 1/2 way. Refer to Section 8.1.5.
- Lockout Tag Out - HSC and PDC compartment for the associated UV Bank. Refer to Section 4.
- Remove the UVI Sensor Housing. Refer to Section 9.5.2.

Tools:

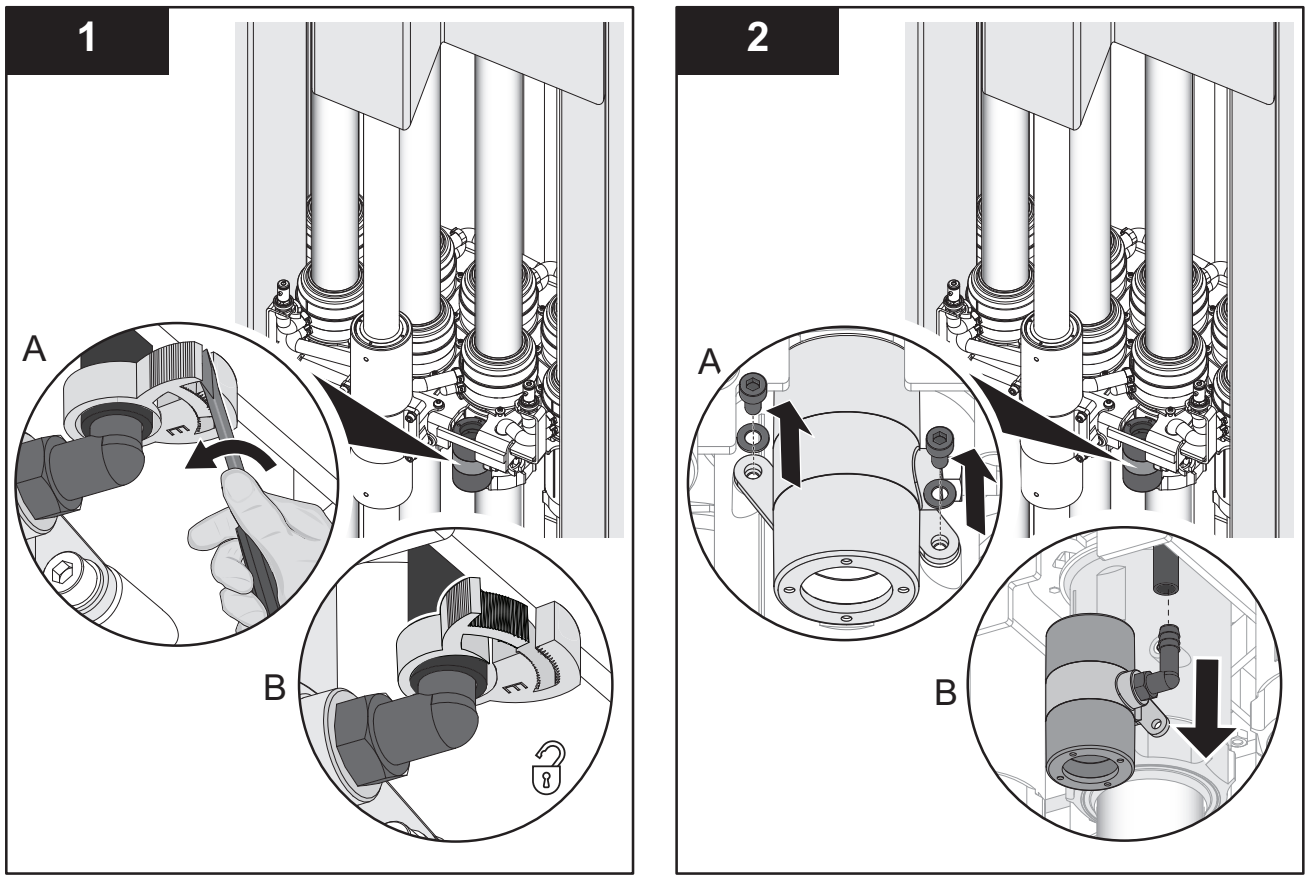


Materials:

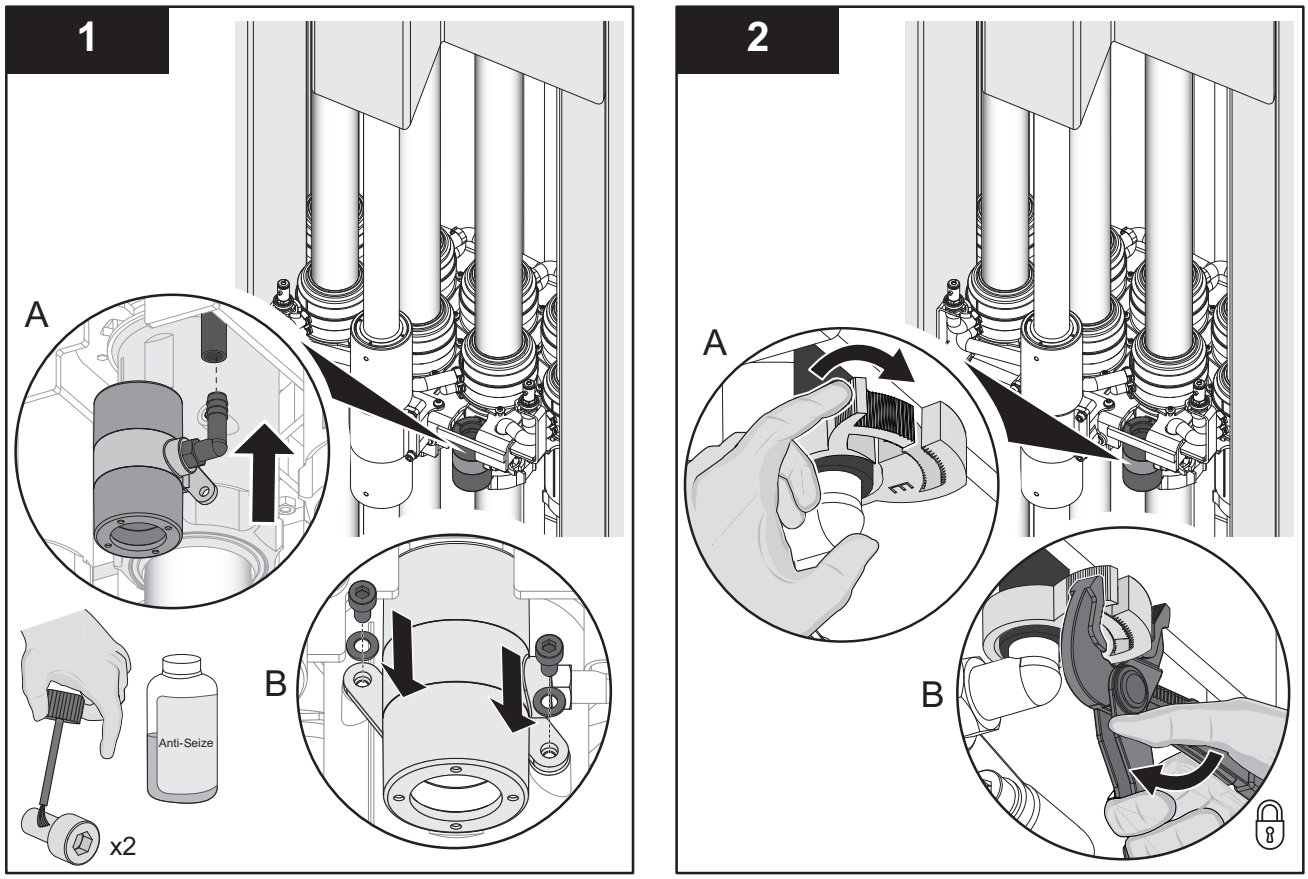
- Wiper Canister (if required)

Procedure:

Remove:



Install:

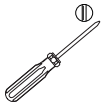


9.5.6 Remove and Replace UVI Sensor Wiper O-rings and Fittings

Prerequisites:

- Remove the UVI Sensor Wiper. Refer to Section 9.5.5.

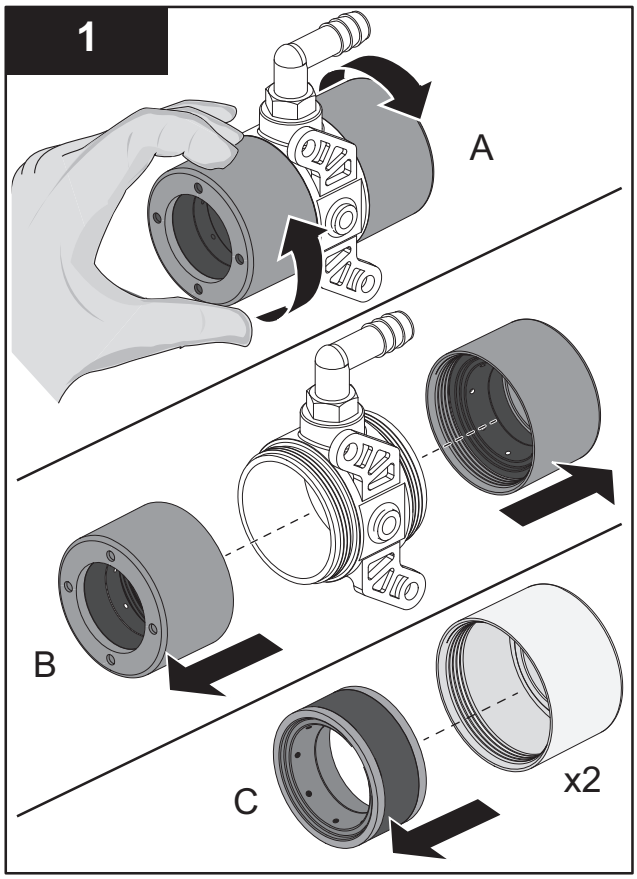
Tools:

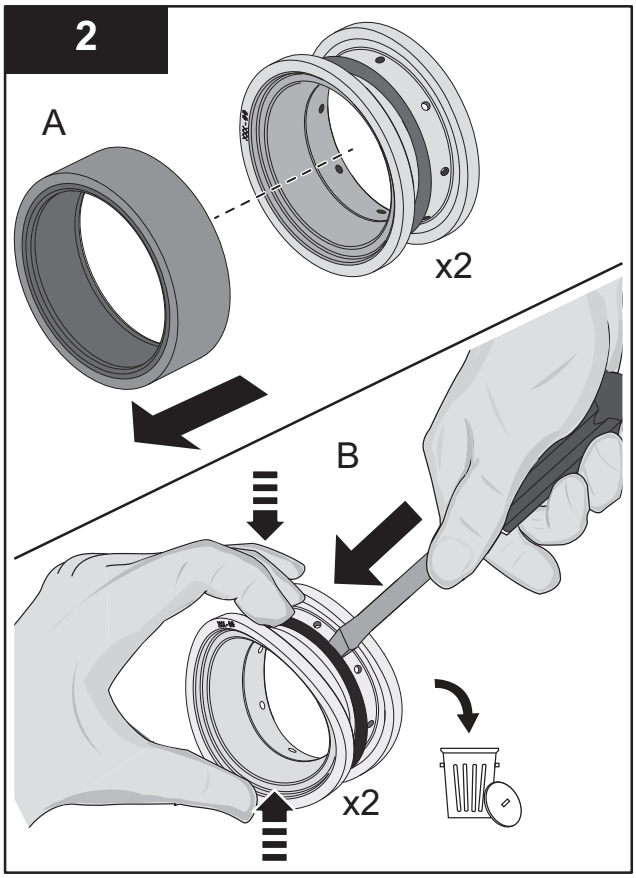


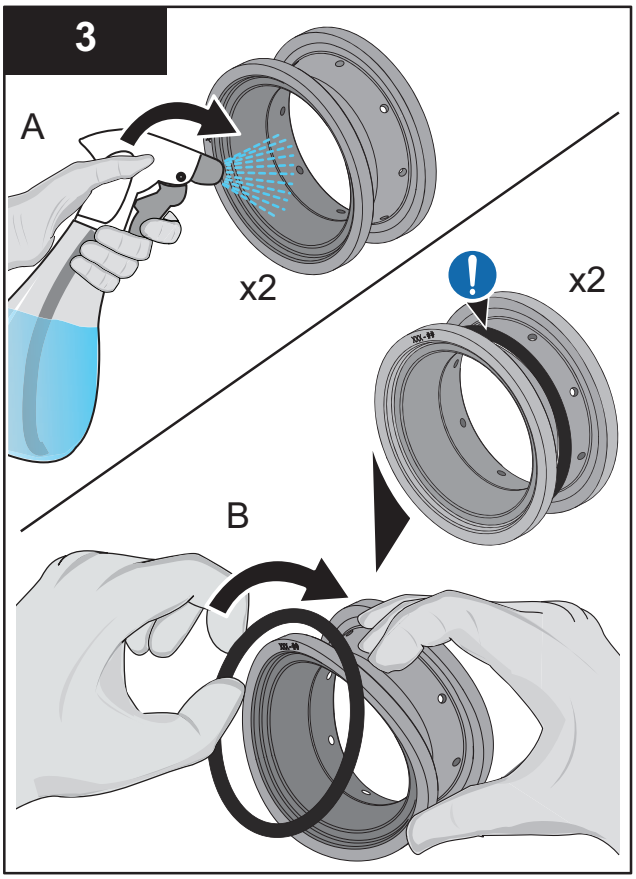
Materials:

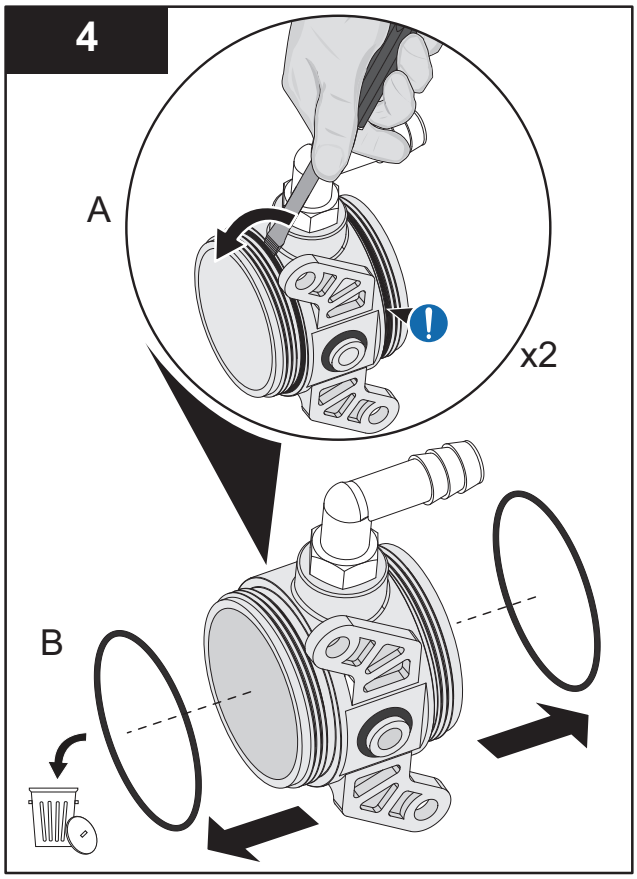
- Wiper Seal Assembly (if required)
- O-rings (if required)
- Fittings (if required)
- End Caps (if required)
- Loctite 222MS Threadlocker

Procedure:

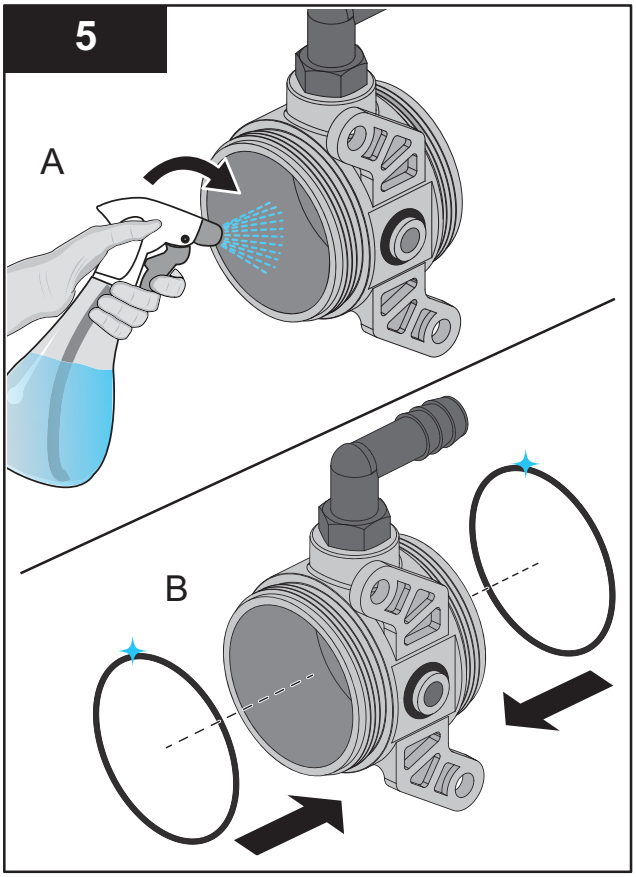




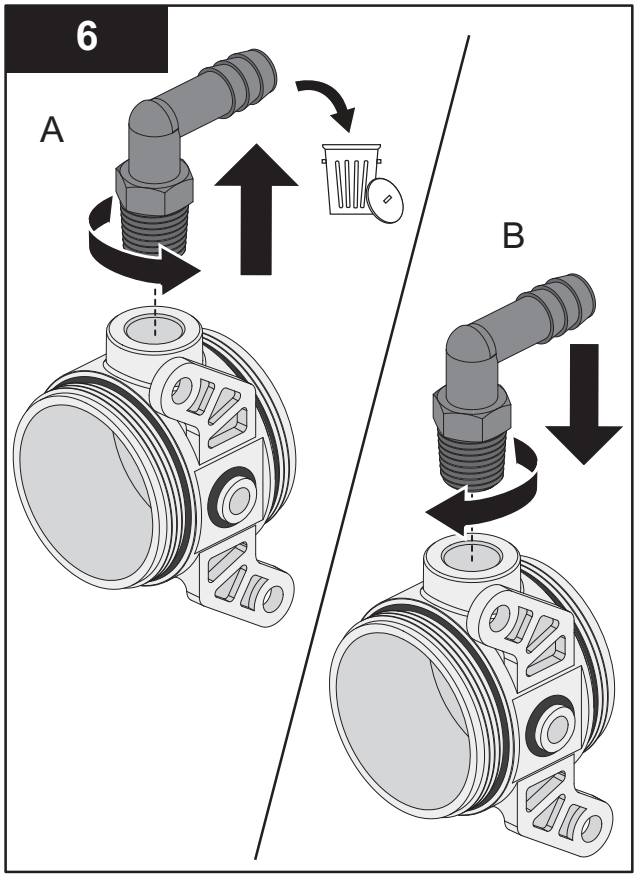




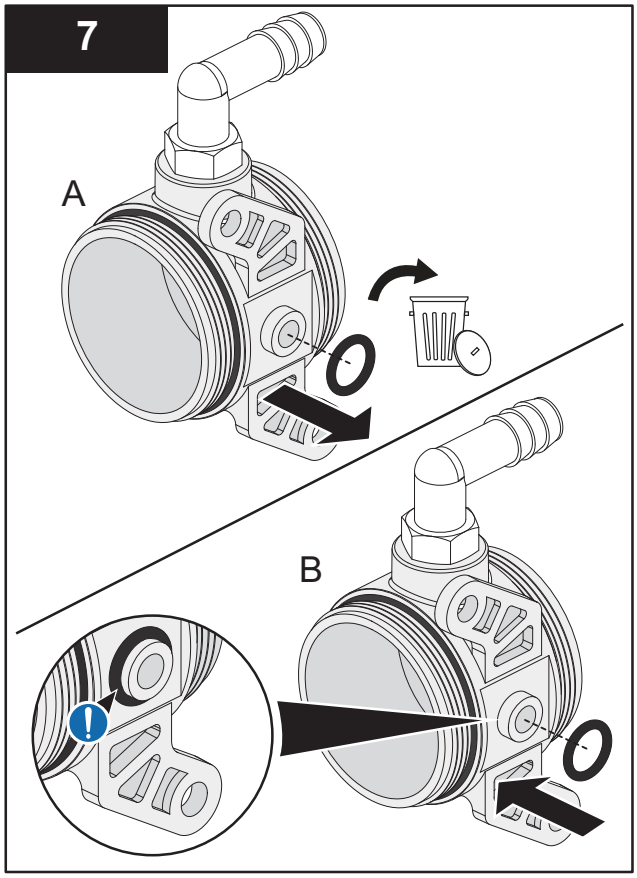
Note: *Ensure inside is free of debris.*



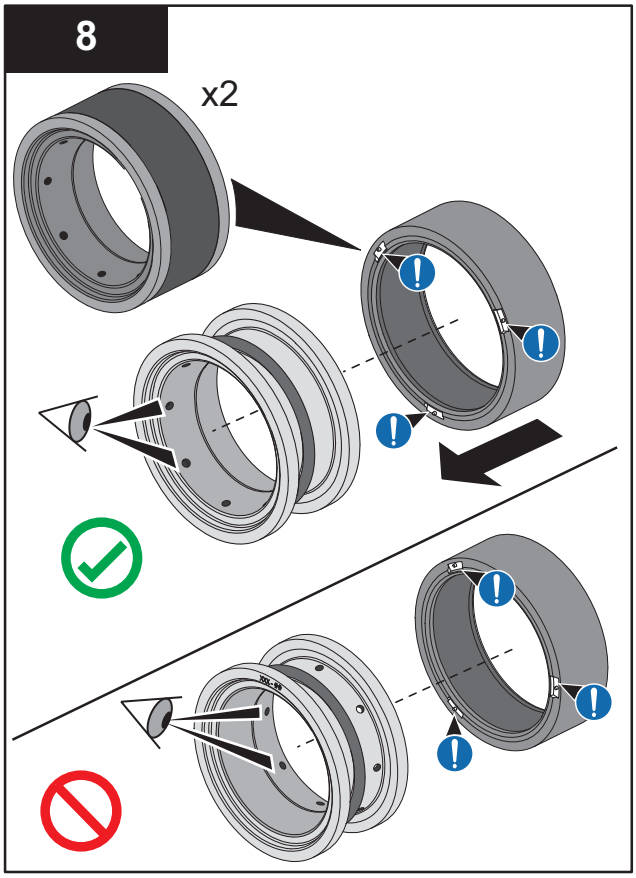
Note: *Ensure O-rings are not rolled or twisted.*



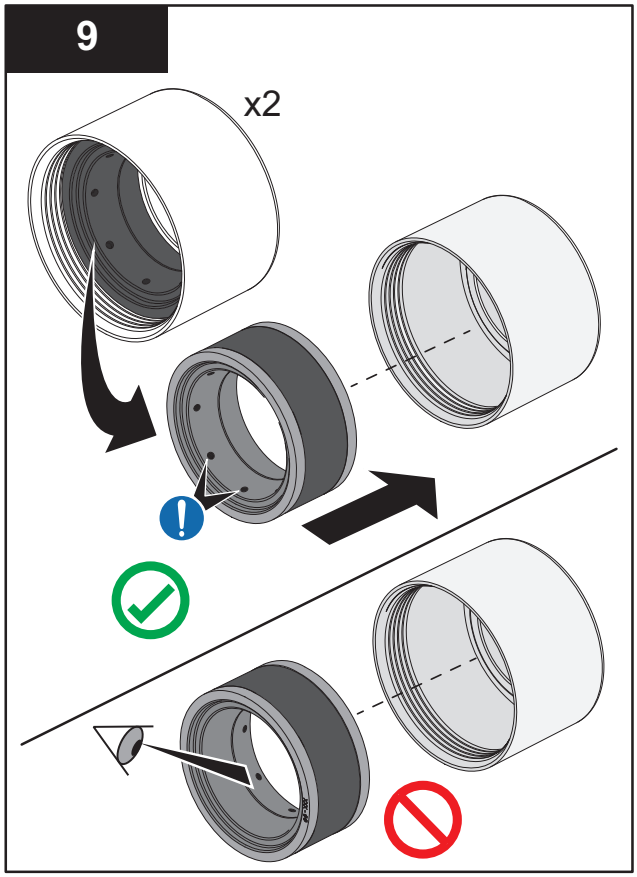
Note: *Replace fill port if damaged or broken.*



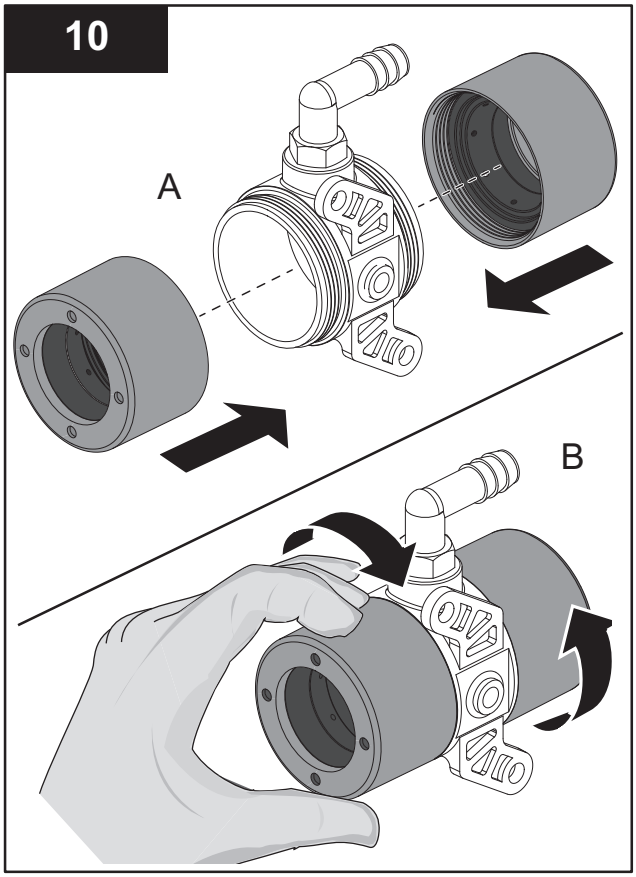
Note: *Replace the O-ring if damaged or broken.*



Note: *Spacer mold injection holes and wiper seal vent holes must be orientated on the same side*



Note: *Ensure the vent holes on the wiper seal are facing the inside of the canister.*

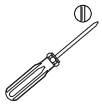


9.5.7 Remove and Replace UVI Sensor Floor Bushing

Prerequisites:

- Remove UVI Sensor Housing. Refer to Section 9.5.2.

Tools:

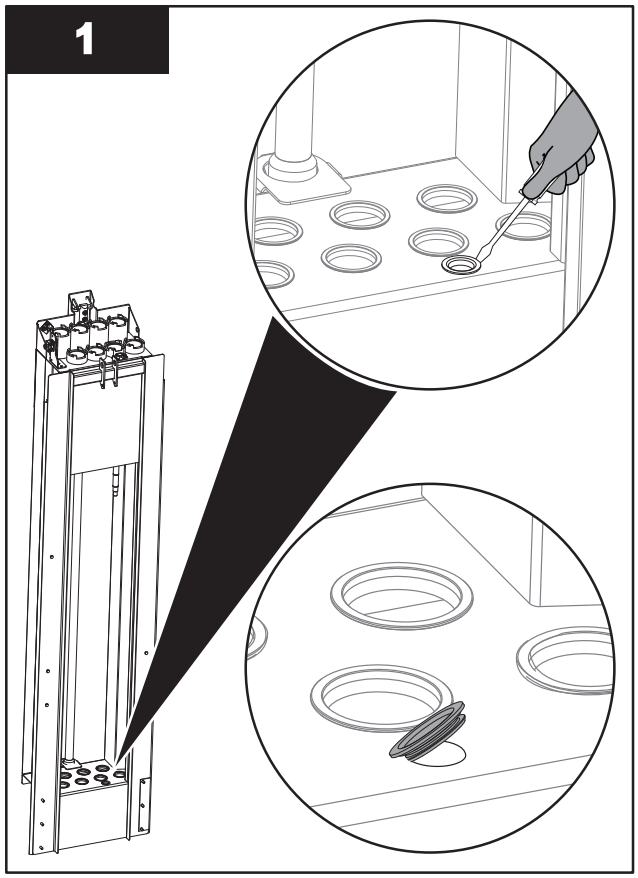


Materials:

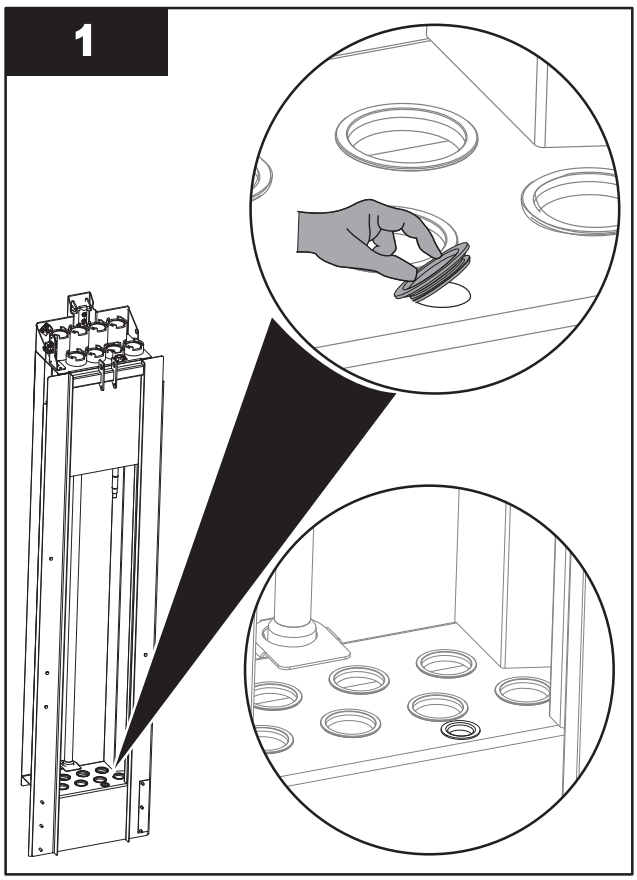
- New Bushing

Procedure:

Remove:



Replace:



9.6 UV Bank

9.6.1 Clean the UV Bank

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lockout Tag Out - PDC compartment for the associated UV Bank. Refer to Section 4.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).

Tools:

Materials:

Procedure:

1. Remove large debris as required.
2. Use hose and water to remove smaller debris, algae etc.
3. When service is complete, assemble is reverse order of disassembly.

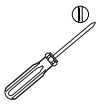
9.6.2 Replace Sleeve Bushing (Floor)

Replace floor sleeve bushings during regular scheduled maintenance or as required.

Prerequisites:

- Remove the Lamp Sleeve. Refer to Section 9.4.2.

Tools:

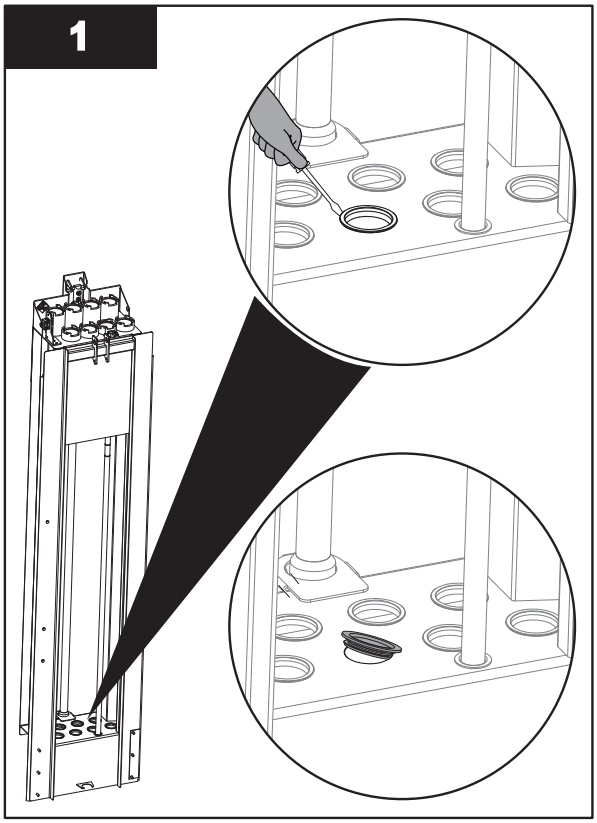


Materials:

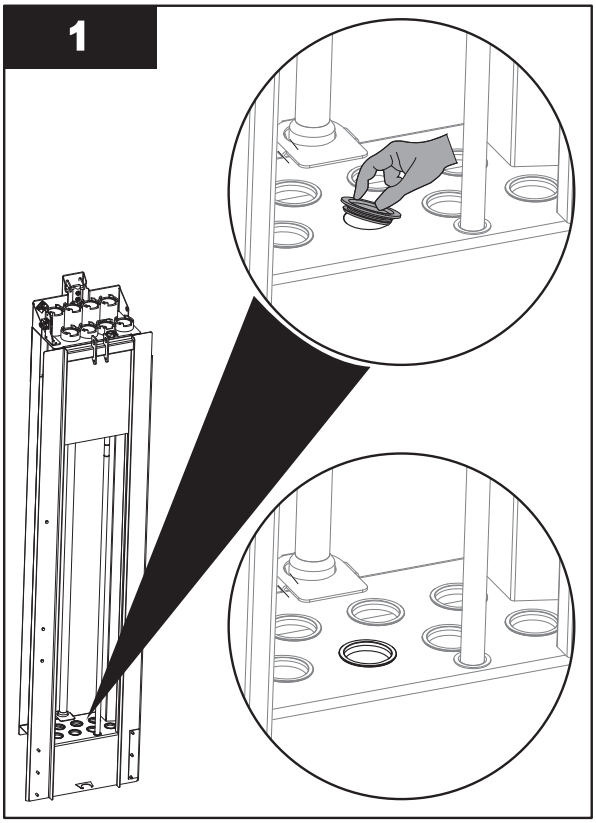
- New Floor Bushings

Procedure:

Remove:



Install:



9.7 Lamp Sleeve Wiper

The required maintenance consists of replacing the wipers, and filling the wiper canisters with ActiClean Gel. The frequency of service depends upon:

- Nature of the fouling agent
- Rate of fouling
- Frequency of cleaning

On average, wiper seals should be inspected every 6 months or whenever sleeves are checked. Replace it if necessary. Otherwise, wiper seal should be replaced every 2 years as per Table 11. ActiClean Gel should be recharged whenever sleeves are checked or a minimum of every 6 months.

9.7.1 Wiper Plate Fill and Vent Ports

The UV Bank can have one or two wiper plates depending on project configuration. Each wiper plate has four (4) fill / vent ports.

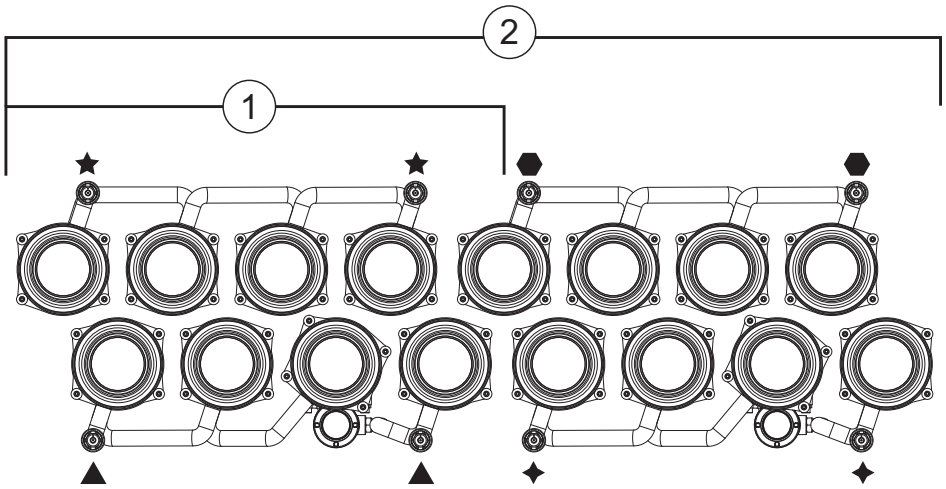


Figure 62 Vent / Drain Location

1	8 - 12 UV Lamps per Bank arrangement	**2**	14 - 24 UV Lamps per Bank arrangement

9.7.2 Fill Wiping System

Fill wiper canisters using a Hand Pump - Refer to Instruction Document Number **DC340601-011.**

Fill wiper canisters using a Drill Pump - Refer to Instruction Document Number **DC340601-008.**

9.7.3 Flush the Wiping System

Prerequisites:

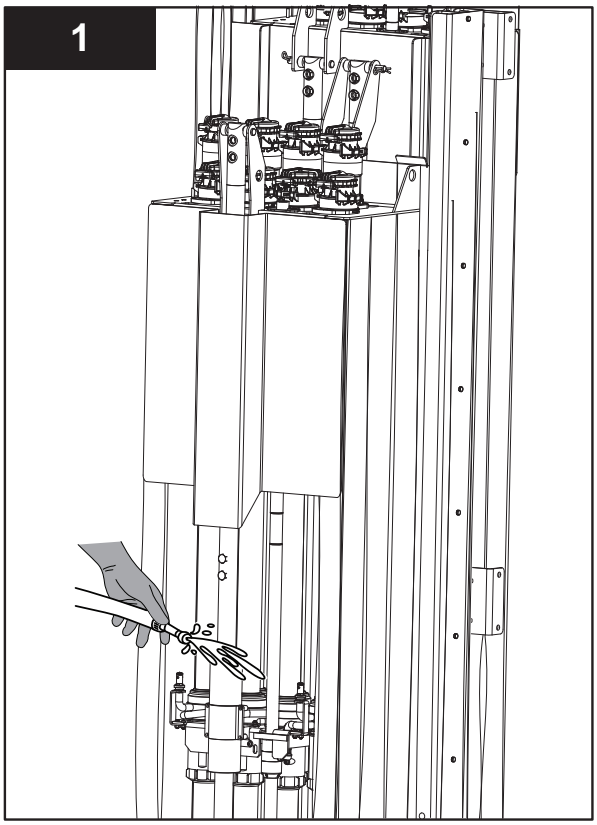
- Shutdown the UV Bank. Refer to Section 5.2.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).
- Move the Wiper to 1/2 way. Refer to Section 8.1.5.
- Lockout Tag Out - HSC and PDC compartment for the associated UV Bank. Refer to Section 4.
- Remove all lamp sleeves from UV Bank. Refer to Section 9.4.2.
- Remove UVI Sensor Housing. Refer to Section 9.5.2.

Tools:

Materials:

Procedure:

Flush:



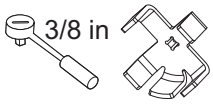
2. Install UVI Sensor Housing (Section 9.5.2).
3. Install UV Lamp Sleeves (Section 9.3.2).
4. Fill Wiping System (Section 9.7.2).

9.7.4 Remove and Install a Wiper Canister

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).
- Move the Wiper to 1/2 way. Refer to Section 8.1.5.
- Lockout Tag Out - HSC and PDC compartment for the associated UV Bank. Refer to Section 4.
- Remove Lamp Sleeve. Refer to Section 9.4.2.
- Remove the UVI Sensor Wiper (for canister behind UVI Sensor only). Refer to Section 9.5.5.

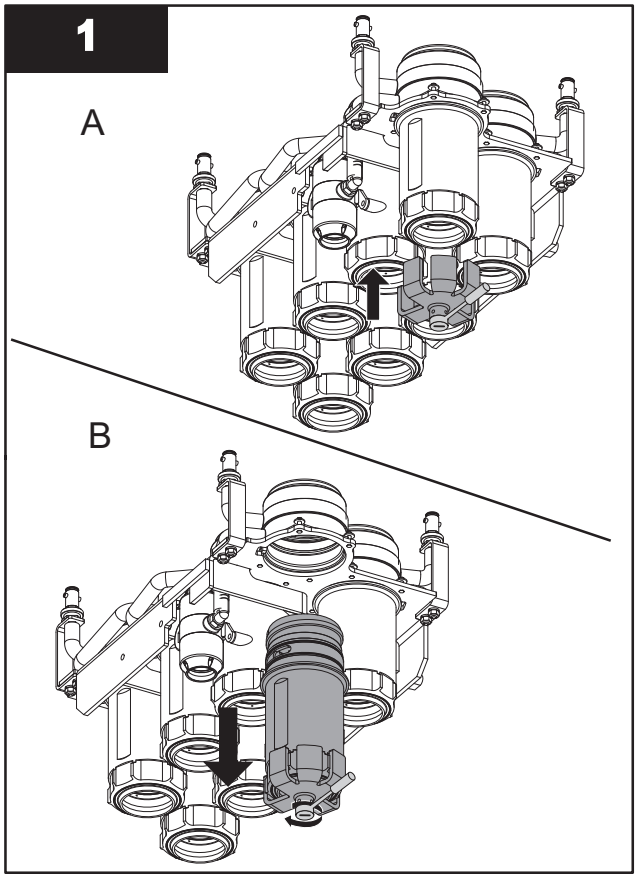
Tools:



Materials:

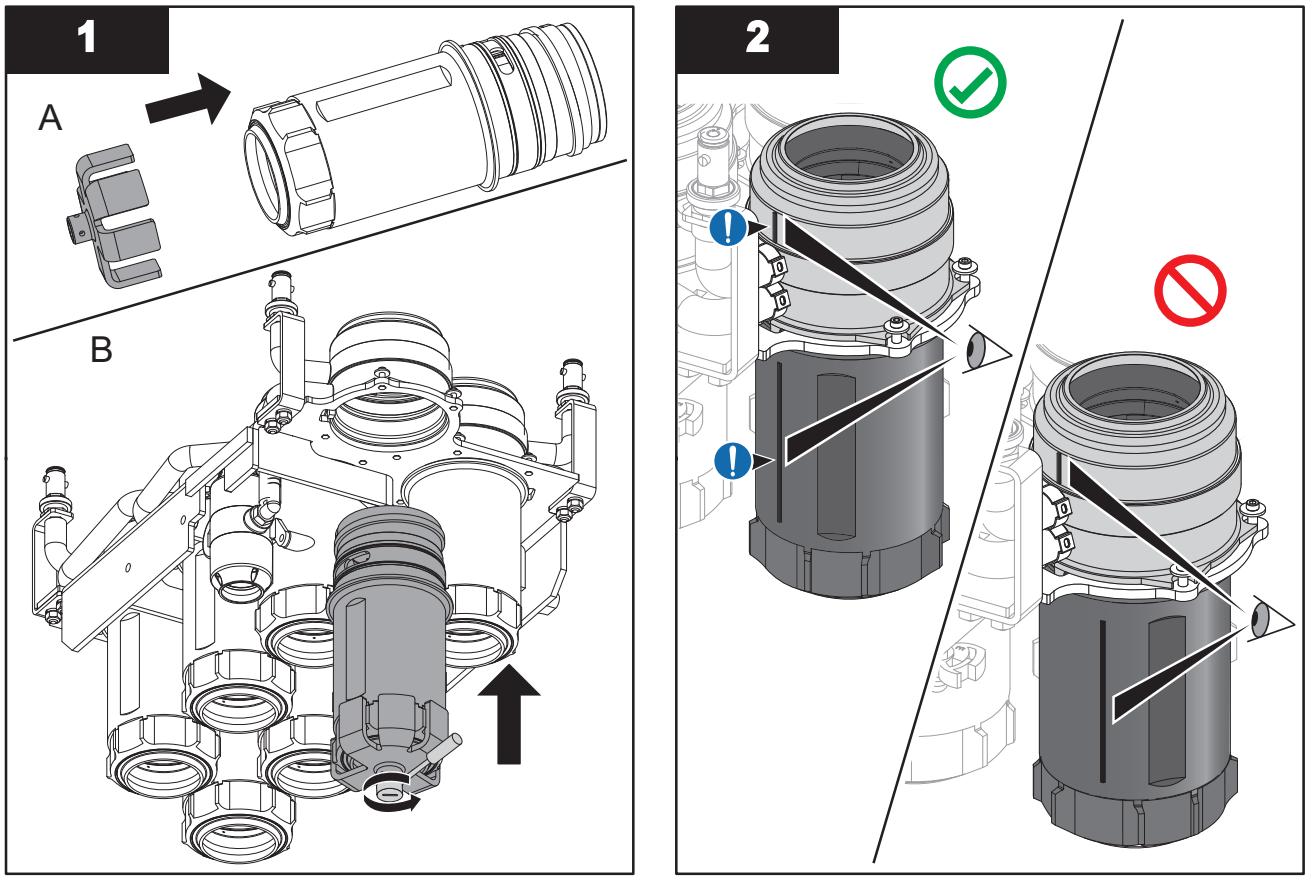
Procedure:

Remove:



Note: *Insert the canister body tool onto the bottom of the canister.*

Install:



Note: *Ensure canister is tightened such that the orientation mark on the canister aligns with the orientation mark on the canister nut.*

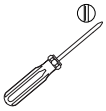
9.7.4.1 Remove and Replace Wiper Seals, O-rings and Bushings

Replace the wiper seals, O-rings and bushings during scheduled maintenance or when wiper seals, O-rings or bushings are worn out and do not clean the lamp sleeves.

Prerequisites:

- Remove a Wiper Canister. Refer to Section 9.7.4.

Tools:

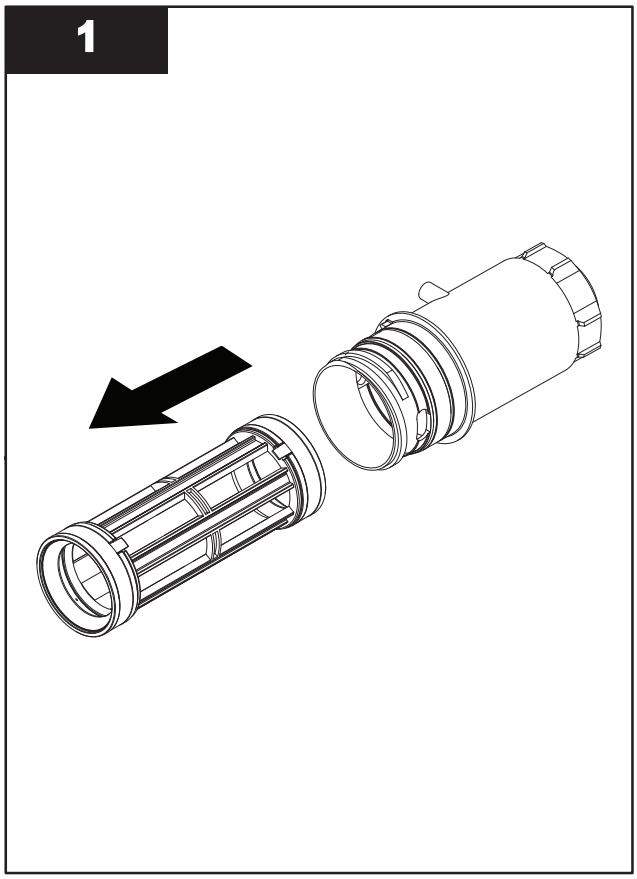


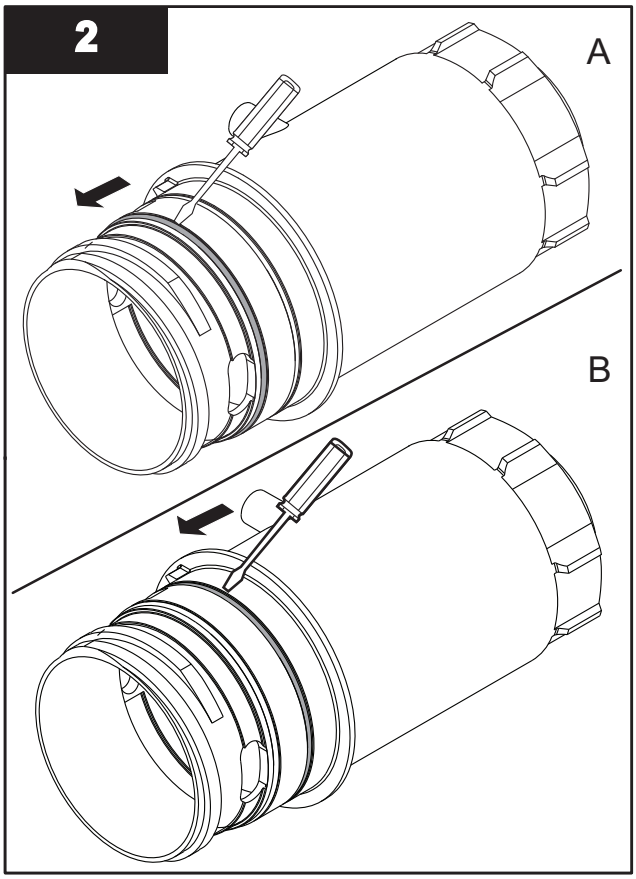
Materials:

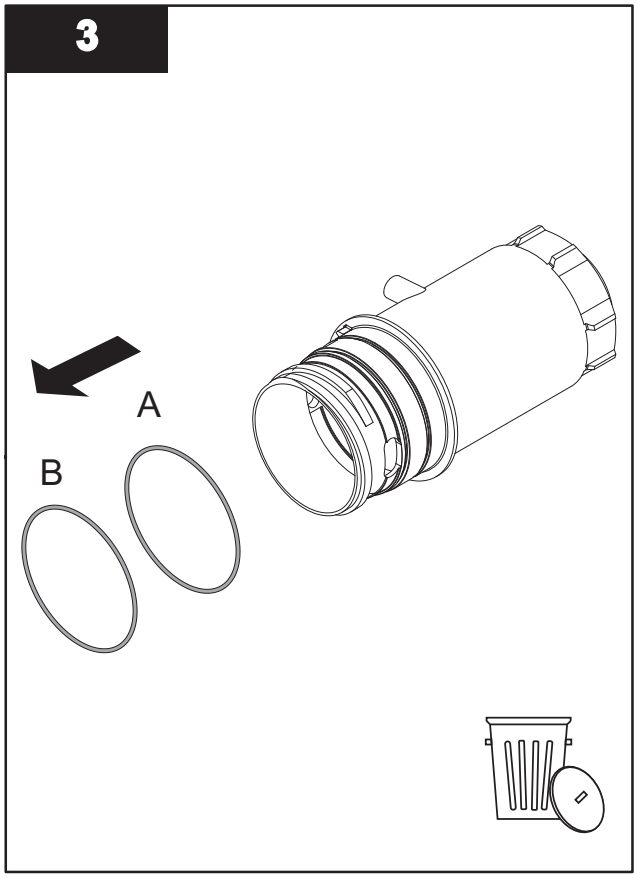
- New seals (if required)
- New wiper bushing (if required)
- New O-rings

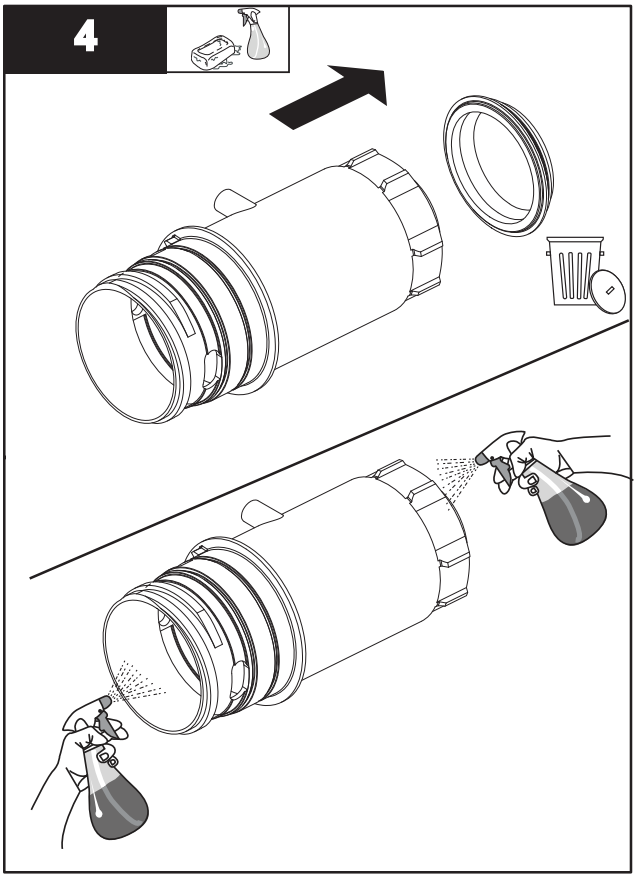
Procedure:

Remove:

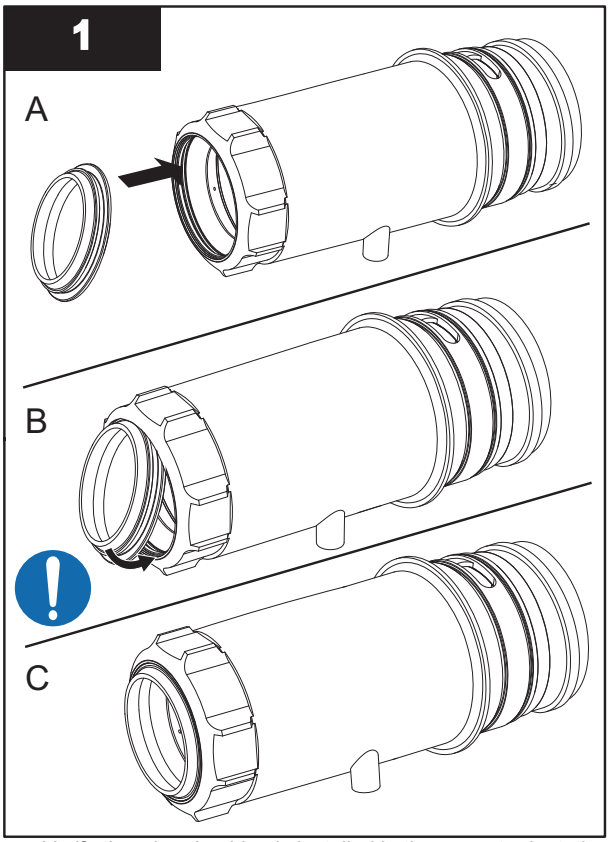


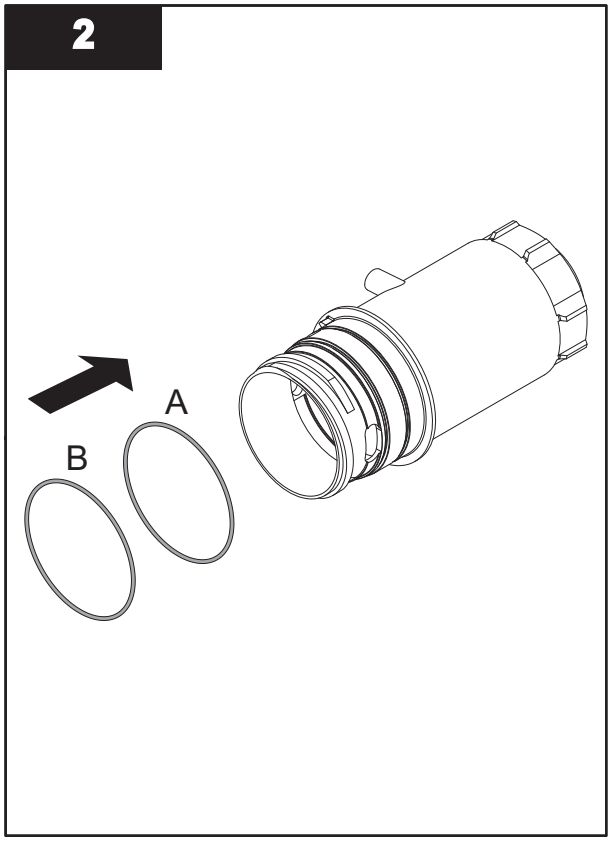




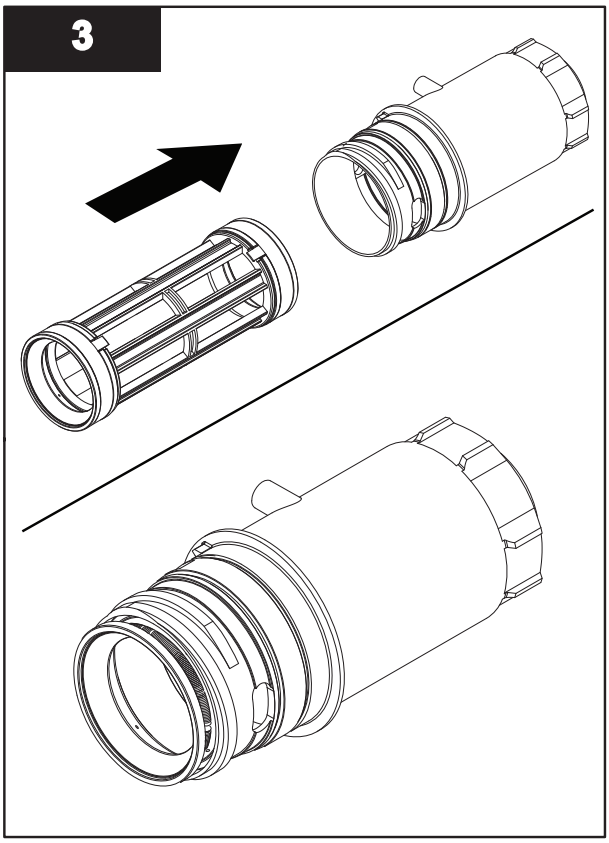


Install:





Note: *Verify the wiper bushing is installed in the correct orientation.*



4. Install Wiper Canister (Section 9.7.4).

9.8 Hydraulic System Center (HSC)

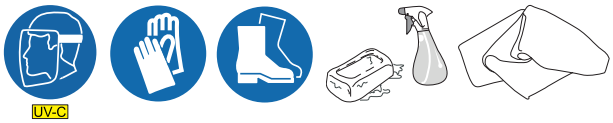
9.8.1 Inspect the HSC

Inspect the HSC during scheduled maintenance.

Prerequisites:

- Lockout Tag Out - HSC for the associated UV Bank. Refer to Section 4.
- Open HSC lower door.

Materials:



Procedure:

1. Inspect the HSC, hoses, filter and fittings for hydraulic fluid leaks. If a leak is visible at the:
   a. Hydraulic Fitting - tighten the hydraulic fitting (Section 9.8.5). Do not over-tighten fittings.
   b. Hydraulic Hose – inspect the hydraulic hoses for damage (bulges, splits, cracks and nicks), replace if damaged (Section 9.8.5).
   c. Hydraulic Filter – turn the filter to tighten, if leak is still present:
      a. Remove the filter (Section 9.8.3).
      b. Remove debris from sealing surfaces of the filter and filter housing, using a clean dry cloth.
      c. Inspect sealing surfaces for damage, replace if damaged (Section 9.8.3).
      d. Ensure the O-ring is correctly positioned and free of damage, replace if required.
      e. Install the filter (Section 9.8.3).
2. Verify the hydraulic fluid reservoir is full. Fill up reservoir if required (Section 9.8.4).
3. Remove debris and hydraulic fluid from the HSC surfaces. Use a mild soap and water solution and sponge or soft cloth.
4. Close HSC lower door.

9.8.2 Depressurize Hydraulic System

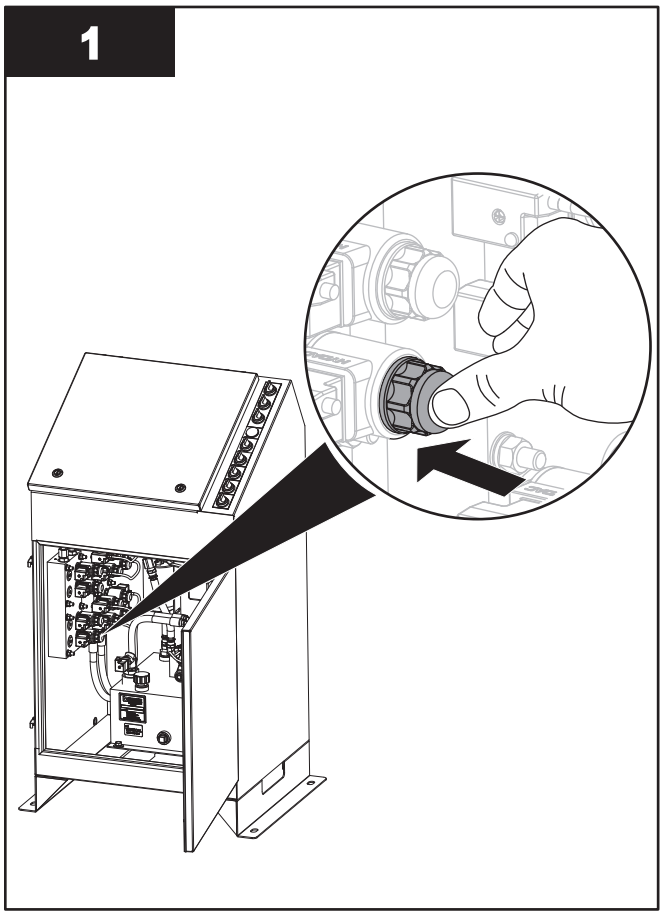
Prerequisites:

- Shutdown the system. Refer to Section 5.2.
- Lockout Tag Out - HSC for the associated UV Bank. Refer to Section 4.
- Open HSC lower door.

Materials:

Procedure:

Before Service:



Note: *Push in the Extend, the Retract and the Lift valve buttons for each UV Bank requiring service.*

9.8.3 Replace the Hydraulic Fluid Filter

Replace the hydraulic fluid filter during scheduled maintenance or when damaged.

Prerequisites:

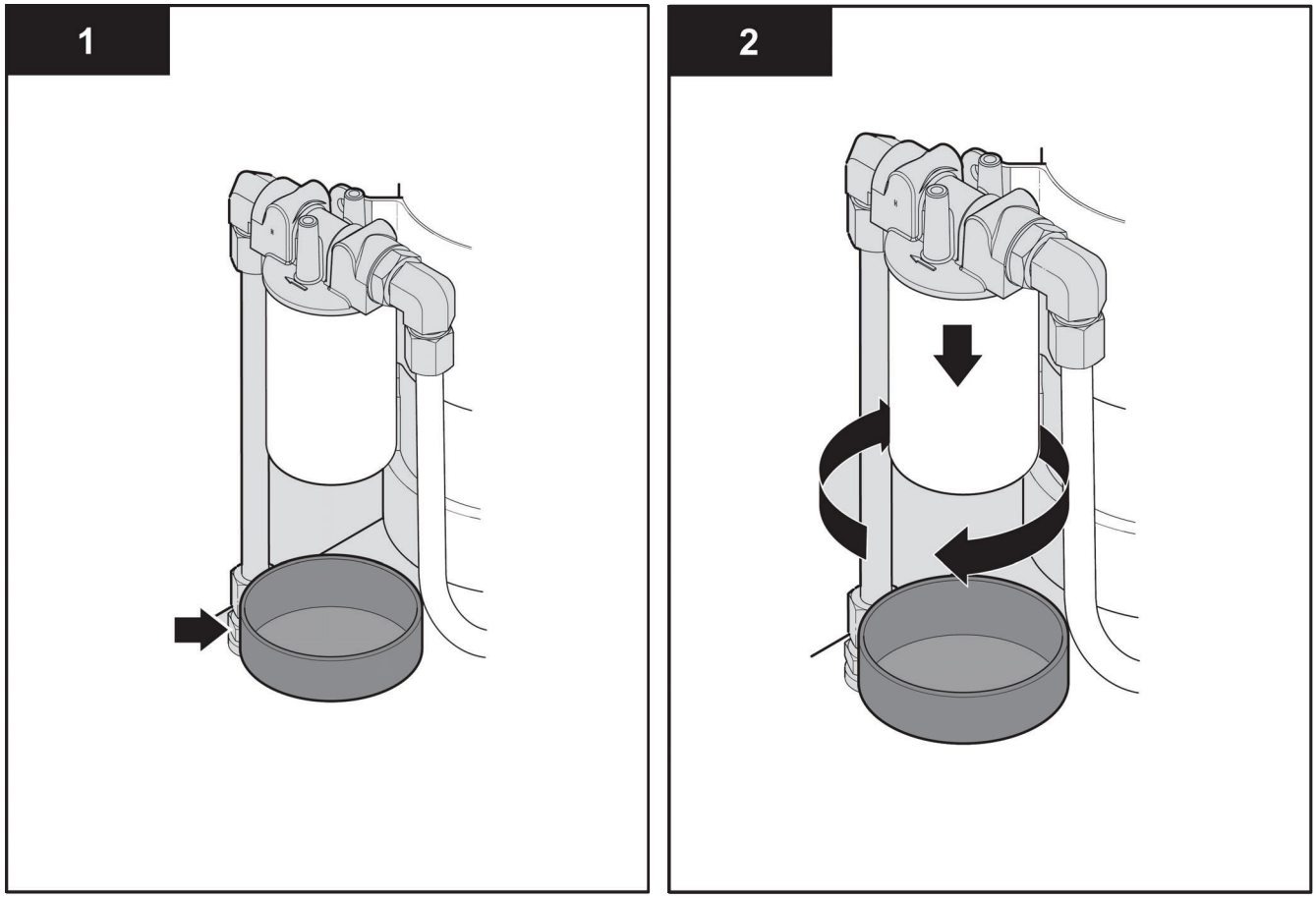
- Depressurize Hydraulic System. Refer to Section 9.8.2.

Materials:

- Hydraulic fluid filter

Procedure:

Replace:



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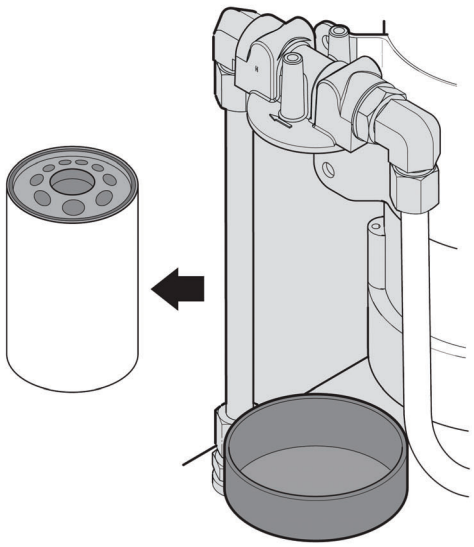

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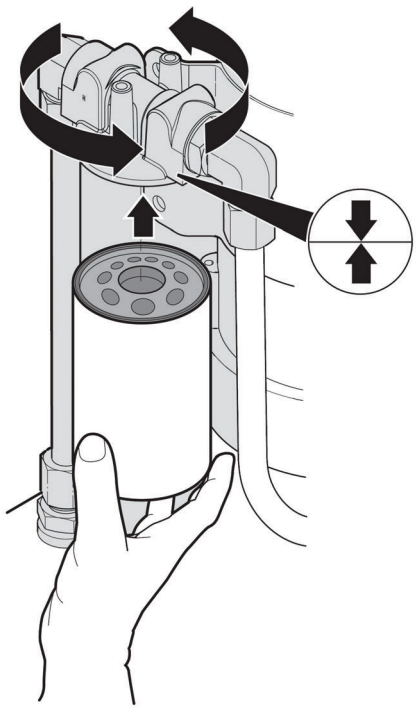
5



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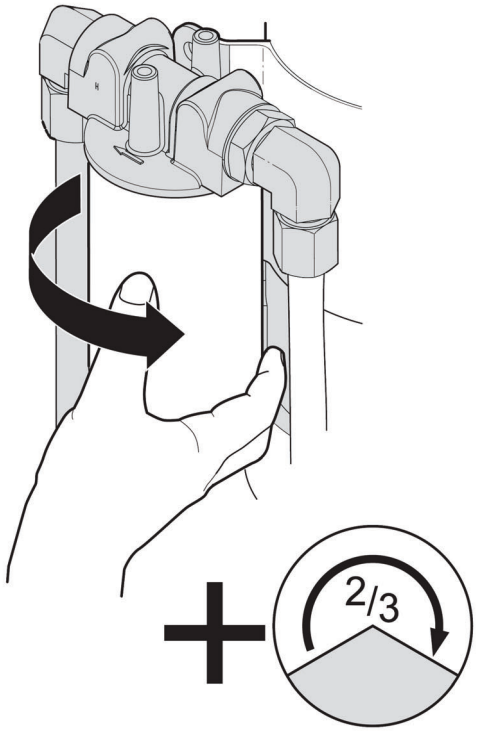


7. Fill up Hydraulic Fluid (Section 9.8.4).
8. Check for leaks, repair as required. Clean up spills.

When service is complete, assemble the prerequisites in the reverse order of disassembly.

9.8.4 Drain and Fill the Hydraulic Fluid Reservoir

Drain the hydraulic fluid reservoir during schedule maintenance. During the first two months of operation, air works its way out of the UV system. Hydraulic fluid must be monitored to make sure the fluid level is adequate.

Fill the hydraulic fluid reservoir when the level is less than full.

NOTICE
Use only a Trojan approved hydraulic fluid. Refer to the reservoir label for more information.

Table 14 Approved hydraulic fluids

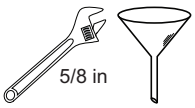
Fluid type	Description and use	Operating temperature
Mineral Hydraulic Oil	• A low viscosity mineral-based oil • Use where wide variations in ambient temperatures occur. • Use all year. No seasonal oil change necessary.	-35 to 49°C (-32 to 120.2°F)
PureDrive Hydraulic Oil	• Water soluble, biodegradable • Use where wide variations in ambient temperatures occur. • Use all year. No seasonal oil change necessary.	-35 to 49°C (-32 to 120.2°F)

Note: *Refer to the reservoir label for more information.*

Prerequisites:

- Depressurize Hydraulic System. Refer to Section 9.8.2.

Tools:

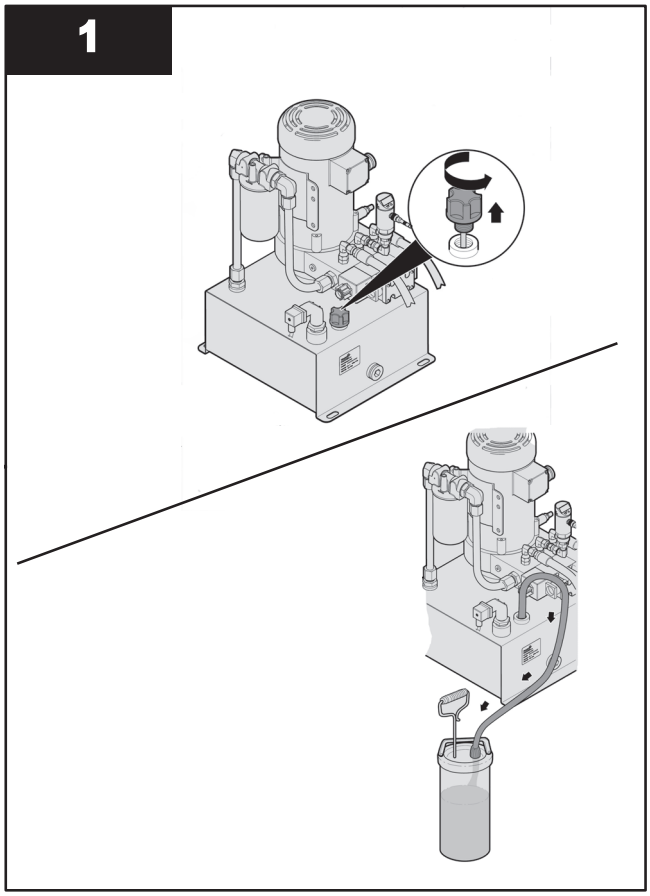


- Pump assembly optional (by others)

Materials:

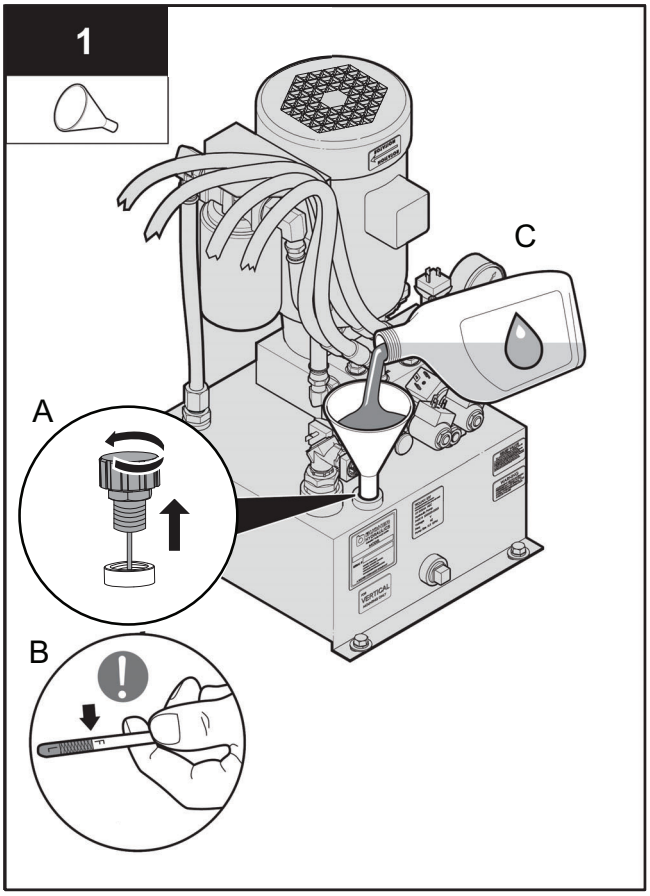
Procedure:

Drain:



Note: *Dispose the waste oil according to local regulations.*

Fill:



Note: *Clean up spills.*

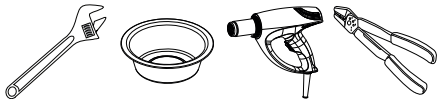
When service is complete, assemble the prerequisites in the reverse order of disassembly.

9.8.5 Replace a Hydraulic Hose

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lockout Tag Out - HSC for the associated UV Bank. Refer to Section 4.
- Depressurize Hydraulic System. Refer to Section 9.8.2.

Tools:



Materials:

- Hydraulic hose

Procedure:

1. Disconnect the hydraulic hose that is damaged.
2. Drain the hose into container.
3. Remove the damaged hydraulic hose from the cable management bracket, and the spiral wrap or cable track. Discard the damaged hose.
4. Connect the new Hydraulic Hose. Refer to Section 7.2.8.1.

   Note: *If multiple hoses need to be replaced, replace one at a time to avoid connecting the hose to incorrect port. Label each hose before disassembling.*
5. Install the hose into the Cable Management Bracket. Refer to Figure 6.
6. Install the hose into the spiral wrap (Figure 11 and Figure 12) or cable track (Figure 16) for the applicable UV Bank.
7. Complete the Hydraulic Hose Fittings and Connections. Refer to Section 7.2.13.1.
8. Bleed the Hydraulic Hose. Refer to Section 9.8.6.

9.8.6 Bleed the Hydraulic Hoses

NOTICE
The hydraulic system will require constant filling during the recharging of the hose or the reservoir will become too low and damage to the pump may occur.
To avoid aerated fluid from entering the pump, make sure that the fluid in the reservoir does not go below the halfway point throughout the procedure.
Ensure hydraulic oil does not contain entrained air.
All UV banks connected to the HSC will require unions at each UV bank before bleeding wiper and lift hoses of air.
Always use a towel when disconnecting hydraulic hoses from connections. Clean up spills.
Always hold hydraulic hose connections up high, so as to prevent fluid from draining out of open hose connections.

Prerequisites:

- Replace a Hydraulic Hose. Refer to Section 9.8.5.
- Remove Lockout and Tag Out from HSC. Refer to Section 4.
- Make sure that the UV Bank is in the full down position. Refer to Section 8.1.3.

- Make sure the hydraulic cylinders are in the fully retracted position before bleeding the hydraulic lines. Refer to Section 8.1.5 and Figure 63.

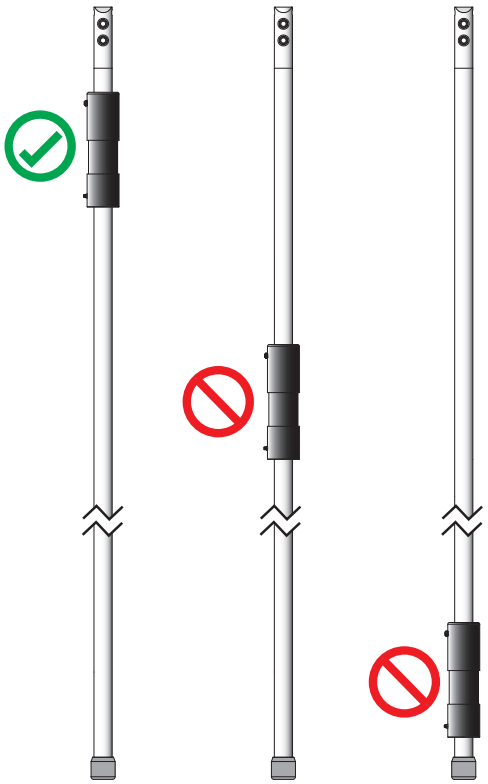
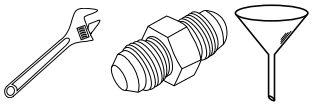
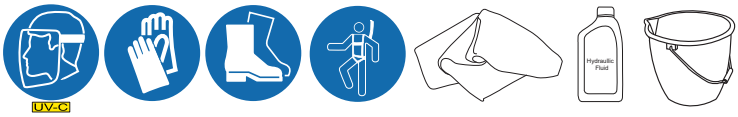


Figure 63 Hydraulic Cylinder position

Tools:



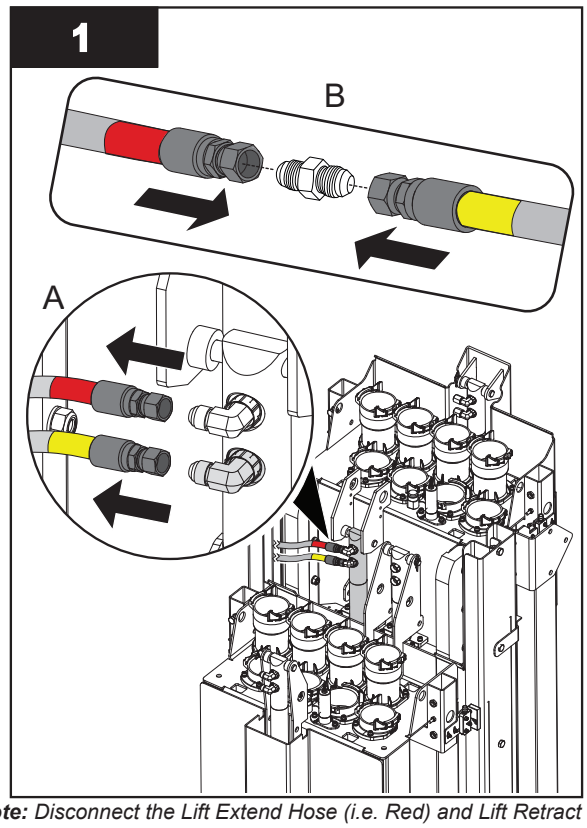
Materials:



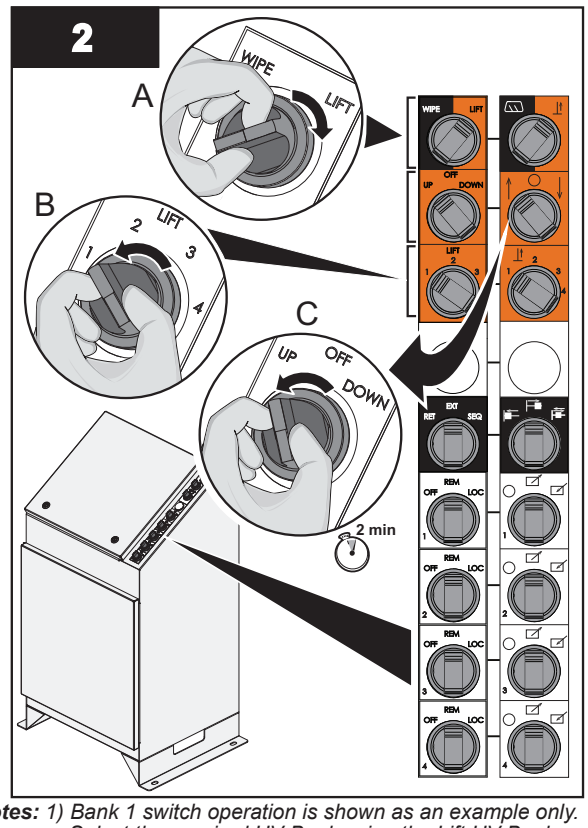
- Short Hydraulic Hose (provided in Operator Kit)

Procedure:

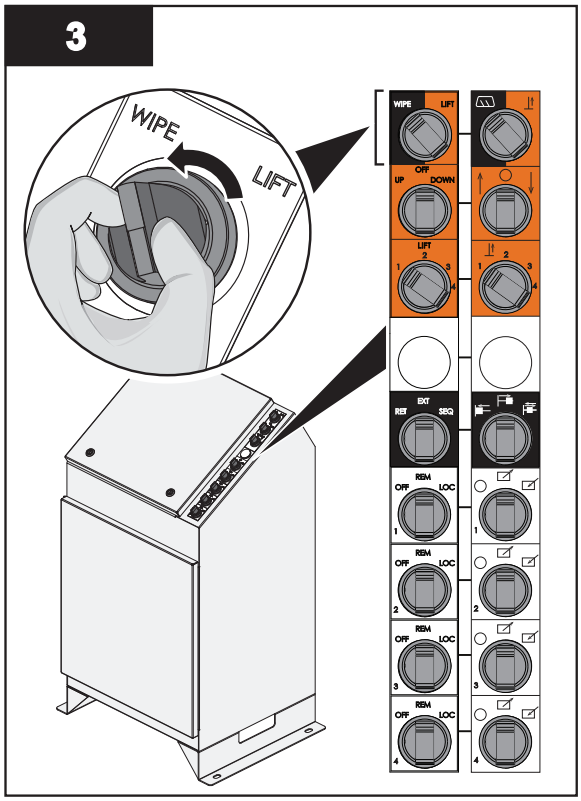
Bleed Lift Cylinder Circuits



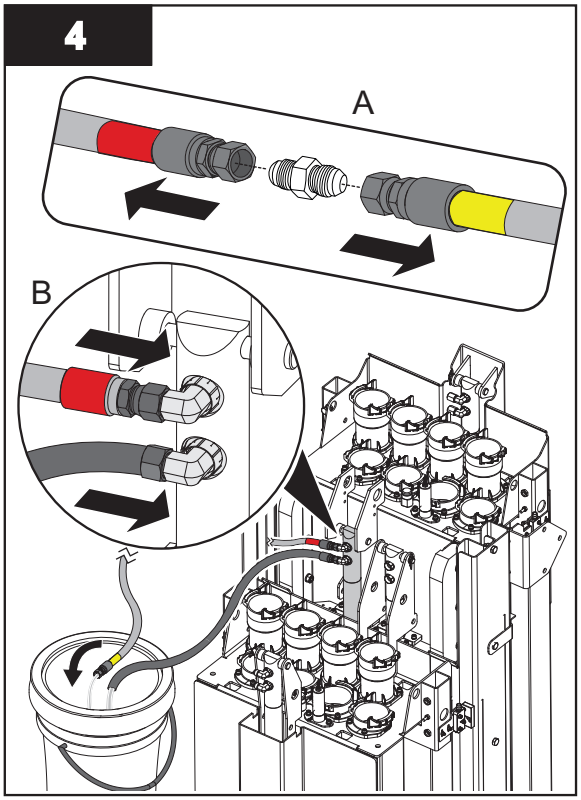
Note: *Disconnect the Lift Extend Hose (i.e. Red) and Lift Retract Hose (i.e. Yellow) from the Cylinder and connect together with the provided union to create a closed circuit.*



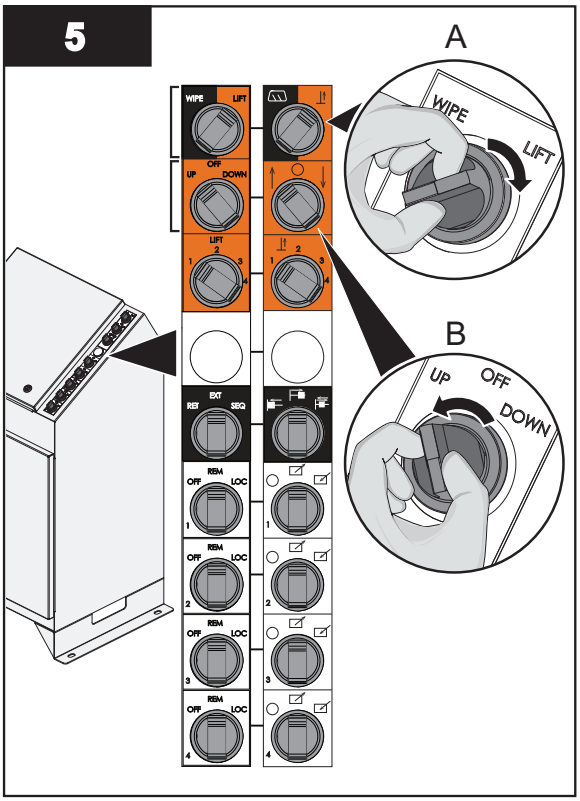
Notes: *1) Bank 1 switch operation is shown as an example only. Select the required UV Bank using the Lift UV Bank Selection Switch.*
2) Operate the hydraulic pump for 2 minutes or until a solid stream of fluid is coming back into the HSC reservoir.
3) Check hydraulic fluid levels, add fluid as required (Section 9.8.4).



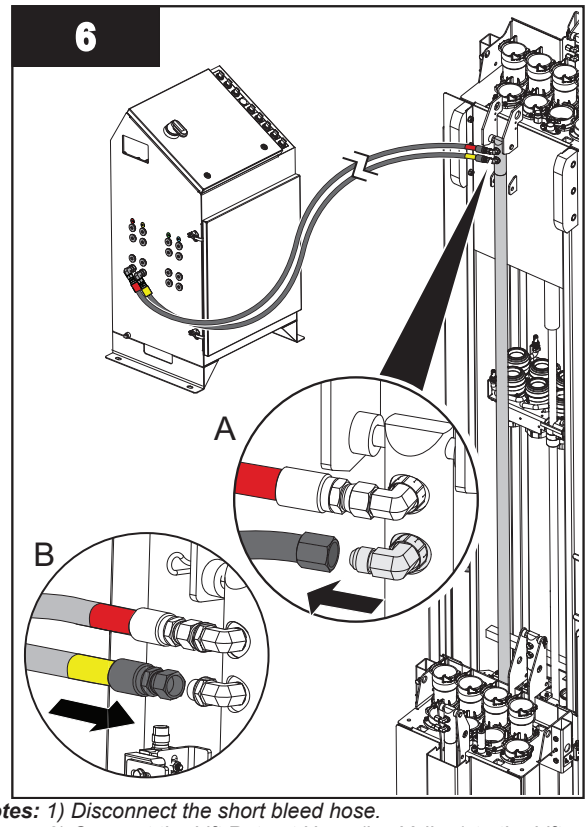
Notes: *1) When complete, turn the wipe/lift switch to the WIPE position.*
2) Depressurize the hydraulic circuit. Refer to Section 9.8.2.



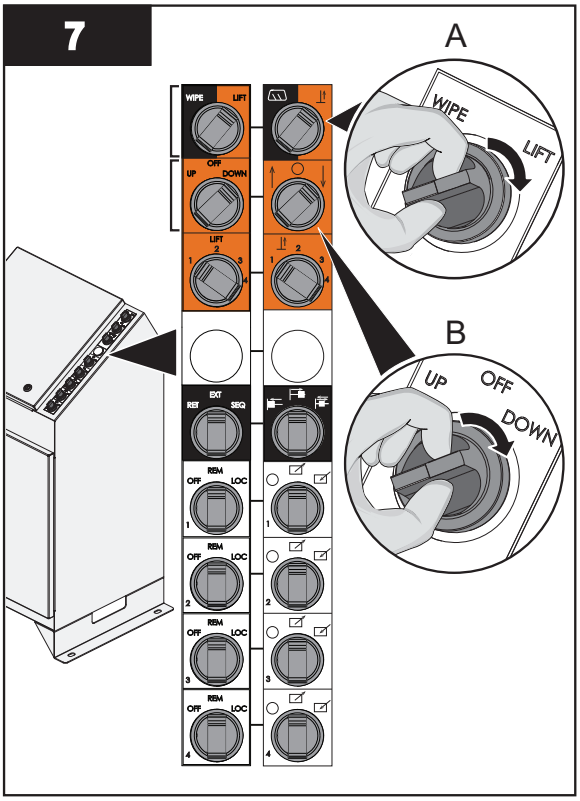
Notes: *1) Connect the Lift Extend Hose (i.e. Red) to the Lift Cylinder.*
2) Connect the short bleed hose to the Lift Retract Fitting on the Lift Cylinder, route the opposite end to the bucket.
3) Route Lift Retract Hose (i.e. Yellow) to the bucket.



Notes: *1) Lift the UV Bank fully up until the HSC pump turns off.*
2) Install the bank locking plates. Refer to Section 8.1.2.



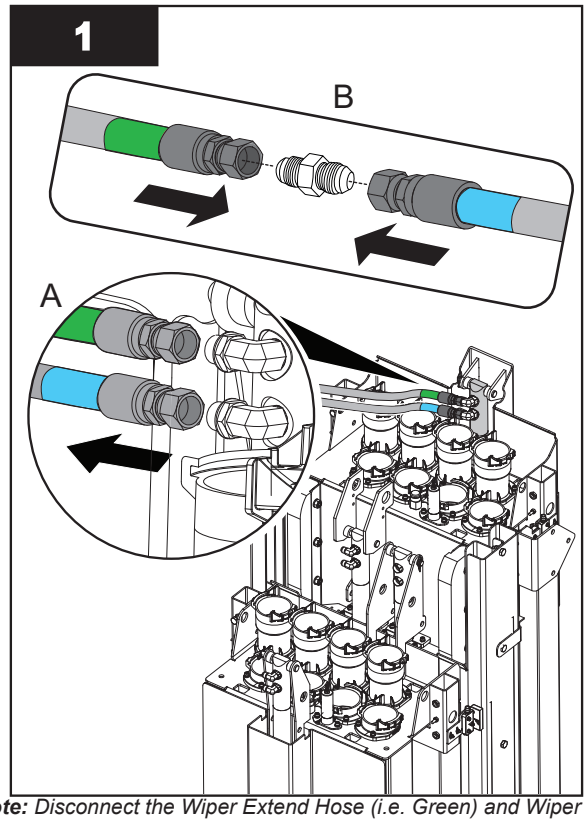
Notes: *1) Disconnect the short bleed hose.*
2) Connect the Lift Retract Hose (i.e. Yellow) to the Lift Cylinder.



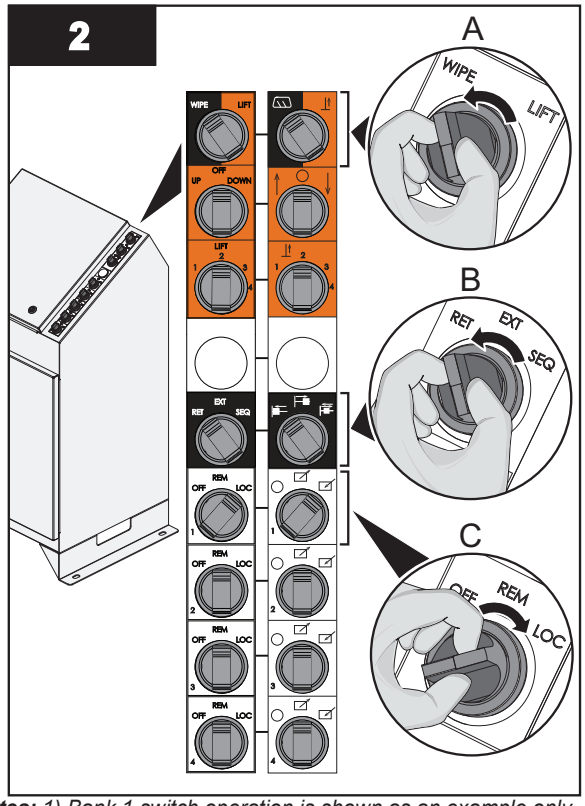
Notes: *1) Remove the bank locking plates.*
2) Lift the UV Bank fully down until the HSC pump turns off. Refer to Section 8.1.3.

8. Repeat steps 1 - 7 for remaining Lift Circuits.

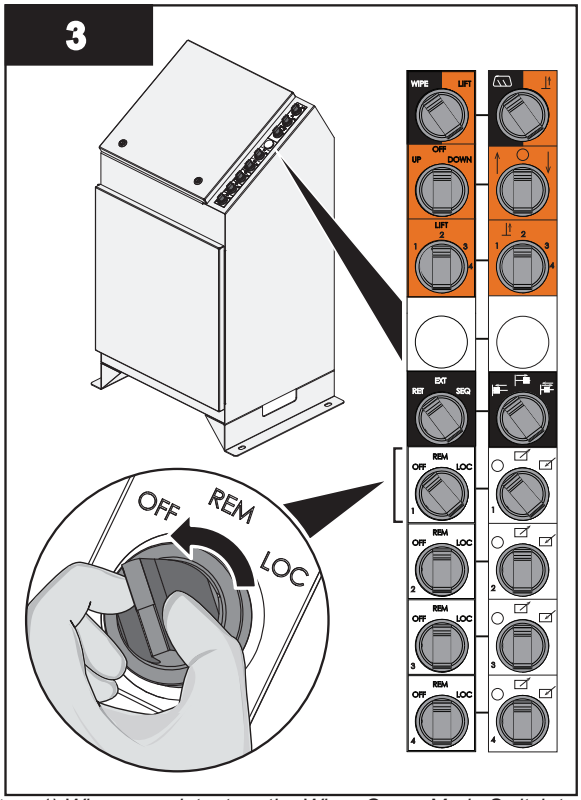
Bleed Wipe Cylinder Circuits



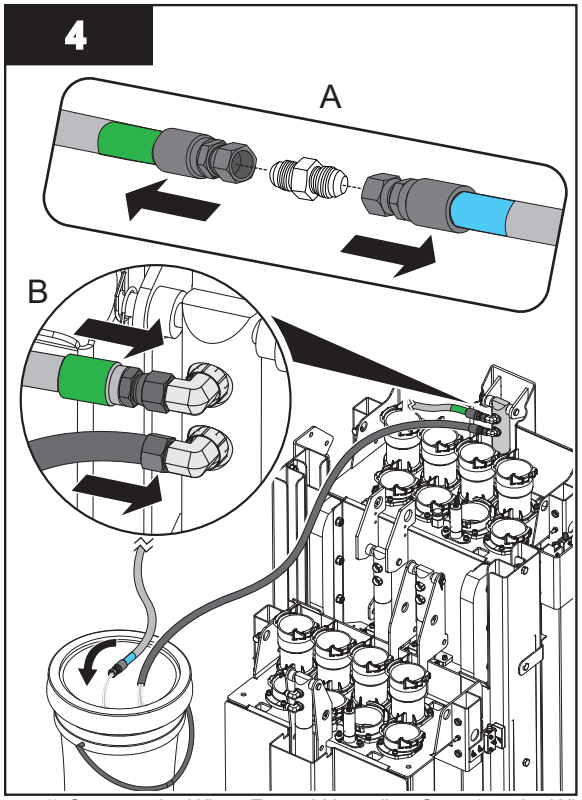
Note: *Disconnect the Wiper Extend Hose (i.e. Green) and Wiper Retract Hose (i.e. Blue) from the Cylinder and connect together with the provided union to create a closed circuit.*



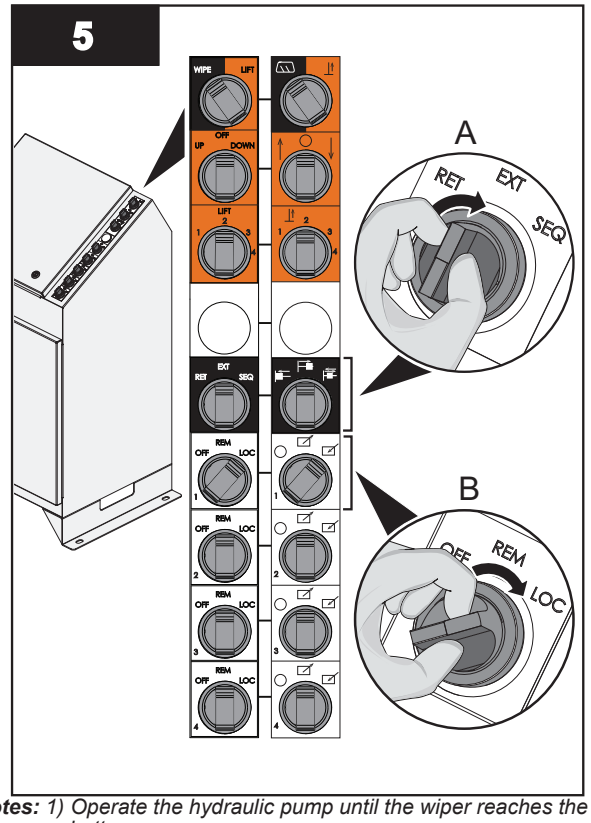
Notes: *1) Bank 1 switch operation is shown as an example only. Select appropriate UV Bank Wiper Group Mode Switch.*
2) Operate the hydraulic pump for 2 minutes or until a solid stream of fluid is coming back into the HSC reservoir.
3) Check hydraulic fluid levels, add fluid as required (Section 9.8.4).



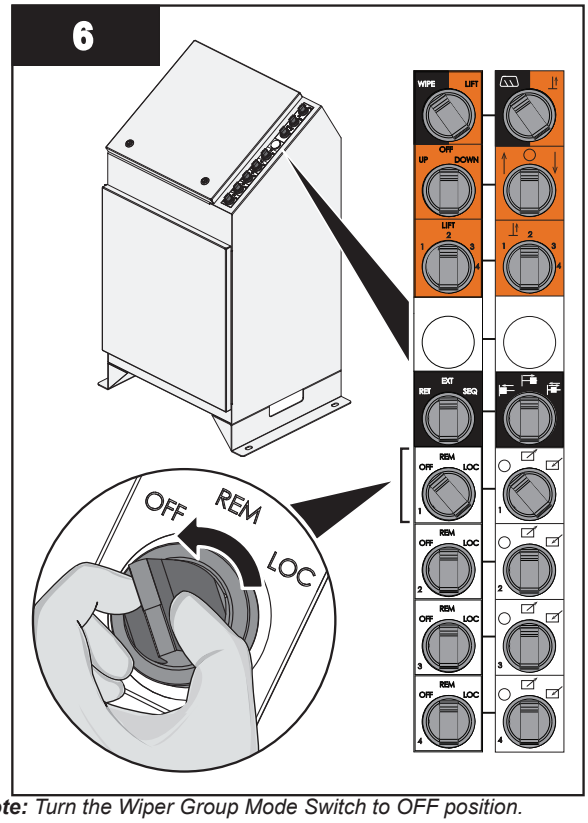
Notes: *1) When complete, turn the Wiper Group Mode Switch to OFF position.*
2) Depressurize the hydraulic circuit. Refer to Section 9.8.2.



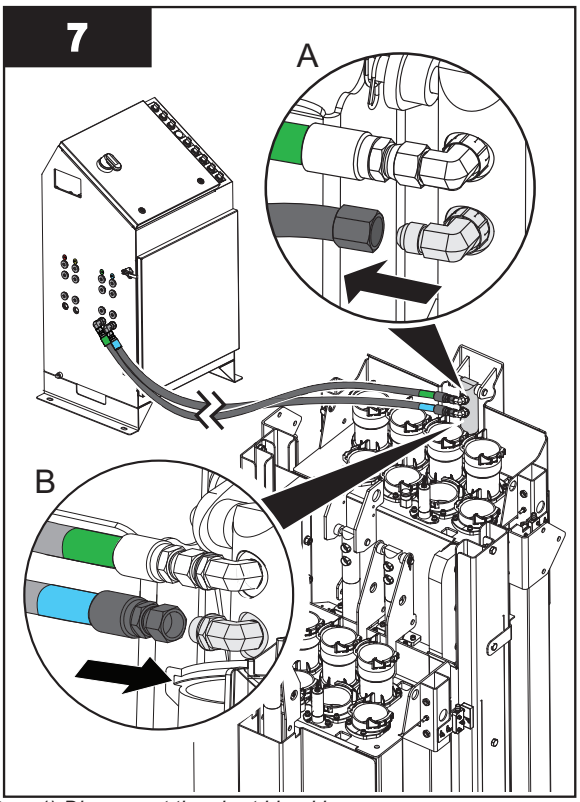
Notes: *1) Connect the Wiper Extend Hose (i.e. Green) to the Wipe Cylinder.*
2) Connect the short bleed hose to the Wiper Retract Fitting on the Wipe Cylinder, route the opposite end to the bucket.
3) Route Wiper Retract Hose (i.e. Blue) to the bucket.



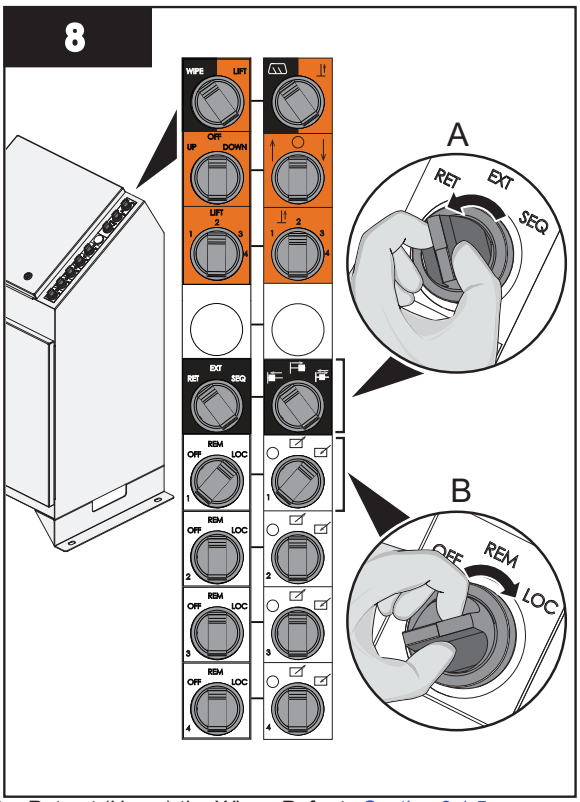
Notes: *1) Operate the hydraulic pump until the wiper reaches the bottom.*
2) Check hydraulic fluid levels, add fluid as required (Section 9.8.4).



Note: *Turn the Wiper Group Mode Switch to OFF position.*



Notes: *1) Disconnect the short bleed hose.*
2) Connect the Wiper Retract Hose (i.e. Blue) to the Wipe Cylinder.



Note: *Retract (Home) the Wiper. Refer to Section 8.1.5.*

9. Repeat steps 1 - 8 for remaining Wipe Circuits.

Post-Requisites:

- Inspect the hydraulic hose and fittings for leaks. If a leak is seen at a hydraulic fitting, tighten the hydraulic fitting.

9.9 Hydraulic Cylinders

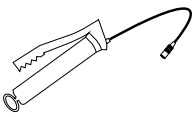
9.9.1 Grease a Wipe Hydraulic Cylinder

Add grease to the wipe hydraulic cylinder during scheduled maintenance or before extended system shutdown and during startup after extended periods of time. The lift hydraulic cylinder does not require to be greased.

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).
- Spray the Lamp Sleeves with clean water.
- Move the wiper plate to below the baffle plate. Refer to Section 8.1.5.
- Lockout Tag Out - HSC and PDC compartment for the associated UV Bank. Refer to Section 4.
- Depressurize the Hydraulic System. Refer to Section 9.8.2.

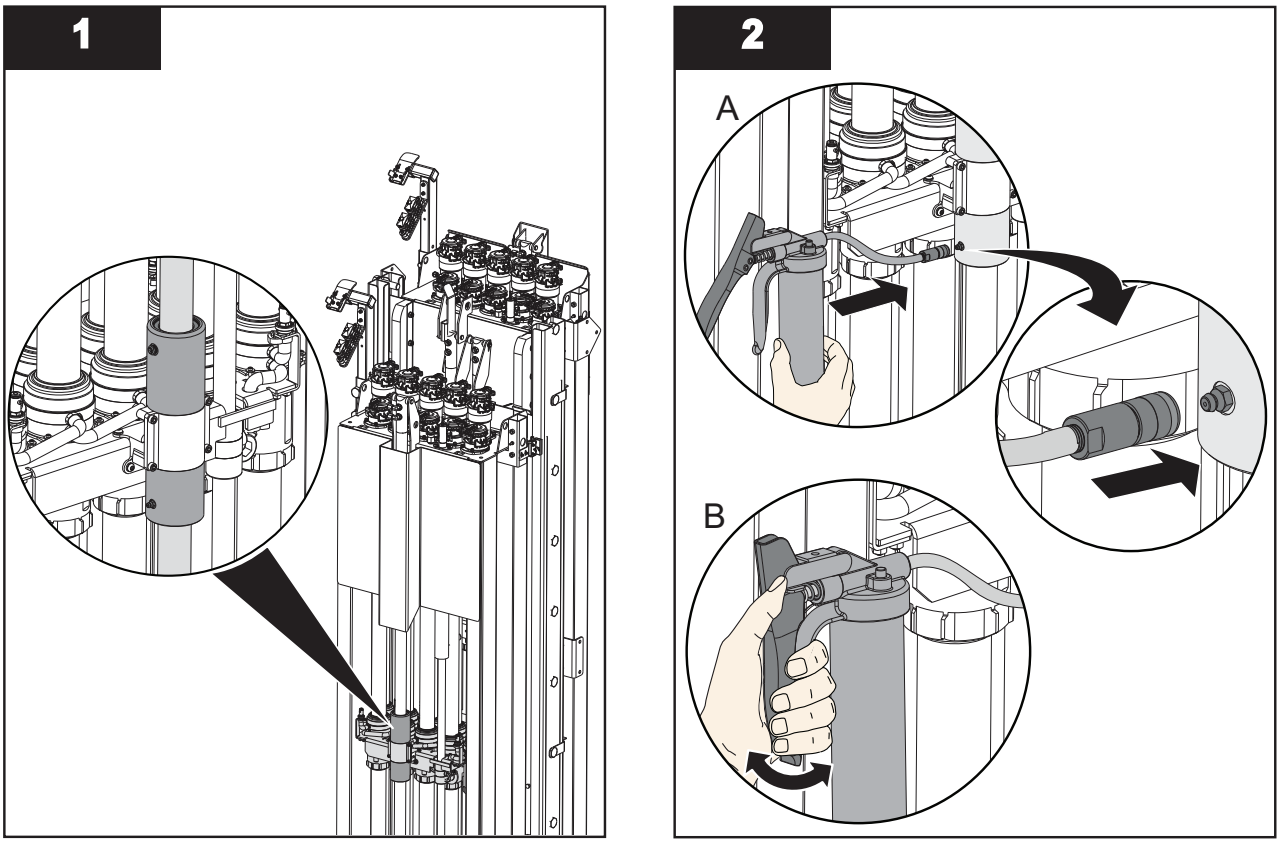
Tools:



Materials:

Procedure:

Grease:



Notes: *1) Support the hydraulic cylinder when greasing to prevent movement.*
2) Clean up excess grease.

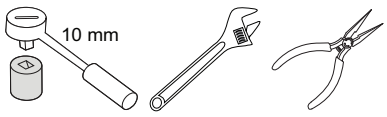
3. Remove the HSC lockout. Refer to Section 4.
4. Complete a full retract and extend of the wiping cylinder.

9.9.2 Remove and Replace Wipe Hydraulic Cylinder

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).
- Spray the Lamp Sleeves with clean water.
- Move the wiper plate to below the baffle plate. Refer to Section 8.1.5.
- Lockout Tag Out - HSC and PDC compartment for the associated UV Bank. Refer to Section 4.
- Depressurize the Hydraulic System. Refer to Section 9.8.2.
- Ensure wiper plate is supported to the UV Bank frame.

Tools:

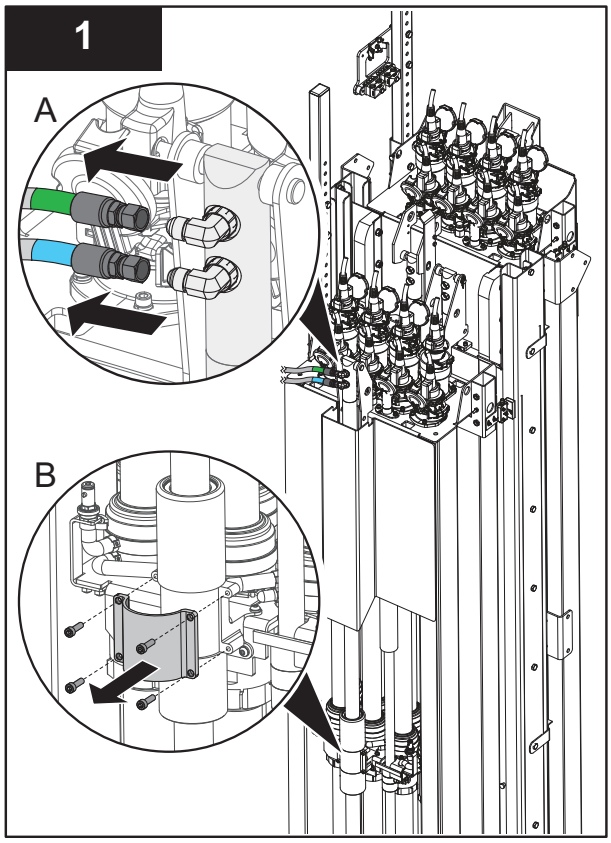


Materials:

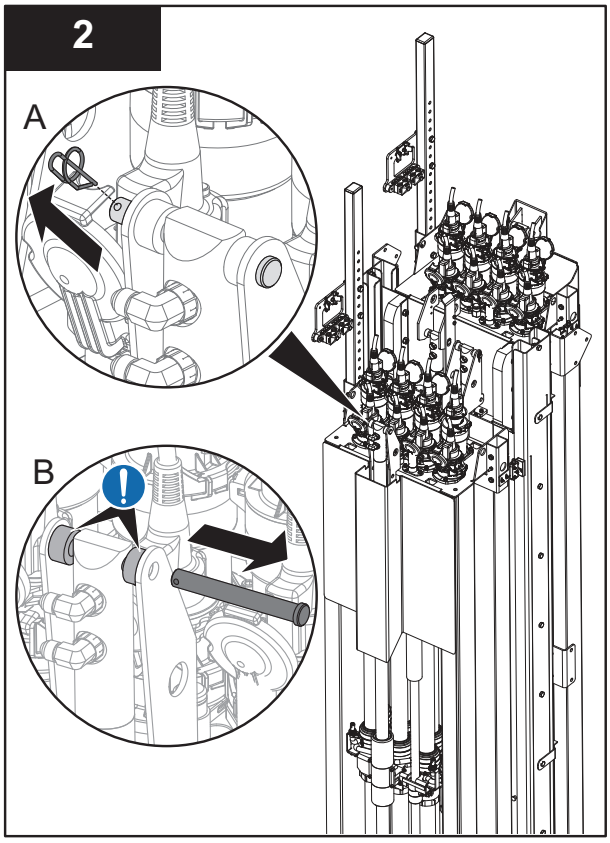
- Cable ties (by others)
- Short Hose (by others)

Procedure:

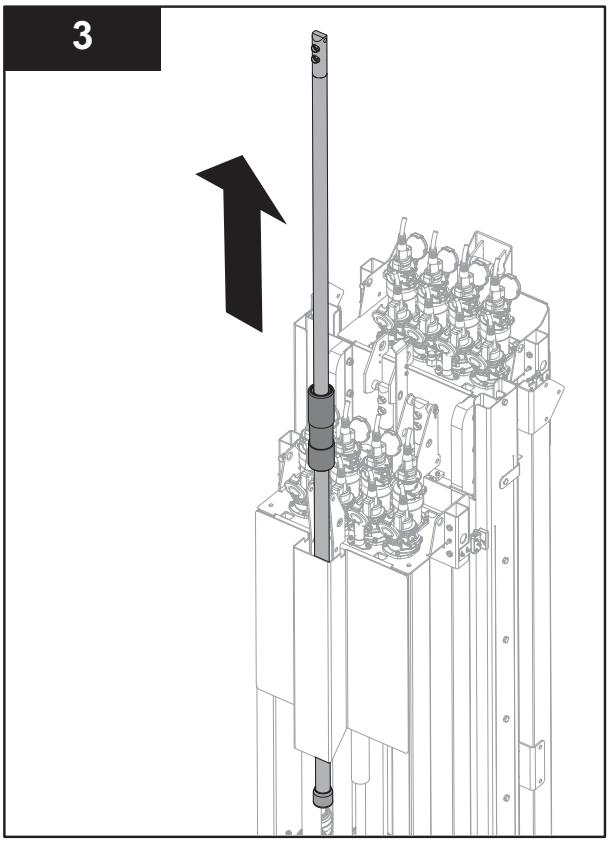
Remove:



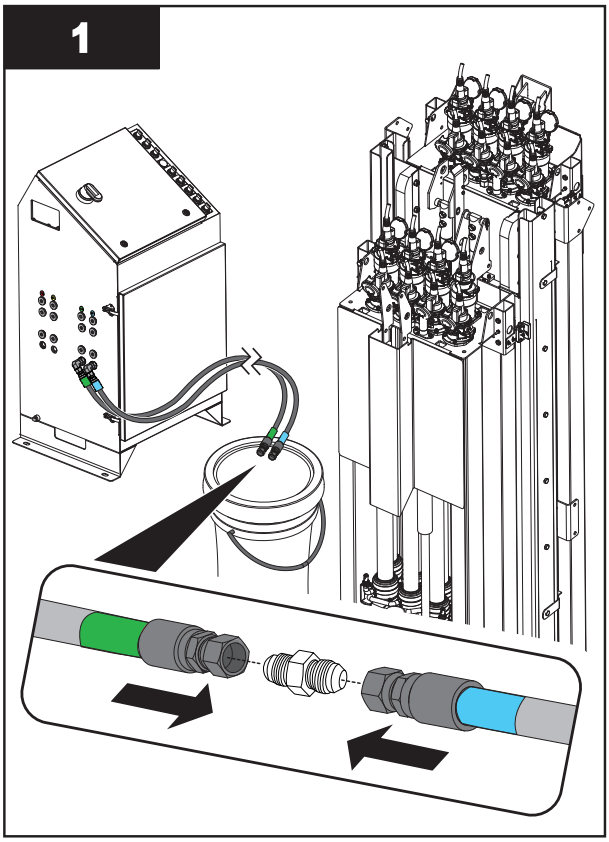
Note: *Place loose hose ends into a bucket.*



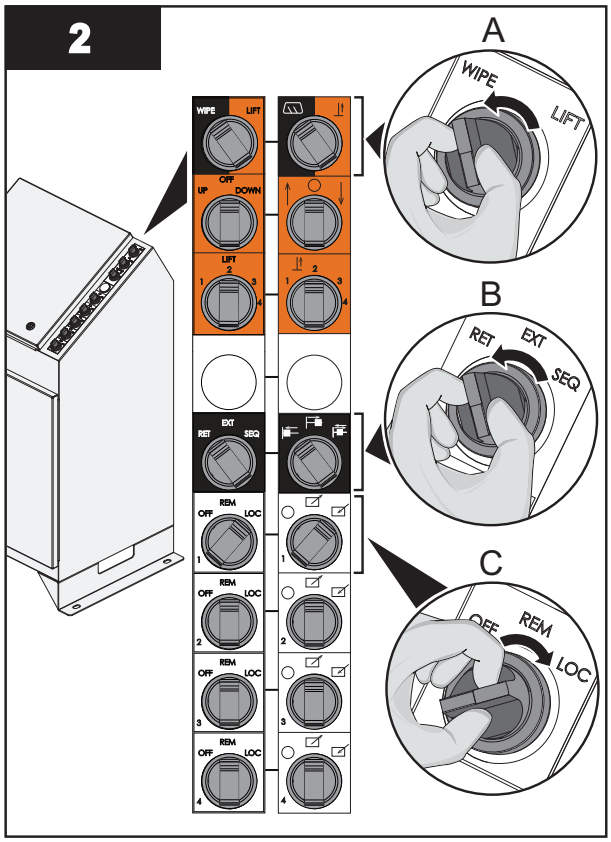
Notes: *1) Do not allow the bushings fall into the UV Channel.*
2) Support the hydraulic cylinder while removing the anchoring pin.



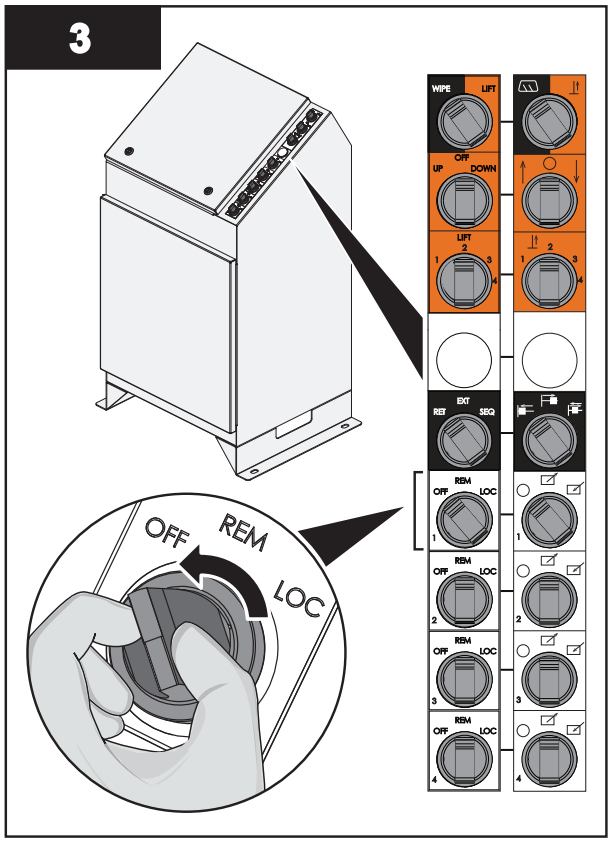
Install:



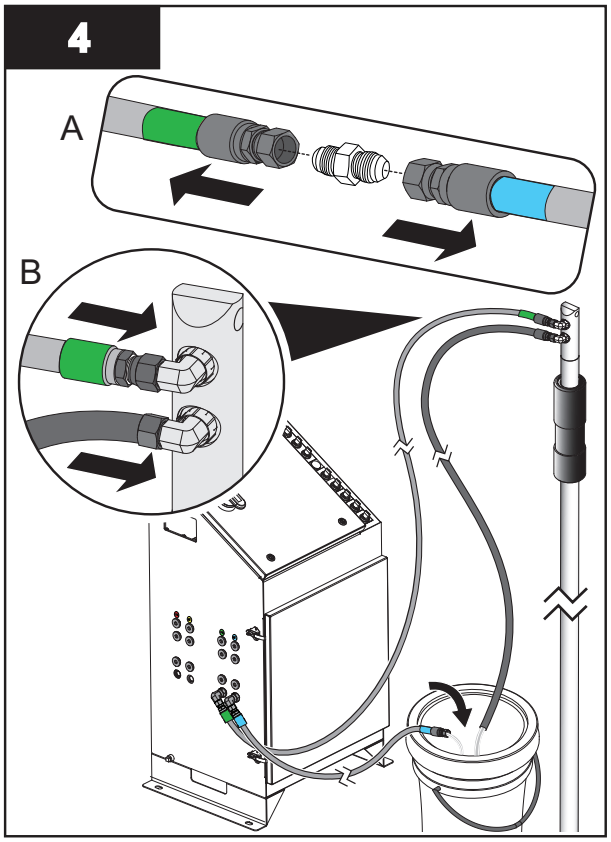
Notes: *1) Connect the Wiper Extend Hose (i.e. Green) and Wiper Retract Hose (i.e. Blue) together with the provided union to create a closed circuit.*
2) Remove the HSC lockout (Section 4).



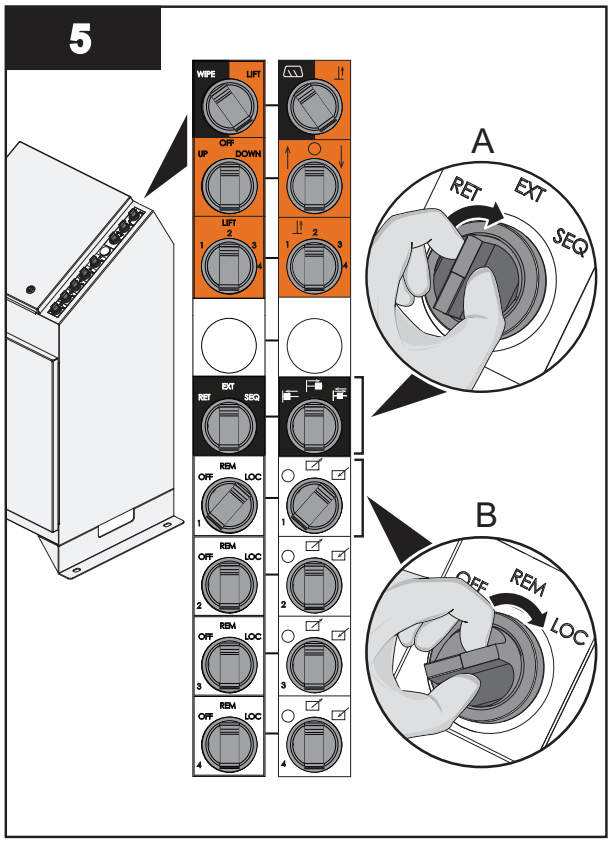
Notes: *1) Bank 1 switch operation is shown as an example only. Select appropriate UV Bank Wiper Group Mode Switch.*
2) Operate the hydraulic pump for 2 minutes or until a solid stream of fluid is coming back into the HSC reservoir.
3) Check hydraulic fluid levels, add fluid as required (Section 9.8.4).



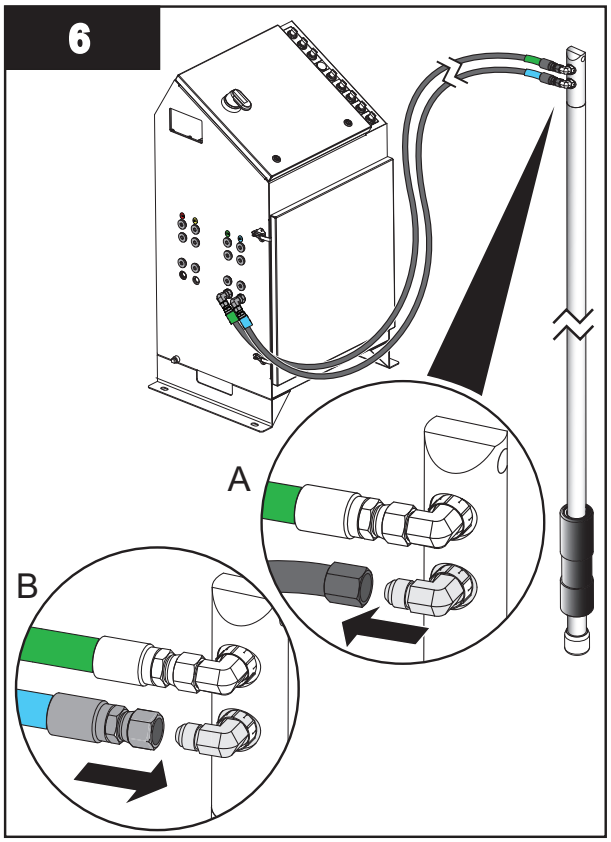
Notes: *1) When complete, turn the Wiper Group Mode Switch to OFF position.*
2) Depressurize the hydraulic circuit. Refer to Section 9.8.2.



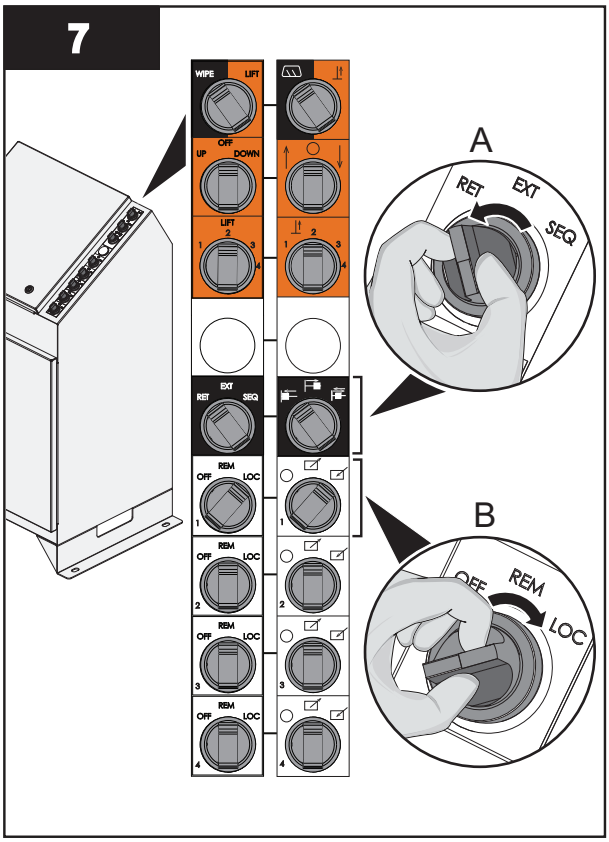
Notes: *1) Connect the Wiper Extend Hose (i.e. Green) to the new Wipe Cylinder.*
2) Connect a short hose to the Wiper Retract Fitting on the Wipe Cylinder and route the opposite end to the bucket.
3) Route Wiper Retract Hose (i.e. Blue) to the bucket.



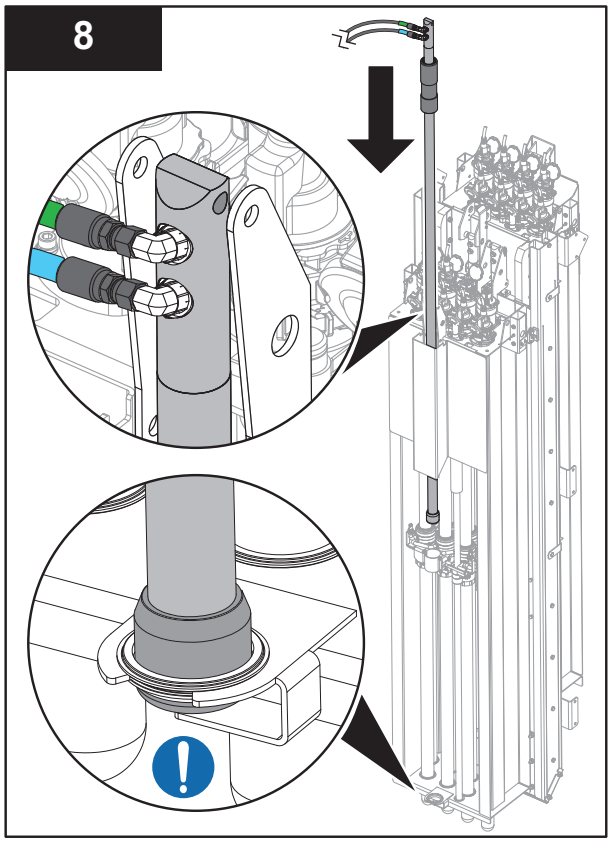
Notes: *1) Operate the hydraulic pump until the follower reaches the bottom.*
2) Check hydraulic fluid levels, add fluid as required (Section 9.8.4).

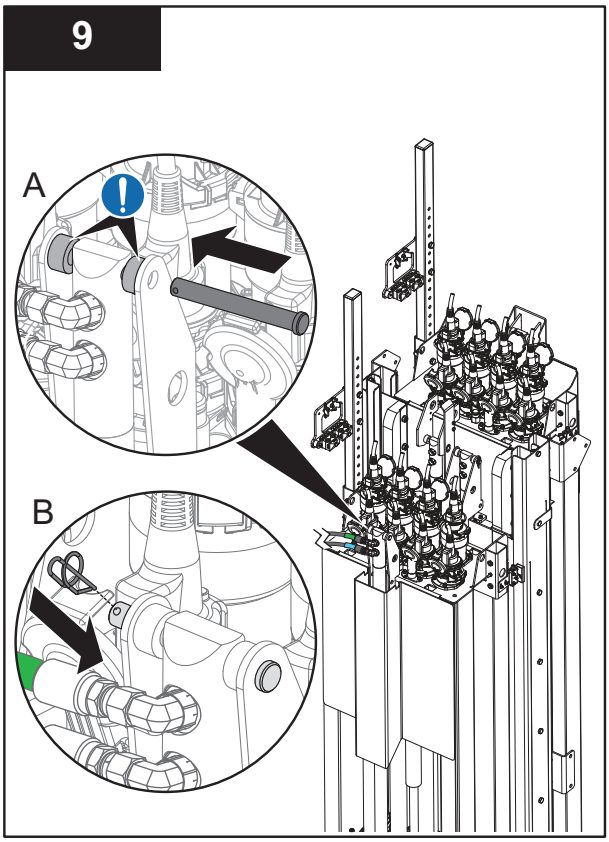


Notes: *1) Disconnect the short hose.*
2) Connect the Wiper Retract Hose (i.e. Blue) to the Wipe Cylinder.

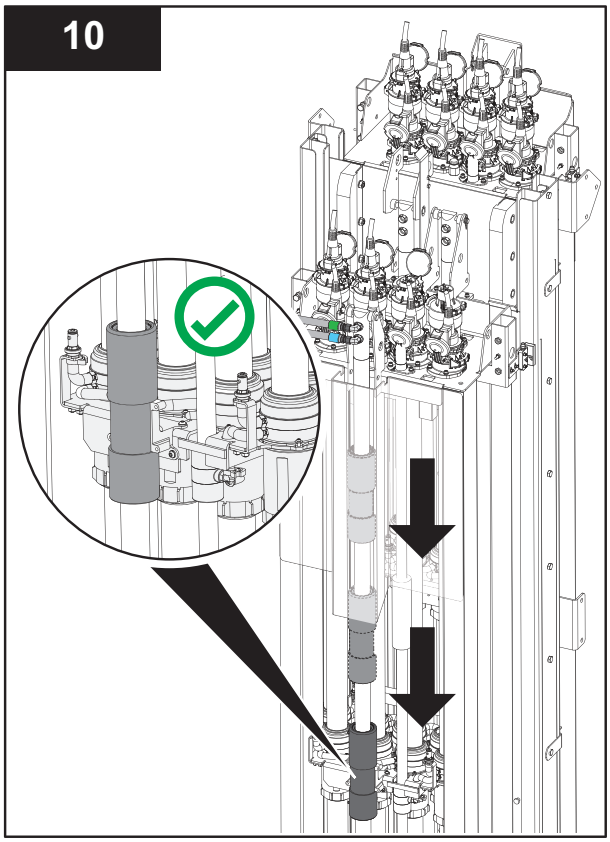


Note: *Operate the hydraulic pump until the follower reaches the top.*

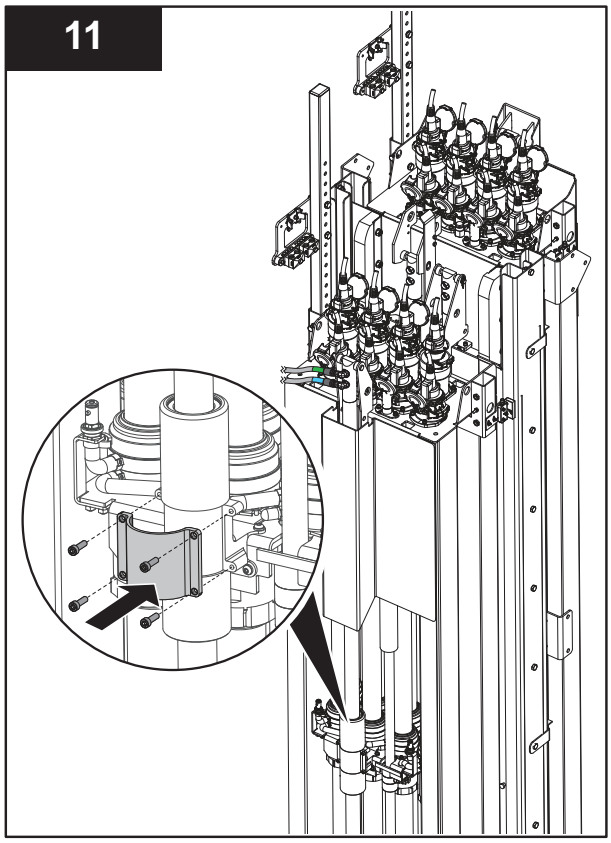




Note: *Carefully place the bushings on each side of the cylinder.*



Note: *Manually move the cylinder follower until it lines up with the wiper plate (Section 8.1.5).*



Note: *Apply anti-seize to the fasteners on wiper plate.*

12. Perform the same procedure for the other cylinder.

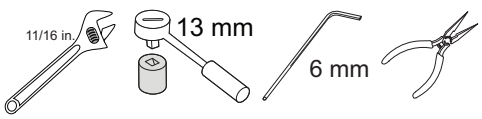
13. Perform prerequisites in reverse order of disassembly.

9.9.3 Remove and Replace Lift Hydraulic Cylinder

Prerequisites:

- Shutdown the UV Bank. Refer to Section 5.2.
- Lift the UV Bank Up - Install the UV Bank locking plates. Refer to Section 8.1.3. Replace grating section(s).
- Lockout Tag Out - HSC and PDC compartment for the associated UV Bank. Refer to Section 4.
- Depressurize Hydraulic System. Refer to Section 9.8.2.

Tools:

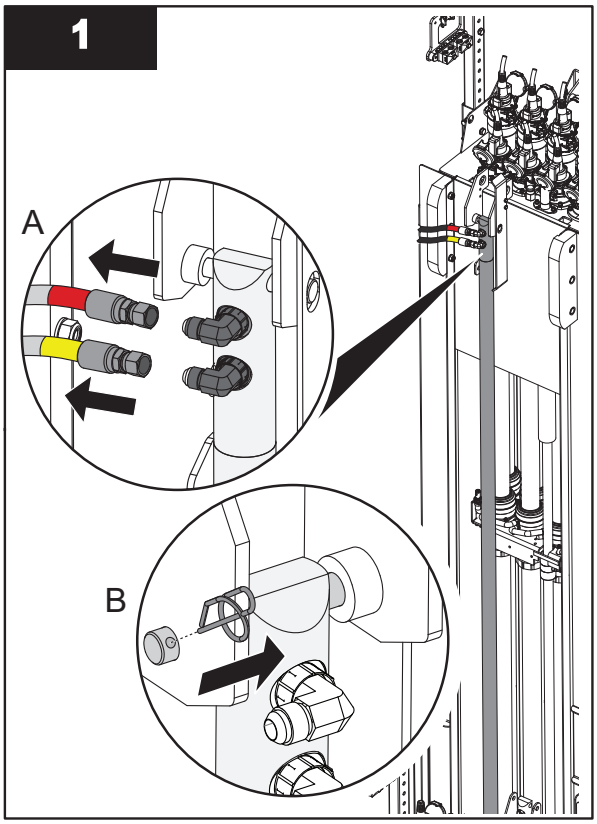


Materials:

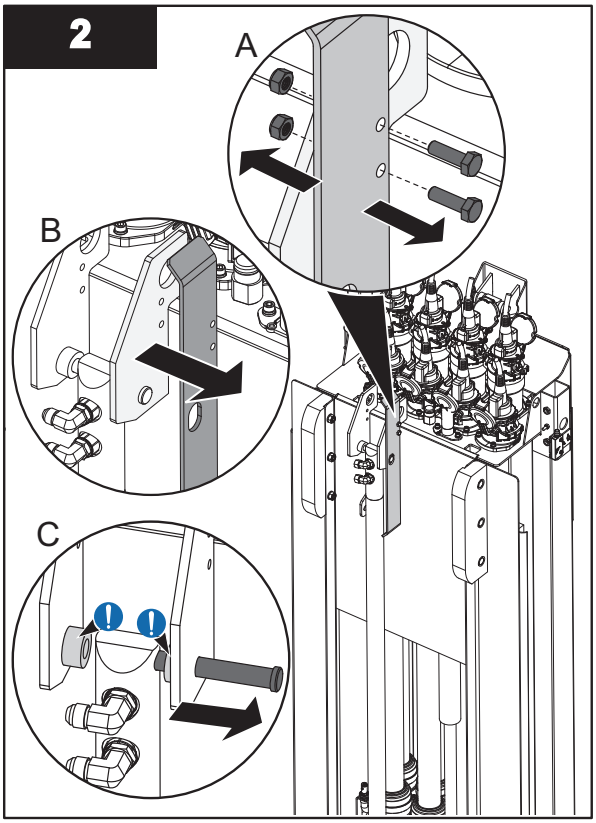
- Short Hose (by others)

Procedure:

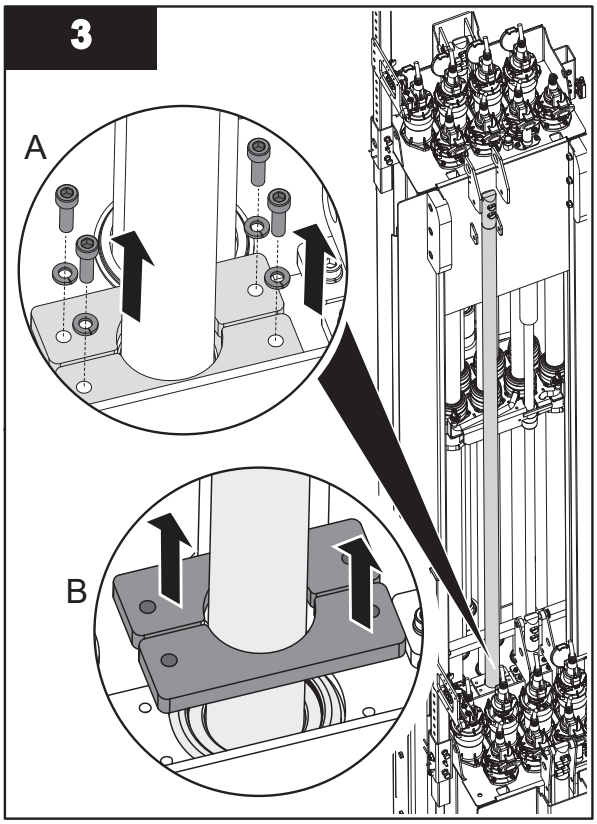
Remove:

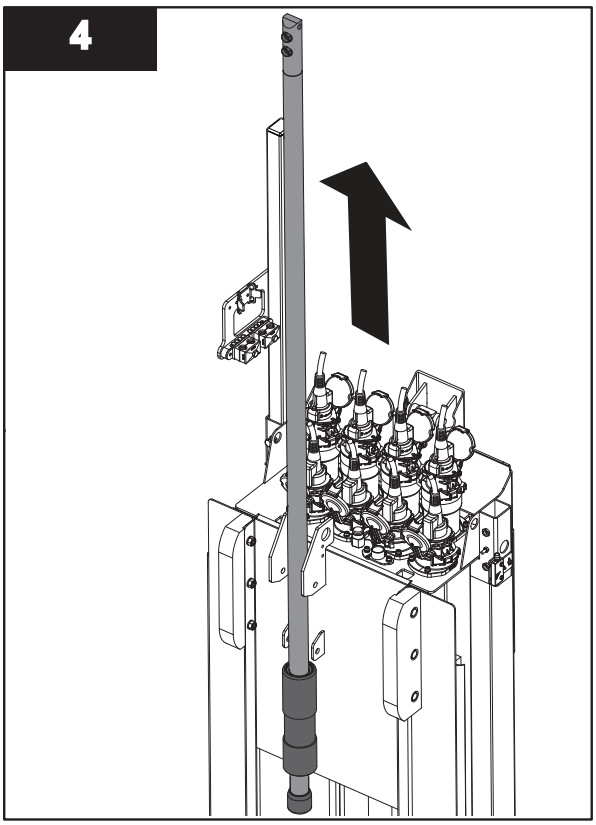


Note: *Place loose hose ends into bucket.*

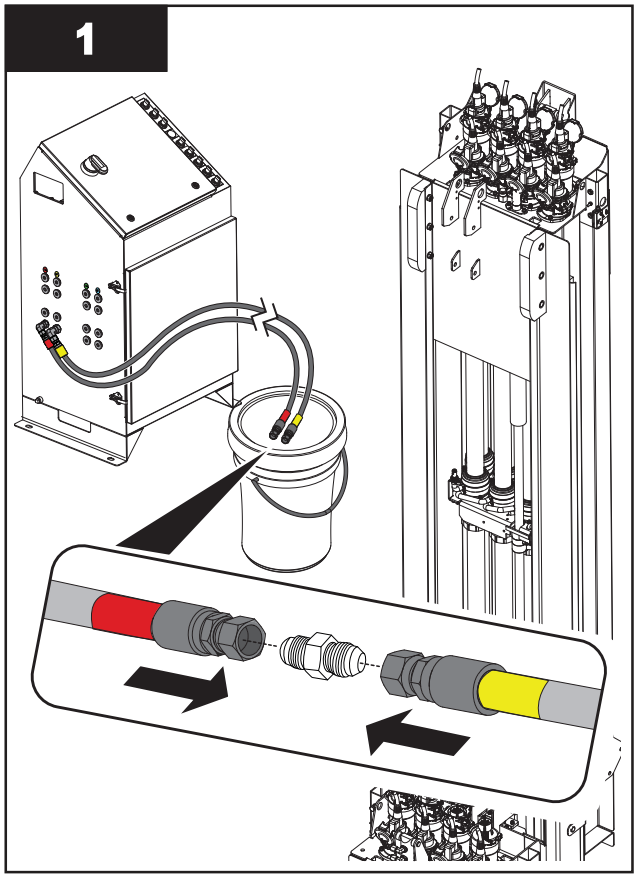


Note: *Do not allow the bushings fall into the UV Channel.*

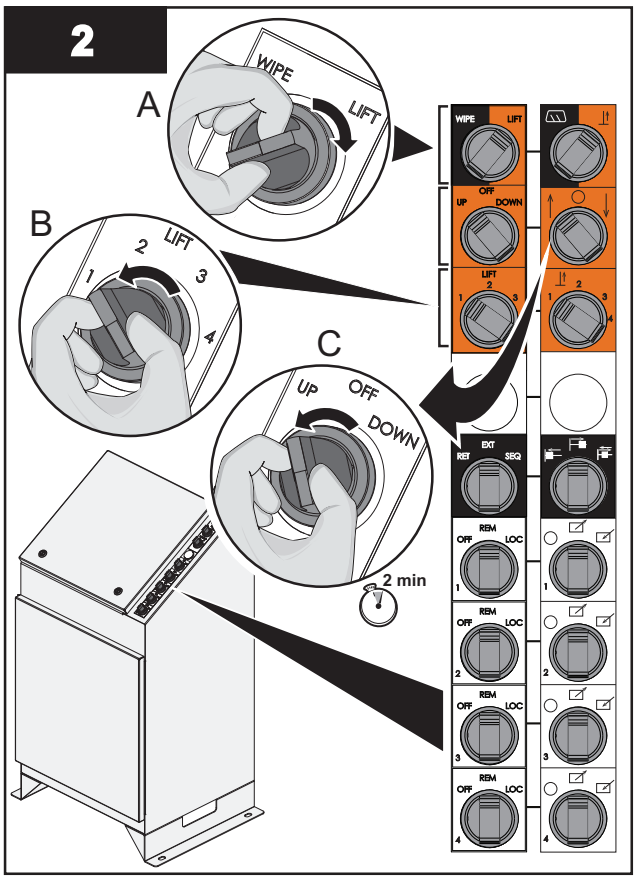




Install:

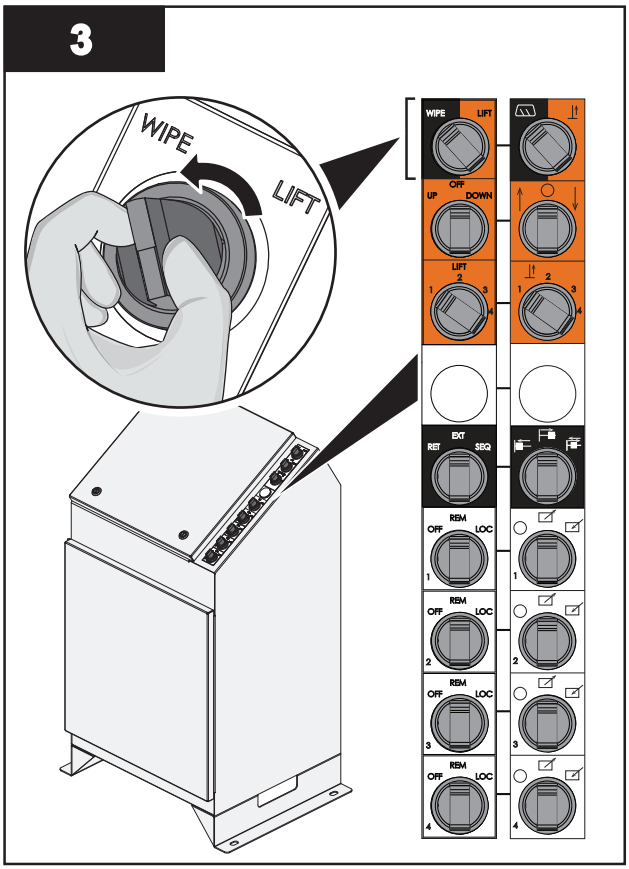


Notes: *1) Connect the Lift Extend Hose (i.e. Red) and Lift Retract Hose (i.e. Yellow) together with the provided union to create a closed circuit.*
2) Remove the HSC Lockout (Section 4).



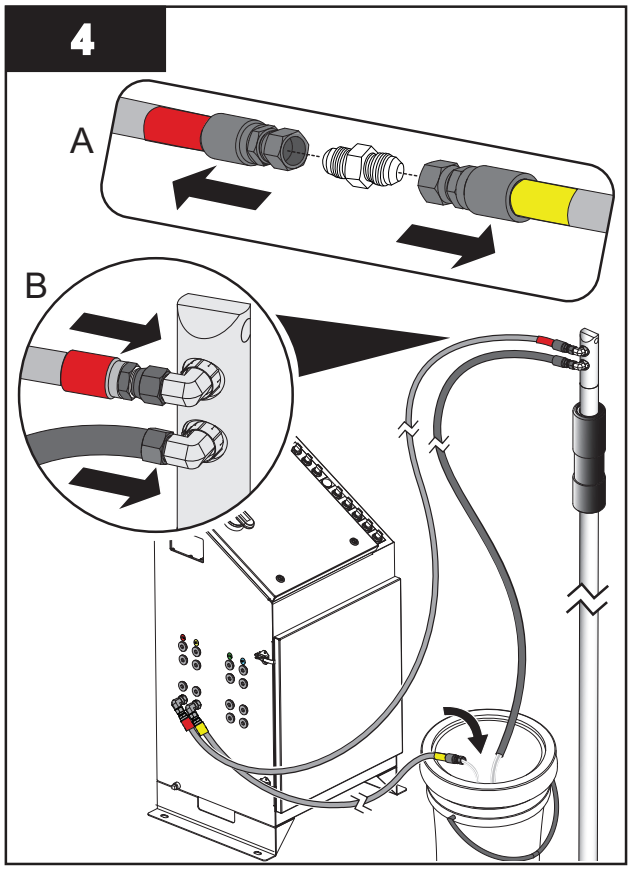
Notes: *1) Bank 1 switch operation is shown as an example only. Select the required UV Bank using the Lift UV Bank Selection Switch.*
2) Operate the hydraulic pump for 2 minutes or until a solid stream of fluid is coming back into the HSC reservoir.
3) Check hydraulic fluid levels, add fluid as required (Section 9.8.4).

3



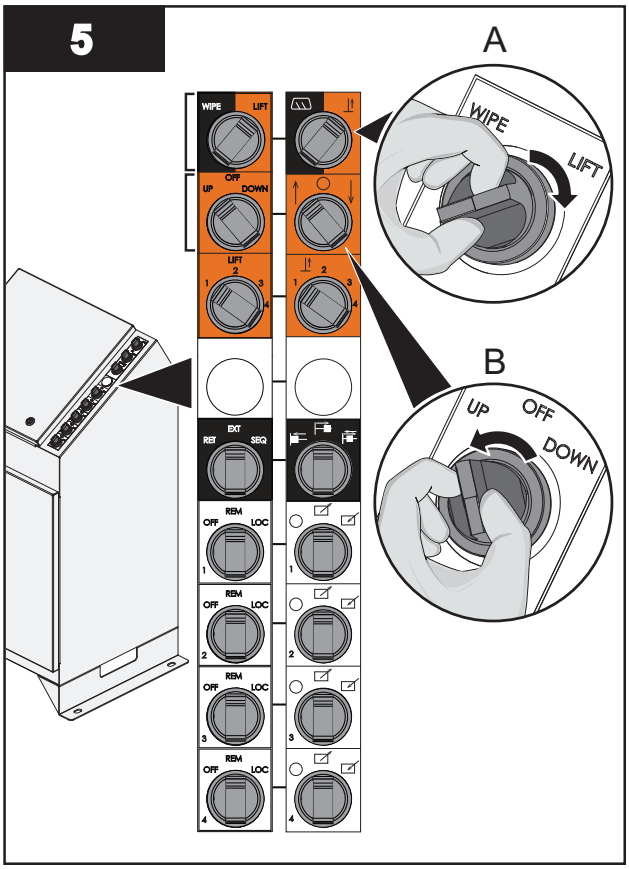
Notes: *1) When complete, turn the wipe/lift switch to the WIPE position.*
2) Depressurize the hydraulic circuit. Refer to Section 9.8.2.

4



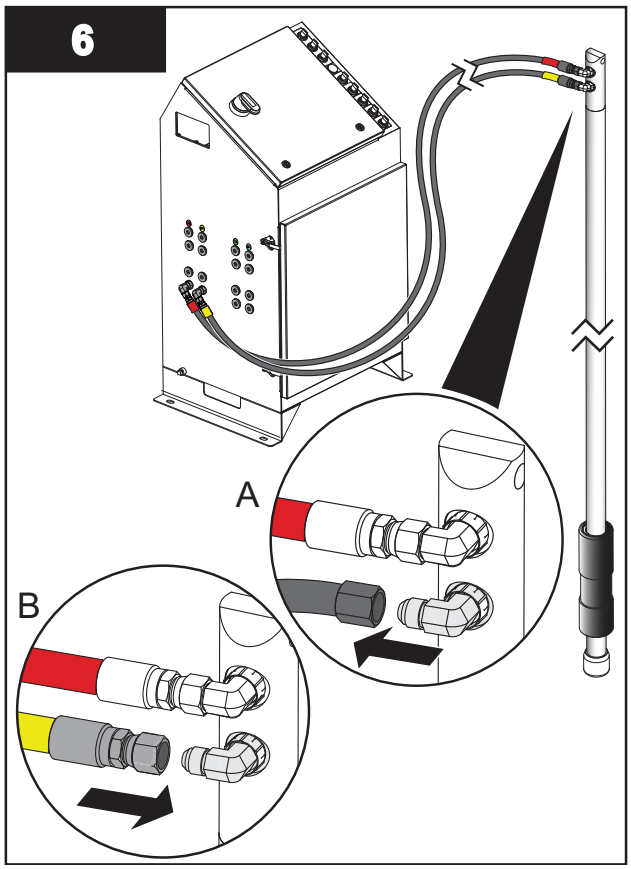
Notes: *1) Connect the Lift Extend Hose (i.e. Red) to the new Lift Cylinder.*
2) Connect a short hose to the Lift Retract Fitting on the Lift Cylinder and route the opposite end to the bucket.
3) Route Lift Retract Hose (i.e. Yellow) to the bucket.

5

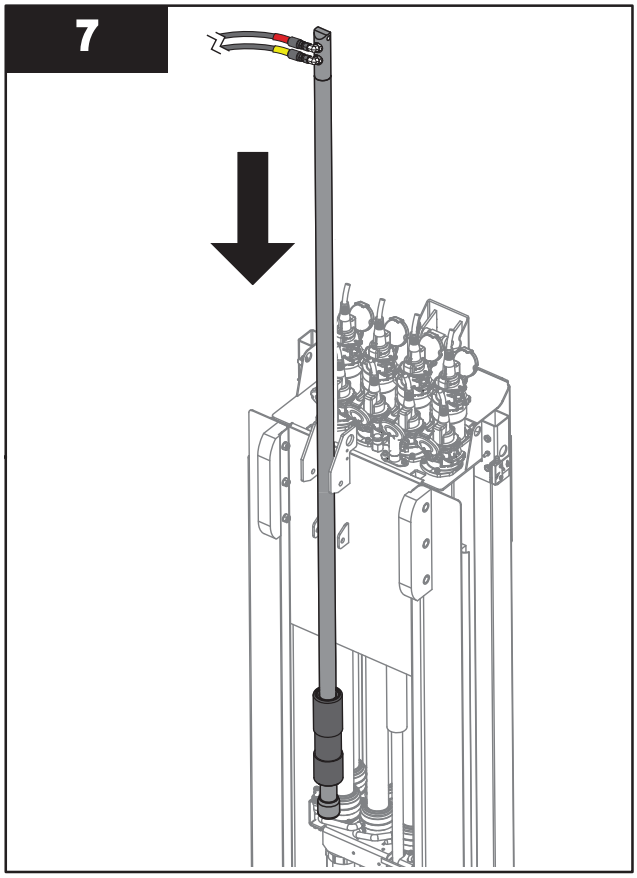


Note: *Operate the hydraulic pump until the follower reaches the bottom.*

6



Notes: *1) Disconnect the short hose.*
2) Connect the Lift Retract Hose (i.e. Yellow) to the Lift Cylinder.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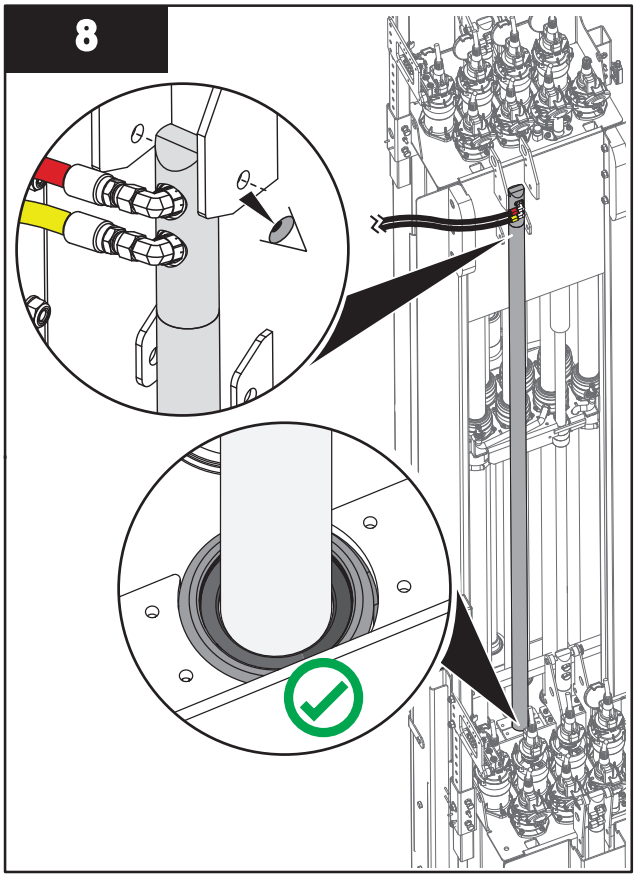
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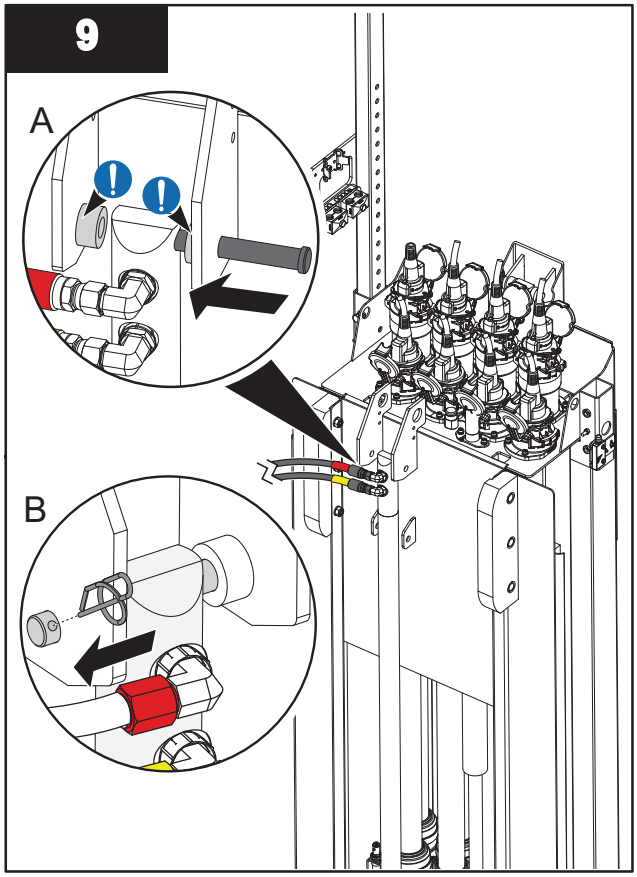
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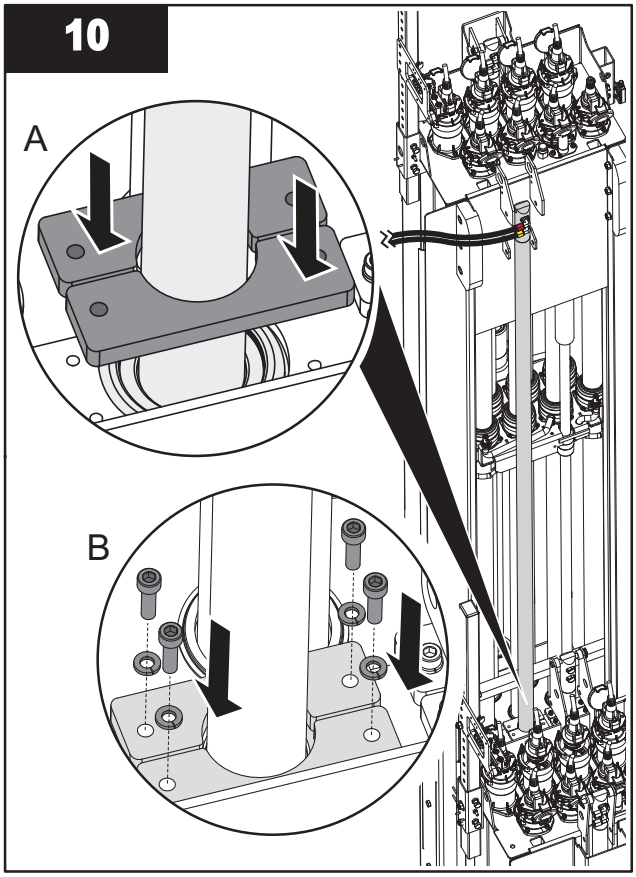
A
B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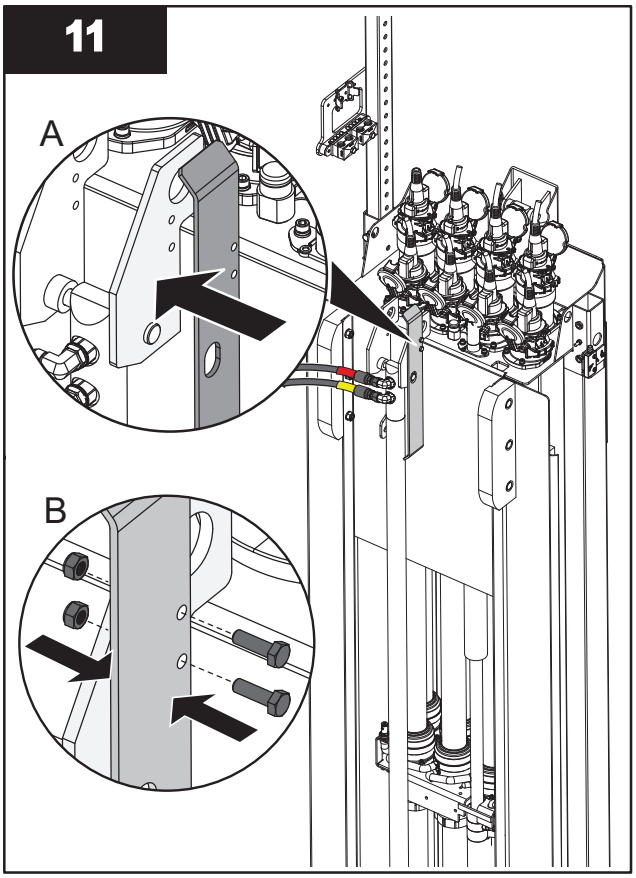
A
B



Notes: *1) Remove the bank locking plates.*
2) Lift the UV Bank down (Section 8.1.3).

9.10 Power Distribution Center (PDC)

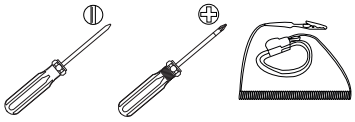
9.10.1 Replace a UV Lamp Driver

The lamp drivers are located inside the PDC. Each lamp driver provides power to two UV lamps.

Prerequisites:

- Disconnect PDC for the associated UV Bank.
- Lockout Tag Out - PDC compartment. Refer to Section 4.
- Wait 5 minutes for stored energy to dissipate.
- Record the number that is selected on each rotary switch on the front panel of the lamp driver (address switches).

Tools:

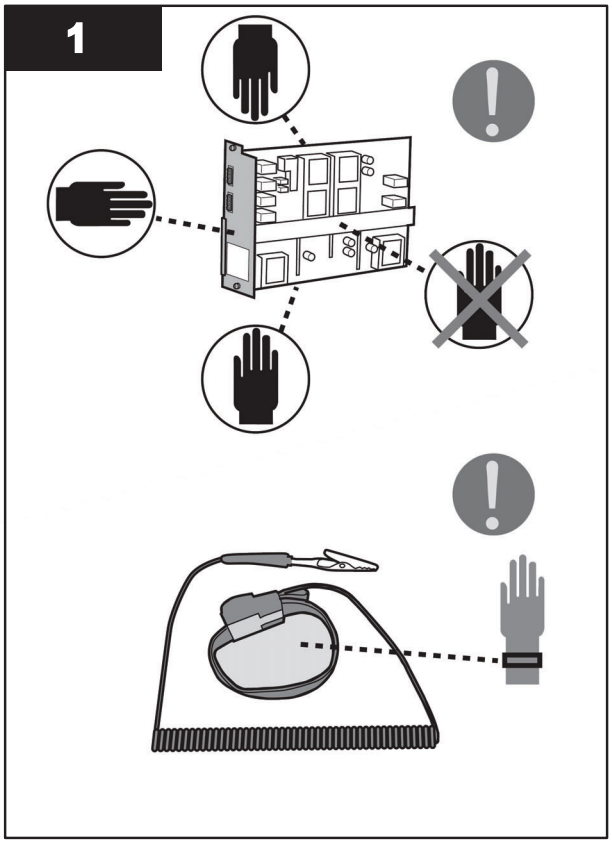


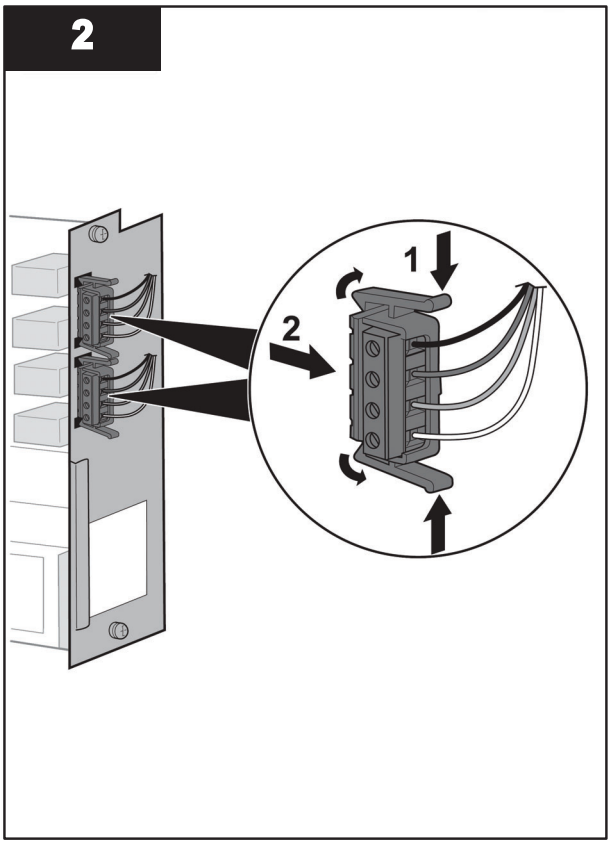
Materials:

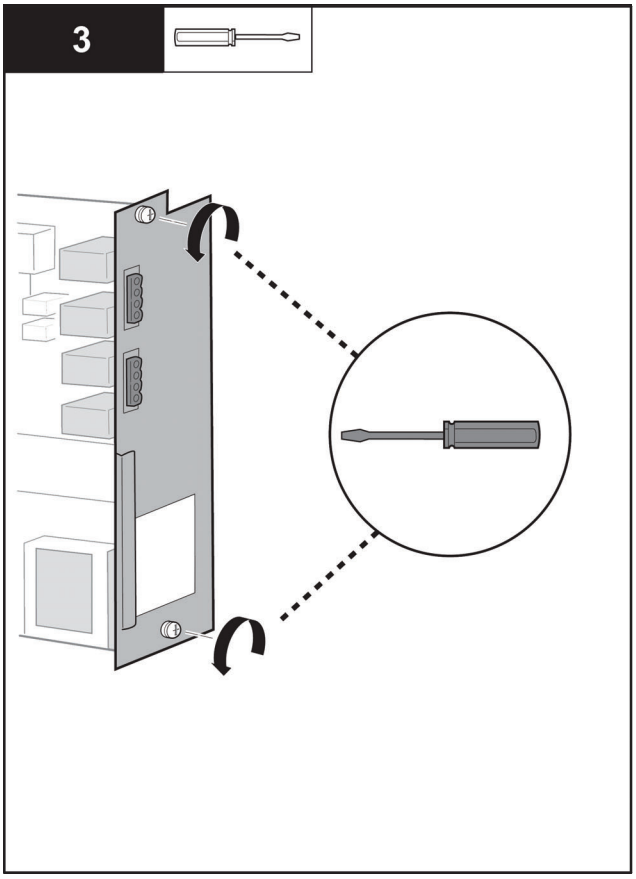
- New Lamp driver

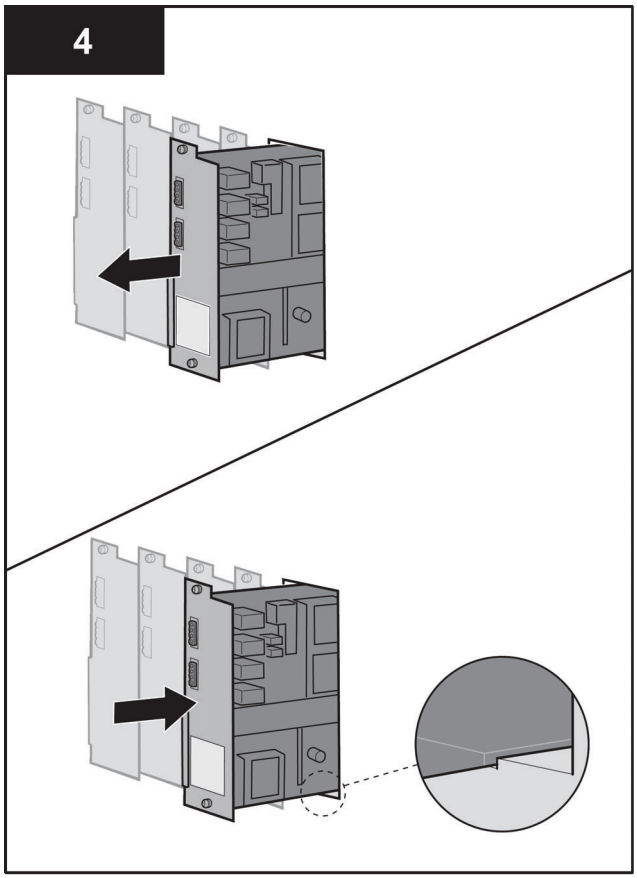
Procedure:

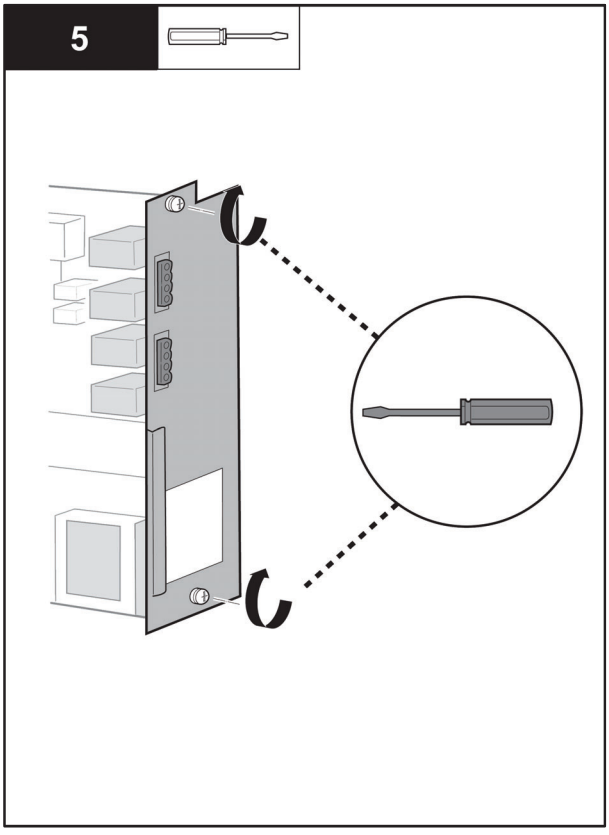
Remove / Replace:

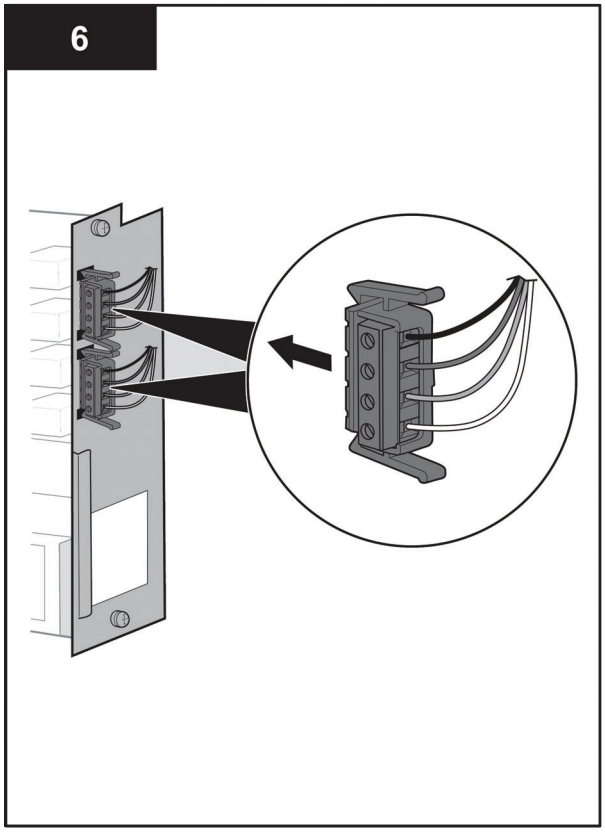




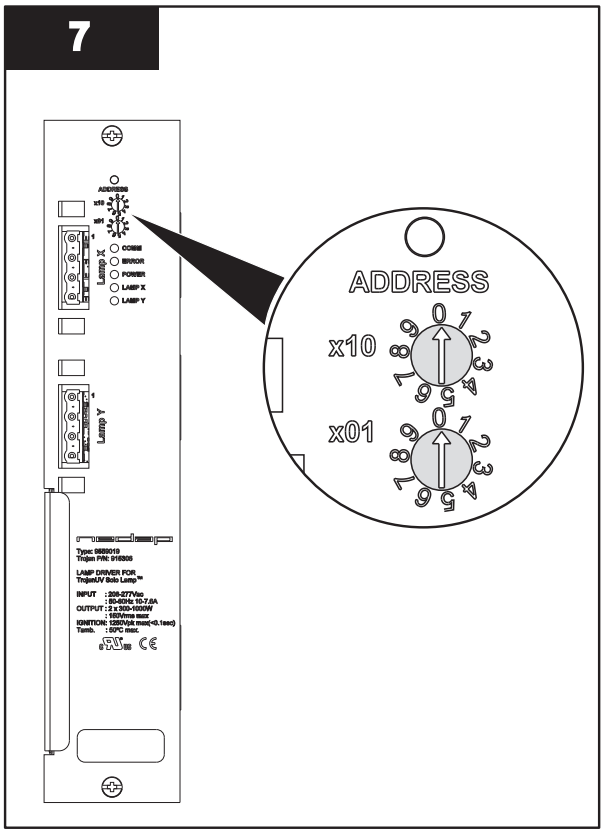








Note: *Verify the connector is fully engaged.*



Note: *Change the Rotary Switch addresses on the new Lamp Driver to match the addresses on the removed Lamp Driver.*

When service is complete, assemble the prerequisites in the reverse order of the disassembly.

9.10.2 Clean the AC Filter

Materials:

Procedure:

1. Push or pull to slide the filter out from either side of the Air Conditioner unit.
2. Flush the filter with warm water from the exhaust side to the intake side.

   Note: *DO NOT use caustics.*
3. Allow filter to dry completely prior to installation.

   Note: *Place the corner down to assure that water completely drains.*

Section 10 Troubleshooting

⚠ DANGER

Obey all warning and caution statements. Refer to Section 2.

Read and understand this Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

NOTICE

Injury or damage to the equipment caused by incorrect testing or maintenance is not covered under the warranty of the manufacturer and is the responsibility of the individual doing the troubleshooting. If there is any question about a procedure, contact your local Service Provider before doing the procedure.

Current active alarms are shown in the Alarm Status screen. The 100 most recent alarms that need attention are listed. Once an alarm condition is corrected, the alarm is removed from the list.

An archived history of alarms is shown in the Alarm History screen. The last 100 alarms are listed in the alarm buffer. When the buffer is full, the oldest alarm will be deleted from the archive.

All UV system alarms are displayed on the alarm status screen when active. Most of the standard alarms are divided into three categories: critical (Table 15), major (Table 16) and minor (Table 17). Delay times for many alarms are user-adjustable.

For the best system operation, correct every alarm condition as it occurs.

When an alarm occurs, the UV system does what is necessary to:

- Keep the UV dose at the target UV dose (when in SCC AUTO mode)
- Prevent damage to the UV lamps, the PDC and the HSC

10.1 Resolving Alarms

10.1.1 Latched Alarms

To resolve latched alarms:

1. Resolve the cause of the latched alarm.
2. Reset the latched alarm:
   a. For PDC and UV Bank latched alarms (Section 8.3.4.5).
   b. For Inlet Gate latched alarms (Section 8.3.3.2).
   c. For Outlet Gate latched alarms (Section 8.3.3.3).
   d. For Not Enough Healthy Banks (NEHC) latched alarms (Section 8.3.2.4).
   e. For HSC and Wiper latched alarms (Section 8.1.6).

10.1.2 Non-Latched Alarms

To resolve non-latched alarms:

1. Resolve the cause of the alarm. Once the cause is removed, the alarm will resolve automatically.

10.2 SCC Alarms

10.2.1 Critical Alarms

Indicates that immediate attention is required. The UV system will partially or completely shut down until the fault is cleared. Alarms may be latched and require a reset from the HMI after the alarm condition is remedied.

Table 15 Critical Alarms

Alarm Description	Description
Bank Low Water Level	The water level sensor has detected a low water level condition. All banks with an active low water condition will be automatically shutdown.
Bank Not In Place (Latched)	The bank not in place proximity sensor indicates that the bank is not in place within the channel. At the relevant Bank Overview Screen, Reset the UV Bank Latched alarm (Section 8.3.4.5).
Channel Water Level Signal Fault	The 4-20 mA signal from the channel water level sensor is below 2 mA or above 20.5 mA.
Inlet gate fail to start opening (Latched)	The inlet gate has been requested to open but has failed to start opening. After the cause has been resolved, reset the Inlet Gate latched alarm (Section 8.3.3.2).
	The inlet gate is commanded to open but the Closed Limit Switch remains closed. After the cause has been resolved, reset the Inlet Gate latched alarm (Section 8.3.3.2).
PDC High Temperature Shutdown (Latched)	The PDC temperature has increased above the maximum limit of 55°C (130ºF). Once the heat has dissipated the secondary alarms will need to be reset. Reset the NEHC latched alarm (Section 8.3.2.4). Reset the UV Bank Latched alarm (Section 8.3.4.5).
SCC Run on UPS (optional)	The UV System has experienced a power loss and the SCC is operating on the UPS battery which will allow the Operator to shutdown the UV system properly.

10.2.2 Major Alarms

Indicates that immediate attention is required, otherwise damage may occur or performance may be compromised. The UV system does not shutdown, however, control actions may be taken to achieve proper equipment operation.

Table 16 Major Alarms

Alarm Condition	Description
Bank configuration mismatch	Bank and HMI settings do not match.
Channel High Water Level	Channel water level is above the high set point.
Controller Fault	A PLC controller/module fault exists.
Flow Meter Fault	The current measure flow rate has dropped below the configured alarm limit for the configured alarm delay time.
High Flow - Out of Validation Range	Check Validation Range mode only – Flow is above High Flow Validation Range Set Point.
HSC Hydraulic Tank Low Level (Latched)	The fluid low level switch has detected low hydraulic fluid within the HSC reservoir. Reset the HSC latched alarm (Section 8.1.6).
HSC Pump Fault (Latched)	The hydraulic pump fails to turn on/off when requested. After the cause has been resolved, reset the HSC latched alarm (Section 8.1.6).
Inlet Gate Fail to Close (Latched)	Gate is commanded to close but the Open Limit Switch is not closed. After the cause has been resolved, reset Inlet Gate latched alarm (Section 8.3.3.2).

Table 16 Major Alarms

Alarm Condition	Description
Inlet Gate Fail to Open (Latched)	Gate is commanded to open but the Open Limit Switch is not closed. After the cause has been resolved, reset Inlet Gate latched alarm (Section 8.3.3.2).
Inlet Gate Fail to Start Closing (Latched)	Gate is commanded to close but the Open Limit Switch remains closed. After the cause has been resolved, reset Inlet Gate latched alarm (Section 8.3.3.2).
Low Flow	Flow has dropped below the validated limit.
Low UV dose	Current calculated UV dose has dropped below the alarm limit entered on the Dose settings screen. The alarm limit is the percentage of the design dose that triggers the alarm. ***Note:*** *The system will request any available UV Banks to operate at 100% power. If the Low UV Dose alarm continues, reset the NEHC latched alarm or NEHB alarms (Section 8.3.2.4).*
Low UVT – Out of Validation Range	Check Validation Range mode only – UVT is below Low UVT Validation Range Set Point.
Multiple Lamp Failure (Latched)	Number of lamps failed equal or exceeds multiple lamp fail set point. After the cause has been resolved, reset UV Bank latched alarm (Section 8.3.4.5).
Not Enough Healthy Banks Available	The number of banks required to meet system dose are not available in the channel.
Not Enough Healthy Channel (NEHC) (Latched)	Not enough “healthy” channels of UV equipment available to ensure proper system performance. The controller will try to open all available channels (if slide gates are controlled) and turn on all available banks (all non-faulted banks, and banks with multiple lamps, multiple lamp driver or module communication faults) at full power. After the cause has been resolved, reset the NEHC latched alarm (Section 8.3.2.4).
Not Enough Healthy Lamps	All Banks lamps have failed to turned ON.
SCC-HSC Communication Fault	A HSC is not responding to polling from SCC.
SCC-PDC Communication Fault	A BCB is not responding to polling from the SCC.
UVI Sensor Fault	The signal from the Bank UVI sensor is faulted. • For Analog Sensor(s) - The Analog Signal is below 2mA • For Digital Sensor(s) - The UVI Sensor is not communicating with the BCB.
UVI Sensor lower than expected fault (SBC) (Latched)	UV Intensity reading is lower than expected. After the cause has been resolved, reset UV Bank latched alarm (Section 8.3.4.5).
UVT meter fault	UVT analog signal below 2 mA or above 20.5 mA.
Weir Gate Fail to Move (Latched).	Gate is commanded to move but gate position not changing. After the cause has been resolved, reset the outlet gate latched alarm (Section 8.3.3.3).
Weir Gate Fault.	Gate is sending a discrete input that it is faulted. This could mean over-torque or other internal device failures.
Weir Gate Not in Remote Auto.	Weir gate is not in Remote Auto
Wiper Group Jammed (Latched)	The high pressure signal has been energized before the minimum wiper travel time, while the wiper is moving. After the cause is resolved, reset the HSC latched alarm (Section 8.1.6).
Wiper Travel Time Exceeded (Latched)	The wiper has exceeded the maximum travel time while retracting or extending. After the cause is resolved, reset the HSC latched alarm (Section 8.1.6).

10.2.3 Minor Alarms

Indicates that the UV system requires maintenance but it is operating in compliance. Alarms are not latched and no reset is required. No other actions will be taken.

Table 17 Minor Alarms

Alarm Condition	Description
Bank Low Water Level Warning	Channel water level is below the low mechanical set point for less than the low water alarm time.
Bank Not In Remote Auto	The bank mode is not in remote auto and/or the PDC mode selector switch is not set to remote.
BCB DIP switch Mismatch Alarm	The BCB DIP switch setting does not match the expected value. Refer to Electrical Drawings for correct DIP Switch settings.
Channel Design Flow Exceeded	Channel Flow exceeds the maximum and wipe process will be inhibited.
Channel Flow Limit for Wiping exceeded	Channel Wipers Remote Wipe inhibited.
Channel Maximum Flow Velocity Exceeded	Channel Flow exceeds the maximum flow velocity set point.
Controller Low Battery	PLC low battery light has illuminated on the PLC.
Flow Meter Override Value Used	Manually entered Flow Override value is being used.
High UVT – Out of Validation Range	Check Validation Range mode only – UVT is above High UVT Validation Range Set Point.
HSC Remote Wipe Inhibited	Conditions exists that will not allow a remote wipe of any HSC wiper groups.
Inlet Gate Not In Remote Auto	Gate is not in Remote Auto.
Lamp Driver Communication Failure	Indicates a communication failure between the BCB and lamp driver(s).
Lamp Driver Failure	Indicates a lamp driver has failed.
Lamp Failure	One or more lamps have failed.
Lamp Lifetime Exceeded	One or more of the lamps in the system have exceeded the lamp lifetime set point.
Lift attempted with lamps energized	The UV Bank has been manually requested to lift while the UV Lamps in that UV Bank are energized.
Low Flow – Out of Validation Range	Check Validation Range mode only – Flow is below Low Flow Validation Range Set Point.
Low UVT Alarm	UVT is below preset low limit set point.
PDC Fan Failure	The PDC fan has a fault, has 2 or more fans failed as indicated by a BCB input.
PDC High Temperature Warning	Warning that the PDC cabinet temperature is increasing.
SCADA Fault	The Plant SCADA network has stopped communication with the PLC for 20 seconds.
SCC Power Restored	SCC power has been restored.
System In Transition	Low dose masked.
System Power On Reset*	System has experienced a power on reset condition.
UPS Fault*	The UPS backup for the SCC has a fault.
UVI Sensor Fault (Non-SBC)	No control action taken.
UVI Sensor Lower Than Expected Warning (Non-SBC)	Inhibits requests from the BCB to initiate a remote wipe of the bank.
UVI Sensor Reference Check Active	A UVI Sensor Reference Check is currently being performed on the bank.

Table 17 Minor Alarms

Alarm Condition	Description
UVI Sensor Reference Check Required	The UVI Sensor Reference Check Required timer has expired; a reference check of the bank UVI sensor(s) is required to maintain system performance.
UVT Below Design Value	UVT is below the design value.
UVT Meter Override Value Used	UVT analog signal below 2 mA or above 20.5 mA.
Wiper Not In Remote	Wiper Group is not set to “Remote” at the HSC.
Wiper Position Unknown (Latched)	The wiper has lost its “Home” position due to a Wiper Group Jammed or Wiper Retract Travel Time Exceeded Fault. After the cause is resolved, reset the HSC latched alarm (Section 8.1.6).

* Displays for systems with UPS only.

10.3 UV Bank

Table 18 UV Bank

Condition	Possible Cause	Solution
Bank will not lift to the up/service position	HSC is not functioning.	HSC power to be checked by an electrician.
		Correct selector switch on HSC of bank attempting to lift (Section 8.1).
Bank XX Not in Place (Latched)	Bank is not in fully down position.	Lift the UV Bank Down (Section 8.1.3).
	Faulty Bank In Place Sensor.	Replace Bank In Place Sensor (Section 7.1.13).
	Faulty Discrete Input Card.	I/O signal function to be checked by an electrician.
	Bank in Place sensor requires a reset.	Unplug and replug back in.
	Bank in Place Sensors have moved.	Check sensor adjustment (Section 7.1.13).
Bank XX Not in Remote Auto	Selector switch or HMI selection is not in remote auto.	Verify PDC mode selector switch is in Remote (Section 8.2.1).
		Verify HMI selection is set to Remote Auto (Section 8.3.4.1).
Bank XX Low Water Level	Channel water level is low and low level electrode/probe is exposed to air.	Ensure the water level in the channel is of the correct level.
	Broken or missing electrode/probe.	Replace broken or missing electrode/probes. Contact your local Service Provider.
	Power loss.	Verify 24 V is present.
	Faulty field wiring.	Contact a certified Electrician to correct wiring.
	Failed water level connections.	Replace low water level sensor enclosure.

Table 18 UV Bank

Condition	Possible Cause	Solution
Bank XX Low Water Level Warning	Channel water level low.	Make sure that the water level in channel is at correct level. Inspect the water level control device is operating correctly.
	Broken low water level rods.	Replace low water level rods. Contact your local Service Provider.
	Power loss.	The SCC contains the low water level controller has lost power. Restore power to the SCC or disable low water level alarm on HMI.
	Faulty field wiring or input card.	Discrete input card signal function to be checked by a controls technician.
		Replace low water level sensor. Contact your local Service Provider.
Bank XX Lift attempted with lamps energized	UV Lamps in UV Bank are energized while a manual lift is initiated.	Return the UV Bank to Wiping Mode.
		Power off UV Lamps in the UV Bank.
Bank XX Multiple Lamp Failure	Number of lamps failed equal or exceeds multiple lamp fail set point.	Replace UV Lamp (Section 9.3.2). Reset Multiple Lamp Failure latched Alarm (Section 8.3.4.5).
	Lamp hours have exceeded 15,000 hours.	
	Faulty Contactor	Contactor to be checked by an Electrician.
	Faulty Lamp Driver Rack	Use lamp driver diagnostics to confirm lamp driver faults
		Lamp Driver to be checked by an Electrician
Bank XX Wiper Group jammed (Latched)	Wiper seals may: • Require cleaning • Require replacement • Be installed incorrectly	Inspect Wiper Seals. Ensure they are properly installed, free of debris and / or need replacement. Refer to Section 9.7.4.1.
	Wiper scrapers may: • Require cleaning • Require replacement • Be installed incorrectly	Inspect wiper scrapers. Ensure they are properly installed, free of debris and / or need replacement. Refer to Section 9.7.4.1.
	Lamp Sleeves require cleaning	Inspect lamp sleeves for debris or buildup. Clean or replace if required. Refer to Section 9.4.2.
	Faulty Pressure Sensor	Contact your local Service Provider
	Incorrect Pressure Setting	Contact your local Service Provider
	Decoupled hydraulic cylinder	Contact your local Service Provider

Table 18 UV Bank

Condition	Possible Cause	Solution
Bank XX Wiper travel time exceed	Debris or buildup on Bank wiper components and/or sleeves.	Lift UV bank to Service position (Section 8.1.3) and remove debris. Also time a wiper sequence in the service position.
	Ambient temperature is too low Section 1.	The hydraulic oil may be operating at a lower then acceptable temperature - slowing the wiping system down.
	Excessive fouling on sleeve.	Fill up cleaning solution (Section 9.7.2).
		Perform manual wipe sequence (Section 8.3.5.1) and manually clean if required (Section 9.4.3).
	Faulty Pressure Sensor	Confirm proper function of pressure sensor. Contact your local Service Provider.
Broken Sleeve	Foreign object in wiper canister.	Remove object. Replace lamp sleeve (Section 9.4.2).
	Foreign or larger objects in channel damaged sleeve.	Inspect upstream and downstream and UV Banks for foreign objects and remove as necessary.
Lamp sleeve hazing (inside)	Water inside sleeve.	Refer to water in sleeve (page 203).
	Off gassing due to foreign substances inside sleeve.	Replace lamp sleeve (Section 9.4.2).
	Oil, silicone lubricant, cleaning solution residue on sleeve or UV lamp.	Clean lamp sleeve and/or UV lamp (Section 9.4.3).
Lamp sleeve hazing (outside)	Mineral/chemical composition of wastewater - Iron, ferric chloride.	Manually clean lamp sleeves (Section 9.4.3).

Table 18 UV Bank

Condition	Possible Cause	Solution
Sleeves are fouled (single hydraulic cylinder and wiper carriage assembly)	HSC not working, due to: 1 - No power (main power and 24V dropout).	Check fuses, power at HSC.
	2- Low level (hydraulic fluid).	Fluid level should be 1/2 full.
	3- Low effluent level.	Make sure the liquid level in the channel is at the correct level.
	4- High effluent level.	Run wipe system when flow returns to normal.
	5- High pressure shutdown.	Section 9.8.2.
	6- Motor run fault.	Check motor overload and full load amps set point.
	7- Comm fault.	Wiring to be checked by an electrician.
	8- HSC not in remote.	Make sure the selector switch is in remote (Section 8.1).
	9- Faulty solenoid.	Contact Electrician.
	10- Wiper group disabled.	Enable wiper group.
	11- Pump failure.	Contact Electrician.
	12- Blown fuse (s).	Contact Electrician.
	13- Disconnect switch OFF.	Turn On.
	Wiper moving but sleeves fouled: 1- Insufficient amount of wipe cycles.	Modify wiper sequence cycle time in wiper settings to provide proper cleaning.
	2- Cleaning solution not topped up or old (increased pH).	Refill cleaning solution.
	3- Worn wiper seals.	Replace wiper seals on bank.
	4- Effluent quality.	Improve quality of upstream effluent.
	Cleaning solution empty.	Fill up cleaning solution.
	Worn wiper seals.	Replace wiper seals.
	Pressure Buildup.	Check wiper collar for cleaning solution blockage.
	Faulty hydraulic cylinder.	Replace hydraulic cylinder. Contact your local Service Provider.
	Pinched or restricted hydraulic hose.	Correct hose assembly. Fix hydraulic hose assembly.
UVI Sensor Reference Check Active	UVI Reference check is being performed.	 Complete the UVI Reference Sensor Check.
UVI Sensor Reference Check Required	Time has expired and a reference sensor check is required.	 Perform the UVI Reference Sensor Check. • For Analog UVI Sensors, refer to instruction DC000601-013. • For Digital UVI Sensors, refer to instruction DC000601-051.

Table 18 UV Bank

Condition	Possible Cause	Solution
UVI Sensor Fault	Faulty or damaged wiring.	To be checked by an electrician: **1** Faulty or loose connections. **2** Continuity in the wire or cable
	Faulty UVI Sensor	Replace UVI Sensor (Section 9.5.1).
Water in sleeve	Damaged or broken sleeve.	Replace lamp sleeve (Section 9.4.2).
	O-ring is damaged.	Replace Lamp Plug O-ring.
	Improper lamp connection (not plugged in correctly).	Remove lamp power cord and reconnect lamp cord (Section 9.3.2).
	Corrosion.	Make sure all connections pins are dry and clean. Replace lamp power cord if necessary.
	Water inside sleeve.	Dry with a lint free cloth with isopropyl alcohol to remove all residues.

10.4 Channel

Table 19 Channel

Condition	Possible Cause	Solution
Channel XX inlet gate failed to start opening (Latched)	Loss of power.	 Inlet gate power to be measured and verified by an electrician.
	Gate operational in other mode.	Verify inlet gate operation in hand.
	Faulty input signal or input card.	Discrete I/O card signal function to be checked by an electrician.
	Input to PLC.	 Verify inlet gate input on PLC.
		Contact gate service personnel.
Channel XX Weir Gate Position Signal Fault	Gate power.	 Measure and verify weir gate power.
	Faulty I/O signal or card.	I/O signal function to be checked by an electrician.
	Check other gate operation.	Verify weir gate operation in hand or local.
		Contact weir gate service personnel.
Channel Weir Gate Fault	Loss of gate power.	Contact Electrician.
	Faulty Gate	Verify the gate is in hand mode or local mode or Contact Weir Gate service personnel.
	Actuator Fault	Contact Electrician
	Actuator elevation	Review layout drawings.
	Faulty Discrete I/O Card	Discrete I/O card signal function to be checked by an electrician.

Table 19 Channel

Condition	Possible Cause	Solution
Channel XX Not Enough Healthy Banks Available	Banks not in remote auto.	Put bank(s) into REMOTE AUTO.
	Banks with multiple lamp or lamp driver fault.	Refer to: Bank XX Multiple Lamp Failure on page 200. Multiple Lamp Driver Failures.
	Low water level.	Refer to Bank XX Low Water Level Error on page 199.
	BCB communication fault.	Refer to SCC- PDC Communication fault on page 207.
	Low UV Dose for target dose set point.	Check UVI, Flow, UVT and End of Lamp life.
Channel XX Inlet gate failed to open (Latched)	Loss of power.	Inlet gate power to be checked by an electrician.
	Gate operational in other mode.	Verify inlet gate operation in hand.
	Faulty input signal or input card.	I/O card signal function to be checked by an electrician.
	Input to PLC.	Electrician verify inlet gate input on PLC.
		Contact gate service personnel.
Channel XX inlet gate failed to start closing (Latched)	Loss of power.	 Inlet gate power to be measured and verified by an electrician.
	Gate operational in other mode.	Verify inlet gate operation in hand.
	Faulty input signal or input card.	I/O card signal function to be checked by an electrician.
	Input to PLC.	 Verify inlet gate input on PLC.
		Contact gate service personnel.
Channel XX Water Level Signal fault	Signal loss.	Verify water level sensor function.
		I/O card signal function to be checked by an electrician.
Channel XX flow limit for wiping exceeded. Wipers will be inhibited for the duration of this alarm	Increase of flow and wiping will be inhibited so as not to affect head loss.	Flow has exceeded the channel hydraulic maximum.
		If flow is below design then verify flow signal.
	Increase of flow.	Verify channel flow has not exceeded 80% of maximum flow.
		If flow is below design then verify flow signal.
Channel XX inlet gate not in remote auto	Incorrect switch position.	Put gate in remote auto.
		Contact gate service personnel.
	Faulty signal or input card.	I/O card signal function to be checked by an electrician.
Channel XX weir gate not in remote auto	Incorrect switch position.	Put gate in remote auto.
		Contact gate personnel for further troubleshooting.
	Faulty signal or input card.	I/O card signal function to be checked by an electrician.
Channel XX High Water Level Alarm	Algae/debris buildup on upstream side of the banks.	Remove algae and debris from bank components.

Table 19 Channel

Condition	Possible Cause	Solution
Channel head loss higher than normal	Higher flow.	Verify flow has not exceeded design limit
	Algae/debris buildup on UV banks.	Remove algae and debris from banks.
Low UVT out of validation range	UVT is below validated range	The UVT reading has gone below the validated range for the current dose calculation mode. ***Note:*** *The UV Banks will operate at the highest power level.*
	Faulty input signal or analog input card.	I/O card signal function to be checked by an electrician.

10.5 System

Table 20 System

Condition	Possible Cause	Solution
Design Flow Exceeded	Increase of flow.	Compare flow meter to SCC HMI flow values.
		Measure 4-20 mA.
Flow Meter fault	Possible loss to PLC Input card.	 I/O card signal function to be checked by an electrician.
	4-20 mA wiring open circuit.	 Check for bad or loose connections.
	Faulty loop isolator.	 Verify the analog flow loop isolator.
	Flow meter failure.	 Replace or fix flow meter.
	Faulty analog input on PLC input card.	 I/O card signal function to be checked by an electrician.
Flow Meter Override Value	Flow meter is bypassed.	The flow meter is bypassed and the system is operating off the entered flow value.
High Flow Out of Validation Range	Flow has gone above the validation range.	Verify channel flow. I/O card signal function to be checked by an electrician.
High UVT out of validation range*	UVT is above validated range.	The UVT reading has gone above the validated range for the current dose calculation mode. ***Note:*** *The UV Banks will operate at the lowest power level.*
	Faulty input signal or analog input card.	I/O card signal function to be checked by an electrician.
Low Flow Alarm	Flow is below recommended operating parameters.	Verify if there is a flow event. Correct flow event.
		I/O card signal function to be checked by an electrician.
		Compare flow meter to SCC HMI flow values.
	Water level management.	Verify flow meter operation.
		Verify upstream and downstream water level controller devices.
Low Flow Out of Validation Range	Flow has dropped below the validated range.	Verify channel flow. I/O card signal function to be checked by an electrician.

Table 20 System

Condition	Possible Cause	Solution
Low UV Dose	UVT value too low (can be either an entered or an online value).	Check wastewater UVT value. Enter correct value (if manually entered) or verify value matches online UVT meter.
		If the UVT value is correct then upstream wastewater processes are causing the UVT values to be below allowable limits. Review processes that could be causing lower UVT levels. Contact your local Service Provider for assistance.
	Bank(s) in “Remote Off” or “Local Off”.	Put bank(s) into “Remote Auto” (Section 8.3.4.1).
	High flow.	Check the online or entered flow. If flow value is correct, then the current influent flow conditions are above allowable limits.
	End of lamp life exceeds 15,000 hours.	Replace UV Lamp (Section 9.3.2).
	Not enough healthy banks.	Refer to Not enough healthy banks on page 197.
Low UVT	UVT is below design set point.	Compare UVT reading on SCC HMI and compare to Online UVT Monitor.
	Water quality has dropped below design.	Verify UVT monitor with a UV photometer or spectrophotometer.
		Resolve upstream process of UVT as required. Contact your local Service Provider for list of items that may inhibit UVT.
Not Enough Healthy Channels (Latched)	Not enough healthy channels of UV equipment available to ensure proper system performance	The controller will try to open all available channel (s) (if slide gates are controlled and turn on all banks) all non-faulted banks, and UV banks with multiple lamps, multiple lamp driver or module communication faults will operate at full power. This alarm can only be cleared after the cause of the alarm has been corrected. This is also a latched alarm so it will have to be cleared by pressing the Not Enough Healthy Channels (NEHC) button on the HMI.
PLC Fault	PLC has faulted.	Verify PLC key switch, fault lights and run mode status.
		Contact PLC or Controls Technician.
PLC Low Battery	Verify battery light on PLC.	PLC battery requires replacement.
		Refer to the PLC manual for battery replacement procedure.
SCADA Fault	Faulty wiring.	Check for faulty or loose connections.
	Power loss to SCC.	Check the input power to the SCC.
	SCADA system faulty.	Contact plant SCADA integrator for support.
SCC- HSC XX Communication Fault	Loss of communication between the HSC and SCC.	Confirm and tighten terminal connections of the communication wiring within the SCC and HSC.

Table 20 System

Condition	Possible Cause	Solution
SCC- PDC Communication fault	Loss of communication between the SCC and PDC.	Confirm and tighten terminal connections for the communication wiring between the SCC and PDC.
		 Measure the incoming BCB voltage.
System Power on Reset	System experienced a power outage.	UV System is recovering from a power failure, wait for the alarm delay time to expire.
SCC Power restored	Power has been restored to the SCC.	Verify slave on address on the HSC.
		System can be restored to normal operation.
SCC Run on UPS	SCC has lost power and allows Operator to properly shutdown the UV System.	 Check main utility power to UV system.
Trend screen is blank	Power to the SCC has been cycled.	After power has been restored allow a few hours and then verify trending values.
	Range settings is incorrect for value.	Configure correct range settings for value (if applicable).
	No compact flash card inserted (if applicable).	Insert Compact Flash card into HMI display (if applicable).
UVT Below Design Value	Water quality or UVT values are lower then design.	Compare UVT reading on SCC HMI and compare to Online UVT Monitor.
		Verify UVT monitor with a UV photometer or spectrophotometer.
	Faulty signal or analog input card.	I/O card signal function to be checked by an electrician.
UVT Below Design Value*	UVT below validated range.	The UVT reading has dropped below the validated range for the current dose calculation mode. ***Note:*** *The UV Banks will operate at the highest power level.*
	Faulty input signal or analog input card.	I/O card signal function to be checked by an electrician.
UPS Fault	UPS status.	Check UPS for fault light.
	Input and output power on the UPS.	Verify input on output power to the UPS.
	Faulty UPS battery.	Replace UPS battery as required.
UVT meter fault	The analog input signal for the flowmeter has dropped below 2 mA or greater then 20.5 mA.	Measure analog signal.
	Power loss to analog input card.	Make sure there is power to the UV Controller and UVT meter.
	4-20 mA wiring open circuit.	Check for loose or bad connections.
	Loop isolator (PDC).	Replace analog UVT loop isolator (PDC).
	Faulty analog input in PLC rack.	I/O card signal function to be checked by an electrician.
	Online UVT failure.	Replace or repair UVT monitor.
UVT Meter - Override Value Used	UVT meter is no longer online.	Restore UVT Monitor to Online mode at the HMI.

10.6 Hydraulic System Center

Table 21 HSC

Condition	Possible cause	Solution
Erratic wiper movement	Blockage of wiper assembly.	Remove blockage from wiper assembly.
	Excessive algae.	Remove algae or debris build up within the wiper canisters.
	Worn seals.	Replace wiper seals.
	Air in the hydraulic lines.	Check fittings to make sure that air is not being introduced through loose connection points. Perform manual wipes until old air is bled through the lines.
Filling ActiClean Gel - ActiClean Gel is not discharging from the overflow port	Tubes are clogged or damaged.	Unplug all tubes or replace as necessary.
	Tube clamps are not tight or missing.	Tighten or replace clamps as necessary.
	Faulty Pump Assembly.	Clean and unclog.
		Replace Pump Assembly.
Filling ActiClean Gel causes a leak (spilling)	Canister ends are loose.	Tighten canister end caps.
	Wiper seal installed backwards.	Install Wiper Seal correctly (Section 9.7.4.1).
	Wiper seal is missing.	Install wiper seal (Section 9.7.4.1).
	Spring seal is missing on wiper.	Replace wiper seal (Section 9.7.4.1).
	Debris between seal and sleeve.	Clean lamp sleeve (Section 9.7.4).
	Damaged canister (e.g. Cracked).	Replace wiper canister (Section 9.7.4).
	Tubing is clogged or damaged.	Unplug all tubes and replace as necessary.
	Too much injection pressure due to improper filling technique.	Follow Fill Wiping System Procedure (Section 9.7.2).
HSC XX Hydraulic tank low level	Low fluid level.	Fluid level should be 1/2 full.
	Fluid leakage.	Tighten if loose.
	Air in the system.	Check over fittings to make sure that air not being induced, through loose connection points.
	Faulty pressure sensor.	Replace low pressure sensor.
HSC XX Pump Fault (Latched)	No power to the Pump.	 3-Phase power to the contactor to be checked by an electrician.
	Contactor is disengaged.	 Contactor to be checked by an electrician.
	HSC input.	 Verify the HSC Controller discrete input light is illuminated.

Table 21 HSC

Condition	Possible cause	Solution
Hydraulic fluid leak	Oil filter is not seated correctly.	Tighten if loose.
	Loose hydraulic fittings.	Tighten if loose.
	Hose leaks.	Tighten if loose, replace hydraulic hoses if required.
Remote Wipe Inhibited	Increase of flow.	Compare flow meter to SCC HMI flow values.
		Measure 4-20 mA.
	Faulty I/O Card	Contact your local Service Provider.
SCC- HSC XX Communication Fault	Faulty or loose communication wiring between the SCC and HSC.	Confirm and tighten terminal connections of the communication wiring within the SCC and the HSC.
Top lamp sleeves are fouled - rest of lamps are properly cleaned	Water level management.	Verify level controller unit is operational and not leaking, repair as required.
Unable to initiate wiper sequence	Low hydraulic fluid.	Verify fluid levels are minimum 1/2 full.
	Motor overload tripped.	Check motor overload and full load amps set point.
	Disconnect switch OFF.	Set the switch to ON.
	No 24 VDC.	 Fuse and input power to be checked by an electrician.
	Fuse Blown.	 Fuse to be replaced by an electrician.
	Bad or loose connection.	Tighten connections, replace wiring as necessary.
	Faulty selector switch.	Contact your local Service Provider.
	Faulty HSC Controller.	 Replace HSC Controller. Contact your local Service Provider.
	Pump failure.	Replace HSC pump. Contact your local Service Provider.
Wiper not in Remote	HSC selector switch is set to “Local” or “Off” mode.	Set UV Bank Wiper Group Mode Switch to “Remote” (Section 8.1.4.1).
Wiper position unknown (Latched)	Wiper has not returned home.	Reset the HSC latched alarm (Section 8.1.6). Operate HSC in Local mode to verify if the wiper returns home.

10.7 Power Distribution Center

Table 22 PDC

Condition	Possible Cause	Solution
Bank XX PDC High Temperature Shutdown (Latched)	PDC has reached high temperature.	Verify ambient temperature does not exceed 55°C (130°F).
	Clogged Filter.	Clean the air filter (Section 9.10.1).
	Failed fans within the lamp driver fan rack.	**1** Confirm that two (2) fans are not functional. If 2 fans have failed. Proceed to step 3. **2** If one (1) fan is faulty, confirm current sensing transformer calibration. Refer to the PDC electrical drawings. **3** Faulty fans to be replaced by an electrician.
	Air Conditioning unit has failed.	Measure the incoming voltage to the air conditioning unit.
		Contact air conditioner manufacturer for service and / or parts.
Bank XX PDC High Temperature Warning	PDC temperature increasing.	Clean the A/C unit air filter (Section 9.10.2).
		Ensure there is not a cooling fan failure.
		A/C unit requires maintenance, contact local A/C certified Technician
		Faulty A/C unit
PDC Fan failure	2 or more fans have failed with the lamp driver cooling fan rack.	**1** Confirm that two (2) fans are not functional. If 2 fans have failed. Proceed to step 3. **2** Confirm current sensing transformer calibration. Refer to the PDC electrical drawings. **3** Faulty fans to be replaced by an electrician.
UV Bank Lamp XX Lamp Driver Communication Failure	Faulty lamp driver.	Check Lamp Driver Diagnostics on the HMI.
		Replace the faulty lamp driver (Section 9.10.1).
	Communication loss between the Lamp Driver and the BCB.	Verify bad or loose communication wiring.
	Lamp Driver is not properly seated in the rack.	Electrician to properly seat the Lamp Driver in the rack.
	Incorrect lamp driver address.	Change driver address and change to a correct driver location in the driver rack. (Section 9.10.1).

Section 11 Replacement Parts

Contact your local Service Provider with the listed information to order replacement parts.

Provide the:

- Product name and model number (refer to the front of this manual)
- Part number and description of the replacement part or accessory

If a replacement part is not listed, contact your Local Service Provider.

11.1 UV Lamp and Lamp Sleeve

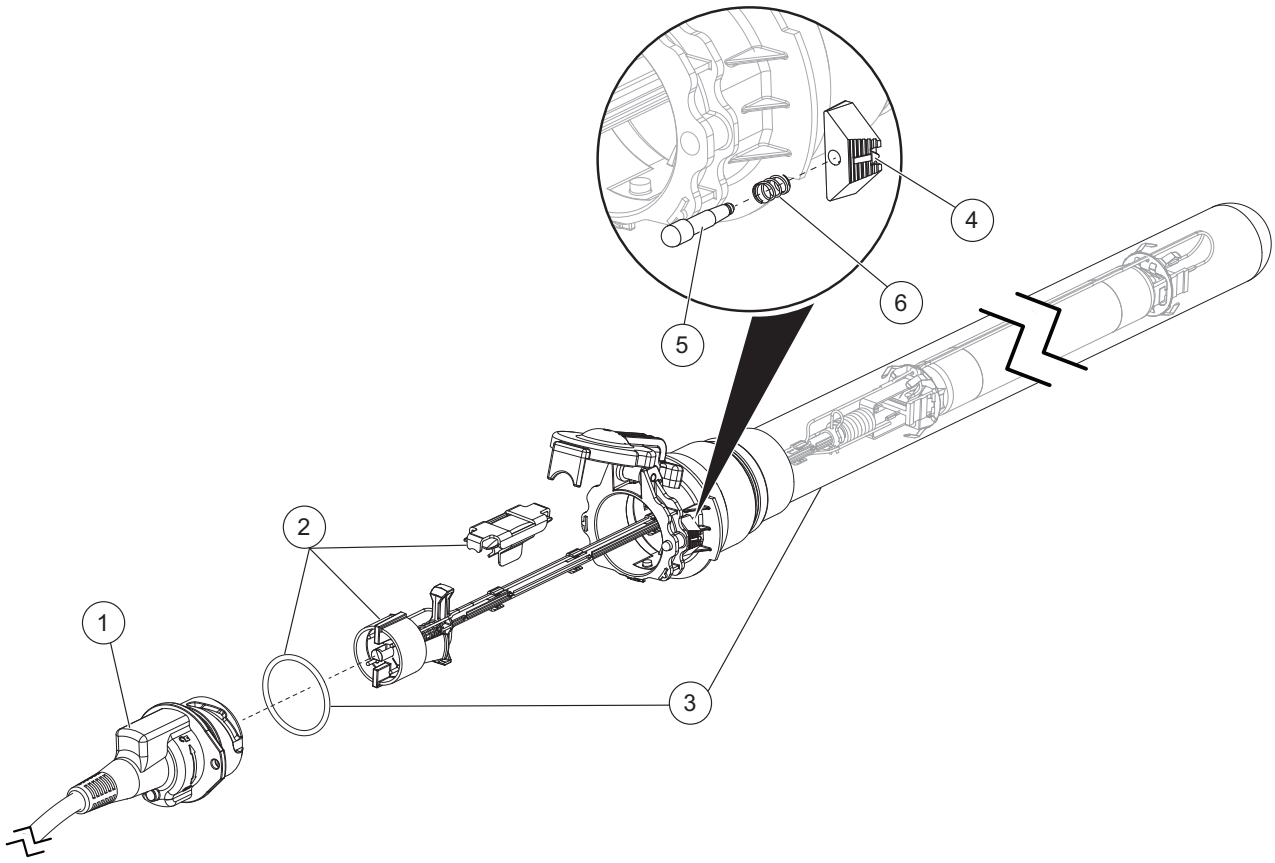


Figure 64 UV Lamp and Lamp Sleeve

Item	Description	Part Number
1	Cable Assembly	
	10 meter length	908108-210R
	15 meter length	908108-215R
	20 meter length	908108-220R
	25 meter length	908108-225R
	30 meter length	908108-230R
2	Lamp Kit (includes UV Lamp, Lamp Plug O-ring and Desiccant Kit)	338299-101*
	Kit, Lamp Desiccant	908118
	Plug, O-Ring	002293-226
3	Sleeve Replacement Kit (includes Lamp Sleeve and Lamp Plug O-ring)	338314-101
	Plug, O-Ring	002293-226
4	Handle, Locking	908072
5	Locking Pin	908073
6	Spring, Compression	013258

* *This component contains MERCURY. Dispose according to Local, State, or Federal Laws.*

11.1.1 Lamp Sleeve Ports Top

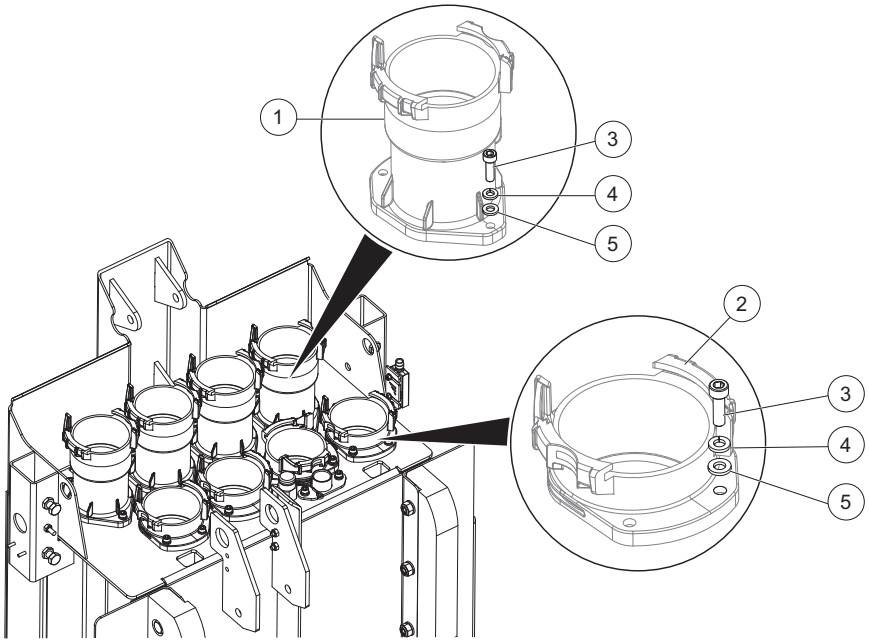


Figure 65 Lamp Sleeve Ports Top

Item	Description	Part Number
1	Top Port, Tall	337722-002
2	Top Port, Short	337722-001
3	Screw, SHCAP M6 x 20 316 SST	010368-MNCC03160
4	Washer, Lock Reg 6mm 316 SST	012075-AA0060316
5	Washer, Plain 6mm 316 SST	012073-R060316

11.2 UV Bank

Item	Description	Part Number
1	Sleeve Bushing 55mm (Floor)	337850
2	UVI Sensor Floor Bushing	792942
3	Lock Plate	337894

11.3 UVI Sensor and Sleeve

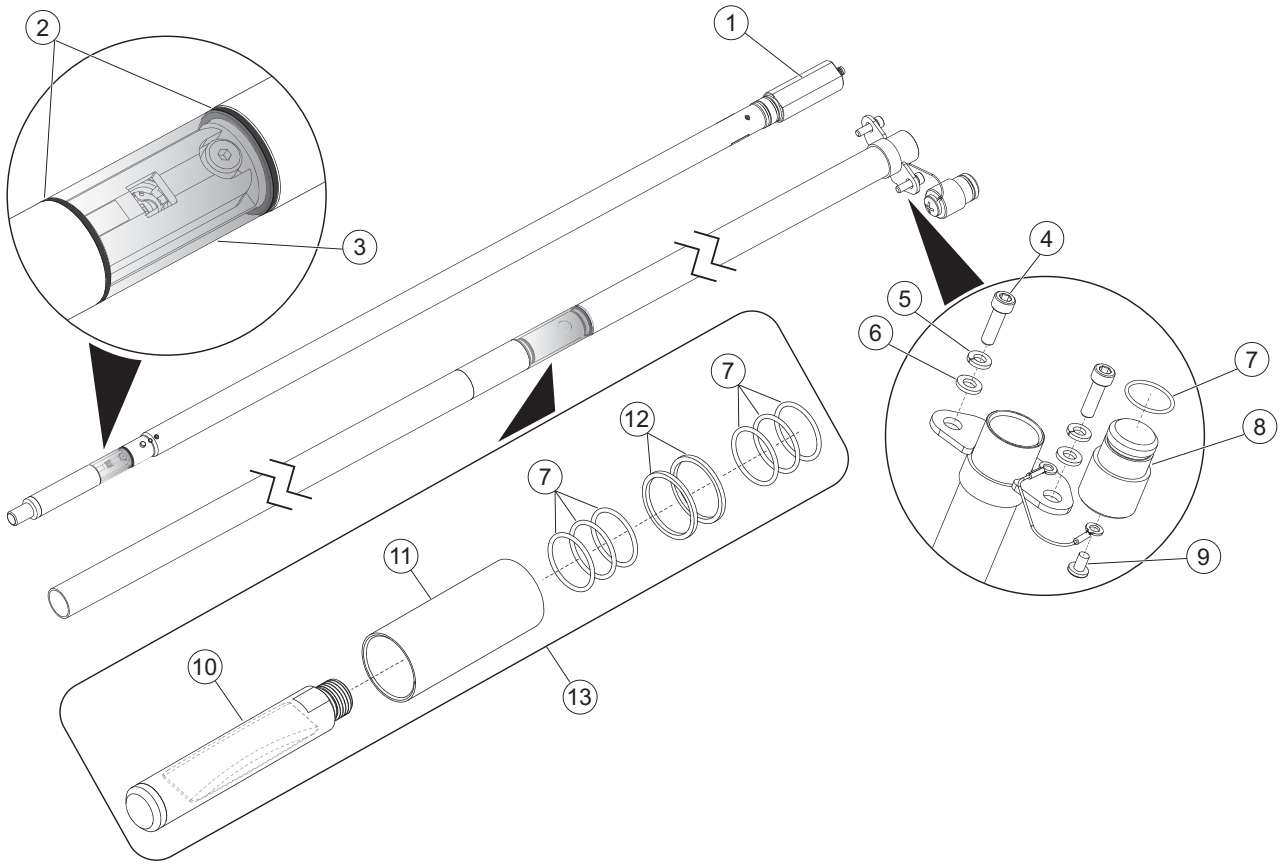


Figure 66 UVI Sensor and Housing

Item	Description	Part Number
1	UVI Sensor Assembly, Duty (15-54.9% UVT) - digital	015525-DR2-S-155
	UVI Sensor Assembly, Duty (55-82% UVT) - analog	015525-SR2-S-382
2	X-ring, .614”ID x .103” V70	002270-016V70
3	Sleeve, Signa 2R Sensor	015522
4	Screw, SHCAP M6 x 20	010368-MNCC03160
5	Washer, Lock 6mm	012075-AA0060316
6	Washer, Plain 6mm	012073-R060316
7	O-ring 13/16 x 1/16 Silicone	002296-019
8	Plug, Sensor Port	015529
9	Screw, 10-24 x 3/8 Pan	010085
10	Desi Pack Assembly, Sensor	338355
11	UVI Sensor Housing Sleeve	908115
12	O-ring, 15/16 X 1/16 SQ Silicone	002297
13	Replacement Kit, Signa 2R Sensor	338325
--	Reference Sensor Kit (includes case, desiccant packs, calibration certificate)	
	Digital (15 - 54.9% UVT)	015530-DR2-155
	Analog (55 - 82% UVT)	015530-SR2-382

11.4 UVI Sensor Wiper

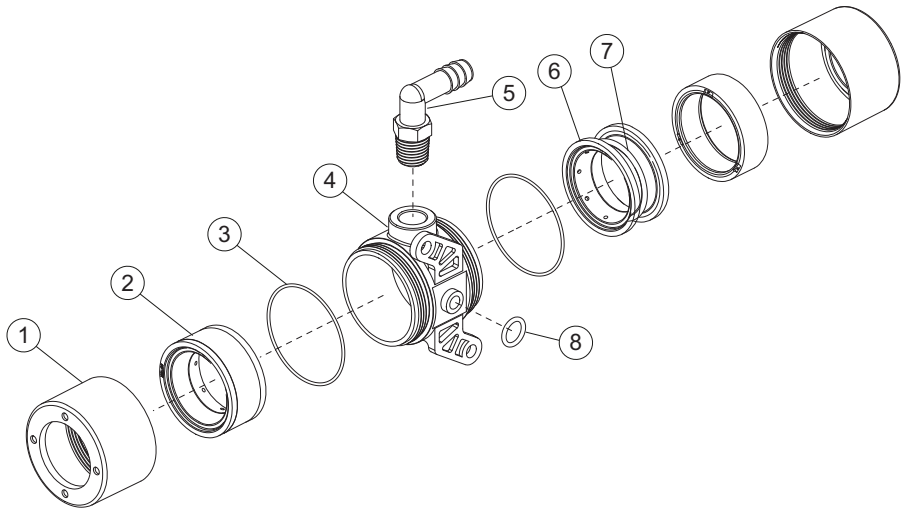


Figure 67 UVI Sensor Wiper

Item	Description	Part Number
1	Cap, Wiper	327116-STD
2	Spacer, Wiper Seal	327017
3	O-ring, Wiper Canister	327118
4	Canister Body, Sensor 28mm	337987
5	Fitting, Wiper	013403
6	Seal, Wiper	327021
7	Spring, Seal	327029
8	O-Ring, 3/8 x 1/2	002211-012

11.5 Wiper Canister Assembly

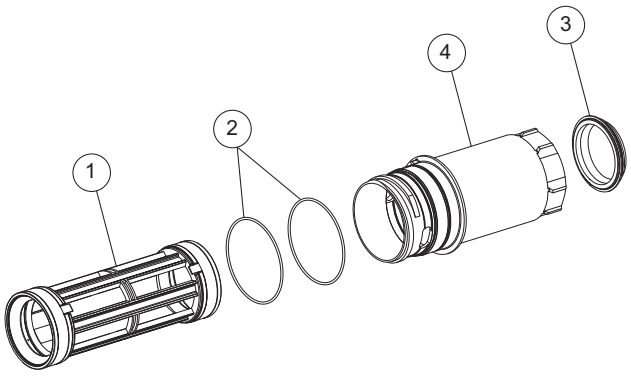


Figure 68 Standard Position

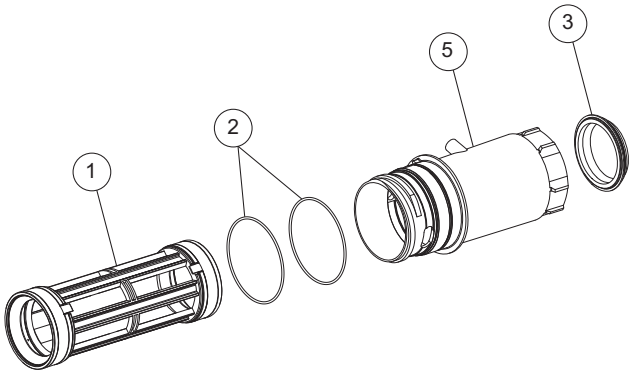


Figure 69 UVI Sensor Position

Item	Description	Part Number
--	Wiper Replacement Kit includes (items 1, 2 and 3)	338044
1	Scroll Cage Assembly (includes wiper seals)	--
2	O-ring, 75 x 2.25mm (x2)	002278-75A2C
3	Sleeve Bushing 55mm (Wiper)	337850
4	Wiper Canister Body, Standard Position	337990-001
5	Wiper Canister Body, UVI Sensor Position	337990-002

11.6 Hydraulic System Center

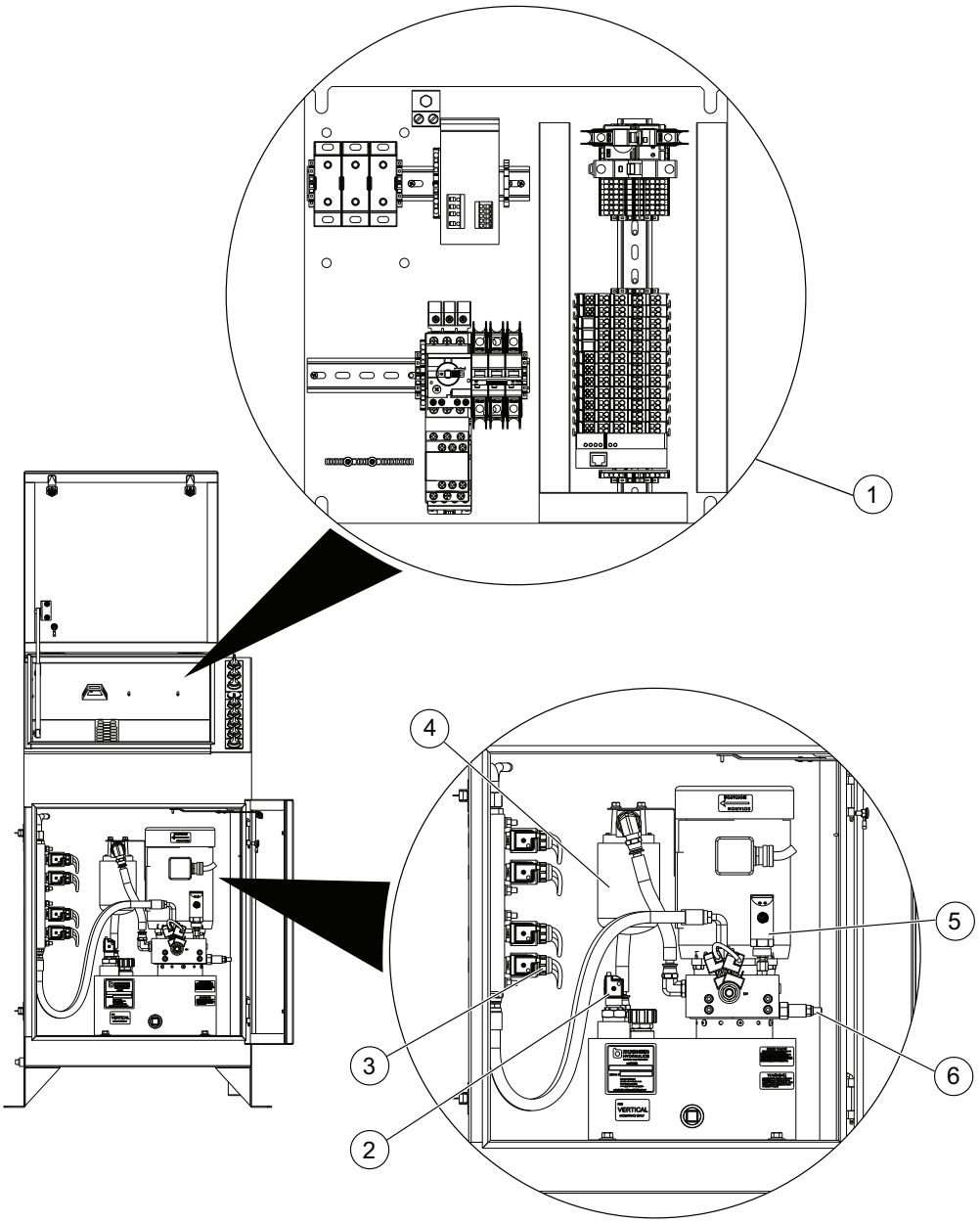


Figure 70 HSC

Item	Description	Part Number
1	Refer to Electrical Drawings Bill of Materials for HSC backplate replacement parts.	
2	Float Switch	907393
3	Solenoid Valve	907933
4	Hydraulic filter	907384
5	Pressure Sensor	917516-580C
6	Pressure Relief Valve	907935
--	Hydraulic Fluid, Mineral Oil 20L**	446022-020
--	Hydraulic Fluid, Pure Drive 20L**	907666-020P
--	VCI Emitter	913187

** Refer to the reservoir label or system description for hydraulic fluid used in the system.

11.7 Hydraulic Cylinder

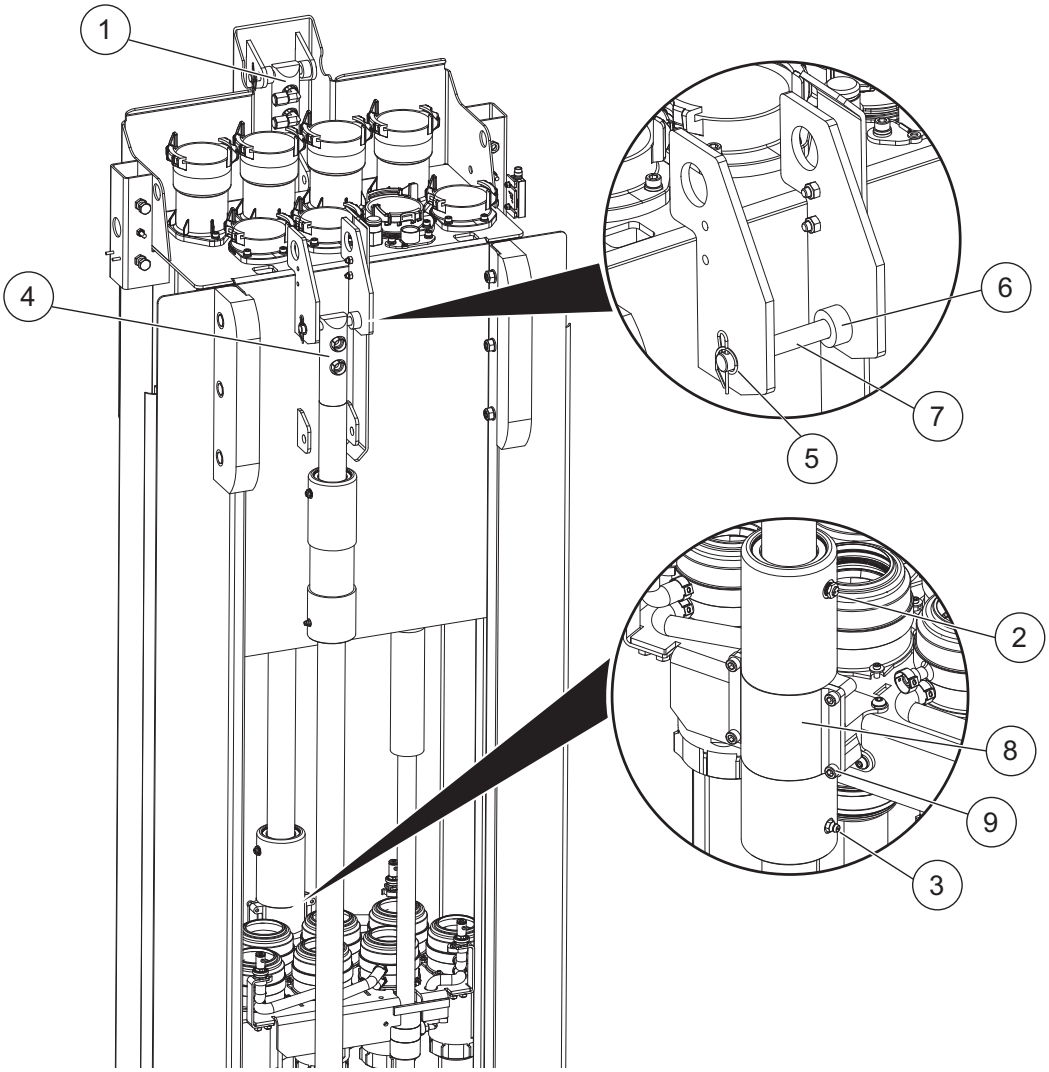


Figure 71 Hydraulic Cylinder

Item	Description	Part Number
1	Wiper Hydraulic Cylinder	338021-001
2	Pressure Relief Vent - Wiper Cylinder	013405
3	Grease Nipple - Wiper Cylinder	326399
4	Lift Hydraulic Cylinder	338021-002
5	Pin, Rue Ring Cotter 5/8-in	013164
6	Spacer, LDPE 1/2-in I.D x 1-in O.D, 1/2-in Long	337706
7	Pin, Clevis 1/2-in diameter, 4-in long 316 SST	337739
8	Cylinder Bracket - Wiper Plate Mounting	337778
9	Screw, SHCAP M6 x 20 316 SST	010368-MNCC03160

11.8 Power Distribution Center

Refer to Electrical Drawings Bill of Materials for additional PDC replacement parts.

Item	Description	Part Number
1	Lamp driver kit	916841
2	Air Conditioner Filter*:	
	8000 / 12000 BTU	917489-001
	20000 BTU	917489-002
3	Roof Fan, Exhaust Filter** - Quantity (x12)	916578-3174100
4	Intake Fan, Filter**	
	Quantity (x5)	916578-3173100
	Quantity (x50)	916578-3173105

* Available for PDC's equipped with an Air Conditioner.
** Available for PDC's not equipped with an Air Conditioner.

11.9 System Control Center

Refer to Electrical Drawings Bill of Materials for SCC replacement parts.

11.10 Miscellaneous

Item	Description	Part Number
--	Grease, food grade	005066
--	Grease Gun	005067
--	Operator Kit	906049-41x2
--	Face Shield	906002
--	Solo Lamp Plug Tool	338174
--	Tool, Canister Body 55mm	337992
--	ActiClean Gel	
	• 4 x 4 Liter	901507
	• 20L Pail	900346
--	Hydraulic Hose	
	• 20 foot length	907875-06B240
	• 30 foot length	907875-06B360
	• 40 foot length	907875-06B480
	• 50 foot length	907875-06B600
--	Fitting, Hydraulic Hose	446025-0606SST
--	Short Hose (included in Operator Kit)	907680-06BB107
--	Photometer Kit	905107
	• Photometer, UV 100/240 VAC	905253
	• Quartz Cuvette 10 mm	905262
	• Solution, 100%T 1 Gal	905036
	• UV Lamp, 254nm, Realtech	905260
--	ActiClean Pump Drill Kit - **North American Projects Only**	
	• 120V Drill	907909-D120V-2R
	• Pumphead with Bracket (ActiClean 20L Pail - not included)	907909-BPERI-2R
	• Pumphead with Bracket (ActiClean 20L Pail - included)	907909-B20L-2R

Item	Description	Part Number
--	Filler Assembly, Hand Pump - **Non North American Projects only**	337914-001
--	Safety Sensor, Interlock (Bank in Place)	917457-001
--	UVI Sensor Sleeve 2cm Gauge	337574

Note: *ActiClean Gel is to be stored in a tightly sealed container at room temperature. It cannot be stored at temperatures below 0°C (32°F) or above 50°C (122°F). ActiClean Gel that has frozen will separate into a liquid and sediment once it thaws and must not be used.*

Water Level Control Device - Weir Trough

Installation, Operation and Maintenance Manual

Original Instructions

Edition 1

DC450101-01-05

If you require technical assistance, please contact your local representative. If you require additional assistance, please contact the Technical Assistance Center (TAC) using the contact information below:

North America:	1-866-388-0488
All other areas:	1-519-457-2318
E-mail:	tac@trojantechnologies.com

At the time of publishing, the information within this document is current. Due to continuous improvements, we may have future changes and recommendations which will be sent via product bulletins.

Table of Contents

Section 1 Safety Information

1.1 Safety Information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger, warning and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual.

1.2 Use of Hazard Information

⚠ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a situation that is not related to personal injury.

1.3 Precautionary Labels

Read all labels and tags attached to the equipment. Personal injury or damage to the equipment could occur if not observed.

	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. When on the equipment, refer to the Instruction/Operational and Maintenance manual for additional safety information.
	This symbol indicates a trained and competent lift operator should be used to move the equipment.
	This symbol indicates a body crush hazard. People should stay clear from under overhead loads.
	This symbol indicates surfaces may be slippery or there is a potential for surface to collapse or to fall below the walking surface.
	This symbol indicates the equipment should be secured with a safety device / hook.
	This symbol indicates a safety glasses with side protection is required for protection against UV exposure.
	This symbol indicates gloves must be worn.
	This symbol indicates safety boots must be worn.

	This symbol indicates a hard hat must be worn.
	This symbol indicates the operator must read all available documentation to perform required procedures.

1.4 Safety Precautions

Read the safety precautions in this section before doing maintenance, service or repair. Obey the instructions in the safety precautions. Failure to follow the instructions in the safety precautions can result in serious injury or death.

⚠WARNING

Body Crush Hazard.

- Failure to follow these instructions could result in serious injury or death due to improper lifting procedures, underrated lifting equipment and, moving parts.
- ALWAYS secure with safety device.
- ALWAYS stay clear of elevated loads.
- ALWAYS comply with local safety regulations.

⚠CAUTION

Slip and Fall Hazard.

- Failure to follow these instructions may result in injuries from slip and fall.
- ALWAYS ensure safe footing.
- ALWAYS clean up spills promptly.
- ALWAYS comply with site-specific safety protocols and procedures.

NOTICE

Personal Protective Equipment Required.

- ALWAYS use appropriate eye, hand, and foot protection.
- ALWAYS wear UV-C safety glasses when around equipment or a UV-C faceshield with safety glasses or safety goggles when inspecting open running equipment.
- ALWAYS follow plant safety procedures and protocols.
- ALWAYS take necessary precautions when working around, operating, or working on this equipment, if contamination of components is expected within this application due to effluent biological or chemical contaminants.

NOTICE

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this manual. Maintain the continuity of the lockout tag out between shifts. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

Note: *Dispose of contaminated parts/components as per country requirements.*

Section 2 Shipment and Storage

⚠ DANGER

Obey all warning and caution statements. Refer to Section 1.

Read and understand the Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

2.1 Shipping the Equipment

The system is delivered to the site by truck. System components are packed in wooden crates labeled with the component name. Other labels identify components which are fragile or breakable and components which must be kept dry.

2.2 Storage Requirements before the Installation

The manufacturer recommends indoor storage of the equipment. The equipment should be stored in a dry warehouse. Heating is not necessary during storage. However, before system start up, the equipment must be warmed to greater than 15 ºC (60 ºF) for a period of 24 hours.

Storage area conditions:

- Ambient air temperature between -40 ºC to 55 ºC (-40 ºF to 130 ºF).
- Relative humidity from 10% to 90%, non-condensing.
- Free from dust and dirt ingress.
- Must not contain corrosive or explosive gases.
- Free from salt air.
- Vermin free.

If indoor storage is not possible, the water level controllers may be stored outdoors with additional conditions:

- Equipment is stored on high ground that is not susceptible to flooding.
- Equipment is elevated a minimum of 300 mm (12 inches) above the ground or as appropriate to prevent flooding.
- Equipment is completely covered with waterproof tarps to prevent exposure to the elements (e.g., rain, snow, sand, dust etc.). Tarps must be tight fitting, attached securely and examined regularly. Water and snow accumulation should be removed regularly.
- Equipment stored in crates should not be exposed to direct sunlight.
- Equipment can be stored in sea containers.

2.3 Overview of Equipment Connections

Refer to the general layout drawings provided by the manufacturer. If the supplied layout drawings do not match the site conditions, contact the Trojan Technologies for assistance.

2.4 Startup and System Commission

After the shipment of the UV system, the contractor will be issued documentation for a start-up request. These documents must be completed and returned to the issuer before a commission date can be scheduled.

Section 3 Installation

⚠ DANGER

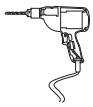
Obey all warning and caution statements. Refer to Section 1.

Read and understand this Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

No special tools are required for installation, other than those used in the day-to-day operation of a mechanical and electrical contracting firm. An appropriately sized crane may be required for off loading and installation of the unit. Size is dependent upon each project configuration.

3.1 Tools and Materials

Symbols	Description	Symbols	Description
	Lifting Straps (properly rated for equipment loads)		Drill with drill bits
	Measuring Tape		Anchor bolt hardware (by others)
	Grout		Outdoor sealant
	Ladder		Wrench
	Level		

3.2 Weir Trough

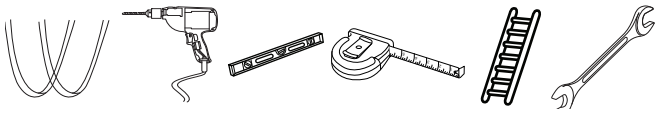
Prerequisites:

- Make sure the channel is free of water upstream and downstream.
- **Make sure that the elevations of the weir to the bottom of the channel floor, top of the channel and the weir riser conform to tolerances indicated in the layout drawing.**

  Note: *Refer to project layout drawing for dimensions. Adhering to the provided dimensions is critical for the proper functioning of the weir.*

- After the weir troughs are installed and are leveled, ensure that the elevation to the top of the trough conforms to the elevation shown on the layout drawing.

Tools:



- Trowel

Materials:

- Stainless steel spacers (by others)
- M10 (3/8-in) or M12 (1/2-in) bolts, washers and lock nuts (for tie bars)

  Note: *The fastener sizes required to install the weir trough may vary depending on trough design.*

- Gasket (optional, unless provided)

Procedure:

Note: *Weir troughs may be provided either transverse or longitudinal. Refer to the appropriate instruction below.*

3.2.1 Transverse Weir Trough

1. Position the weir trough and gasket (if provided) for final installation according to the layout drawing.

   Note: *It is recommended to have minimum two people to install weir troughs.*

   Note: *It is recommended to install the most downstream weir trough first, progressing upstream until all weir troughs have been installed.*

NOTICE

DO NOT stretch or compress the weir troughs to fit in the channel. Use 316 stainless steel spacers if the channel is wider than the weir trough. If the weir trough is wider than the channel, increase the width of the channel.

2. Mark the anchor holes in the mounting brackets. The number of holes required is based on the total holes provided in the mounting gusset plates and flanges located at either end of the weir trough.
3. Remove the weir trough and set aside. Drill the anchor bolt holes.

   Note: *The anchor bolt length is specified by the local code.*

4. Position the weir trough and gasket (if provided) into the final position. Attach the weir trough to the walls beginning with the open end. Compress open end to ensure that the gasket creates a water tight seal.
5. Complete anchoring at gusset plate end. Add stainless steel spacers as required to ensure gaps are sealed between the gusset plate and the opposing wall.
6. Repeat steps 1 - 5 until all weir troughs have been installed.

7. Install tie bars using provided bolts, washers and lock nuts. Ensure lock nuts are wrench tight. Refer to Figure 1.

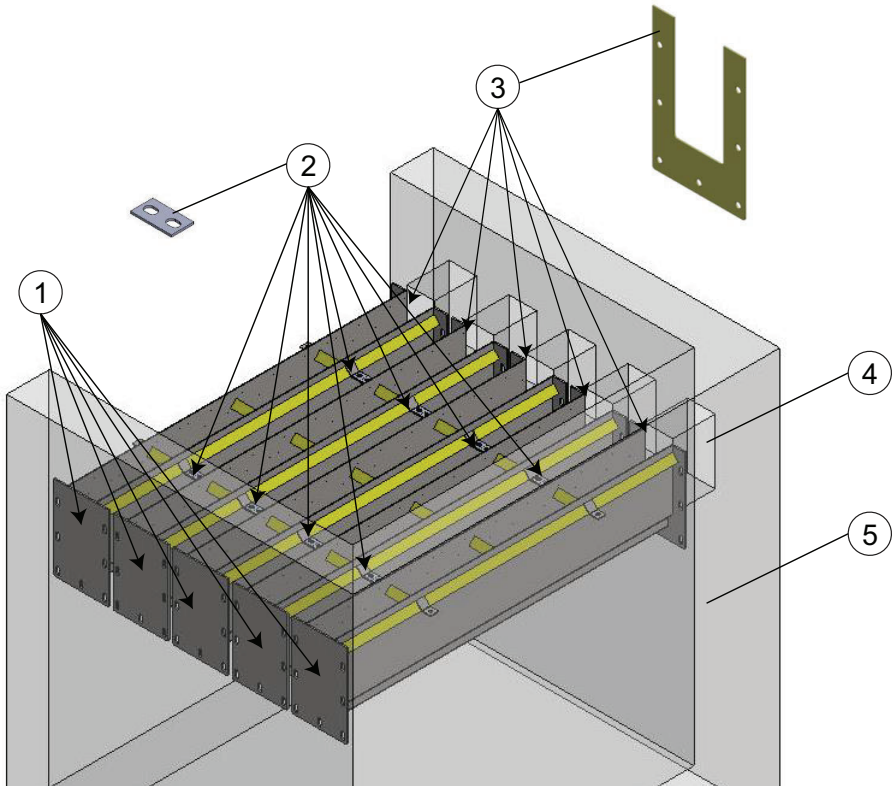


Figure 1 Transverse Weir Trough Installation

1	Weir Trough	**4**	Flow-through cut outs in channel wall (by others)
2	Tie Bar	**5**	UV Channel (by others)
3	Gasket (optional, unless provided)		

3.2.2 Longitudinal Weir Trough

1. Position the weir trough and gasket (if provided) into position on top of the beam supports (by others).

   Note: *It is recommended to have minimum two people to install weir troughs.*

   Note: *Depending on site specific designs, the weir trough mounting flange may be required to mount before the wall cut out or after the wall cut out. If the weir trough flange is mounted after the cutout, the weir trough will be partially supported by the wall. Refer to the site specific layout for details.*

NOTICE

DO NOT stretch or compress the weir troughs to fit in the channel. If the weir trough is wider than the channel, increase the width of the channel.

2. Mark the anchor holes in the mounting flanges of the weir trough. The number of holes required varies, depending on the weir trough length and depth.
3. Remove the weir trough and set aside. Drill the anchor bolt holes.

   Note: *The anchor bolt length is specified by the local code.*
4. Position the weir trough and gasket (if provided) into the final position. Make sure that the weir trough is level, shim if required.
5. Attach the weir trough to the wall at the open end with mounting hardware. If a gasket was provided, tighten hardware to compress it such that a water tight seal is created. Verify the weir trough is level and at the correct elevation. Adjust as required.
6. Complete anchoring the weir trough to the beam supports.

7. Install the tie bars.
8. Fill any gaps between the mounting flange and the wall with marine grade sealant.

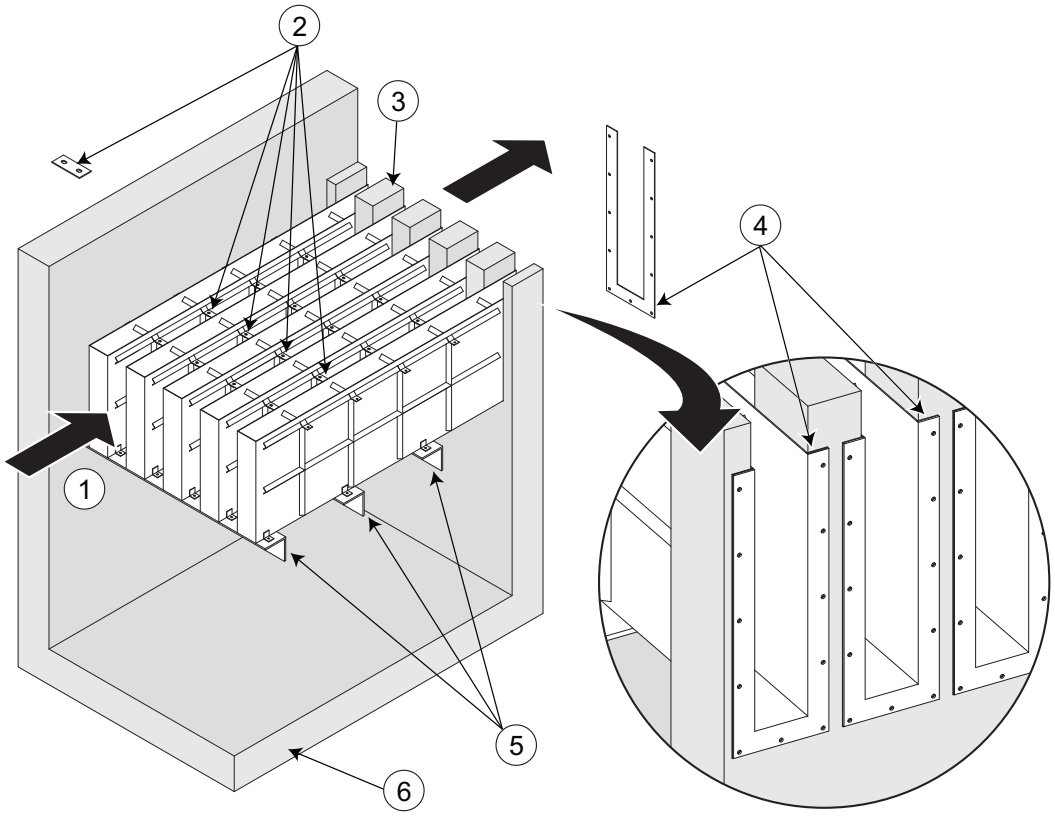


Figure 2 Longitudinal Weir Trough Installation

1	Channel Flow Direction	**4**	Gasket (optional, unless provided)
2	Tie Bar	**5**	Beam Supports (by others)
3	Flow-through cut outs in channel wall (by others)	**6**	UV Channel (by others)

⚠ DANGER

Obey all warning and caution statements. Refer to Section 1.

Read and understand this Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

4.1 Preventive Maintenance Schedules

Table 1 shows required periodic maintenance.

Table 1 Required Preventive Maintenance Schedule

System Component	Maintenance Requirement	Bi-Weekly	Monthly	Annually
Water Level Control	Inspect for debris and remove as needed. Perform once every two weeks for poor water quality conditions.	X	X	
	Inspect grouting/seals and repair/replace if any signs of cracking or damage			X

4.2 Inspect and Clean the Level Controller

Tools:

- Pressure Washer

Materials:

- Water

Procedure:

1. Inspect the crest of the weir periodically.
2. If necessary, use a power washer to remove algae or other buildup. Clean up spills.

INSTRUCTION

PRODUCT LINE:	TROJANUVSIGNA™	**DOCUMENT NUMBER:**	DC090601-006
TOPIC:	INSTRUCTION, LEVEL SENSOR CONTROL BOX INSTALLATION AND MAINTENANCE	**EDITION/REVISION:**	01-02

1. OVERVIEW

The Level Sensor Control Box is a standalone panel which contains power relays for the Low Level Sensor, optional High Level Sensor and optional Ultrasonic Level Sensor. Upon installation completion and system start-up, the panel will not require further adjustment.

2. SAFETY PRECAUTIONS

⚠ DANGER

Arc Flash and Shock Hazard - Live Electrical Circuit Present.

- Failure to follow these instructions will result in electrical shock, injury or death from electrocution.
- Devices inside this equipment contain stored energy.
- NEVER work inside this equipment until at least 5 (five) minutes after disconnecting main power to allow stored energy to dissipate.
- Lockout tag out all sources of power before performing any inspection, repair, or maintenance. ***There may be more than one source of power!***

NOTICE

Personal Protective Equipment Required.

- ALWAYS use appropriate eye, hand, and foot protection.
- ALWAYS wear UV-C safety glasses when around equipment or a UV-C faceshield with safety glasses or safety goggles when inspecting open running equipment.
- ALWAYS follow plant safety procedures and protocols.
- ALWAYS take necessary precautions when working around, operating, or working on this equipment, if contamination of components is expected within this application due to effluent biological or chemical contaminants.

NOTICE

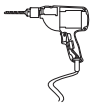
Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this manual. Maintain the continuity of the lockout tag out between shifts. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

Note: *Dispose of contaminated parts/components as per country requirements.*

3. PREREQUISITES

- Shutdown the UV System. Refer to the Operation and Maintenance Manual.
- Apply Lockout and Tag Out devices as necessary. Refer to Operation and Maintenance Manual.
- Clear area where the Level Sensor Control Box will be installed. Refer to project layout drawings.

4. TOOLS

	Lifting Straps - adequately rated for UV Bank weight		Power Drill
	Measuring Tape		Level

5. MATERIALS

- Anchor Bolts (by others)

6. INSTALLATION

6.1 Mounting the Level Sensor Control Box

1. Lift the enclosure into the final installed position.
2. Mark the anchor points on the wall. Set aside the enclosure.

   Note: *Level Sensor Control Box can alternatively be installed on a pedestal.*
3. Drill anchor bolt holes and install 6 mm (1/4 inch) anchors.
4. Install the enclosure onto the anchors. Secure with mounting hardware as per local codes.

6.2 Electrical Installation

Prerequisites:

- Use appropriately rated cable and strain reliefs as per the Electrical and Layout Drawings provided by Trojan Technologies.
- Lockout Tag Out devices as necessary. Refer to Operation and Maintenance Manual.

Tools:

	Power Drill with Bits

Materials:

	Cloth

6.3 PROCEDURE

1. Locate the location for the incoming power connection and field connections on the underside of the enclosure.
2. Open the enclosure door, put a cloth over equipment inside to protect from metal filings.
3. Drill holes for incoming power and field wiring.
4. Carefully remove the protective cloth without dropping metal filings inside of the enclosure. Remove all filings from the enclosure.
5. Install the power and all applicable field wiring. Obey all local codes for main incoming power supplies and applicable field wiring. Refer to electrical drawings.

Note: *All openings created on the cabinets MUST be filled with equipment marked with the same type rating as the enclosure (Ex. Cable Strain Reliefs).*

7. MAINTENANCE

7.1 Clean the Level Sensor Control Box

Prerequisites:

- Shut down the UV system. Refer to the Operation and Maintenance manual.
- Lockout Tag Out devices as necessary. Refer to Operation and Maintenance Manual.

Materials:

	Soapy Water		Cloth

Procedure

1. Use a mild soap and water solution and a damp sponge or soft cloth.
2. Gently wipe the controller exterior to remove debris.

Note: *DO NOT use any corrosive cleansers.*

8. TROUBLESHOOTING

In the event of a Low Level Signal fault (refer to TrojanUVSigna™ Operation and Maintenance Manual - Troubleshooting), where a power failure to the sensor is identified, the following steps are suggested to troubleshoot potential causes:

Prerequisites:

- Check power supply and relays for functionality.
- Lockout Tag Out devices as necessary. Refer to Operation and Maintenance Manual.

Materials:

Troubleshoot:

1. Open panel and check wires for loose connections.
2. Conduct a conductivity test on wiring to ensure there is no problem in the wiring.

8. ASSISTANCE

If you require technical assistance, please contact your local representative. If you require additional assistance, please contact the Technical Assistance Center (TAC) using the contact information below:

North America:	1-866-388-0488
All other areas:	1-519-457-2318
E-mail:	tac@trojanuv.com

At the time of publishing, the information within this document is current. Due to continuous improvements, we may have future changes and recommendations which will be sent via product bulletins.

PRODUCT LINE:	TROJANUVSIGNA™(Type 2 Row)	**DOCUMENT NUMBER:**	DC340601-007
TOPIC:	INSTRUCTION, LAMP CABLE ROUTING INSIDE PDC	**EDITION / REVISION:**	01-02

1. OVERVIEW

The procedure below describes the appropriate steps and safety precautions to follow in order to route and connect the Lamp cables to the Lamp Drivers in the Power Distribution Center (PDC).

2. SAFETY PRECAUTIONS

Read the safety precautions in this section before doing maintenance, service or repair. Obey the instructions in the safety precautions. Failure to follow the instructions in the safety precautions can result in serious injury or death.

⚠ DANGER

Arc Flash and Shock Hazard - Live Electrical Circuit Present. Hazardous Voltage.

- Failure to follow these instructions will result in electrical shock, injury or death from electrocution.
- Devices inside this equipment contain stored energy.
- NEVER work inside this equipment until at least 5 (five) minutes after disconnecting main power to allow stored energy to dissipate.
- Lockout tag out all sources of power before performing any inspection, repair, or maintenance. ***There may be more than one source of power!***

NOTICE

Personal Protective Equipment Required.

- ALWAYS use appropriate eye, hand, and foot protection.
- ALWAYS wear UV-C safety glasses when around equipment or UV-C face shield with safety glasses or safety goggles when inspecting open running equipment.
- ALWAYS follow plant safety procedures and protocols.
- ALWAYS take all necessary precautions when working around, operating, or working on this equipment, contamination of components is expected within this application due to effluent biological or chemical contaminants.

NOTICE

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this manual. Maintain the continuity of the lockout tag out between shifts. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

***Note**: Dispose of contaminated parts/components as per country requirements.*

3. PRE-REQUISITES

- Apply Lockout Tag Out devices as necessary. Refer to Operation and Maintenance Manual.
- Review PDC Wiring Diagrams
- Apply temporary wiring labels to both ends of each Lamp Cable.
- Connect UV Lamp Connectors to the Lamp Ports at the UV Bank. Route Lamp Cables to the PDC.

4. TOOLS

	Wire Side Cutter		Ferrule Crimper		Utility Knife
	Cable Jacket Stripper		Terminal Screwdriver		Wire Stripper

5. MATERIALS

- Lamp Cables (provided)
- Lamp Wire Labels (provided)
- Ferrules, four (4) required for Lamp Cables (by others)
- PDC Wiring Diagrams (provided)
- Lamp Cable Connectors (provided)
- Electrical Tape or Heat Shrink

6. LAMP DRIVER OVERVIEW

6.1 UV Bank Lamp Row and UV Lamp Identification

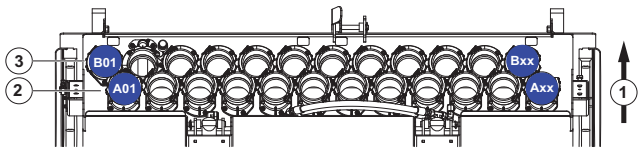


Figure 1 Lamp Row and UV Lamp Identification

1	Effluent Flow Direction	2	Lamp Row A
3	Lamp Row B		

***Note**: The number of lamps varies by project. Replace "xx" with the number of UV Lamps per row applicable to your UV Bank.*

6.2 PDC Section Layouts with Wire Routing and Lamp Numbering

***Notes: 1)** Arrows shown indicate lamp cable routing path.*
***2)** Refer to Electrical Drawings for project specific Lamp Driver / UV Bank Layout.*

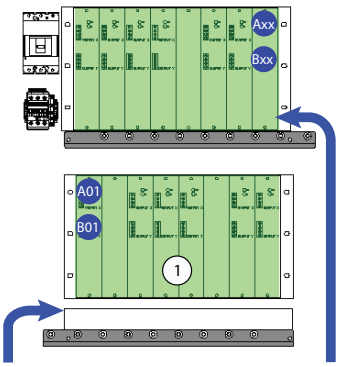


Figure 2 Example - One (1) UV Bank, 18-24 UV Lamps per UV Bank

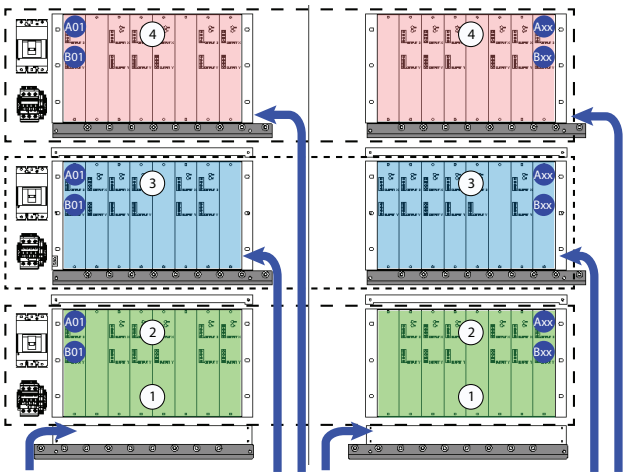


Figure 3 Example - Three (3) UV Banks, 18-24 UV Lamps per UV Bank

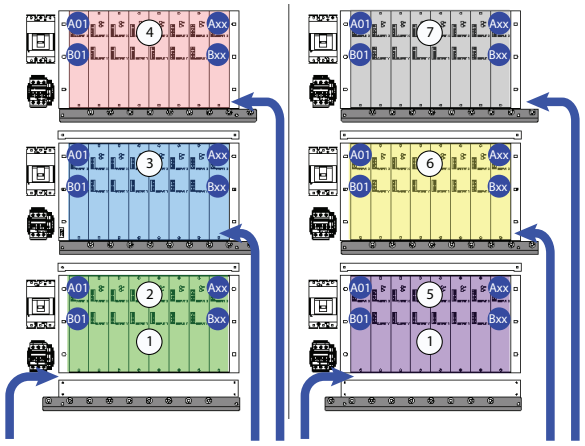


Figure 4 Example - Six (6) UV Banks, 8-16 UV Lamps per UV Bank

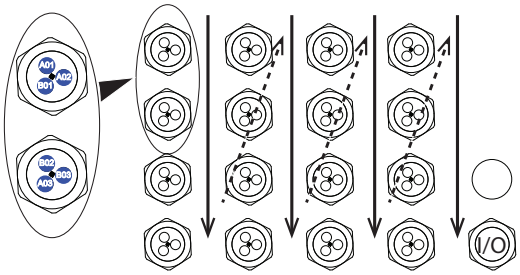
1	Lowest Lamp Driver Rack	2	Bank A
3	Bank B	4	Bank C
5	Bank D	6	Bank E
7	Bank F		

7. PROCEDURE

1. Route three lamp cables through each strain relief in bottom of panel starting with POSITION A01 until all cables have been run. Pull the Lamp Cables all of the way through the strain relief.

Notes: 1) *"Position A01" will be the first lamp on the Lowest Lamp Driver Rack depending on the PDC side that is being wired.*

2) *Do not apply wire labels at this time, they are to be applied in step 2C.*



Note*: Make sure all unused strain relief holes are plugged.*

2A. **Refer to the provided electrical drawings for Lamp Cable to Lamp Driver wiring.** Route cables on the left side to each Lamp Driver in the Lower Left and Lower Right Racks starting with POSITION A01. Route cables through cable supports as shown, starting with CABLE A.

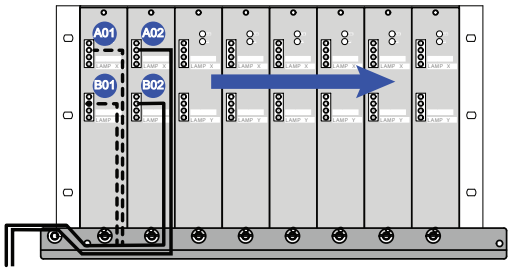
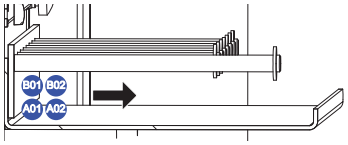


Figure 5 Lower Left or Lower Right Driver Rack

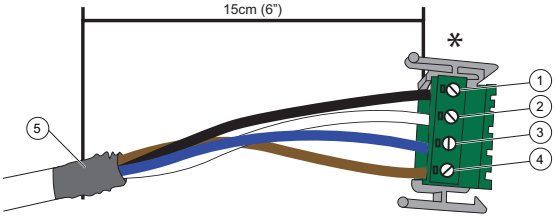


2B. Determine length of cable needed to reach the lamp connection point on the Lamp Driver, remove excess slack and cut the cable to length.

2C. Remove approximately 15cm (6") of cable insulation, ferrule each conductor, connect to Lamp Driver connector. Repeat Steps 2A to 2C for each cable.

Notes: 1) ** = Top when connected to the Lamp Driver.*

2) *Apply heat shrink or electrical tape after stripping the jacketing.*



1	Pin 1 - Black	**2**	Pin 2 - White
3	Pin 3 - Blue	**4**	Pin 4 - Brown
5	Electrical Tape or Heat Shrink		

3. For cable routing purposes only (Figure 6)**. Refer to the provided electrical drawings for Lamp Cable to Lamp Driver wiring:**

- For Lamp Driver Racks in the middle or top position, route and land cables beginning on the right side of the Lamp Driver Rack. Install the first lamp cable in the upper most position (i.e. I). Install the next Lamp Cable into the (II) position, and so on. Move right to left until complete.

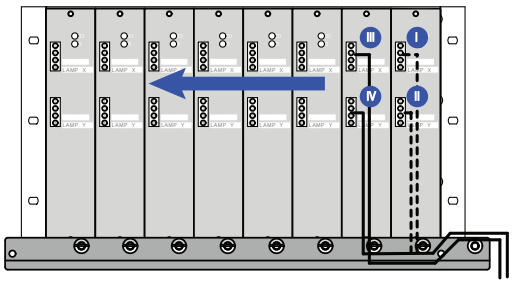


Figure 6 All Other Lamp Driver Racks

8. ASSISTANCE

If you require technical assistance, please contact your local representative. If you require additional assistance, please contact the Technical Assistance Center (TAC) using the contact information below:

North America:	1-866-388-0488
All other areas:	1-519-457-2318
E-mail:	tac@trojanuv.com

At the time of publishing, the information within this document is current. Due to continuous improvements, we may have future changes and recommendations which will be sent via product bulletins.

INSTRUCTION

PRODUCT LINE:	TROJANUVSIGNA™ (ALL TYPES) TROJANUVFLEX™	**DOCUMENT NUMBER:**	DC000601-019
TOPIC:	INSTRUCTION, HOSE ASSEMBLY FIELD CONNECTION	**EDITION/REVISION:**	01-02

1. OVERVIEW

The procedure below provides the appropriate steps and safety precautions to follow in order to install fittings onto hydraulic hoses.

2. SAFETY PRECAUTIONS

Read the safety precautions in this instruction before starting the procedure. Obey the instructions in the safety precautions. Failure to follow the instructions in the safety precautions can result in serious injury or death.

NOTICE

Personal Protective Equipment Required.

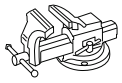
- ALWAYS use appropriate eye, hand, and foot protection.
- ALWAYS wear UV-C safety glasses when around equipment or UV-C face shield with safety glasses or safety goggles when inspecting open running equipment.
- ALWAYS follow plant safety procedures and protocols.
- ALWAYS take all necessary precautions when working around, operating, or working on this equipment, contamination of components is expected within this application due to effluent biological or chemical contaminants.

NOTICE

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this manual. Maintain the continuity of the lockout tag out between shifts. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

***Note**: Dispose of contaminated parts/components as per country requirements.*

3. TOOLS

	Hacksaw		Bench Vise
	Wrench 7/16”		Wrench 11/16”

4. MATERIALS

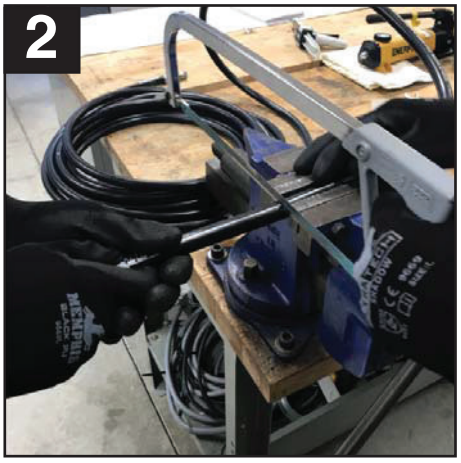
- Hydraulic Hose (provided)
- Hose Fittings (provided)
- Hydraulic Oil (**Mineral Oil or Pure Drive as provided**)

5. PROCEDURE

Note: *The field connect fitting is to be used on the HSC connection only. The pre-crimped end of hose is to be connected to the UV Bank.*

Remove protective plastic film from hose ends.

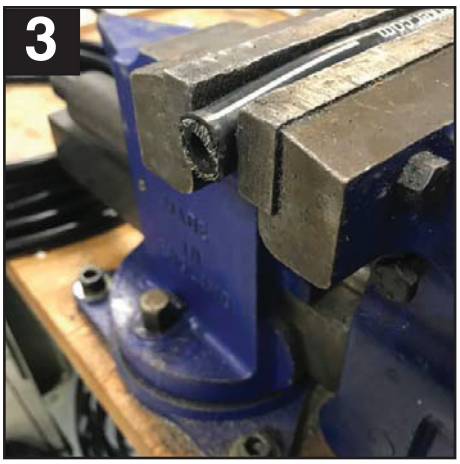
Note: *The hose end with the hose fitting is to be connected to the UV Bank cylinder.*



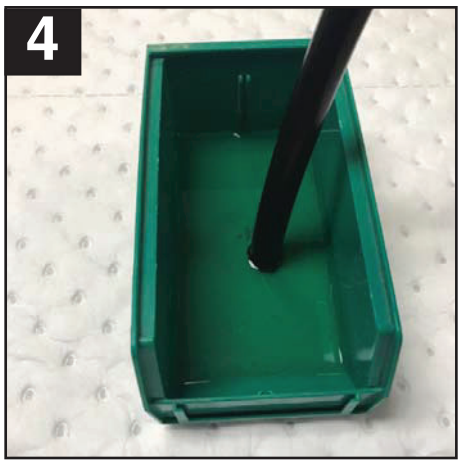
Identify and mark the overall length of hose required.

Place hose in a bench vise. Apply only enough pressure to hold the hose, do not compress the hose. Cut off excess hose length.

Install colored hose bands. Refer to the Operation and Maintenance Manual.



Ensure that the cut end of the hose is clean and free of any debris.

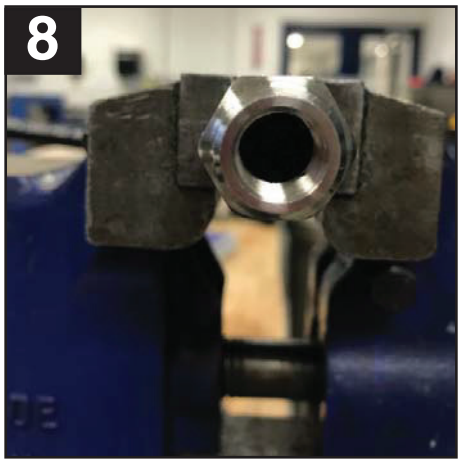


Keep the cut end facing downward.
Dip the end of the cut hose in provided hydraulic fluid.

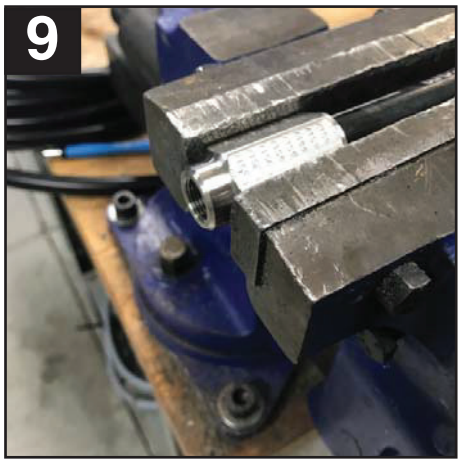
Insert hose into bench vise, leave 50mm (2 inch) hose extending from the vise.

Thread the hose fitting onto the hose by turning it ***counter clockwise*** until it bottoms. Back the fitting out 1/2 turn.

There will be significant resistance, the fitting may require the use of a wrench to complete the install.



View from the fitting end to verify that the hose is fully seated in the fitting.



Remove the hose from the vise, re-clamp on the fitting.

Dip the fitting insert in hydraulic fluid.

Thread the insert into the fitting by turning clockwise.

Note: *There will be significant resistance, the fitting may require the use of a wrench to complete the install.*

Verify that the insert is fully seated in the fitting. The gap between the hose and the hose fitting is to be no greater than 2mm.

Remove the hose from the bench vise.

6. POST-REQUISTIES

1. Connect the field fitting end of the hose to the HSC. Refer to the Operation and Maintenance Manual.
2. Repeat all steps for remaining hoses.

7. ASSISTANCE

If you require technical assistance, please contact your local representative. If you require additional assistance, please contact the Technical Assistance Center (TAC) using the contact information below:

North America:	1-866-388-0488
All other areas:	1-519-457-2318
E-mail:	tac@trojanuv.com

At the time of publishing, the information within this document is current. Due to continuous improvements, we may have future changes and recommendations which will be sent via product bulletins.

INSTRUCTION

PRODUCT LINE:	TROJANUVSIGNA® (All Models)	**DOCUMENT NUMBER:**	DC000601-013
TOPIC:	INSTRUCTION, REFERENCE SENSOR PROCEDURE, ANALOG SENSORS	**EDITION/REVISION:**	03-01

1. OVERVIEW

The Reference UVI Sensor is used to provide comparative values over time to demonstrate continued good (satisfactory) operation of the Duty UVI Sensor. The Reference UVI Sensor is designed to be mounted into the same sensor port and sensor sleeve as the Duty UVI Sensor.

The Reference UVI Sensor uses the same type of material and is identical in calibration to the Duty UVI Sensor. The Reference UVI Sensor is provided with its own protective case and is to be stored in a dry, warm, and clean environment.

The Reference Sensor Procedure can begin once all the Prerequisites have been met.

2. SAFETY PRECAUTIONS

Read the safety precautions in this instruction before starting the procedure. Obey the instructions in the safety precautions. Failure to follow the instructions in the safety precautions can result in serious injury or death.

⚠ DANGER



Arc Flash and Shock Hazard - Live Electrical Circuit Present.

- Failure to follow these instructions will result in electrical shock, injury or death from electrocution.
- Equipment should be accessed by competent personnel only.
- Devices inside this equipment contain stored energy.
- NEVER work inside this equipment until at least 5 (five) minutes after disconnecting main power to allow stored energy to dissipate.
- Lockout tag out all sources of power before performing any inspection, repair, or maintenance. ***There may be more than one source of power!***

⚠ DANGER


Fall Hazard.

- Failure to follow these instructions will result in injuries due to fall.
- Always use appropriate fall resistant procedures and equipment while working near an uncovered channel, when a fall hazard is present, in compliance with local regulations.

⚠ CAUTION

UV Light Hazard.

- Failure to follow these instructions may result in serious burns to unprotected eyes and skin.
- ALWAYS use UV protective gear, including gloves, clothing, and face shield when UV light is present.
- NEVER look directly at illuminated UV lamp, even with protective gear.
- NEVER illuminate UV lamp if personnel may be directly exposed to UV light.

NOTICE

Personal Protective Equipment Required.

- ALWAYS use appropriate eye, hand, and foot protection.
- ALWAYS wear UV-C safety glasses when around equipment or a UV-C faceshield with safety glasses or safety goggles when inspecting open running equipment.
- ALWAYS follow plant safety procedures and protocols.
- ALWAYS take necessary precautions when working around, operating, or working on this equipment, if contamination of components is expected within this application due to effluent biological or chemical contaminants.

NOTICE

Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this manual. Maintain the continuity of the lockout tag out between shifts. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

***Note**: Dispose of contaminated parts/components as per country requirements.*

3. PREREQUISITES

- Ensure the UV Bank has been operating for a minimum of 20 minutes.

  ***Note:** The Reference Sensor procedure button will only display if:*

  - Lamp 4 is on with no major faults ***(Type 2 Row only)***
  - Lamp A1 is on with no major faults ***(Type 4 and 6 Row only)***
  - UV Bank is in operation (UV Bank is ON and not in warm-up or timing-off)
  - UV Bank Wipe is not in progress
  - UV Bank is communicating with SCC

4. MATERIALS

- Reference Sensor Data Sheets
- Reference Sensor
- Kimwipes
- Alcohol wipes

5. PROCEDURE

1. Bank Overview screen ⟶ Reference Sensor button.
2. If the Realtime Sensor Reading (Figure 1) is greater than 19mA, and the UV bank mode is in Local ON, change the UV bank mode to Remote ON or Remote Auto.

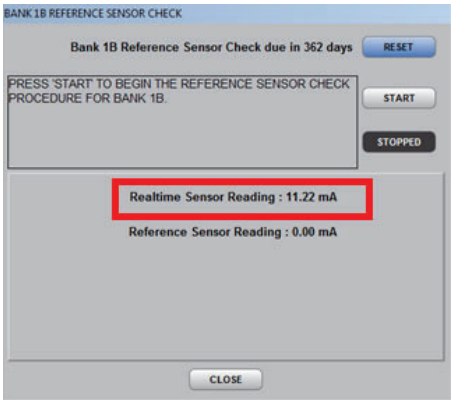


Figure 1 Realtime Sensor Reading

3. Press START (Figure 2) ⟶ The BCB will increase bank power to 100% and wait for the Realtime Sensor Reading to stabilize.

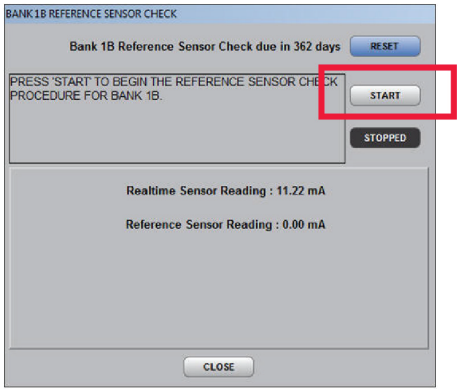


Figure 2 Reference Sensor Check

4. If the Realtime Sensor Reading (Figure 1) is greater than 19mA, reduce power in 10% increments (Figure 3) until the reading is equal to or lower than 19mA.

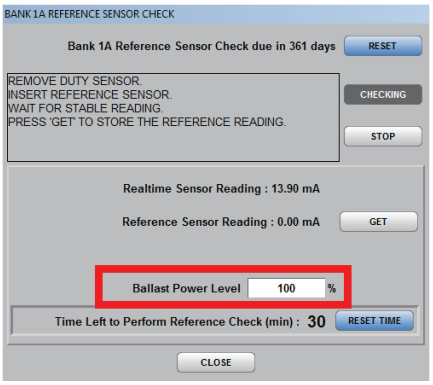


Figure 3 Reference Sensor - Ballast Power Level

5. Once the Realtime Sensor Reading is stable, remove the Duty UVI Sensor and insert the Reference UVI Sensor. Refer to Operation and Maintenance Manual.
6. Once the Reference Sensor Reading has stabilized, press the GET button for the Reference Sensor Reading (Figure 4).

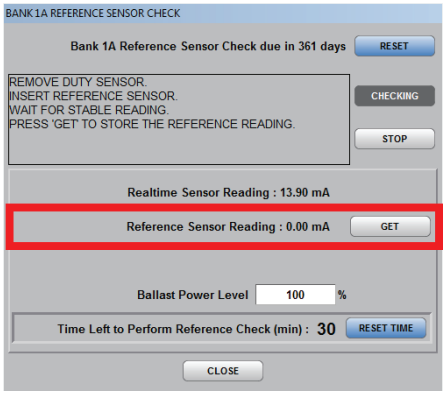


Figure 4 Reference Sensor - GET Screen

7. Record the value (mA) on the Reference Sensor Data Sheet in the **Reference Sensor Reading (B)** column.
8. Remove the Reference UVI Sensor and insert the Duty UVI Sensor. Refer to Operation and Maintenance Manual.

9. Once the Duty Sensor Reading has stabilized, press the GET button for the Duty Sensor Reading (Figure 5).

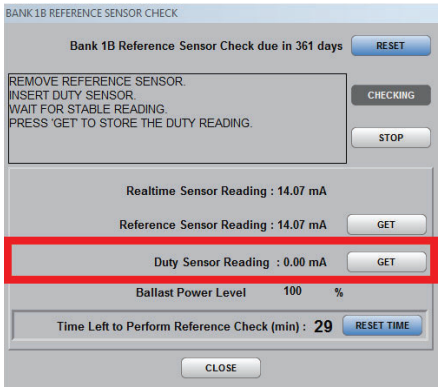


Figure 5 Duty Sensor - GET Screen

10. Record the value (mA) on the Reference Sensor Data Sheet in the **Duty Sensor Reading (A)** column.
11. Press the STOP button to end the Reference Sensor Procedure.
12. Push RESET when procedure is complete to reset the time until next calibration.

    Note: *The top of the window displays the days left for performing the reference sensor check.*

13. Calculate the **Calibration Ratio (A-4 / B-4)** as shown on the REFERENCE SENSOR DATA SHEET. Record the value.

TrojanUV Reference Sensor Procedure Data Sheet

Based on the 2006 'EPA Disinfection Guidance Manual for the Final LT2ESWTR'.

Date: _____

Site: _____ **Operator:** _____

%UVT: _____ **Sensor Saturation Cut-Off Level:** _____ **mA**

TROJAN UV WATER CONFIDENCE™

Bank ID	Sensor ID	Duty Sensor Serial No.	Reference Sensor Serial No.	Duty Sensor Reading (A) (mA)	Reference Sensor Reading (B) (mA)	Calibration Ratio (A - 4) / (B - 4)	Calibration Ratio ≤ 1.2 (Yes/No[1])

Note 1: [Extracted from 2006 EPA Guideline] If calibration ratio is greater than 1.2, verify that the reference UV sensor is accurate with a different reference UV sensor (i.e. verify that the duty UV sensor truly failed the calibration check) by inserting a second reference UV sensor and repeating the reference procedure. If a second reference UV sensor is unavailable, the sensor calibration can be checked against two duty sensors (as opposed to another reference sensor).

7. ASSISTANCE

If you require technical assistance, please contact the Technical Assistance Center (TAC) using the contact information below:

North America:	1-866-388-0488
All other areas:	1-519-457-2318
E-mail:	tac@trojantechnologies.com

At the time of publishing, the information within this document is current. Due to continuous improvements, we may have future changes and recommendations which will be sent via product bulletins.

RW Gate Company
79 102nd STREET
TROY, NEW YORK 12180
OFFICE: 518-874-4750
FAX: 518-274-0210
WEBSITE: www.rwgate.com

8/1/23

Trojan Technologies
3020 Gore Road
London, Ontario Canada, N5V 4T7

Attn: Michael Bartram

Subject: Ann Arbor, MI – Trojan UV Inlet & Outlet Gates
Your P.O.# Awaiting Order
RW Gate Ref. 23223

Michael,

Please find attached a copy of the shop drawings and submittal information for the above mentioned project for your review and approval.

23223-010 Model RW750-S Sluice Gate, 72” Wide x 72” High
23223-011 Model RW750-S Sluice Gate Sections
23223-01E Model RW750-S Engineering Data
23223-01C Model RW750-S Calculations
23223-020 Model RW750-S Sluice Gate, 72” Wide x 72” High
23223-02C Model RW750-S Calculations
Rotork Electric Actuator Data Sheets
Rotork Electric Actuator Dimensional Drawings
Rotork Electric Actuator Wiring Diagram
Installation Instructions.

The proposed equipment is submitted as our best interpretation of the available contract documents. Verification of all elevations and dimensions relating to the mounting structure is the responsibility of the reviewing engineer and contractor.

RW Gates policy is that written approval of submittal drawings is required before equipment can be scheduled for fabrication, email is acceptable.

This submittal is not and should not be considered a confirmation of acceptance of all legal and contractual documents of a contract or terms of an unexecuted purchase order.

Please feel free to contact me if you have any questions or need any further assistance.

Best regards,

Matthew Palmer
RW Gate Company
mpalmer@rwgate.com

SITE FASTENERS PER GATE			
ITEM	DESCRIPTION	MATERIAL	QTY
1	5/8"-11 x 10" THREADED ROD	SS. 316	20
2	5/8"-11 NUT	SS. 316	34
3	5/8" WASHER	SS. 316	34
4	5/8"-11 x 8" THREADED ROD	SS. 316	14
5	1/2"-13 x 7" THREADED ROD	SS. 316	2
6	1/2"-13 NUT	SS. 316	4
7	1/2" WASHER	SS. 316	2
8	3/4"-10 x 10" THREADED ROD	SS. 316	6
9	3/4"-10 NUT	SS. 316	12
10	3/4" WASHER	SS. 316	6

REV.	REVISION	DRAWN	DATE	CHK'D
A	ORIGINAL DRAWING	MFP	7/31/23	MFP

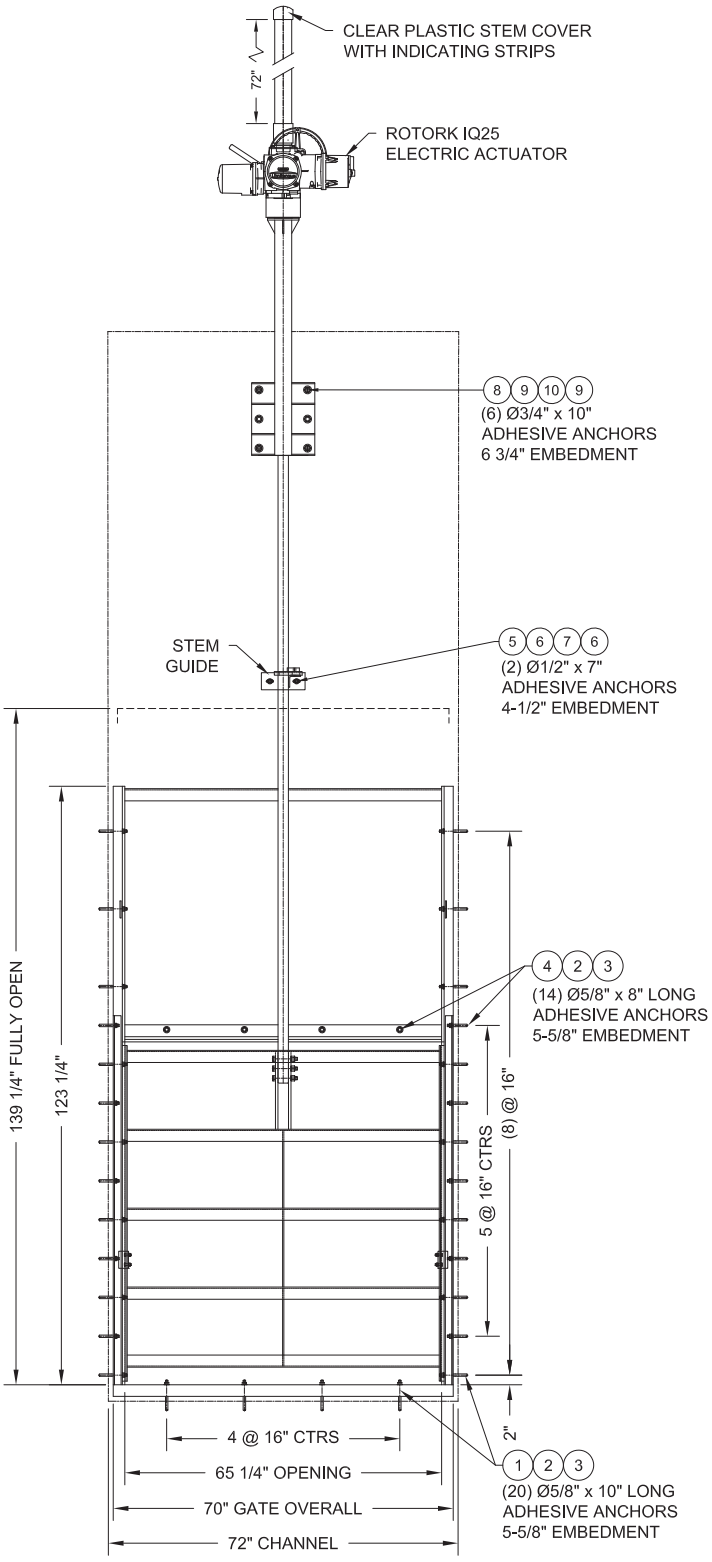
GATE LOCATION: UV INLET SLIDE GATES

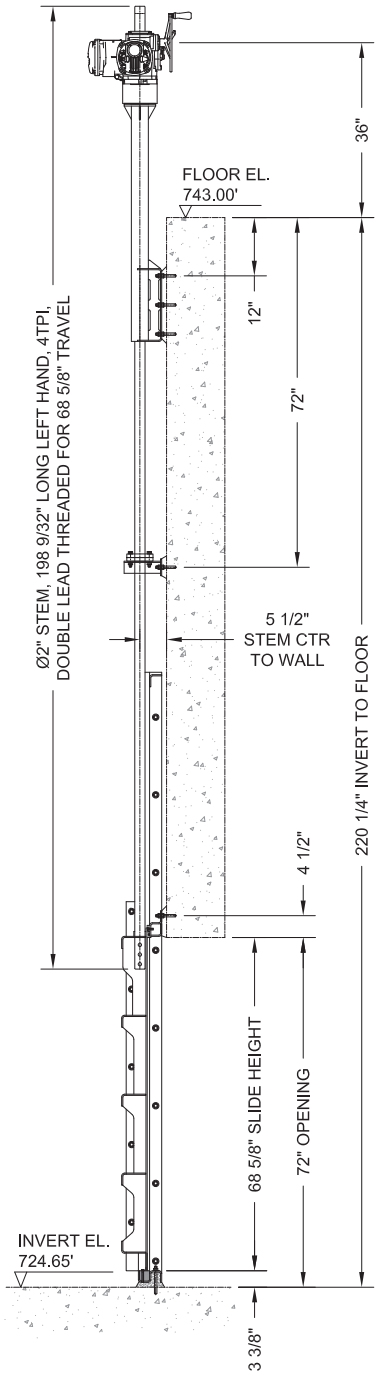
FOR GATE SECTIONS SEE DWG: 23223-011

APPROX GATE WEIGHT: 1050 LB

GATE MOUNTING: CHANNEL MOUNT

THREADED ROD, NUTS AND WASHERS SUPPLIED.
ADHESIVE BY OTHERS.





RW GATE COMPANY

QUANTITY: 2	SEATING	UNSEATING
DESIGN HEAD (FT)	12.0	12.0
ALLOWABLE LEAKAGE RATE (GPM / FT)	0.1	0.1

TOLERANCES
UNLESS OTHERWISE SPECIFIED
FRACTIONAL ±1/8
DECIMAL ±0.005
ANGULAR ±2°

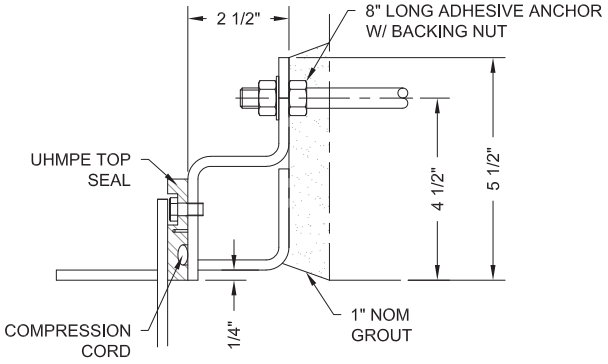
TITLE: ANN ARBOR, MI - WWTP UV DISINFECTION

DATE: 7/31/23

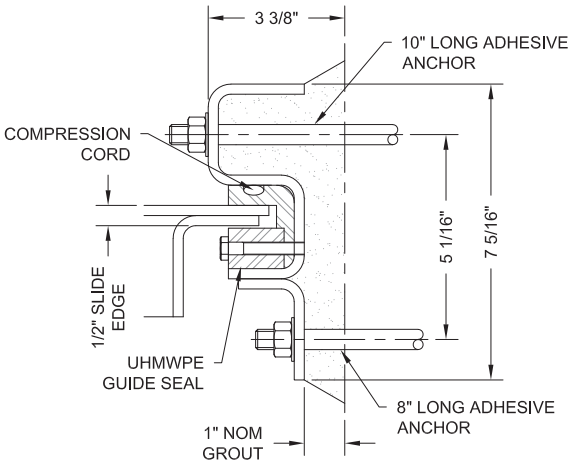
TITLE: 72" x 72" SERIES RW1000S SLIDE GATE

SCALE:	MATERIAL:	DWG. NO.	REV.
1:25	SEE 23223-01E	23223-010	A

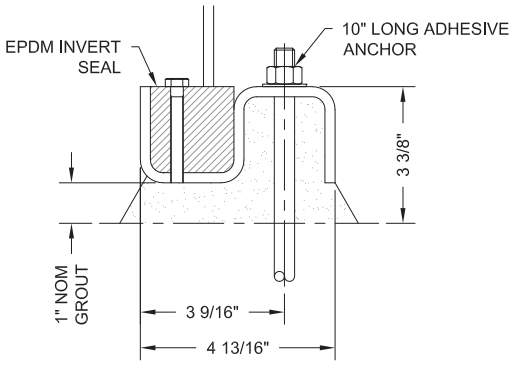
REV.	REVISION	DRAWN	DATE	CHK'D
A	ORIGINAL DRAWING	MFP	8/1/23	MFP



TOP SEAL SECTION
WALL MOUNT



GUIDE SECTION
CHANNEL MOUNT



INVERT SECTION
CHANNEL MOUNT

RW GATE COMPANY

PROJECT
ANN ARBOR, MI - WWTP UV DISINFECTION

DATE. 8/1/23

TITLE
SERIES RW750-S SLUICE GATE SECTIONS

SCALE:	MATERIAL:	DWG. NO.	REV.
1:3	SEE 23223-01E	23223-011	A

DOCUMENT No.	REV.	ENGINEERING DATA SHEET	DATE	DRAWN BY
23223-01E	A		8/1/23	MFP

RW750-S: STAINLESS STEEL SLUICE GATES

MATERIALS OF CONSTRUCTION

FRAME	STAINLESS STEEL GRADE 304L	ASTM A240
SLIDE	STAINLESS STEEL GRADE 304L	ASTM A240
STEM	STAINLESS STEEL GRADE 304	ASTM A276
GUIDE SEALS	UHMWPE	ASTM D4020
TOP SEAL	UHMWPE	ASTM D4020
INVERT SEAL	EPDM	ASTM D2000
STEM GUIDE BRACKET	STAINLESS STEEL GRADE 316L	ASTM A240
STEM GUIDE BUSHING	UHMWPE	ASTM D4020
PEDESTAL	STAINLESS STEEL GRADE 316L	ASTM A240/276
FASTENERS	STAINLESS STEEL GRADE 316	ASTM F593
ACTUATOR LIFT NUT	BRONZE	ASTM C95800/B584
STEM COVER	CLEAR BUTYRATE	

NOTES

ALL STAINLESS STEEL WELDED IN ACCORDANCE WITH AWS D1.6
GATES DESIGNED TO AWWA C.561

MIN STAINLESS STEEL THICKNESS: 0.25”
MAX SLIDE DEFLECTION 1/16”
MAX SLIDE DEFLECTION RATIO 1/360
OPERATING STEM L/r = 200 OR LESS

OPERATOR

ROTORK IQ25 ELECTRIC ACTUATOR

ANCHORS

RW GATE SUPPLIES THE THREADED ROD, NUTS AND WASHERS FOR INSTALLATION, ADHESIVE TO BE SUPPLIED BY INSTALLER.
MINIMUM EMBEDMENT DEPTH GIVEN ON INSTALLATION DRAWINGS.

RECOMMENDED ADHESIVES:

- HILTI HIT RE500 EPOXY ADHESIVE (OR RE500-SD)
- ITW RAMSET / REDHEAD EPCON CERAMIC 6 EPOXY ADHESIVE
- OR APPROVED EQUAL

RW GATE COMPANY

Gate Calculation Sheet
23223-01C

Rev: A
Date: 6/1/23

Project: Ann Arbor, MI - Trojan UV Inlet & Outlet Gates
Drawing Ref: 23223-010
Description: Model RW-750S Sluice Gate, 72" wide x 72" high

Constants

γ =Specific Weight of Water $\gamma := 62.4 \frac{lbf}{ft^3} = 0.036 \frac{lbf}{in^3}$

E =Youngs Modulus of Stainless Steel $E := 2.8 \cdot 10^7 \ psi$

μ =Seal Coefficient of Friction $\mu := 0.2$

Variables

H =Design Head at Invert $H := 12 \ ft = 144 \ in$

H_o =Operating Head at Invert $H_o := 12 \ ft = 144 \ in$

A_w =Gate Opening Width $A_w := 65.25 \ in = 5.438 \ ft$

A_h =Gate Opening Height $A_h := 68.625 \ in = 5.72 \ ft$

Slide Design

Slide plate section of depth equal to stiffener spacing, taken at lowest point of gate opening.
Considered as simply supported beam under uniform load (Roark's p. 104, 2e)

d=section depth $d := 16.50 \ in$

I =Slide Section Moment of Inertia $I := 18.0978 \cdot in^4$

y =Slide Section Centroid to Furthest Face $y := 4.1204 \ in$

$L_a := A_w$ $L_a = 65.25 \ in$

w_a =Load per unit length $w_a := \left(H - \frac{d}{2}\right) \cdot \gamma \cdot d = 80.9 \frac{lbf}{in}$

σ =stress $\sigma := \frac{w_a \cdot {L_a}^2 \cdot y}{8 \ I} = 9801 \ psi$ Acceptable <18,000 psi

δ =Deflection $\delta := \frac{5 \ w_a \cdot {L_a}^4}{384 \cdot E \cdot I} = 0.0377 \ in$ Acceptable, δ <1/16"

δ_s =Deflection Ratio $\delta_s := \frac{L_a}{\delta} = 1732$ Acceptable, > 720

Stem Design

Operator is Rotork Electric Actuator

H_c =Head at Gate Centerline $H_c := H - \frac{A_h}{2} = 9.141\ ft$

D =Stem Outside Diameter $D := 2.125\ in$

r =Stem Radius of Gyration $r := 0.50 \cdot in$

F_h =Lifting Load Due to Operating Head $F_h := H_c \cdot \gamma \cdot \mu \cdot A_h \cdot A_w = 3547\ lbf$

W =Slide Weight + Stem Weight $W := 770\ lbf$

F_d =Seal Drag $F_d := 2000 \cdot lbf$

F_L =Lifting Force $F_L := F_h + F_d + W = 6317\ lbf$

S_f =Stem Factor $S_f := 0.0243 \cdot ft$

O_T =Operating Torque Required $O_T := F_L \cdot S_f = 154\ lbf \cdot ft$

O_R =Rated Output Torque $O_R := 220\ ft \cdot lbf$ Acceptable > O_T

T_s =Stall Torque $T_s := 528\ lbf \cdot ft$

R =Stall Torque Reserve $R := 1.5$

T_d =Design Thrust $T_d := \frac{T_s \cdot R}{S_f} = 32593\ lbf$

σ_s =Stem Stress $\sigma_s := \frac{T_d \cdot 4}{\pi \cdot D^2} = 9190\ psi$ Acceptable < 18,000 psi

L_s =Stem Free Length $L_s := 79\ in$

L_r =L/r Ratio $L_r := \frac{L_s}{r} = 158$ Acceptable < 200

B =Buckling Load $B := \frac{2 \cdot \pi^3 \cdot E \cdot D^2}{4} \cdot \left(\frac{r}{L_s}\right)^2 = 78520\ lbf$

Acceptable > Design Thrust

SITE FASTENERS PER GATE			
ITEM	DESCRIPTION	MATERIAL	QTY
1	5/8"-11 x 10" THREADED ROD	SS. 316	20
2	5/8"-11 NUT	SS. 316	34
3	5/8" WASHER	SS. 316	34
4	5/8"-11 x 8" THREADED ROD	SS. 316	14
5	1/2"-13 x 7" THREADED ROD	SS. 316	2
6	1/2"-13 NUT	SS. 316	4
7	1/2" WASHER	SS. 316	2

REV.	REVISION	DRAWN	DATE	CHK'D
A	ORIGINAL DRAWING	MFP	7/31/23	MFP

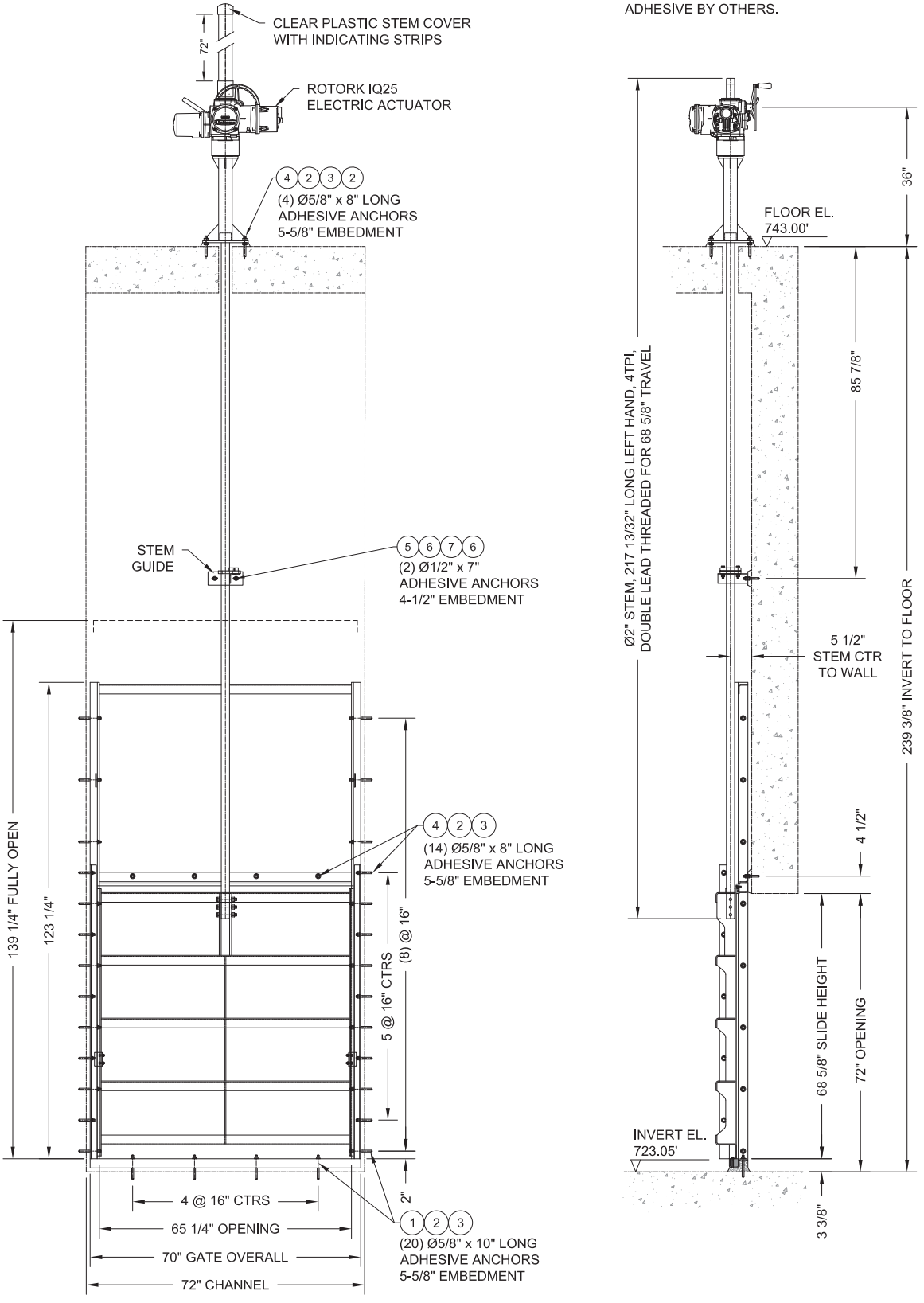
GATE LOCATION: UV OUTLET SLIDE GATES

FOR GATE SECTIONS SEE DWG: 23223-011

APPROX GATE WEIGHT: 1070 LB

GATE MOUNTING: CHANNEL MOUNT

THREADED ROD, NUTS AND WASHERS SUPPLIED. ADHESIVE BY OTHERS.



RW GATE COMPANY

QUANTITY: 2	SEATING	UNSEATING
DESIGN HEAD (FT)	12.0	12.0
ALLOWABLE LEAKAGE RATE (GPM / FT)	0.1	0.1

TOLERANCES
UNLESS OTHERWISE SPECIFIED
FRACTIONAL ±1/8
DECIMAL ±0.005
ANGULAR ±2°

TITLE: ANN ARBOR, MI - WWTP UV DISINFECTION

DATE: 7/31/23

TITLE: 72" x 72" SERIES RW1000S SLIDE GATE

SCALE:	MATERIAL:	DWG. NO.	REV.
1:25	SEE 23223-01E	23223-020	A

Gate Calculation Sheet
23223-02C

Rev: A
Date: 6/1/23

Project: Ann Arbor, MI - Trojan UV Inlet & Outlet Gates
Drawing Ref: 23223-020
Description: Model RW-750S Sluice Gate, 72" wide x 72" high

Constants

γ =Specific Weight of Water $\gamma := 62.4\ \frac{lbf}{ft^3} = 0.036\ \frac{lbf}{in^3}$

E =Youngs Modulus of Stainless Steel $E := 2.8 \cdot 10^7\ psi$

μ =Seal Coefficient of Friction $\mu := 0.2$

Variables

H =Design Head at Invert $H := 12\ ft = 144\ in$

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Slide Design

Slide plate section of depth equal to stiffener spacing, taken at lowest point of gate opening.
Considered as simply supported beam under uniform load (Roark's p. 104, 2e)

d=section depth $d := 16.50\ in$

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y =Slide Section Centroid to Furthest Face $y := 4.1204\ in$

$L_a := A_w$ $L_a = 65.25\ in$

w_a =Load per unit length $w_a := \left(H - \frac{d}{2}\right) \cdot \gamma \cdot d = 80.9\ \frac{lbf}{in}$

σ =stress $\sigma := \frac{w_a \cdot {L_a}^2 \cdot y}{8\ I} = 9801\ psi$ Acceptable <18,000 psi

δ =Deflection $\delta := \frac{5\ w_a \cdot {L_a}^4}{384 \cdot E \cdot I} = 0.0377\ in$ Acceptable, δ <1/16"

δ_s =Deflection Ratio $\delta_s := \frac{L_a}{\delta} = 1732$ Acceptable, > 720

Stem Design

Operator is Rotork Electric Actuator

H_c =Head at Gate Centerline $H_c := H - \frac{A_h}{2} = 9.141\ ft$

D =Stem Outside Diameter $D := 2.125\ in$

r =Stem Radius of Gyration $r := 0.50 \cdot in$

F_h =Lifting Load Due to Operating Head $F_h := H_c \cdot \gamma \cdot \mu \cdot A_h \cdot A_w = 3547\ lbf$

W =Slide Weight + Stem Weight $W := 790\ lbf$

F_d =Seal Drag $F_d := 2000 \cdot lbf$

F_L =Lifting Force $F_L := F_h + F_d + W = 6337\ lbf$

S_f =Stem Factor $S_f := 0.0243 \cdot ft$

O_T =Operating Torque Required $O_T := F_L \cdot S_f = 154\ lbf \cdot ft$

O_R =Rated Output Torque $O_R := 220\ ft \cdot lbf$ Acceptable > O_T

T_s =Stall Torque $T_s := 528\ lbf \cdot ft$

R =Stall Torque Reserve $R := 1.5$

T_d =Design Thrust $T_d := \frac{T_s \cdot R}{S_f} = 32593\ lbf$

σ_s =Stem Stress $\sigma_s := \frac{T_d \cdot 4}{\pi \cdot D^2} = 9190\ psi$ Acceptable < 18,000 psi

L_s =Stem Free Length $L_s := 86\ in$

L_r =L/r Ratio $L_r := \frac{L_s}{r} = 172$ Acceptable < 200

B =Buckling Load $B := \frac{2 \cdot \pi^3 \cdot E \cdot D^2}{4} \cdot \left(\frac{r}{L_s}\right)^2 = 66258\ lbf$

Acceptable > Design Thrust

Electric Actuator Datasheet

Your Reference:	RW Gate - REQ 2-24 - WWTP - City of Ann Arbor, MI
Our Reference:	CUS120306-00-2
Date of Quotation:	8/1/2023

Item	Units	
Line Number		1
Tag Number		Item #1
Quantity	Each	4

Valve Requirements	Units	
Type		Slide Gates
Size		72"x72"
Torque	lbs ft	111.00
Thrust	lbsf	4567.00
Coupling Type		Thrust Base - Threaded
Coupling Dimension	in	1.88
Turns		144.00
Operating Time	secs	390
Max. Handwheel Rim Pull	lbsf	120.00

Equipment Offered	Units	
Actuator		IQ3 25 F14 A WT
Actuator Speed	rpm	43
Output Flange		FA14
Coupling Type		Thrust Base - Threaded
Coupling Dimension	in	2.01
Maximum RS Diameter	in	2.01
Actuator Weight	lb	119.12
Combination Weight	lb	119.12
Handwheel Type		SHW
Handwheel Ratio		13.30
Handwheel Turns		2074.80
Rim Pull	lbsf	57.52

Actuator Performance	Units	
Torque	lbs ft	219.79
Thrust	lbsf	22480.89
Resultant Thrust	lbsf	9043.22
Output Speed	rpm	43.00
Operating Time	secs	217.67

Requested Safety Factors	
Torque	1.50
Modulating Torque	1.00
Thrust	1.50
Modulating Thrust	1.00

Calculated Safety Factors	
Torque	1.98
Thrust	4.92

Electrical Data		
Voltage	V	480
Phase	Ø	3
Frequency	Hz	60 Hz
Starting current	A	18.23
Starting power factor		0.81
Rated load current	A	4.40
Current at average load	A	3.05
Power factor at average load		0.54
Motor power at average load	kW	1.29
Number of poles of motor		4

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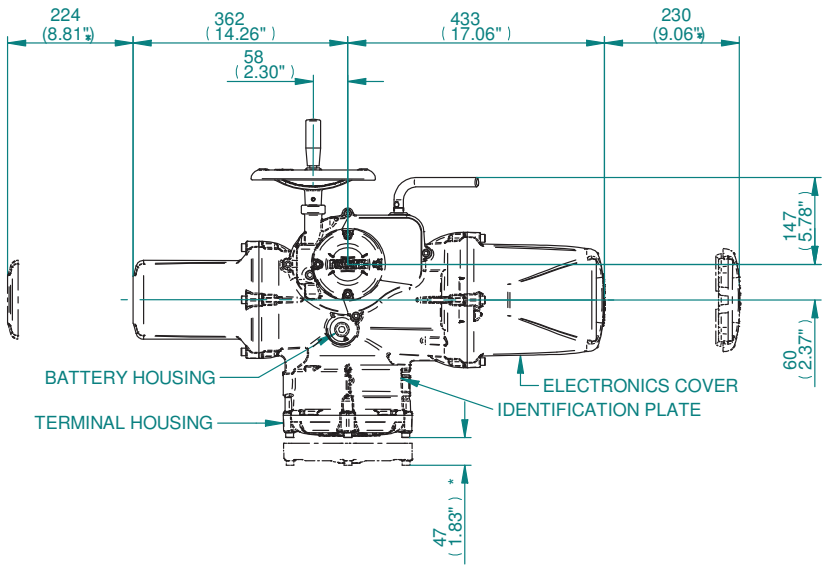
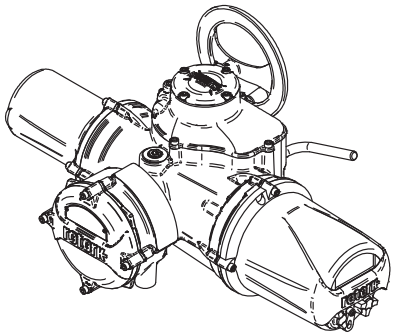
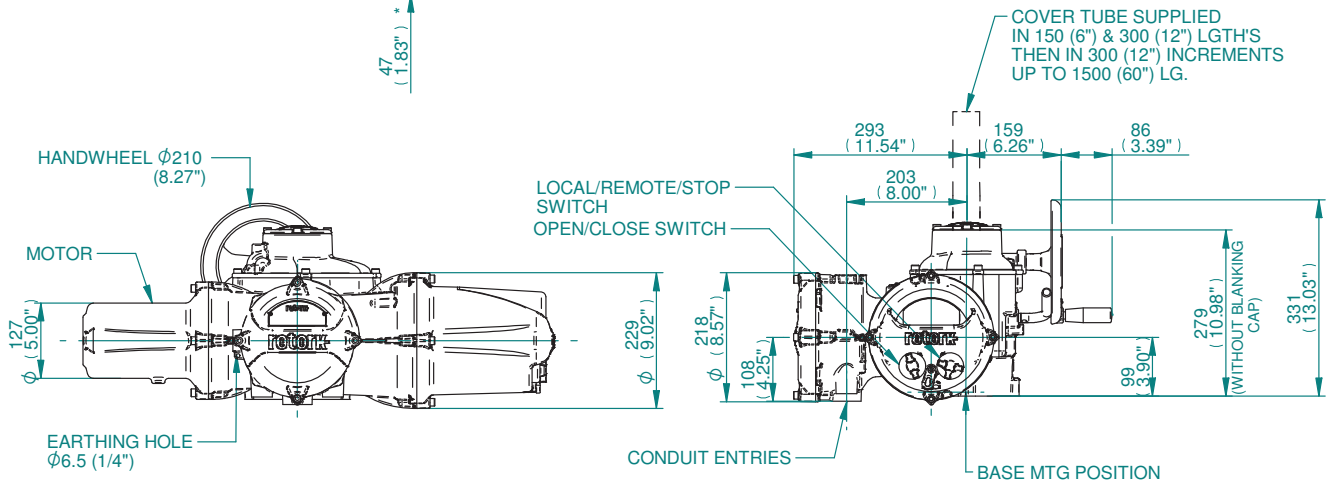
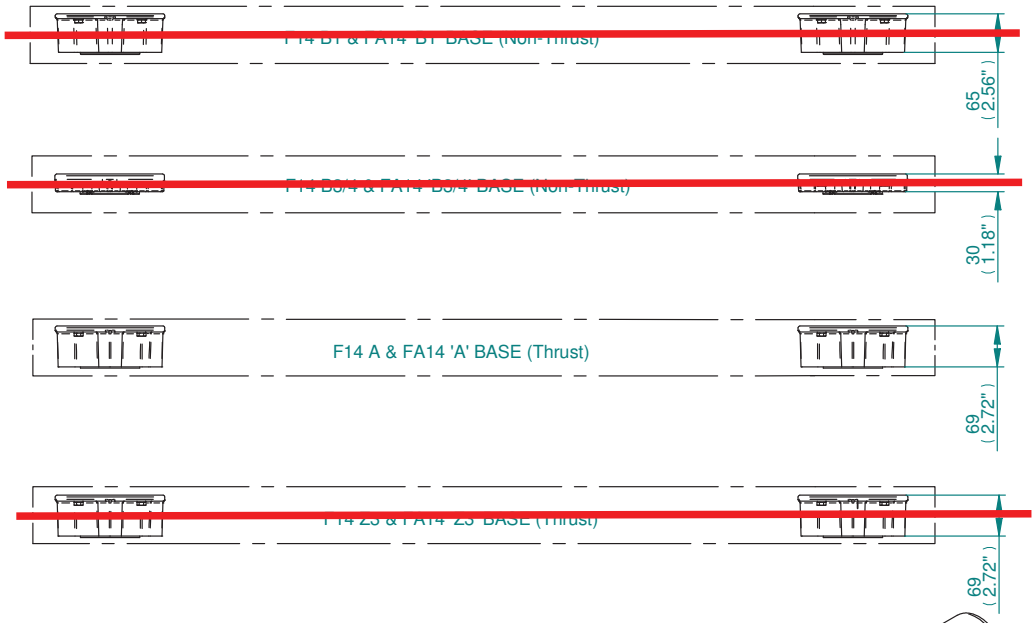
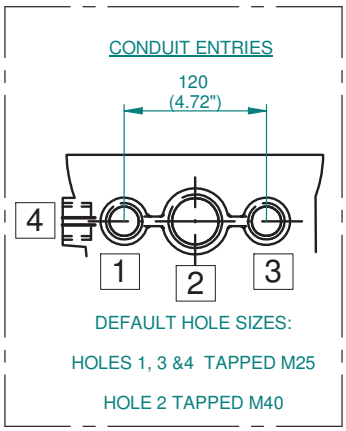
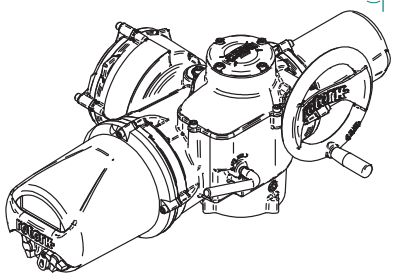






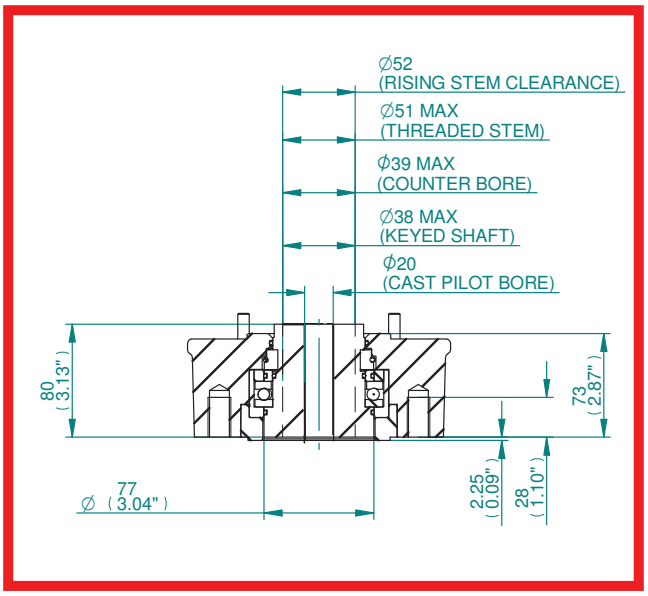




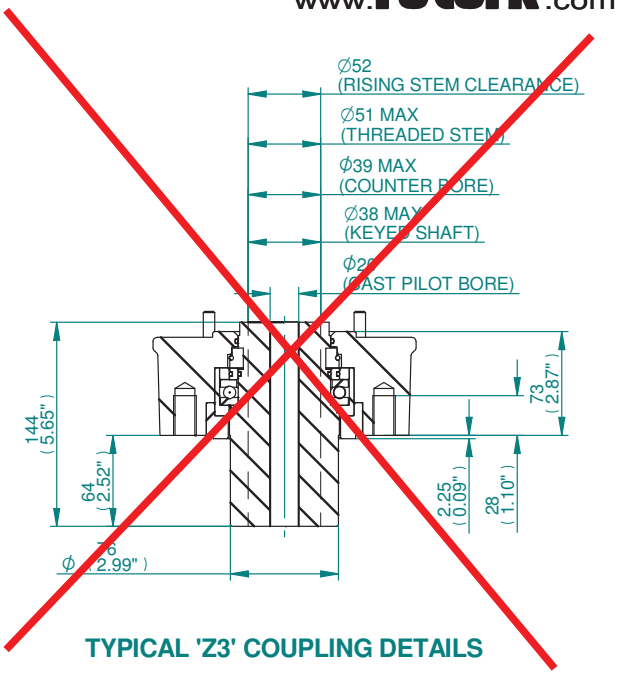


NOTES
1. FOUR BASE OPTIONS ARE DETAILED TO SUIT THE RELEVANT COUPLING ARRANGEMENT.
2. THE REQUIRED BASE FOR THE SIDE & END VIEWS SHOULD BE LOADED TO MTG POSITION INDICATED.
3. '*' REMOVAL ALLOWANCE REQUIRED.

Title	Date	A4	Doc Number	Ver No	Scale	Sheet No
DIMENSIONAL DATA SHEET FOR IQ3 (Size 20-25) WITH SIDE HANDWHEEL	111219		IQ3-2SP-BC	12	1:12	2 of 4

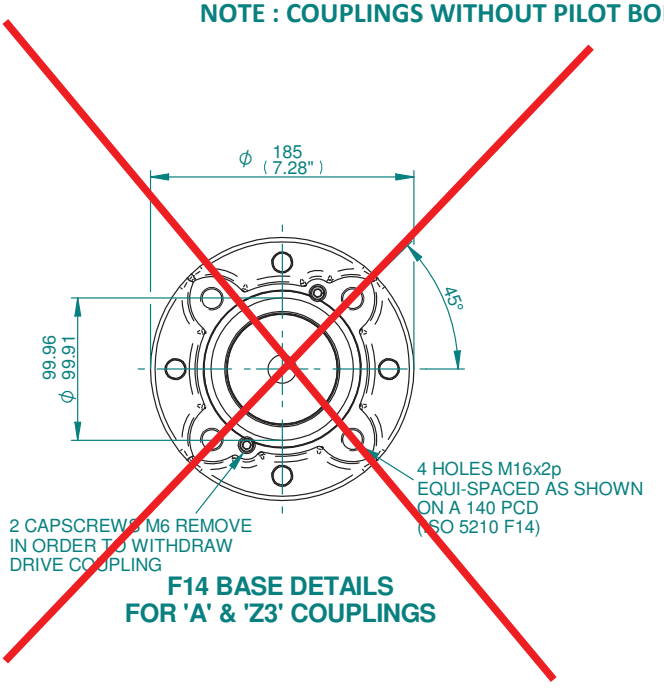


TYPICAL 'A' COUPLING DETAILS

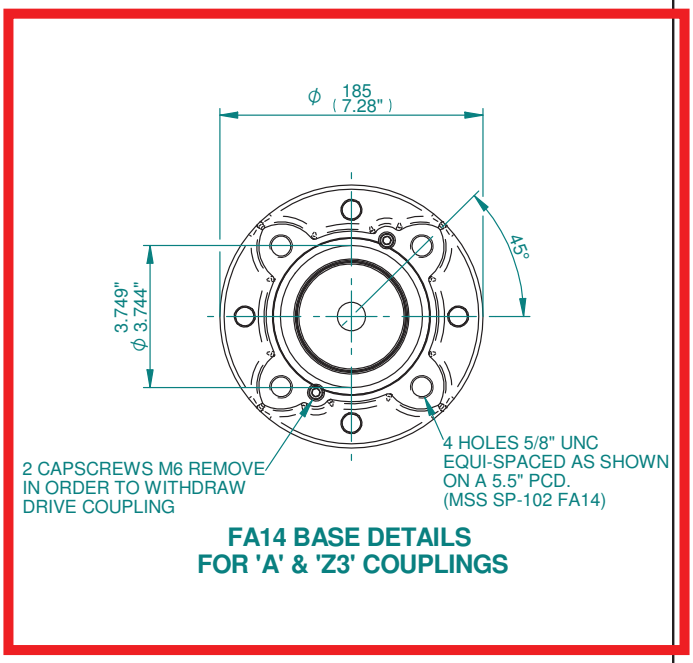


TYPICAL 'Z3' COUPLING DETAILS

NOTE : COUPLINGS WITHOUT PILOT BORE AVAILABLE IF SPECIFIED WITH ORDER.



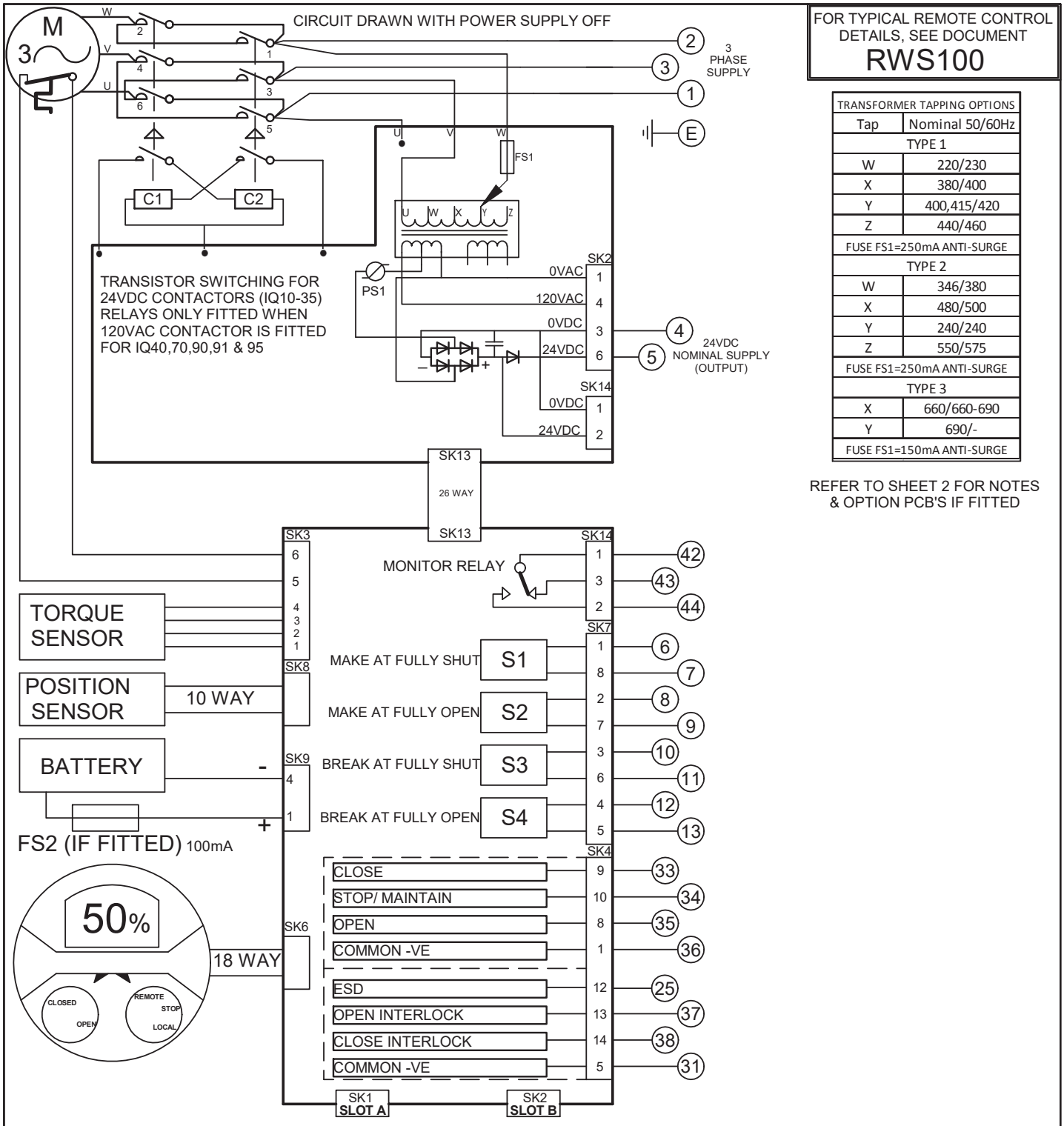
F14 BASE DETAILS
FOR 'A' & 'Z3' COUPLINGS



FA14 BASE DETAILS
FOR 'A' & 'Z3' COUPLINGS

IQ3 SIZE 20-25
THRUST BASES

Title	Date	A4	Doc Number	Ver No	Scale	Sheet No
DIMENSIONAL DATA SHEET FOR F14/FA14 BASE & COUPLING OPTIONS	111219		IQ3-2SP-BC	12	1:5	3 of 4



FOR TYPICAL REMOTE CONTROL DETAILS, SEE DOCUMENT
RWS100

TRANSFORMER TAPPING OPTIONS	
Tap	Nominal 50/60Hz
TYPE 1	
W	220/230
X	380/400
Y	400,415/420
Z	440/460
FUSE FS1=250mA ANTI-SURGE	
TYPE 2	
W	346/380
X	480/500
Y	240/240
Z	550/575
FUSE FS1=250mA ANTI-SURGE	
TYPE 3	
X	660/660-690
Y	690/-
FUSE FS1=150mA ANTI-SURGE	

REFER TO SHEET 2 FOR NOTES & OPTION PCB'S IF FITTED

Iss	Date	Chkd	Revision Details
5	090113	PMJ	Re-track of the 24V DC pin of SK14 to behind the diode.
6	060614	PMJ	400v added to type 1 tapping Y. Note added to sheet 2 note 1.

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ROTORK CONTROLS INC
ROCHESTER
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Tel:585-247-2304

IQ BASIC DIAGRAM

Drawn by: PMJ
Date : 160512
Base WD: 100B0000
Job No : - -
MI No : - -

Circuit Diagram Number: 100B0000
B1 C1 B2 C2

Issue No: 6

Sheet: 1 of 2

NO OPTIONS FITTED

NOTES

1.FUSES:
-PS1 is a self-resetting fuse.
-Refer to publication PUB002-039 for approved fuses FS1 and FS2.
-Actuator rated voltage specified on nameplate. Voltage tolerance +/-10%, applies for rated torque performance; duty cycle is not gauaranteed.

2.REMOTE CONTROL:
-For typical remote control circuits refer to:
  -RWS indicated or PUB002-041.
-For DC and AC control, connect –ve/0V to terminal 36.
-(For negative switch / positive common, refer to RWS indicated).
-Control signal threshold voltages:
  -DC: “on” ≥16Vdc / “off” ≤8Vdc, max 60Vdc.
  -AC: “on” ≥60Vac / “off” ≤40Vac, max 120Vac.
-Control signal duration to be 300ms minimum.
-Maximum current drawn from remote control signals is:
  -8mA at 24Vdc or 12mA at 120Vac.
-Supply provided on terminals 4 & 5:
  -Intended for remote control.
  -Max external load 5W at 24Vdc / 5VA at 120Vac

3.INDICATION:
-For typical position, status and alarm indication see PUB002-041.
-“S” contacts are user configurable and are shown in their default setting.
-Refer to PUB002-040 for functions and configuration instructions.
-Monitor Relay indicates actuator availability for remote control (shown “unavailable”). It can be configured to exclude local/remote selection.
-Refer to PUB002-040 for monitored functions and configuration instructions.
-Voltage applied to indication contacts must not exceed 150Vac
-Individual Switch current must not exceed 3.5A inductive, 5A resistive and no more than 8A in total for all 4 contacts.

4.BATTERY:
-Battery maintains local and remote “S” contact indication only.
-Refer to installation manual for approved replacement battery types.

See Sheet 1 for all Revision details/information

Circuit Diagram Number	Issue No	Sheet
100B0000	6	2 of 2

RW Gate Company
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TROY, NEW YORK 12181
OFFICE: 518-874-4750
FAX: 518-274-0210
WEBSITE: www.rwgate.com

INSTALLATION INSTRUCTION MANUAL

SLUICE GATES, WEIR GATES, SLIDE GATES & STOP GATES

This manual includes the recommended methods of handling, storage, installation, operation and maintenance for fabricated sluice gates, slide gates and stop gates manufactured by RW Gate Company of Troy, New York.

This manual should be used in conjunction with the installation drawings included in the submittal package provided by RW Gate. If any questions arise, please contact our Service Dept. at 518-874-4750 or reach us through the CONTACT section on www.rwgate.com. When possible, please have the serial number available when contacting us.

The equipment is durable and built for a long useful service life, however, care must be taken in the handling, storage and installation. RW Gate assumes no liability, expressed or implied, for issues that arise from the improper handling, storage or installation of the gates.

Section 1 - HANDLING

Section 1.1 GENERAL. To prevent personal injury or equipment damage, follow standard safety procedures when handling equipment and make sure all lifting and rigging equipment is properly set and in safe working condition.

Section 1.2 INITIAL HANDLING. When unloading the equipment from a box trailer, shipping container or flatbed truck, use care during the removal process. In most cases, the equipment will be shipped secured to a wooden skid.

1. Lift the skid through the openings in the bottom.
    a. Never pull the equipment out of the truck and let drop to the ground.

b. Never lift using a chain or a sling wrapped around operating stems or equipment on the skid.

2. Review the packing list and compare the items on the list to the equipment received. If the shipment appears incomplete, please contact RW Gate immediately.
3. If damage has occurred in transit, properly document (i.e. take photos if possible) all damage and file the necessary report with the freight carrier and contact RW Gate immediately.
4. Set the equipment on timbers on a flat surface and store it in accordance with Section 2.

SECTION 2 - STORAGE

Section 2.1 General. To prevent the possibility of damage, follow the storage instructions below. Keep in mind that there are precision parts, such as stem threads and operating mechanisms that should be carefully stored and protected from damage.

1. Equipment should be stored on timbers on a flat surface to keep it off the ground and to prevent distortion.
2. All operating mechanisms (manual, electric or hydraulic) should be handled and treated as precision machinery and protected accordingly.
3. Do not stack skids of equipment.
4. Equipment should be covered with tarps to protect it from foreign matter while stored.
5. Do not cut or grind ferrous materials (i.e. ductile iron pipe, rebar, steel structural shapes, etc.) in close proximity to the equipment.
6. To prevent bending when handling and storing, stems should be supported over their full length. They should be stored on a flat surface and the threaded portion should be covered and protected from damage.
7. Components such as stop collars and anchor bolt hardware are normally shipped in a bag or box mounted on the skid.

Section 2.2 Storage of Electric Actuators. When electric motor actuators (aka electric motor operators) are provided, extra care is required to protect this equipment.

1. Electric actuators should be stored indoors in a clean, dry area.
2. Damage due to improper storage may void the warranty.
3. Proper storage may include the energizing of heaters upon receipt of units to prevent corrosion of internal controls.

Section 2.3 Storage of Hydraulic Cylinders. When hydraulic cylinders, associated power units and controls are provided, extra care is required for this equipment.

1. The cylinder, power unit and controls should be installed indoors in a clean, dry area.
2. Damage due to improper storage may void the warranty.

3. Cylinders stored for a long period of time should be stored in the vertical position to prevent damage to seals.

SECTION 3 - INSTALLATION

Section 3.1 General. Review the following information in conjunction with the installation drawing for each gate to confirm proper setting, mounting type (i.e. non-shrink grout, resilient gasket or other) and component location. If the installation drawings are not available, please contact RW Gate at 518-874-4750 or through www.rwgate.com. Please provide the serial number and the project name.

Section 3.2 Installation – Mounting Gate with Embedded Frame. On gates with embedded side frames and/or invert members, box-outs are strongly recommended in the channel walls and/or the floor during the concrete pour. We do NOT recommend pouring the concrete walls with the gates in place as this can warp the frame.

1. The minimum box-out size will be indicated on the installation drawing and it will need to be of a sufficient size to accommodate the embedded portion of the frame.
2. The void between the box-out and the frame will need to be filled with non-shrink cementitious grout after the concrete has hardened.
3. ***IMPORTANT TIP:*** *The frame must be well supported prior to the addition of grout to prevent distortion.* Use timbers or similar to hold the inside dimensions of the frame during installation. Distortion of the frame can lead to excessive operating effort and increased leakage.
4. Measure the distance inside the frame from side to side, along the entire length of the frame to confirm that it matches the dimension on the installation drawing. Measure the inside of the frame diagonally to ensure that frame remains straight and square.
5. Extreme care should be taken to keep the seals and the slide free from grout during installation.
6. Any misplaced grout on the slide or seal system should be removed while wet and easy to remove.
   IMPORTANT TIP: *Gently remove grout from the seals. Never use a chisel or grinder to remove dried grout from the seals as damage to the seals can occur.*

Section 3.3 Installation – Mounting Gate with Anchor Bolts. When anchors are furnished for mounting the gate or gate components, the location, type of anchorage, embedment depth and projection of the anchor bolts will be shown on the installation drawing. Non-shrink cementitious grout or a resilient gasket will need to be installed between the gate and the wall. Read this entire section before installing the gate.

1. ***IMPORTANT TIP:*** *The frame must be well supported prior to the addition of grout to prevent distortion.* Use timbers or similar to hold the inside dimensions of the frame during installation. Distortion of the frame can lead to excessive operating effort and increased leakage.
2. Measure the distance inside the frame from side to side, along the entire length of the frame to confirm that it matches the dimension on the installation drawing. Measure the inside of the frame diagonally to ensure that frame remains straight and square.
3. Extreme care should be taken to keep the seals and the slide free from grout during installation.
4. Any misplaced grout on the slide or seal system should be removed while wet and easy to remove.
   IMPORTANT TIP: *Gently remove grout from the seals. Never use a chisel or grinder to remove dried grout from the seals as damage to the seals can occur.*

    a. **<u>Using Adhesive Type or Wedge Type Anchor Bolts</u>**.
        i. When adhesive type (studs with epoxy) or wedge type anchors are utilized, the installer will need to drill into the concrete wall, clean out the hole and closely follow the instructions from the original manufacturer of the adhesive or wedge type anchor bolt.
        ii. ***IMPORTANT TIP:*** *When drilling into concrete for the anchors, it is extremely important to make sure to drill into the wall to allow the full embedment depth shown on the installation drawing. Do NOT embed the anchors less than the depth indicated on the installation drawings. The size, location and embedment depth has been calculated to withstand the maximum loads at the design head. Conforming to the anchor embedment depth is critical.*
        iii. When grout is used, make sure that backing nuts are placed on the anchor studs prior to mounting the gate onto the anchor studs as shown on the installation drawings.
        iv. ***IMPORTANT TIP:*** *If the backing nuts are not installed and the outside nuts are over-tightened, frame distortion can occur and this can lead to excessive operating effort and increased leakage. Frame distortion can pull the seal away from the slide thus creating a path for leakage.*
        v. The gate may be used as a template for the anchors. It is usually best to leave the slide inside the frame when using the frame as a template.
        vi. Proper tightening of the nuts on the anchors holding the gate to the wall may prevent serious problems in operation or performance of the gate. The recommended torque values for common fastener sizes are listed as diameter =

torque (ft. lb) respectively: ½-inch = 35; 5/8-inch = 75; ¾-inch = 100; 7/8-inch = 150; 1-inch = 200.

b. **<u>Using Hook Type (Embedded) Anchors</u>**.
   i. When hook type anchor bolts are utilized, the anchor bolts should be placed in the holes drilled in the forms at the exact locations and projection as indicated on the drawings. The hook ends of the anchor bolts should then be wired to the opposite form or to reinforcing rods to hold the bolts firmly in place.
   ii. ***IMPORTANT TIP:*** *When using hook-type anchors, extreme care should be taken to ensure that the anchors are installed correctly as this will help prevent damage to the threads during placement of the gate onto the anchors.*
   iii. When grout is used, make sure that backing nuts are placed on the anchor studs prior to mounting the gate onto the anchor studs as shown on the installation drawings. If the backing nuts are not installed and the outside nuts are over-tightened, frame distortion can occur and this can lead to excessive operating effort and increased leakage. Frame distortion can pull the seal away from the slide thus creating a path for leakage.
   iv. Proper tightening of the nuts on the anchors holding the gate to the wall may prevent serious problems in operation or performance of the gate. The recommended torque values for common fastener sizes are listed as diameter = torque (ft. lb) respectively: ½-inch = 35; 5/8-inch = 75; ¾-inch = 100; 7/8-inch = 150; 1-inch = 200.

c. **<u>Grout Pad / Mounting Gasket.</u>**
   i. When gates are anchored to the wall, it is necessary that a uniform grout pad or a resilient gasket be placed between the gate frame and the concrete wall. The type of mounting and the thickness of the grout pad or gasket will be shown on the installation drawing.
   ii. The grout pad or the resilient gasket is necessary to serve as a leak tight seal between the gate and the wall.
   iii. ***IMPORTANT TIP:*** *Gates should not be mounted directly to a wall without either grout or a gasket as this will result in leakage between the gate and wall. The use of dry pack or mastic may not function as a proper seal due to the potential for high pressure when the gate is in service.*
   iv. When a gasket is utilized to seal between the gate and the wall, the wall will need to be straight and plumb within 1/8-inch or less. The area of the concrete wall where the gate will be mounted should be ground flat if necessary. If the wall is not straight and plumb, leakage can occur between the gate and the wall. Removal of the gate,

modifications to the wall and re-installation of the gate may be required to rectify this situation.

v. The projection of the anchor bolts will be shown on the installation drawings and will include provisions for the grout or gasket.
vi. Grout pads might also be required for pedestals, stem guides or wall brackets. Refer to the installation drawing.
vii. All anchor bolts should be checked prior to gate installation to ensure that the threads are undamaged.
viii. Additional installation information for the wedge-type anchor bolts or epoxy for the adhesive type anchor bolts will be provided as part of this manual. This information should be reviewed prior to installation.

d. <u>Installation Procedure with Grout Pad</u>.

i. When grout is used, two nuts will be provided for each anchor bolt; one backing nut and one outside nut.
ii. Backing nuts are used to position the gate to ensure that it will be mounted vertically even if the concrete wall is not straight and plumb.
iii. Outside nuts are used to tighten the gate frame against the backing nuts. Refer to the installation drawings for details.
iv. Backing nuts should be installed on the anchor bolt prior to mounting the gate, leaving approximately 1 inch between the wall and gate frame for the insertion of grout unless the profile of the mounting surface prevents this.
v. ***IMPORTANT TIP****: The most important aspect to backing nut placement is that the gate frame is on a vertical plane.*
vi. If the mounting surface is noticeably uneven, refer to the grout manufacturer's installation instructions for the maximum grout pad thickness. The minimum grout pad thickness is the thickness of the backing nuts.
vii. When grout is used, make sure that backing nuts are placed on the anchor studs prior to mounting the gate onto the studs as shown on the installation drawings.
viii. ***IMPORTANT TIP:*** *If the backing nuts are not installed and the outside nuts are over-tightened, frame distortion can occur and this can lead to excessive operating effort and increased leakage. Frame distortion can pull the seal away from the slide thus creating a path for leakage.*
ix. After anchor studs and backing nut installation, the gate should be lifted and carefully set in place in such a way as to prevent damage to the threads on the studs.
x. After the gate is mounted on the anchors, mount the outside nuts on the anchors. The use of the double nut arrangement helps to ensure that the gate can be mounted straight and plumb regardless of whether the wall is

straight and plumb and that the gate can be firmly tightened into position without distortion.

xi. ***IMPORTANT TIP:*** *It is especially important that all horizontal frame members are level prior to grouting. Extra care is required to ensure that the invert seal on downward-opening gates and the top seal on four-sided gates remain in contact with the slide plate*. This may require that the horizontal portion of the gate frame be adjusted away from the concrete wall to ensure that the seal is allowed to make contact slide plate. This is accomplished by using the backing nuts.

xii. When properly adjusted, the installer should not be able to slide a 0.004 feeler gauge between the seal and the slide plate.

xiii. With the gate frame located approximately 1 inch from the wall, forms should be mounted around the flange and a non-shrink cementitious grout should be placed between the flange and the concrete wall.

xiv. The grout needs to be completely and uniformly applied around the perimeter of the gate as shown on the installation drawings. All voids should be thoroughly filled with grout to ensure that leakage cannot occur between the gate and the wall.

xv. ***IMPORTANT TIP:*** *Dry pack and mastic are not recommended to serve, in lieu of non-shrink grout, as the seal between the gate and the concrete wall.*

xvi. Care should be taken to avoid getting grout on the seals or the slide. All grout that adheres to the seals or the slide should be thoroughly removed. It is easier and preferable to remove the grout while it is still wet.

xvii. After installation and prior to initial operation, review the installation drawings, as it might be necessary to cut off a portion of the anchor studs on the horizontal members to provide clearance for unimpeded vertical travel of the slide.

xviii. Check the projection of the anchor bolts across the top of the opening on upward opening gates with top seals.

xix. Check the projection of the anchor bolts across the bottom of the opening on downward opening gates.

xx. If any upstop bolts (on upward opening gates) or downstop bolts (on downward opening gates) were removed from the side frames or slide to facilitate installation, they need to be re-installed.

e. **<u>Installation Procedure with Gasket</u>**.

i. Gasket should be visually inspected prior to installation. Gasket should be intact with no cracks or damage that

could allow leakage. Gaskets may be provided in multiple pieces with a dovetail connection.

ii. When a gasket is utilized to seal between the gate and the wall, the wall will need to be straight and plumb within 1/8-inch or less. The area of the concrete wall where the gate will be mounted should be ground flat if necessary.

iii. ***IMPORTANT TIP:*** *If the wall is not straight and plumb, leakage can occur between the gate and the wall. Do not over-tighten the nuts to accommodate the uneven wall. Removal of the gate, modifications to the wall and re-installation of the gate may be required to rectify a flatness problem with the wall. If this is not possible, the gate may need to be installed with a grout pad.*

iv. Mastic should be used between the gasket and gate frame. A heavy bead of mastic should be placed between the opening and the location of the anchors, ensure sufficient mastic is present at the welded corners of the gate to seal any unevenness at the weld locations. Mastic should also be applied to adhere the gasket to the concrete wall, again a heavy bead of mastic should be placed between the opening and the location of the anchors. Mastic should be Sikaflex sealant or better. Wall and gasket should be properly cleaned and prepared prior to adding mastic.

v. When a gasket is used, one nut will be provided for each anchor bolt. The nuts are used to compress the gasket and tighten the gate frame against the wall. Refer to the installation drawings for details.

Section 3.4 <u>Installation of Wall Thimble</u>.

1. **General:** Some sluice gates will be wall thimble mounted. See installation drawings. The wall thimble will need to be installed flat and true. Proper installation of the wall thimble is of critical importance to a properly installed gate.
    a. The mounting flange of each fabricated wall thimble is marked with vertical centerlines and with the word “TOP” stamped on the top of the wall thimble. Wall thimbles need to be set in place with the “TOP” mark up, the front flange flat to the face of the wall and top and bottom centerline marks plumb.
    b. The positioning thimbles with a round flange will be clearly shown on the installation drawings.
    c. The bolt pattern on the gate will be produced to match the bolt pattern on the thimble in the described position.
    d. The wall thimble should be firmly supported on the forms. Forms should be supported and stiffened against movement. If the forms move, they may distort the wall thimble mounting flange and this can lead to serious gate mounting issues and operational problems.

e. After being set at the proper elevation, the wall thimble must be internally braced to carry the weight of the concrete. Care should be used in placement of the braces so as not to distort the wall thimble. Gate attachment hardware will be misaligned if the wall thimble is distorted.
f. The tapped holes in the face of the wall thimble should be plugged or capped to prevent concrete from entering the threaded holes.
g. After the concrete has hardened and the forms removed, the front surface of the wall thimble should be thoroughly cleaned and bracing should be removed. Make sure to remove all concrete that has flowed onto the mounting surface from the edges. All tapped holes should be inspected and cleaned of concrete if necessary.

Section 3.5 <u>Installation of Gate to a New Wall Thimble</u>.

1. The face of the wall thimble should be thoroughly cleaned and all wall thimble studs should be mounted with the specified thread engagement and projection. Care should be taken to prevent damage to the studs during installation of the gate.
2. Mastic or a gasket is required between the surface of the wall thimble and the mounting flange of the gate. Mastic is normally used for this purpose and should be applied in accordance with the label directions. Mastic should be Sikaflex sealant or better.
3. ***IMPORTANT TIP:*** *It is very important to apply a uniform and reasonably thick, ½" , bead of mastic (Sikaflex 1a polyurethane elastomeric sealant) on the front flange in between the gate opening and the wall thimble studs. Encircle bolt holes with the mastic. If the mastic is applied on the outside of the wall thimble studs, leakage can occur through the mounting holes on the gate frame.*
4. If a gasket is used, it should be installed over the studs to provide a smooth mounting surface for the gate. If the gasket is other than one piece, the gasket joints should be assembled and aligned in accordance with the match markings and sealed with a mastic, Sikaflex 1a sealant or better. When applying gasket materials, care should be taken to ensure that excessive amounts of lumpy, dried materials are not present when the gate is drawn tightly and evenly to the wall thimble.
5. The gate can then be lifted and set over the studs and the nuts put in place and tightened. Care should be taken during this process to help ensure that the threads on the studs are not damaged. The sequence of tightening should be done in multiple passes by applying progressively larger force each pass. Equal torque should be applied to all nuts so that the gate is firmly and evenly tightened to the mounting flange without distortion. See following "Nut Tightening Torque" information. Remove sealant that oozes out as the gat is tightened against the wall thimble.
6. Proper tightening of the nuts on studs holding the gate to the wall thimble may prevent serious problems in operation or performance of the gate. The recommended torque values for common fastener sizes are listed as

diameter = torque (ft. lbs) respectively: ½-inch = 35; 5/8-inch = 75; ¾-inch = 100; 7/8-inch = 150; 1-inch = 200.

Section 3.6 <u>Installation of Gate to an Existing Wall Thimble</u>.

1. The mounting requirements will be shown on the installation drawing.
2. If the existing bolt holes on the thimble will be used, refer to Section 3.5. If the mounting flange of the existing wall thimble is damaged, contact the factory prior to installation.
3. If the gate will be mounted to an existing wall thimble and a new bolt pattern will be used, drill through the existing flange and into the concrete behind the flange. If adhesive type anchors are used, follow the instructions in Section 3.3.1.
4. After the anchorage is prepared, follow the instructions in Section 3.5.

Section 3.7 <u>Installation of Gate to a Pipe Flange</u>.

1. The procedure is the same as when the gate is mounted to a wall thimble. See Section 3.5.

Section 3.8 <u>Installation – Assembly of the Gate Components</u>.

1. General: In most cases, self-contained gates will be shipped fully assembled. On some gates, shipping restraints or the design of the gate (i.e. non self-contained, etc.) require some field assembly. Reference the installation drawings for the location and position of all components.
    a. **Gates.**
        i. If the slide was removed from the frame to facilitate mounting the frame to the wall, carefully reinstall the slide. Make sure the slide and frame, including the seal system, is free of grout and debris when the slide is reinstalled.
        ii. Keep in mind that the slide is a very tight fit in the frame due to the seal compression which is necessary for low leakage. The portion of the slide that engages the frame should be completely clean and may be lubricated to facilitate reinstallation.
        iii. Care should be taken to prevent seal damage during reinstallation.
        iv. If the frame or slide was spliced to facilitate shipping, refer to the installation drawings for proper reassembly.
    b. **Stems.**
        i. Make sure to handle all stems and operating mechanisms as precision parts. When handling stems, pay particular attention to the stem threads. Stem thread damage can lead to excessive operation and lift nut damage.
        ii. When reassembling a gate that has been disassembled at the project site, make sure stem is centered. On non self-contained gates, make sure that the stems are installed

straight and plumb. This is particularly important on a gate with two or more stems.

iii. On gates with multiple stems, when the operators are installed, it is important that the stems be in proper time and the top of the slide be level.

iv. Stem guides, when separate from the frame, should be anchored to the wall in accordance with the installation drawings with uniform clearance between the stem and the stem guide bushing.

c. Manual Operators and Electric Motor Actuators.

i. All manual operators and electric motor actuators and pedestals, when applicable, are identified by the installation drawing and/or drawing number and should be used with the proper gate and stem.

ii. After the stem has been positioned in place, the operator can be lowered onto the stem and turned into position.

iii. When grout is used between the base of a pedestal (aka floorstand) and the operating floor, backing nuts should be placed on the anchor studs between the floor and the base so that it is plumb and the base is approximately 1" above the operating floor.

iv. Approximately 1" of grout should then be uniformly and thoroughly placed between the pedestal base and the operating floor.

v. After the grout has hardened, the outside nuts should be tightened firmly in place.

vi. For operators, after the operator has been installed, tension should be applied to the stem by manually turning the handwheel or crank in a direction that would normally open the gate. However, the gate should not be opened. The intent is merely to apply tension that will result in a straight stem.

vii. Follow the electric motor actuator supplier's instructions for mounting the actuator onto the stem.

viii. ***IMPORTANT TIP:*** *When installing the electric motor actuator on the yoke or pedestal, make sure the bearings are reinstalled in the proper sequence. Refer to the electric actuator manufacturer's installation instructions for details.*

ix. The internally threaded bronze lift nut will arrive separately, via UPS or Fed Ex, from RW Gate. Actuators will be drop shipped from the original manufacturer.

x. For electric motor actuators, the gate should be opened with the manual handwheel at least 3 inches before using the electric controls. In this manner, the proper phasing and direction of rotation of the motor can be determined without damaging the gate assembly. Once the unit has

been installed, the manufacturer's directions should be followed closely in setting the closing and opening limit switches. Follow the manufacturer's instructions if it appears that adjustment is necessary.

xi. The gates should be placed in the fully closed position. On upward opening gates, the slide should be lowered so that there is minimum compression of the slide onto the invert seal. On downward opening gates, the slide should be positioned as shown on the installation drawing.

xii. ***IMPORTANT TIP:*** *Fabricated gates should be set to close on position, not on torque. With the proposed equipment, there are no wedges to overcome thus these gates should be set to close on position.*

xiii. Stop collars are provided when shown on the installation drawings. Stop collars are used to limit slide travel. The stop collar should be installed on the stem and set so there is approximately 1/16" of clearance between the bottom of the stop collar and the top of the operator nut when the slide is at its lowest point of travel. On upward opening gates, the compressible invert seal should be slightly compressed as necessary for the bottom of the slide to make contact to the seal along its entire width.

xiv. Set screws should then be tightened to hold the stop collar in place.

d. Hydraulic Cylinders.

i. Hydraulic cylinders should be mounted on the anchor bolts in such a way that the piston rod and stem are in proper alignment and there is sufficient clearance for piping, fitting, etc.

ii. With the gate in the closed position, the piston should be lowered so that it is in contact with the bottom head of the cylinder.

iii. The coupling between the piston rod and the stem should be screwed into place and locked.

iv. In most cases, the top area of the piston is larger than the underside. Therefore, if pressure applied to both surfaces is the same, more force will be applied in the closing direction than in the opening direction. For that reason, pressure-reducing valves should be provided in the line to the top of the cylinder to lower the pressure to that required to properly close the gate. This allows full operating pressure to be applied to the bottom of the piston resulting in more opening than closing force.

v. All piping should be thoroughly flushed and cleaned prior to making connection to the hydraulic cylinder.

SECTION 4 – POST-INSTALLATION INSTRUCTIONS

Section 4.1 Prior to Operation.

1. Clean both sides of the slide, the frame, seals and stem of all grout, sand, paint and other debris. Pay particular attention to the seals, stem threads and slide.
2. Check to make sure the stem is centered and straight.
3. Check to make sure that any stem guides are positioned correctly and are securely fastened.
4. Make sure all anchor nuts have been tightened.
5. Apply tension to stem and check any stem guides for proper alignment. There must be a uniform clearance between the operating stem and all stem guides.
6. If necessary, clean the stem threads using only a wire brush with stainless steel or brass bristles.
7. ***IMPORTANT TIP:*** *Do NOT use a grinder or similar rotary device with brush type wheel to clean the stem threads as damage will occur to the stem threads.*
8. Lubricate the stem threads with an appropriate lubricant for the project site conditions. For example, if the area is dry and dusty, a dry lubricant is recommended. If the project site is in an area with high temperatures, a high temperature lubricant is recommended.
9. ***IMPORTANT TIP:*** *Operating effort will be greatly increased if the stem threads have not been cleaned and are not properly lubricated.*
10. Install stem cover to prevent rain, snow, etc. from entering the operator housing.

DOCUMENT No.	REV.	ENGINEERING DATA SHEET	DATE	DRAWN BY
ST-R10-001	A		3/12/2014	CRG

ACCELERATED WEAR TEST SUMMARY
UHMWPE SEAL, SLIDE GATE / SLUICE GATE

TEST DATE: 3/4/2014 TO 3/10/2014

PLACE: RW Gate, P.O. Box 33, Troy NY 12181, USA

TEST GATE: RW1000-S, 24" x 24", Drawing RW1000-PT1-XXX

PROCEDURE: Gate mounted near horizontal within testing tank.
Pneumatic cylinder operator with limit switches, electronic control and cycle counting, stroke 22" at 300 open/close cycles per hour.
Tank filled to above level of gate opening with water and 50 lb of sand.
Water sand mix continuously agitated through slide movement and exhaust from pneumatic cylinder.

CYCLES COMPLETED: 30,000

PRE CYCLE LEAKAGE: 0.0167 GPM/ft/min @ 27 ft Unseating Head (12psi)

POST CYCLE LEAKAGE: 0.0224 GPM/ft/min @ 27 ft Unseating Head (12psi)

AVERAGE WEAR ON UHMWPE SEAL: 0.018"

AVERAGE WEAR ON STAINLESS STEEL SLIDE: 0.001"

Witness: _____ CLIVE GAMBLE Director of Engineering

RW GATE COMPANY

RW GATE COMPANY
PO BOX 33
TROY, NEW YORK 12181
OFFICE: 518-874-4750
FAX: 518-274-0210
WEBSITE: www.rwgate.com

One Year Warranty

The RW Gate Company warrants that the products provided will be free from defects in materials and workmanship for a period of 12 months after initial operation or 18 months after shipping receipt at the project site or customer's location, whichever is first. If the product proves defective during this warranty period, RW Gate Company at its option, will either repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, the Customer must notify RW Gate Company of the defect before the expiration of the warranty period.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care in accordance with the RW Gate O&M Manual.

This warranty is given by RW Gate Company with respect to the product in lieu of any other warranties, express or implied. RW Gate Company's responsibility to repair or replace defective products is the sole and exclusive remedy provided to the customer.

Third party items will be covered under a separate warranty from the original manufacturer. RW Gate Company will assist making any claims regarding third party equipment provided as part of the RW Gate Company equipment.

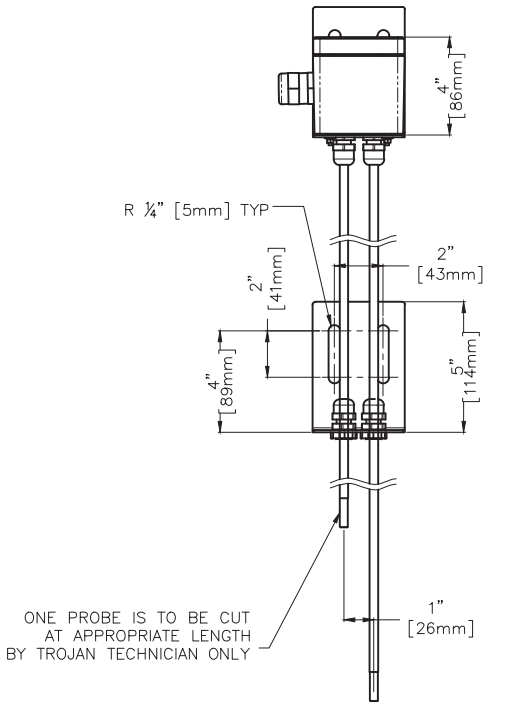
INSTRUMENTATION

DRAWINGS & CUT SHEETS

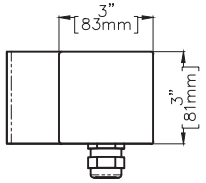
SECTION CONTENTS

TROJAN UV™

Water Confidence™



FRONT VIEW
SCALE:NOT TO SCALE



TOP VIEW
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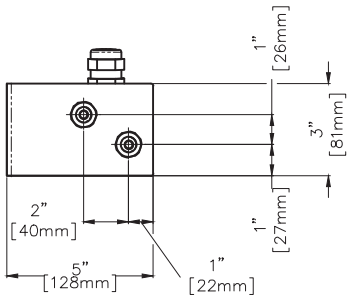

BOTTOM VIEW
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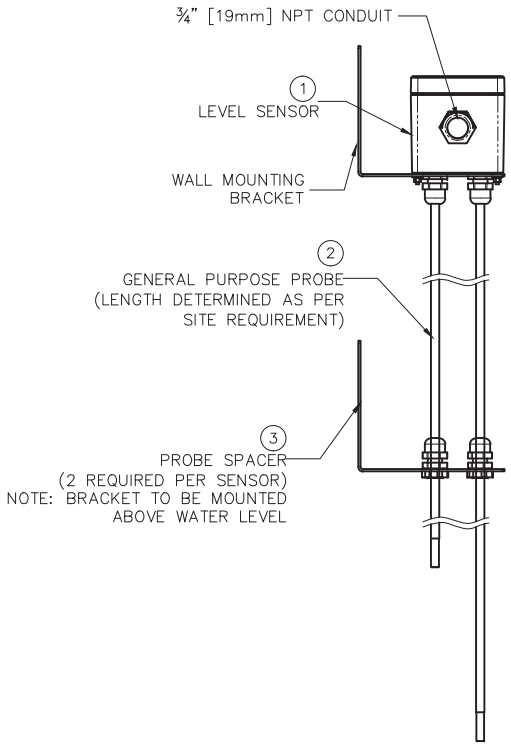


SIDE VIEW
SCALE:NOT TO SCALE

NOTES:

1. LEVEL SENSOR PROBES TO BE INSTALLED BY CERTIFIED TROJAN SERVICE TECHNICIAN. ONE PROBE IS TO BE CUT AT APPROPRIATE LENGTH (TOP OF THE TOP LAMP).

2. USE WEATHER PROOF ¾" [19mm] CONDUIT FOR THE WIRES (BY OTHERS) WITH APPROPRIATE WEATHER PROOF FITTINGS, GROMMETS, TO MAINTAIN TYPE 4X (IP56) RATING OF THE SENSOR BOX.

3. MOUNTING BOLTS ARE RECOMMENDED TO BE LOCATED ON THE CENTER OF THE SLOTS TO MAINTAIN ADJUSTABILITY.

4. SENSOR BOX TO BE EPOXY FILLED AFTER WIRES ARE ROUTED BY CERTIFIED TROJAN SERVICE TECHNICIAN.

ITEM	QTY	DESCRIPTION	PART NUMBER
3	1	SENSOR, PROBE SPACER	319016
2	2	SENSOR, PROBE WATER LEVEL	914369G
1	1	SENSOR, PROBE MOUNTING ENCL	319015

TROJANUV

DESCRIPTION: TROJANUVSIGNA™, RODDED LEVEL SENSOR

STANDARD DRAWING NO. SG0028

DRAWN BY : KDH	DATE : 130C07
CHECKED BY : MMB	DATE : 130C07
APPROVED BY : SAH	DATE : 130C07
SCALE (8.5x11) : NOT TO SCALE	LOG NUMBER : N/A

REFERENCE NO. 319014G

DWG NO. S01 REV. A

Series DC
For Remote Applications

Series DC controls are designed for applications where only direct current power is available. DC units can be used as differential level controls or single point alarm contactors. Because of solid state reliability, plug-in convenience, and choice of 12 or 24 VDC supply voltage, Warrick DC controls can be used with confidence in many applications.

Contact Design	SPDT 1 N.O. & 1 N.C. (1 form C), non-powered contacts
Contact Rating	5 amp @ 30 VDC or 120 VAC Resistive 1/8 hp
Mode of Operation	Direct/Inverse, factory set
Sensitivity	0 - 1M ohm maximum, factory set
Primary Voltage	12 VDC, 24 VDC, negative ground (±20%)
Supply Current	40 mA when relay energized, 10 mA w/relay de-energized
Secondary Voltage	12 VDC
Terminal Style	Screw connector
Temperature	-50°F to +150°F (-46°C to +65°C)
Options	Time Delay

Series DC

Applications

- Single and Differential Service
- Solar and Wind Powered Pumps
- Portable Cleaning Equipment
- Battery-Powered Level Control
- Well Pumps
- Remote Reservoirs
- Remote Irrigation
- Onboard Ship Level Control

How to Order

Use the **Bold** characters from the chart below to construct a product code.

DC X X X X XX XX

Series
DC

Supply Voltage
1 – 12 VDC **2** – 24 VDC

Sensitivity
B – 22K **D** – 470K
C – 100K **E** – 1M

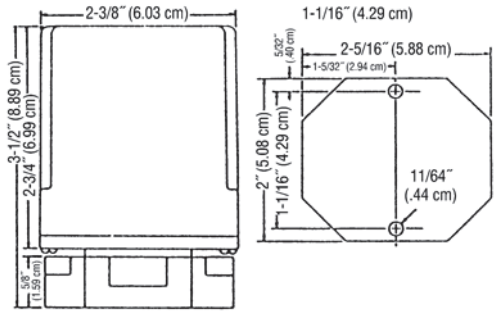
Mode of Operation
D – Direct **I** – Inverse

Enclosure
0 – None **1** – NEMA 1 **4** – NEMA 4

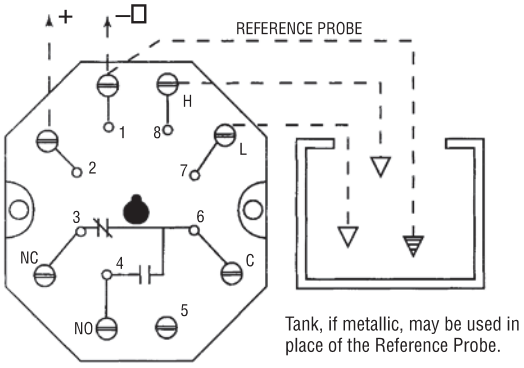
Time Delay (increasing level) **01-30** sec.

Time Delay (decreasing level) **01-30** sec.

Dimensions



Wiring



Tank, if metallic, may be used in place of the Reference Probe.

WARRICK CONDUCTIVITY SENSORS

Warrick® Sensor Fittings and Probes

Warrick Liquid Level Sensors are available in single- and multi-probe models and with a variety of fittings. The versatility of the Warrick design makes these sensors ideal for a diverse range of applications.

Examples include:

- Food and Beverage
- Caustics and Acids
- Sumps
- Reservoirs
- Pharmaceuticals
- Boilers and Steam Generators
- Ponds
- Sewage and Wastewater

Probe Styles

- Metal Rods
- Wire Suspended
- Corrosion Resistant
- Sanitary

Fitting Styles

- 3/8˝ to 3˝ Threaded Mount
- Bracket Mount
- Flange Mount
- External Mount
- Sanitary Mount
- Condulet Mount

Sensor Selection Chart

SERIES		3E	3N	3F	3G	3C	3K	3J	3L	3M	3MT	3S	3R	3T	3B	3H	3W	3Y
Page Number		E-20	E-20	E-19	E-19	E-23	E-23	E-18	E-18	E-25	E-25	E-24	E-21	E-21	E-20	E-18	E-22	E-22
Body Options	Flange			•	•													
	Pipe Thread	•			•			•										
	Flat Mount		•		•													
	Side Chamber					•	•											
	Non-Contact Electrodes											•						
	Food Grade Connection									•	•							
	Bracket Mount											•						
Fitting Body Material Options	Brass	•	•	•		•		•										
	PVC		•	•	•													
	1018 Carbon Steel			•														
	Stainless Steel	•		•														
	Forged Steel			•														
	Nylon									•	•							
	Cast Iron	•				•	•	•				•						
Housing Material	Coated Aluminum	•	•	•		•	•	•				•						
	Polycarbonate				•													
Number of Probes	1 to 3		•					•										
	1 to 4					•	•			•	•							
	1 to 7	•		•	•							•						
Electrodes	Electrode Only								•				•	•	•	•	•	•

EURONORD
PC 0808

3.2 x 3.1 **UL Type 1, 4, 4X, 12 and 13**

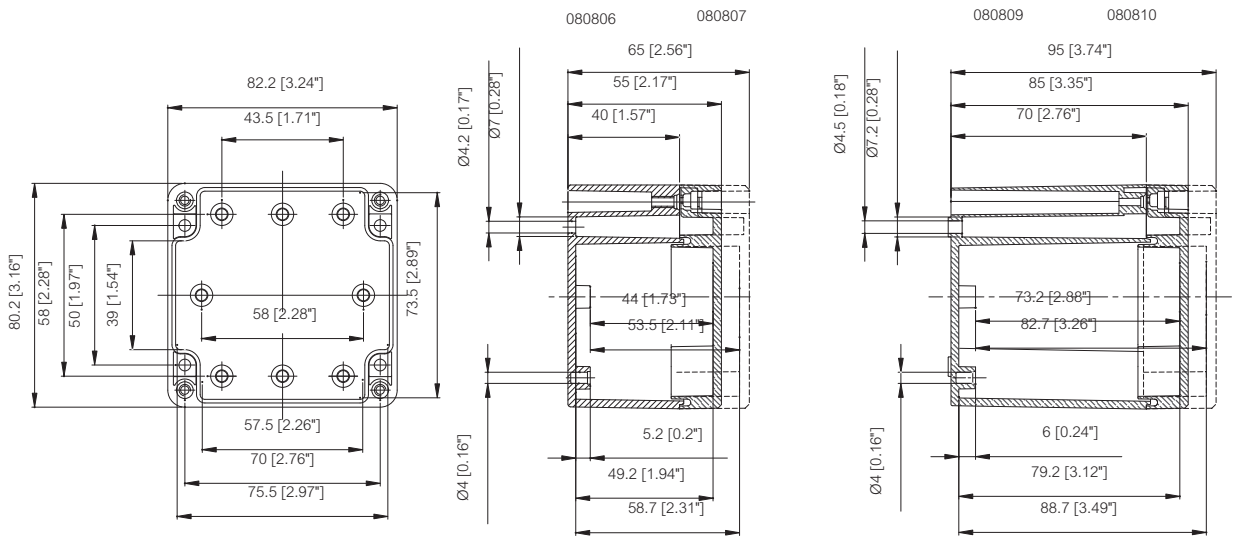
Including: Base with hardware screws for accessory mounting, cover with PUR gasket and ferritic stainless steel cover screws.

Enclosures

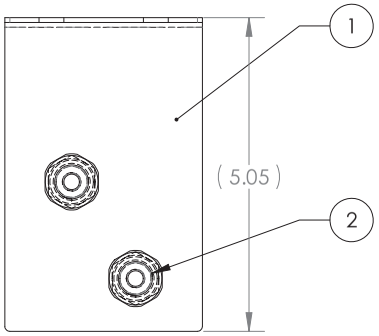
Order symbol	UL Order symbol	Dimensions inch	Dimensions mm	Description
PC 080806	UL PC 080806	3.2 x 3.1 x 2.2	82 x 80 x 55	Enclosure, PC ▪ Opaque cover
PC 080807	UL PC 080807	3.2 x 3.1 x 2.6	82 x 80 x 65	Enclosure, PC ▪ Opaque cover
PC 080809	UL PC 080809	3.2 x 3.1 x 3.3	82 x 80 x 85	Enclosure, PC ▪ Opaque cover
PC 080810	UL PC 080810	3.2 x 3.1 x 3.7	82 x 80 x 95	Enclosure, PC ▪ Opaque cover
PCT 080806	UL PCT 080806	3.2 x 3.1 x 2.2	82 x 80 x 55	Enclosure, PC ▪ Transparent cover
PCT 080807	UL PCT 080807	3.2 x 3.1 x 2.6	82 x 80 x 65	Enclosure, PC ▪ Transparent cover
PCT 080809	UL PCT 080809	3.2 x 3.1 x 3.3	82 x 80 x 85	Enclosure, PC ▪ Transparent cover
PCT 080810	UL PCT 080810	3.2 x 3.1 x 3.7	82 x 80 x 95	Enclosure, PC ▪ Transparent cover

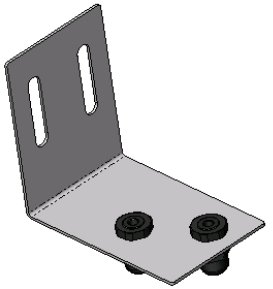
Accessories

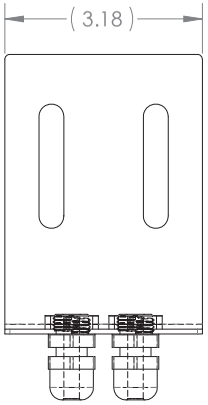
Order symbol	Dimensions inch	Dimensions mm	Description
TM 0808	2.2 x 2.8	56 x 71	Back Panel
TF 28037			Mounting foot kit (4 pcs) ▪ incl. screws
TH A			Gray plastic hinges (2 pcs) ▪ incl. mounting screws

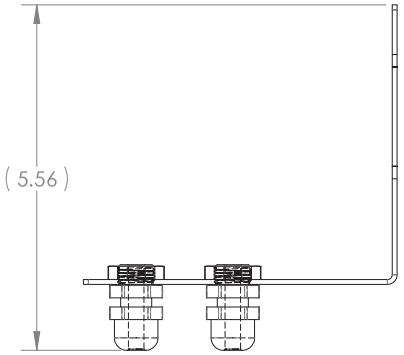


REV	SHT	ZONE	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
A			DRAWING RELEASED	11-1152	DJ	LQ	JJS	2011-12-01









NOTE:

1/ PRIOR TO SHIPPING, SUPPLIER MUST IDENTIFY FINISHED PRODUCT PER ES0275

ITEM NO	QTY.	ITEM DESCRIPTION	PART NO.	DRAWING NO.
2	2	STAIN RELIEF, M-12 0.276 B	915889-S2507	915889G
1	1	BRACKET, UV3+ LVL SNSR	319016-01	SEE SHEET 2

UNLESS OTHERWISE SPECIFIED:
DO NOT SCALE DRAWING

INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994

DIMENSIONS ARE IN INCHES

TOLERANCES APPLY AS SHOWN BELOW:

2 PL DEC ± 0.01
3 PL DEC ± 0.005
ANGLE ± 1.0

REMOVE ALL BURRS, ALL CORNERS R 0.010" OR BREAK EDGE. ⓒ CRITICAL CHARACTERISTIC

THIRD ANGLE PROJECTION

CONFIDENTIALITY NOTICE

SolidWorks MAINTAINED DATA CHANGES SHALL BE INCORPORATED ELECTRONICALLY

DRAWN BY	DJ
CREATED ON	2011-09-13
RELEASE LOG #	11-1152

TROJAN UV

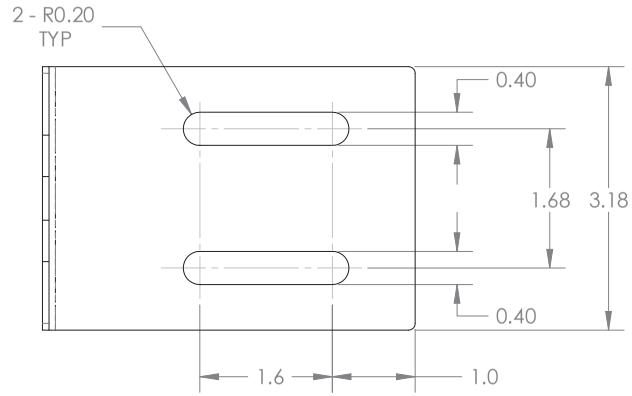
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V-4T7

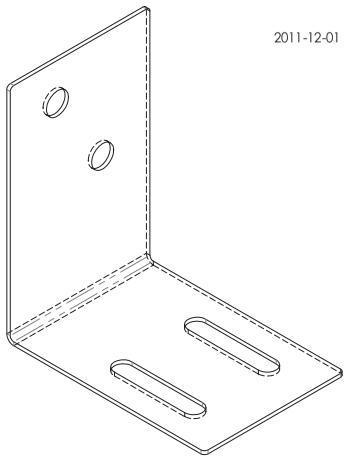
DESCRIPTION: BRACKET ASSY, UV3+ LVL SNSR

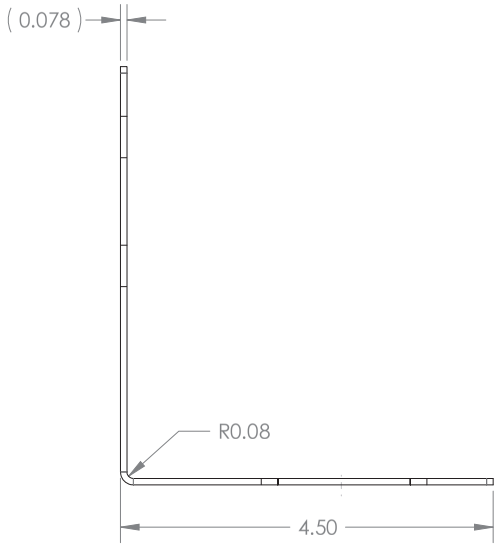
DWG NO. 319016 | REV A

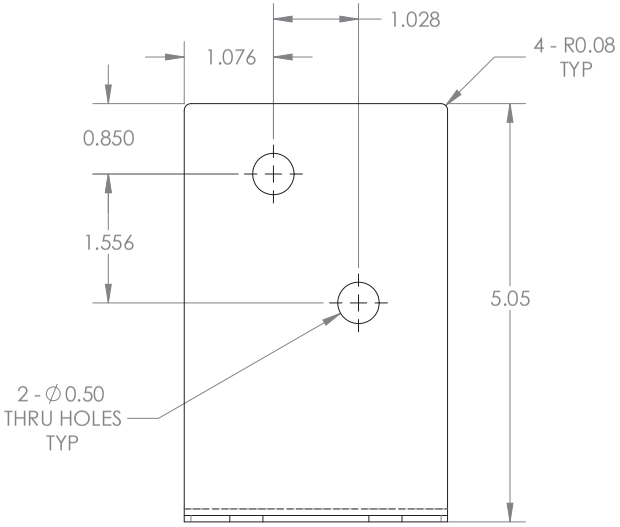
MASS: 0.71 lbs | SCALE: 1:2 | SHEET 1 OF 2 | SIZE B

CURRENT STATUS: Released









ITEM 1: 319016-01

NOTES:

1/ MATERIAL: 14 Ga. (.0781) SST304
2/ REMOVE BURRS/SHARP EDGES.

UNLESS OTHERWISE SPECIFIED: DO NOT SCALE DRAWING INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994 DIMENSIONS ARE IN INCHES TOLERANCES APPLY AS SHOWN BELOW: 2 PL DEC ± 0.01 3 PL DEC ± 0.005 ANGLE ± 1.0 REMOVE ALL BURRS, ALL CORNERS R 0.010" OR BREAK EDGE. ⓒ CRITICAL CHARACTERISTIC THIRD ANGLE PROJECTION	**CONFIDENTIALITY NOTICE** COPYRIGHT 2011 BY TROJAN TECHNOLOGIES. ALL RIGHTS RESERVED. NO PART OF THIS DOCUMENT MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED IN ANY FORM, WITHOUT THE WRITTEN PERMISSION OF TROJAN TECHNOLOGIES. **SolidWorks** MAINTAINED DATA CHANGES SHALL BE INCORPORATED ELECTRONICALLY DRAWN BY: DJ CREATED ON: 2011-09-13 RELEASE LOG #: 11-1152	TROJAN UV 3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V-4T7 DESCRIPTION: BRACKET ASSY, UV3+ LVL SNSR DWG NO. 319016 REV A MASS: 0.71 lbs SCALE: 1:2 SHEET 2 OF 2 SIZE B

CURRENT STATUS: Released

915889-S2134 Strain Relief

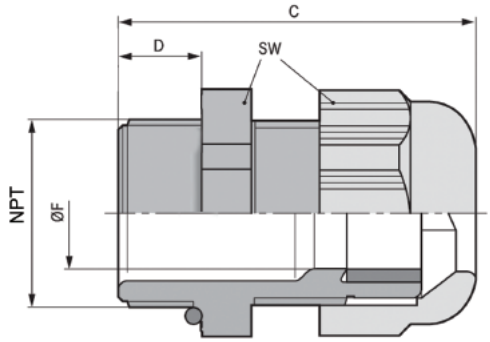
SKINTOP® SLN/ SLRN

Liquid Tight, Non-Metallic Strain Relief Cable Gland with NPT Threads

SKINTOP® SLN/ SLRN is a durable, liquid tight, easy to assemble strain relief cable gland with NPT threads that is universally suited for all types of machinery & equipment, including automation, motion control, process control and robotics.

Application Advantage:

- The heavy duty SKINTOP® design provides great pullout strength and very reliable strain relief
- Superior integrated locking mechanism includes an internal ratchet for vibration proof protection
- Multi-trapezoidal thread requires just one twist to tighten
- Generous high quality neoprene bushing provides a liquid tight and dust proof, hermetic seal



Complete the installation with:


Cable O.D. Page 486


EPIC® Connectors: Page 258


SKINTOP® DIX Page 524


Plugs Page 526

Technical Data:

Materials:
Body: Polyamide
Bushing: CR

Color:
- Black (RAL 9005) UV Resistant
- Gray (RAL 7001)

Protection:
Seal: IP 68, 5 Bar (Exceeds NEMA 6/ 6P Pressure rating)

Temperature range:
Static: -40° C to +80° C
Dynamic: -20° C to +80° C

SKINTOP® SLN: Liquid Tight, Non-Metallic Strain Relief Cable Gland with NPT Threads

Part Number Black	Part Number Gray	Thread Type & Size	UL Status	Clamping Range øF inches	SW Wrenching Flats inches	C Overall Length inches	D Thread Length inches	Standard Pack Size	Weight 100 pcs. lbs.
S2138	S1138	NPT-3/8"	R	.138 - 0.315	0.748	1.693	.591	100	2.00
S2112	S1112	NPT-1/2"	L	.197 - 0.472	0.945	1.772	.591	100	2.50
S2134	S1134	NPT-3/4"	L	.512 - 0.709	1.299	2.087	.591	50	5.50
S2101	S1101	NPT-1"	L	.748 - 1.000	1.654	2.362	.591	25	9.00

SKINTOP® SLRN: Liquid Tight, Non-Metallic Strain Relief Cable Gland with Reducer Bushing

Part Number Black	Part Number Gray	Thread Type & Size	UL Status	Clamping Range øF inches	SW Wrenching Flats inches	C Overall Length inches	D Thread Length inches	Standard Pack Size	Weight 100 pcs. lbs.
S2238	S1238	NPT-3/8"	R	.079 - .236	0.748	1.693	.591	100	2.00
S2212	S1212	NPT-1/2"	L	.157 - .354	0.945	1.772	.591	100	2.50
S2234	S1234	NPT-3/4"	L	.354 - .630	1.299	2.087	.591	50	5.50
S2201	S1201	NPT-1"	L	.551 - .827	1.654	2.362	.591	25	9.00

NOTES:

1. Locknuts may be ordered separately, refer to Page 498.
2. Orders of 2000 pieces or more per item will be bulk packaged unless otherwise requested.
3. UL Status: R = Recognized; L = Listed

915889-S2507 Strain Relief

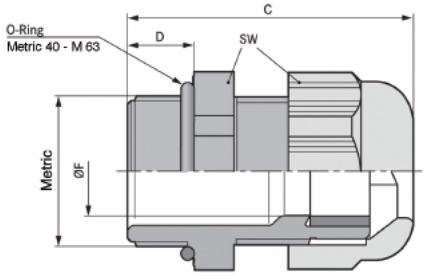
SKINTOP® SLM/ SLRM

Liquid Tight, Non-Metallic Strain Relief Cable Gland with Metric Threads

SKINTOP® SLM/ SLRM is a durable, liquid tight, easy to assemble strain relief cable gland with Metric threads that is universally suited for all types of machinery & equipment, including automation, motion control, process control and robotics.

Application Advantage:

- The heavy duty SKINTOP® design provides great pullout strength and very reliable strain relief
- Superior integrated locking mechanism includes an internal ratchet for vibration proof protection
- Multi-trapezoidal thread requires just one twist to tighten
- Generous high quality neoprene bushing provides a liquid tight and dust proof, hermetic seal
- Economical solution that covers a large clamping range with only 8 sizes



NOTES:
1. Orders of 2000 pieces or more per item will be bulk packaged unless otherwise requested.
2. UL Status: R = Recognized; L = Listed


Cable O.D. Page 486

EPIC® Connectors: Page 258

SKINTOP® DIX Page 524

Plugs Page 526

Technical Data:

Materials:
Body: Polyamide
Bushing: CR
Locknuts: Included

Color:
- Black (RAL 9005) UV Resistant
- Gray (RAL 7001)

Protection:
Seal: 70 PSI
IP 68, 5 Bar
(Exceeds NEMA 6/ 6P Pressure rating)
IP 69K

Temperature range:
Static: -40° C to +100° C
Dynamic: -20° C to +100° C

SKINTOP® SLM: Liquid Tight, Non-Metallic Strain Relief Cable Gland with Metric Threads

Part Number Black	Part Number Gray	Thread Type & Size	UL Status	Clamping Range øF inches	SW Wrenching Flats inches	C Overall Length inches	D Thread Length inches	Standard Pack Size	Weight 100 pcs. lbs.
S2507	S1507	M-12X1.5	R	0.138 - 0.276	0.591	1.181	.315	100	1.00
S2509	S1509	M-16X1.5	R	0.177 - 0.394	0.748	1.339	.315	100	1.50
S2513	S1513	M-20X1.5	L	0.276 - 0.512	0.984	1.457	.354	100	2.50
S2516	S1516	M-25X1.5	L	0.354 - 0.669	1.181	1.575	.394	50	3.50
S2521	S1521	M-32X1.5	L	0.433 - 0.827	1.417	1.850	.394	25	6.00
S2529	S1529	M-40X1.5	L	0.748 - 1.102	1.811	2.047	.394	10	10.50
S2536	S1536	M-50X1.5	L	1.063 - 1.378	2.165	2.441	.472	5	17.50
S2542	S1542	M-63X1.5	L	1.339 - 1.772	2.598	2.795	.472	5	25.50

SKINTOP® SLRM: Liquid Tight, Non-Metallic Strain Relief Cable Gland with Reducer Bushing

Part Number Black	Part Number Gray	Thread Type & Size	UL Status	Clamping Range øF inches	SW Wrenching Flats inches	C Overall Length inches	D Thread Length inches	Standard Pack Size	Weight 100 pcs. lbs.
S2607	S1607	M-12X1.5	R	0.039 - 0.197	0.591	1.181	.315	100	1.00
S2609	S1609	M-16X1.5	R	0.079 - 0.276	0.748	1.339	.315	100	1.50
S2613	S1613	M-20X1.5	L	0.197 - 0.394	0.984	1.457	.354	100	2.50
S2616	S1616	M-25X1.5	L	0.236 - 0.512	1.181	1.575	.394	50	3.50
S2621	S1621	M-32X1.5	L	0.276 - 0.591	1.417	1.850	.394	25	6.00
S2629	S1629	M-40X1.5	L	0.591 - 0.906	1.811	2.047	.394	10	10.50
S2636	S1636	M-50X1.5	L	0.866 - 1.142	2.165	2.441	.472	5	17.50
S2642	S1642	M-63X1.5	L	1.102 - 1.535	2.598	2.795	.472	5	25.50

Form 159
Sheet P/N 7800447
Rev. C

Warrick® Direct Current Controls Series

Installation and Operation Bulletin

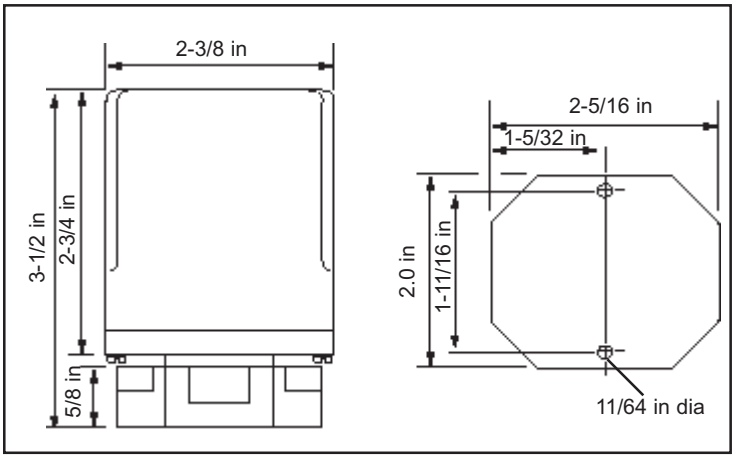
This bulletin should be used by experienced personnel as a guide to the installation of Series Direct Current Controls. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Gems Sensors or its local representative if further information is required.

Installation

1. Remove the plug-in module from the octal base. When plug-module is removed, the pin number identification can be see on the octal base.
2. Mount the octal socket (base) on a rigid vertical or horizontal surface using two #6 or #8 screws. The controls should be mounted within an enclosure of proper NEMA integrity.
3. After the base has been mounted, refer to the applicable wiring diagram. Connect the electrodes to the designated terminals of the socket using #14-#18 AWG wire for interconnecting leads. Be sure that the control is wired in accordance with the appropriate application drawing.
4. Wire the appropriate load contact in series with the "Hot" lead of the load device. **Note**: Load current rating must not exceed the maximum rating of the relay contact.
5. In accordance with the proper wiring diagram, connect the negative side (-) of the power supply to terminal #1 of the octal socket and the positive side (+) of the supply to terminal #2 of the socket. Verify that the power supply output voltage correlates to the data label on the control. **Caution: Reversal of power supply leads from designated polarity may damage the internal solid-state circuitry of the control. Verify the correct polarity of the power supply connections before proceeding to step #6.**
6. Plug the DC level control into the octal socket. Numbers at the base of the pins match the numbers on the installed base. The control is keyed for proper installation; the unit will not plug in if the pins are not properly aligned.

Warrick Controls recommends that you inspect and clean the electrode rods annually.

Dimensional Diagram



Use copper (60/70° C) wire only. Torque to 20 inch pounds.

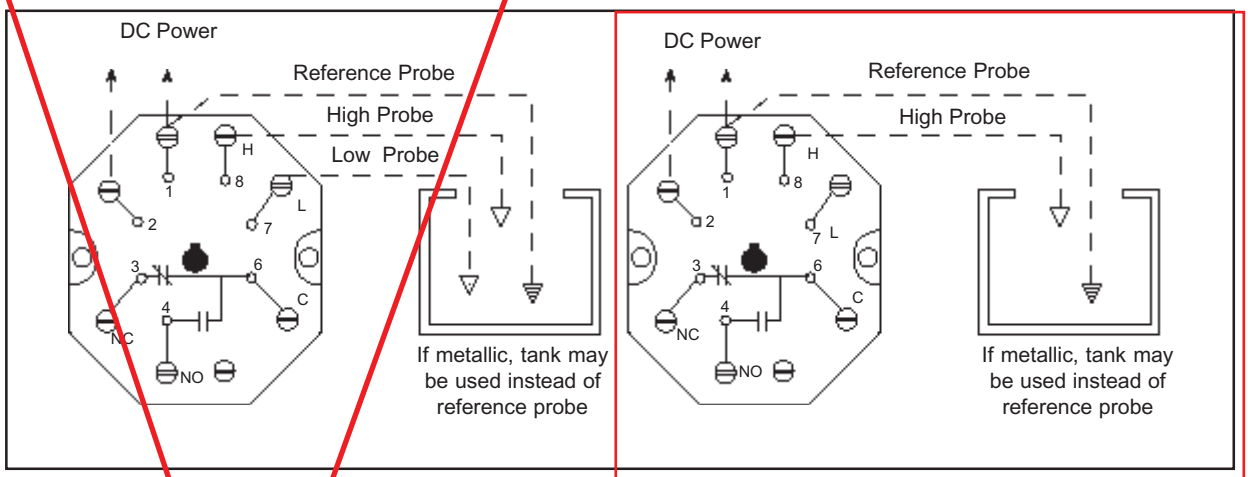
DC XXXX XX XX

- Time Delay: (decreasing level 1-30 sec)
- Time Delay: (increasing level 1-30 sec)
- Enclosure: **0**- none, **1**- NEMA 1, **4**- NEMA 4
- Mode: **D**- direct, **I**- inverse
- Sensitivity (ohms): **B**- 22K, **C**- 100K, **D**- 470K, **E**- 1M
- Supply Voltage: **1**- 12 VDC, **2**- 24 VDC

Specifications

Contact Design:	SPDT (1 form C) 1 Normally Open (N.O.) and 1 Normally Closed (N.C.)
Contact Ratings:	5A @ 30 VDC or 120 VAC, 4A @ 240 VAC resistive, 1/8th Hp 120 VAC, 240 VAC pilot duty code C150
Contact Life:	Mechanical - 20 million operations. Electrical - 100,000 operations minimum @ rated load
Electronics Module:	Solid-state components epoxy sealed in a black polystyrene plug-in style housing
Supply Voltage	12 or 24 VDC - Negative ground, ±20%
Supply Current:	12 VDC Model - Relay de-energized 10mA, Relay energized 40mA
Sensitivity Range:	0-1M maximum specific resistance, ohm factory set
Temperature Range:	-50° to +150° F

Wiring Diagram



Differential Level Wiring

Connect negative side (-) of VDC supply line to terminal #1 and positive (+) side to terminal #2. **Note**: Check polarity of power connections. Connect terminal #8 (H) to the high electrode and terminal #7 (L) to the low electrode. Terminal #1 can be grounded to tank if the tank is metallic. When the tank is not metallic, terminal #1 must be connected to an additional electrode of length equal to or longer than the longest probe.

Operation

Direct Mode: The control energizes closing load contact 4-6 and opening load contact 3-6 when the level rises to the short electrode connected to terminal #8. The control remains energized until the level recedes below the long electrode connected to terminal #7.

Inverse Mode: The control de-energizes opening load contact 4-6 and closing load contact 3-6 when the level rises to the short electrode connected to terminal #8. The control remains de-energized until the level recedes below the long electrode connected to terminal #7.

Note: For single level service controls utilizing both increasing and decreasing time delays, a jumper wire is required between terminals #7 and 8.

Single Level Wiring

Connect negative side (-) of VDC supply line to terminal #1 and positive side (+) to terminal #2. **Note:** Check polarity of power connections. Connect terminal #8 (H) to the electrode. Terminal #1 can be grounded to tank if the tank is metallic. When the tank is not metallic, terminal #1 must be connected to an additional electrode of length equal to or longer than the longest probe.

Operation

Direct Mode: The control energizes closing load contact 4-6 and opening contact 3-6 when the level rises to the electrode connected to terminal #8. The control de-energizes and the contacts return to their de-energized state when the level recedes below the electrode connected to terminal #8.

Inverse Mode: The control de-energizes opening load contacts 4-6 and closing load contact 3-6 when the level rises to the electrode connected to terminal #8. The control energizes and the contacts return to the energized state when the level recedes below the electrode connected to terminal #8.

Gems Sensors Inc.
One Cowles Road
Plainville, CT 06062-1198
Tel: 860-793-4579
Fax: 860-793-4580

UVAS PLUS sc SENSOR

Applications
- Drinking Water
- Wastewater
- Industrial

Continuously protect plant treatment processes from high influent organic loads.

Continuous, Automatic Early Warning Systems

Use the Hach UVAS plus sc UV Absorbance/ %Transmittance Sensor to continuously protect plant treatment processes from high influent organic loads.

Control Activated Sludge Processes

Activated sludge processes require precise balancing of organic load, aeration, and nutrients. Continuous trending of the organics using the UVAS plus sc sensor can help operators know how to balance other factors resulting in cost and time savings.

Self-cleaning Wiper System

The detector windows are automatically cleaned by a built-in wiper that eliminates surface films or particles that can diminish accuracy.

Monitor Efficiency of UV Disinfection Process

Hach's UVAS plus sc is designed to provide continuous UV light transmittance (UVT) measurement of pre-disinfected source water. Operational costs related to sampling for UVT may be reduced with continuous on-line measurement.

Self-diagnostics and Easy Maintenance

Diagnostic routines built into the UVAS plus sc sensor reduce the need for extensive calibration and maintenance. Only semi-yearly inspection and replacement of the wiper and seals is needed.

Principal of Operation

The Hach UVAS plus sc UV Absorbance / %Transmittance Sensor determines the Spectral Absorption Coefficient (SAC) at a wavelength of 254 nm. Measurements can be expressed in absorption units (1/m), mE, AU, %T, %T/cm, mg/L, or ppm.

This sensor requires a Hach sc200 or sc1000 Digital Controller.

HACH®
Be Right™

Specifications*

	UVAS plus sc Tank Sensors	UVAS plus sc Bypass Sensors
Measurement Technique	UV absorption measurement (2-beam technique), reagent-free	
Measurement Method	SAC 254 in accordance with DIN 38404 C3	
Measurement Path Length	1, 2, 5 and 50 mm	2, 5, and 50 mm
Measurement Range	Choice of: 0.01 to 60 m^{-1} at 50 mm 0.1 to 600 m^{-1} at 5 mm 0 to 1500 m^{-1} at 2 mm 2 to 3000 m^{-1} at 1 mm	Choice of: 0.01 to 60 m^{-1} at 50 mm 0.1 to 600 m^{-1} at 5 mm 0 to 1500 m^{-1} at 2 mm
Compensation	550 nm	
Measurement Interval	≥ 1 minute	
Sample Temperature	2 to 40°C (35.6 to 104°F)	
Sample pH	4.5 to 9 pH	
Probe Pressure Limit at Inlet	0.5 bar (7.25 psi) maximum	
Sample Flow Rate	n/a	0.5 L/hour minimum
Sample Connection	n/a	4 mm ID/6 mm OD hose
Sensor Cable Length	10 m (32.8 ft.)	
Control Function	PID, time control, 2-point controller (with sc controller)	
Inspection Interval	6 months	
User Maintenance	1 h / month, typical	
Dimensions	70 x 333 mm (2.75 x 13.11 in.) approximate	
Weight	3.6 kg (7.9 lb.) approximate	

**Subject to change without notice.*

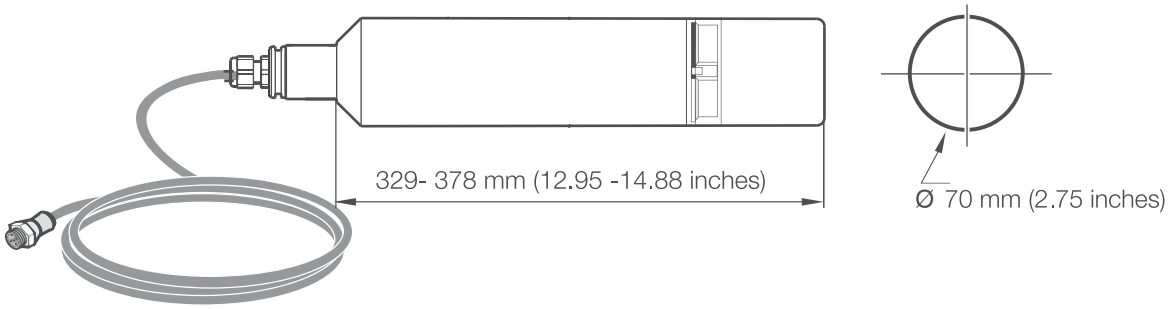
NOTE

The UVAS plus sc probes cannot be used in sea water.

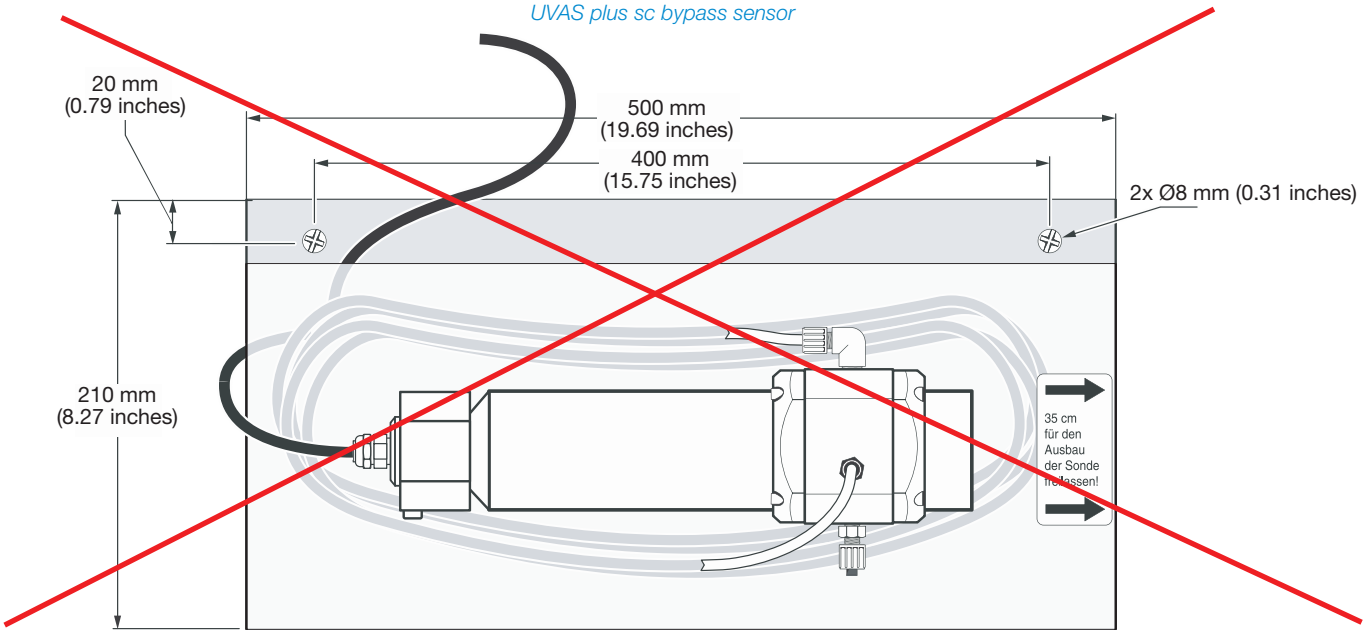
Dimensions

Hach UVAS plus sc UV Absorbance / %Transmittance Sensors can be installed using a fixed-point installation kit as shown in the bottom illustration. The bypass panel below can be used for non-immersion applications. With the cable supplied, the sensor can be used in a sample stream within 10 meters (32.8 feet) of the controller.

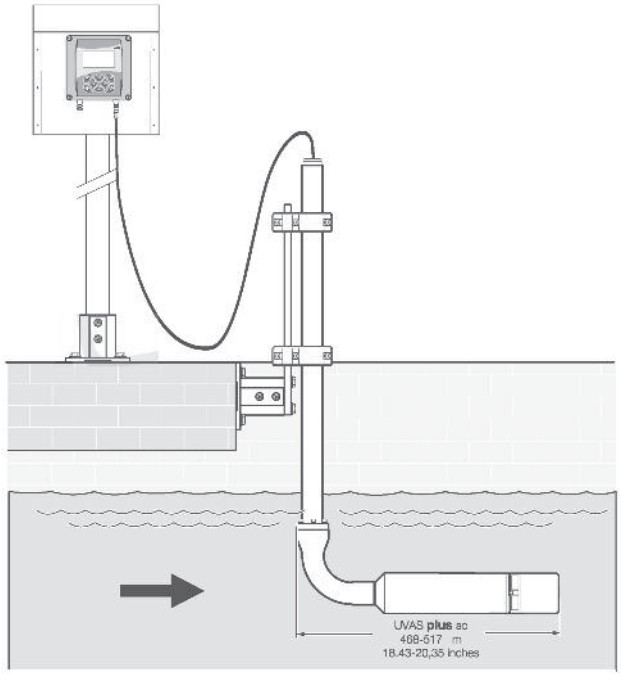
UVAS plus sc tank sensor



UVAS plus sc bypass sensor



Installation for mounting the Hach UVAS plus sc UV Absorbance / %Transmittance Sensor for immersion in open tanks.



Ordering Information

The following sensors include the Hach sc200 Multi-parameter Controller (see LIT2665 for complete details).

2976700	1 mm UVAS plus sc sensor
2976400	2 mm UVAS plus sc sensor
2976600	5 mm UVAS plus sc sensor
2976500	50 mm UVAS plus sc sensor

UVAS plus sc Sensor Only

LXV418.99.10002	1 mm UVAS plus sc sensor only
LXV418.99.20002	2 mm UVAS plus sc sensor only
LXV418.99.50002	5 mm UVAS plus sc sensor only
LXV418.99.90002	50 mm UVAS plus sc sensor only

Bypass Panel

LZX868	Bypass Panel for 50 mm sensor
LZX867	Bypass Panel for 5 mm sensor
LZX869	Bypass Panel for 2 mm sensor
LZX450	Sedimenter for UVAS sc sensor

Mounting Hardware

LZY714.99.53520	Mounting Hardware with 90 degree adapter

HACH COMPANY World Headquarters: Loveland, Colorado USA

United States: 800-227-4224 tel 970-669-2932 fax orders@hach.com
Outside United States: 970-669-3050 tel 970-461-3939 fax int@hach.com
hach.com

LIT2485 Rev 3
C14 Printed in U.S.A.

Be Right™

Digital Controller SC4500

Applications

- Wastewater
- Drinking Water
- Industrial Water
- Other

Claros Enabled

Service Protected

Ready for Now. Ready for the Future.

Technologies are advancing rapidly, providing new levels of convenience, accuracy, and efficiency. Which is exactly why the SC4500 Controller from Hach® is designed to integrate easily into your current system while allowing you to upgrade as your capabilities advance, without having to replace inventory. With a wide range of analog and digital connectivity options and the availability of intelligent instrument and data management features, the SC4500 unlocks the future, today.

Easy Adoption

The familiar experience of a modern touchscreen, the ability to use your current Hach sensors, and the same footprint as the SC200, make installation and integration of the SC4500 Controller seamless.

No Time for Downtime

The SC4500's built-in predictive diagnostic software ensures measurement confidence and reduces the risk of unexpected equipment downtime by enabling proactive maintenance planning via MSM, including step-by-step instructions.

The Connectivity Options You Need

The Controller provides local communication to SCADA or a PLC, as well as remote access through a secure, cloud-based connectivity option to integrate with Claros™, the Water Intelligence System from Hach. From analog and advanced digital protocols to wi-fi, cellular or LAN, the SC4500 gives you the flexibility to adapt in a rapidly changing world.

Technical Data*

Description	Microprocessor-controlled and menu-driven controller that operates the sensor
Dimensions	½ DIN - 144 x 144 x 192 mm (5.7 x 5.7 x 7.6 in.)
Weight	3.7 lb (controller only, w/o modules)
Display	3.5-inch TFT color display with capacitive touchpad
Enclosure Rating	UL50E type 4X, IEC/EN 60529–IP 66, NEMA 250 type 4X Metal enclosure with a corrosion-resistant finish
Operating Temperature Range	-20 to 60 °C (-4 to 140 °F) (8 W (AC)/9 W (DC) sensor load) -20 to 45 °C (-4 to 113 °F) (28 W (AC)/20 W (DC) sensor load) Linear derating between 45 and 60 °C (-1.33 W/°C)
Storage Conditions	-20 - 70 °C (-4 - 158 °F), 0 - 95% relative humidity, non-condensing
Altitude	2000 m (6562 ft) maximum
Installation Category	Category II
Pollution Degree	4
Protection Class	I, connected to protective earth
Power requirements	AC controller: 100-240 VAC ±10%, 50/60 Hz; 1 A (28 W sensor load) DC controller: 24 VDC +15% -20%; 2.5 A (20 W sensor load)
Measurements	Two device digital SC connectors
Relays	Two relays (SPDT); Wire gauge: 0.75 to 1.5 mm^2 (18 to 16 AWG) AC controller Maximum switching voltage: 100 - 240 VAC Maximum switching current: 5 A Resistive/1 A Pilot Duty Maximum switching power: 1200 VA Resistive/360 VA Pilot Duty DC controller Maximum switching voltage: 30 VAC or 42 VDC Maximum switching current: 4 A Resistive/1 A Pilot Duty Maximum switching power: 125 W Resistive/28 W Pilot Duty
Communication (optional)	Analog: Five 0-20 mA or 4-20 mA analog outputs on each analog output module Up to two analog Input modules (0-20 mA or 4-20 mA). Each input module replaces a digital sensor input. Digital: Profibus DPV1 module Modbus TCP Profinet IO module Ethernet IP module
Network Connectivity	LAN: Two Ethernet connectors (10/100 Mbps) Cellular: External 4G Wi-Fi
USB Port	Used for data download and software upload. The controller records approximately 20,000 data points for each connected sensor.
Compliance Certifications	CE. ETL certified to UL and CSA safety standards (with all sensor types), FCC, ISED, KC, RCM, EAC, UKCA, SABS, C (Morocco)
Warranty	12 months
Compatible Network Technologies	GSM 3G/4G (e.g. AT&T, T-Mobile, Rogers, Vodafone etc.) CDMA (e.g. Verizon)

**Subject to change without notice.*

Compatible Instruments / Software Version (Release Year)

Amtax sc / V2.30 (2018) or higher

A-ISE sc / V1.02 or higher

AN-ISE sc / V1.08 (2013) or higher

N-ISE sc / V1.02 or higher

Nitratax clear sc, Nitratax eco sc, Nitratax plus sc / V3.13 (2013) or higher

Phosphax sc / V2.30 (2018) or higher

Phosphax sc LR/MR/HR / V1.01 (2018) or higher

TSS sc / V41.73 (2013) or higher

Solitax sc / V2.20 (2013) or higher

TU5300sc, TU5400sc / V1.34 (2017) or higher

SS7 sc (in Bypass) / V1.06 (2006) or higher

Ultraturb sc / V3.06 (2017) or higher

1720E / V2.10 (2006) or higher

Sonatax sc / V1.15 (2016) or higher

CL17sc / V2.7 (2019) or higher

CL10sc / V1.14 (2013) or higher

9184sc, 9185sc, 9187sc* / V2.03 (2013) or higher

Uvas plus sc / V3.01 (2017) or higher

LDO 2 sc* / V1.22 (2013) or higher

3798sc* / V2.03 (2013) or higher

3700sc + Inductive Conductive Digital Gateway 6120800 / V3.00 (2017) or higher

3422sc, Analog 3400 + Contacting Cond. Digital Gateway 6120700 / V3.00 or higher

pHD sc*, pHD-S sc / V3.10 (2016) or higher

1200-S sc* / V2.04 (2013) or higher

pHD analog + Digital Gateway 6120500 / V3.00 (2017) or higher

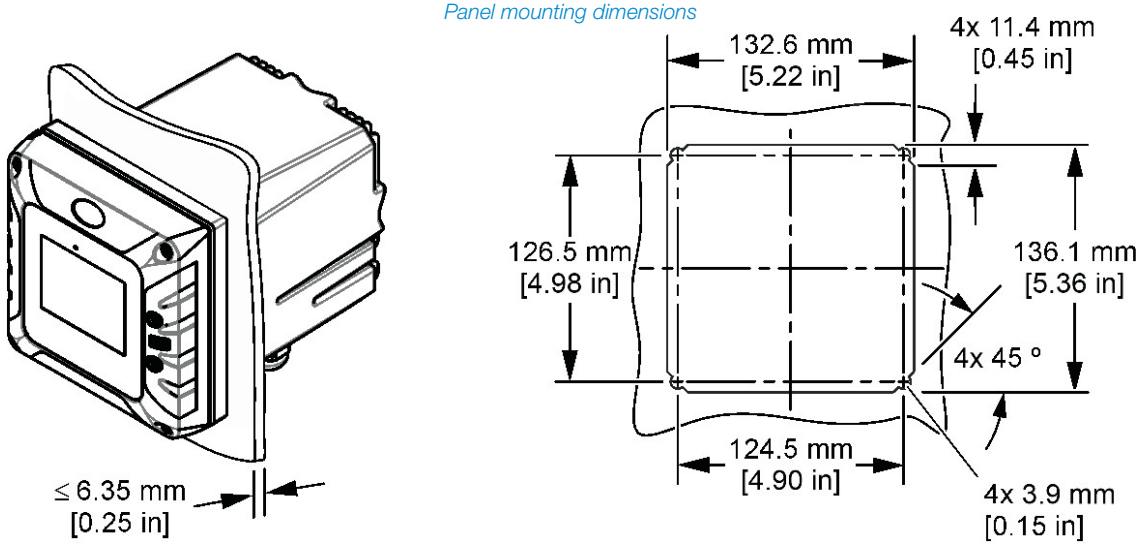
RC and PC analog sensor + Digital Gateway for conventional analog pH and ORP sensors 6120600 / V3.00 (2017) or higher

8362sc* / V3.00 (2017) or higher

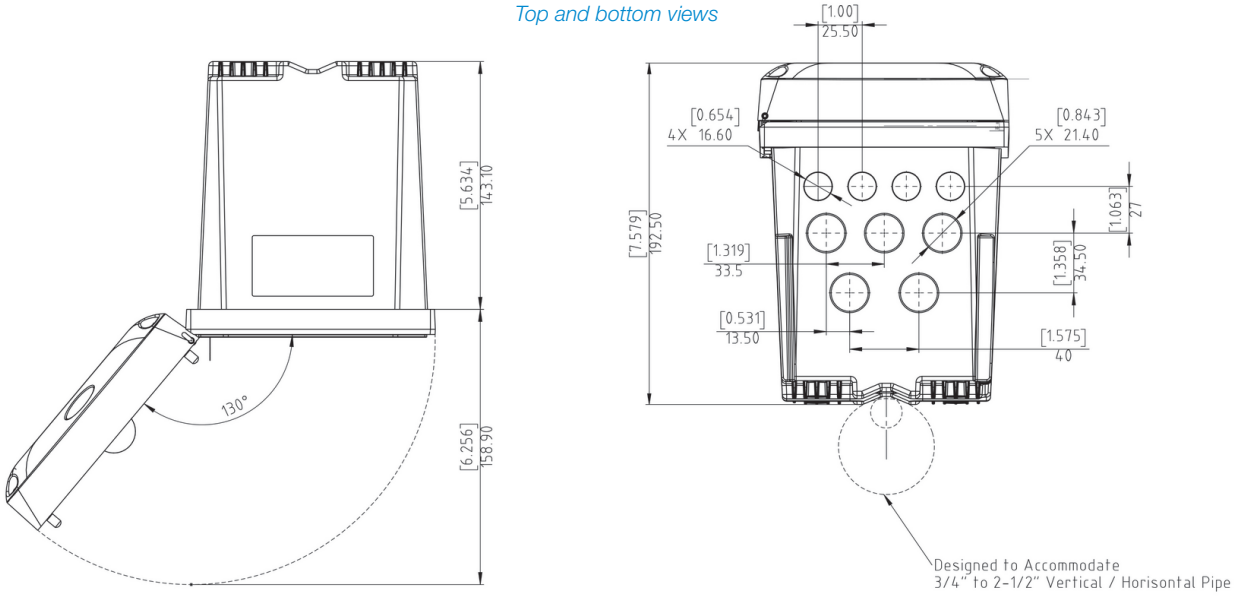
**Hardware Version1 of instrument is not supported*

Dimensions

Panel mounting dimensions



Top and bottom views



Door Opening Details

Order Information

Controller

LXV525.99A11551	SC4500 Controller, Prognosys, 5x mA Output, 2 digital Sensors, without plug
LXV525.99E11551	SC4500 Controller, Prognosys, 5x mA Output, 2 digital Sensors, US plug
LXV525.99A11541	SC4500 Controller, Prognosys, 5x mA Output, 1 digital Sensor, 1 mA Input, without plug
LXV525.99E11541	SC4500 Controller, Prognosys, 5x mA Output, 1 digital Sensor, 1 mA Input, US plug
LXV525.99AA1551	SC4500 Controller, Claros-enabled, 5x mA Output, 2 digital Sensors, without plug
LXV525.99EA1551	SC4500 Controller, Claros-enabled, 5x mA Output, 2 digital Sensors, US plug
LXV525.99AA1541	SC4500 Controller, Claros-enabled, 5x mA Output, 1 digital Sensor, 1 mA Input, without plug
LXV525.99EA1541	SC4500 Controller, Claros-enabled, 5x mA Output, 1 digital Sensor, 1 mA Input, US plug

Additional configurations are available. Please contact Hach Technical Support or your Hach representative.

Accessories

LXZ525.99.D0001	SC4500 mA Input Module
LXZ525.99.D0002	SC4x00 mA Output Module (5 Outputs)
LXZ525.99.C0002	SC4500 Ethernet IP Upgrade Kit
LXZ525.99.C0003	SC4500 Modbus TCP/IP Upgrade Kit
LXZ525.99.00026	SC4500 Ethernet Cable M12 to M12 / C1D2, 10 m
LXZ525.99.00017	SC4500 USB Stick
LXZ524.99.00004	SC4x00 UV Protection Screen
LXZ524.99.00005	SC4x00 UV Protection Screen with Sunroof
LXZ524.99.00033	SC4x00 Sunroof Visor
LXZ524.99.00036	SC4x00 Mounting Hardware Sunroof with Visor
LXZ524.99.00037	SC4x00 Sunroof with Visor

Claros Enabled

This instrument connects to Claros, Hach's innovative Water Intelligence System. Claros allows you to seamlessly connect and manage instruments, data, and process – anywhere, anytime. The result is greater confidence in your data and improved efficiencies in your operations. To unlock the full potential of Claros, insist on Claros Enabled instruments.

Service Protected

With Hach Service, you have a global partner who understands your needs and cares about delivering timely, high-quality service you can trust. Our Service Team brings unique expertise to help you maximize instrument uptime, ensure data integrity, maintain operational stability, and reduce compliance risk.

DOC053.53.35316.Aug21

Hach World Headquarters: Loveland, Colorado USA
United States: 800-227-4224 tel 970-669-2932 fax orders@hach.com
Outside United States: 970-669-3050 tel 970-461-3939 fax int@hach.com
hach.com

HACH® Be Right™

UV254 FIELD METER

P SERIES

WATER QUALITY MONITORING SOLUTIONS

FEATURES & BENEFITS

- Easy to use with fast 90 second warm up time
- Measures in UVT or UVA with simple toggle feature
- Accurate and precise results within seconds
- No zeroing to DI water before each test
- Rugged for field testing with optional Battery Pack
- Wastewater to high purity test ranges

MUNICIPAL DRINKING WATER
MUNICIPAL WASTEWATER
INDUSTRIAL PROCESS WATER
INDUSTRIAL WASTEWATER

OVERVIEW

The UV254 portable field meter from Real Tech leads the way in organics testing. Benefiting from Spilt-Sense technology, the instrument has a unique memory calibration feature that allows the meter to be used for an extended period of time before DI calibration is required. Operation is straight forward with accurate and repeatable results obtained in seconds. An optional Battery Pack allows for sampling anywhere, anytime giving the user true portability.

MODELS & RANGE

P series models include UV254 portable field meter, sampling cuvette, wall adapter and car adapter.

MODEL #	PATH LENGTH	UVT (%)	UV254 (cm^{-1})
P050	1 mm	0 - 100	0 - 20
P100	2 mm	0 - 100	0 - 10
P110T	2 mm and 10 mm	0 - 100	n/a
P110A	2 mm and 10 mm	n/a	0 - 10
P200	10 mm	1 - 100	0 - 2
P300	40 mm	32 - 100	0 - 0.5

BATTERY PACK

PRODUCT #	NAME	DESCRIPTION
UVT-068010	Battery Pack	Factory installed battery pack upgrade for UV254 P series meters, comes with battery charger.

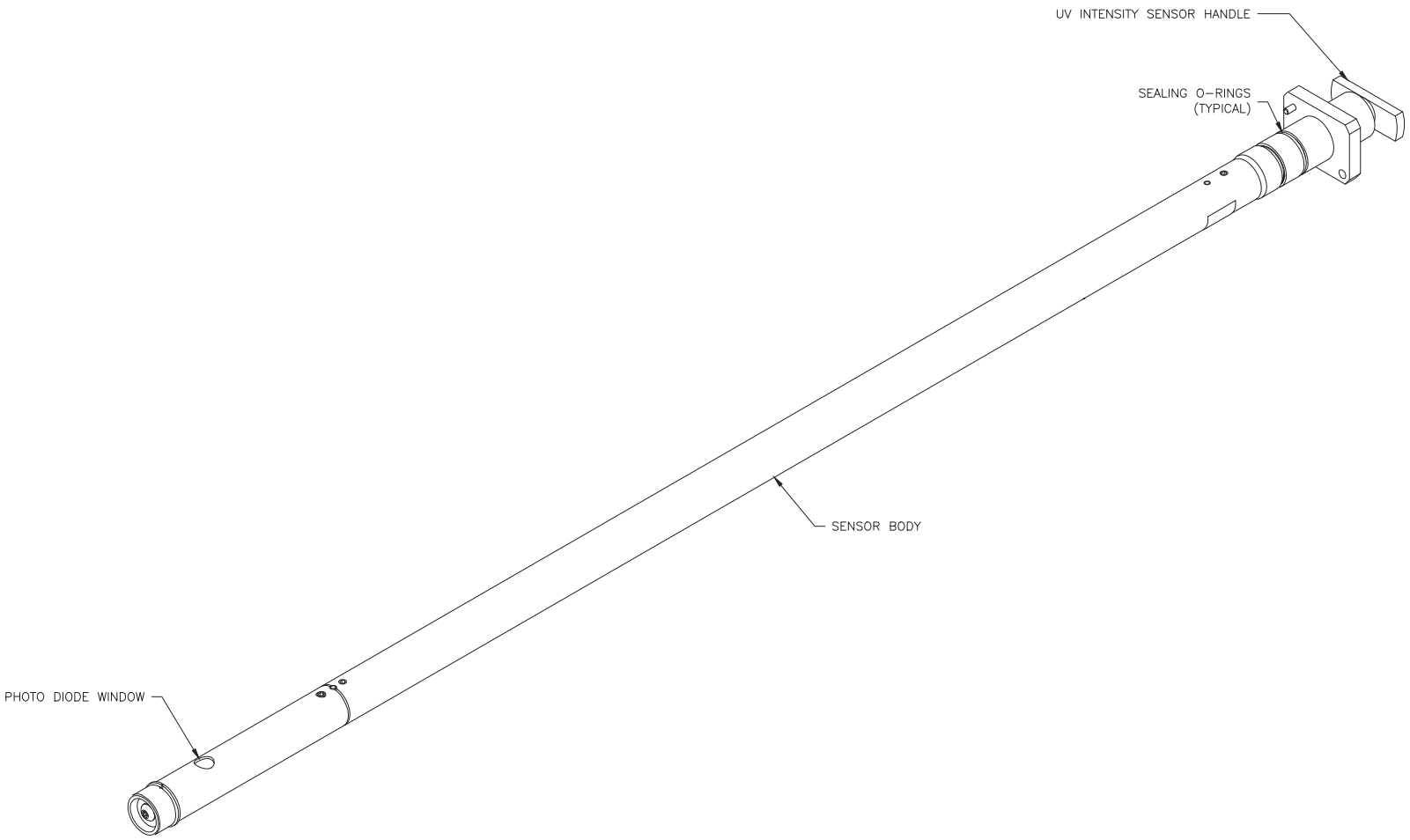
REAL TECH INC.

SPECIFICATIONS

CHARACTERISTIC	TECHNICAL DATA
Units	cm^{-1} or %
Accuracy	+- 0.5 % FS
Resolution	0.001 UVA or 0.1% UVT
Calibration	Calibration memory prevents the need to re-zero to DI water
Self-Diagnostics	Notification of system failure
Display	32 character backlit LCD
Wavelengths	253.7 nm
Light Source	Low-pressure mercury UV lamp / UV LED
Lamp Life	2 years
Dimensions	8.7"L x 7.5"W x 3.9"H (254 cu in)
Enclosure	Rugged, compact, watertight and dustproof
Electrical	12VDC 1A wall adapter (accepts 90-250 VAC 50/60Hz). 12VDC car adapter
Storage Temp.	-20 to 60°C (-4 to 140°F)
Operating Temp.	0 to 45°C (32 to 113°F)
Weight	4 lb
Technology	Split-Sense
Warranty	2-year limited warranty

* Technical Specifications are subject to change without notice.

Real Tech Inc.
1150 Champlain Court,
Whitby, Ontario L1N 6K9 Canada
TF: 1.877.779.2888 T: 1.905.665.6888
info@realtechwater.com



TROJANUV

DESCRIPTION:
TROJANUVSIGNA, UV INTENSITY SENSOR ASSEMBLY

DRAWN BY : KDH	DATE : 13OC16
CHECKED BY : SAH	DATE : 13OC16
APPROVED BY : RLM	DATE : 13OC16
SCALE (8.5x11) : NOT TO SCALE	LOG NUMBER : N/A

STD. DRAWING NO.	SG0032
REFERENCE NO.	015461G
DWG NO.	D01
REV.	A

Non-contact safety sensor
Eden

Eden is a non-contact safety sensor used as interlocking device for e.g. doors and safe position monitoring.

Eden consists of two parts: Adam and Eva. Adam senses the presence of Eva without mechanical contact and therefore without any wear. The compact size of Eden and its 360° mounting possibility make it easy to use in most applications.

Different models of Eden are available for different types of control modules. All Eden models make it very easy to reach PL e, often using fewer components than other solutions.

All Eden models have an IP67/IP69K sealing.

Continuous operation

Easier troubleshooting
Extensive LED indication and status information reduce downtime.

Suitable in harsh environments
IP67/IP69K and a temperature range of -40 to +70°C offer an excellent resistance in demanding environments.

No wear, no mechanical breakage
Non-contact sensing means no mechanical wear and no actuator that must fit in a specific opening. Moreover, the large sensing tolerance means better tolerance to vibrations and fewer unwanted process stops.

Affordable range

Local reset function
The integrated reset function reduces the number of cables and PLC inputs.

PL e with fewer components
Series connection with PL e, local reset and DYNlink signal allow to considerably reduce the number of components needed to reach PL e.

Easy to install

Large mounting tolerance
A 360° mounting possibility with generous tolerances facilitates mounting.

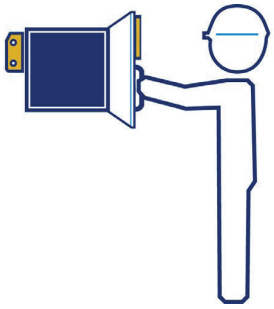
Fast connection
M12 connectors, local reset and accessories speed up installation.

Applications
Eden

Applications

Doors and hatches

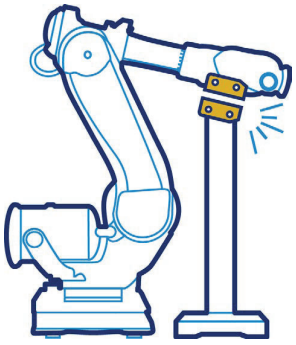
Eden monitors whether the hatch is open or closed. The dangerous movement is stopped as soon as the hatch is opened.



Position control

Eden can be used to monitor the position of a machine when someone is in the work area. This can be useful when removing power to the machine causes problems like a long restart time.

As long as the machine remains in the safe position monitored by Eden, a person can be allowed to enter the hazardous area even though the machine is still powered. If the machine leaves the safe position while the person is still in the hazardous area, power is removed from the machine.



Features
Eden

Features

Easy PL e with Eden safety sensor

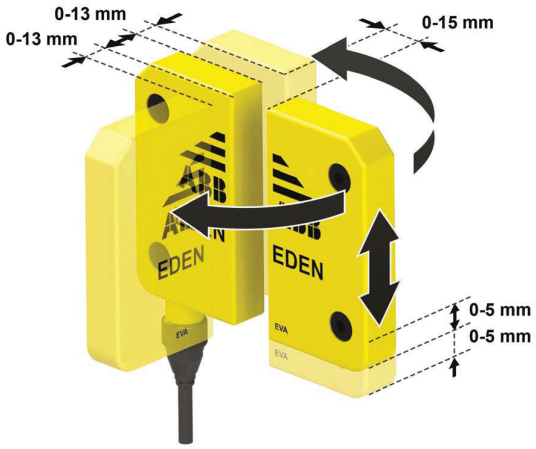
- Eden sensors can be connected in series while maintaining Cat. 4.
- Only one Eden per guard is necessary to reach PL e (instead of two key switches).
- Eden reaches PL e without any need for periodic checks (see ISO/TR 24119).

Low or high level coded sensor

Eva is available with General code or Unique code. If a new Adam is paired with an Eva general code at start up, Adam will accept all Eva with general code as a valid actuator. Eden will then classify as a low level coded sensor.
If a new Adam is paired with an Eva Unique code at startup (or Eva AS-i), Adam will only accept this specific Eva as a valid actuator. In this case Eden is classified as a high level coded sensor. A high level coded sensor should be used when the motivation to defeat a sensor cannot be eliminated (see EN ISO 14119:2013).

360° mounting possibility

Eden offers 360° mounting possibility with generous tolerances.



Local reset button

A local reset button with integrated LED can be connected directly to Adam Reset instead of to the safety control module. In this way, each Eden can easily have its own reset button, which saves cable length and safety relays/PLC inputs. Adam Reset monitors the reset function and manages the LED in the reset button in the following way:

on - Adam and Eva are not in contact
flashing - Adam and Eva in contact, waiting for reset
off - Adam and Eva in contact and reset

Info signal and extensive indication facilitate trouble-shooting

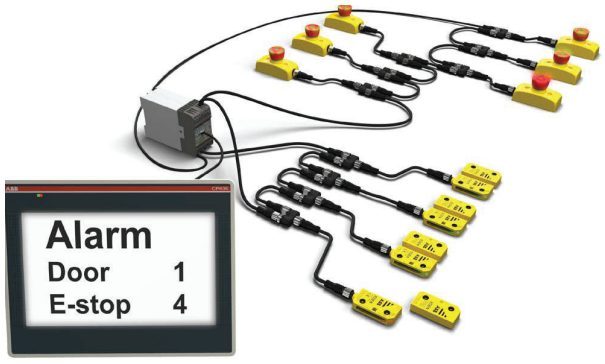
All Eden models offer extensive LED indication to help trouble-shooting and localizing which doors/hatches are opened. The LED on Adam lights in green or red depending on status:

green - valid Eva within range
red - valid Eva out of range
flashing red/green - valid Eva within range, but no valid safety signal received (loop broken “upstream”)

The LED on Adam AS-i has slightly different default settings and can be programmed to light in any behaviour.

Simple status information with StatusBus

StatusBus is a simple and cost effective way to collect the status information of safety sensors. The StatusBus functionality is available with some DYNlink devices and allows to collect the status of each individual safety device, even when connected in series. A single input on Pluto safety PLC can collect the status of up to 30 safety devices. The devices are connected using standard cable and M12-5 connectors. No specific bus cable or extra communication module is necessary.



Models
Eden

Models

Eden DYN

Eden DYN consists of an Adam DYN and an Eva (general or unique code).
Adam DYN uses the ABB Jokab Safety DYNlink signal that allows to connect several safety products in series while maintaining PL e using only one channel. DYNlink signals must be used with Vital safety controller or Pluto safety PLC.
Up to 30 Adam DYN can be connected in series to Vital and up to 10 Adam DYN can be connected in series to one input of Pluto.
All products using the DYNlink signal can easily be connected in series and mixed in the same loop with a maintained PL e.
Tina adapters allow to use other products in a DYNlink loop, and a wide range of connection accessories simplifies the cabling.

Eden DYN

Eden OSSD

Eden OSSD consists of an Adam OSSD and an Eva (general or unique code).
Adam OSSD can be used with all safety relays and safety PLCs compatible with OSSD signals (commonly used for light guards). Up to 30 Adam OSSD can be connected in series, and since OSSD devices monitor their own outputs for short circuits, a Cat. 4/PL e can still be reached.

Eden OSSD

Eden AS-i

Eden AS-i consists of an Adam AS-i and an Eva AS-i (Eva AS-i has a unique code).
Eden AS-i can be used with any AS-i monitor. AS-i is a bus system that offers a very simple connection of up to 31 safety devices to one monitor according to PL e and makes it easy to move, remove and add safety devices.
When Eden AS-i is used with Pluto programmable safety controller, no other AS-i master or monitor is necessary, and no specific knowledge of AS-i is required.

Eden AS-i

Ordering information

Eden

2TLC010045V0201

Adam DYN-Info M12-5

Adam

Type of safety controller	StatusBus	Info signal	Local reset	Series connection	Connector male	Type	Order code
Pluto	x	x [1]		x	M12-5	Adam DYN-Status M12-5	2TLA020051R5200
Pluto or Vital		x		x	M12-5	Adam DYN-Info M12-5	2TLA020051R5100
			x	x	M12-5	Adam DYN-Reset M12-5	2TLA020051R5300
OSSD compatible (incl. Pluto and Sentry)		x			M12-5	Adam OSSD-Info M12-5	2TLA020051R5400
		x		x	M12-8	Adam OSSD-Info M12-8	2TLA020051R5700
			x		M12-5	Adam OSSD-Reset M12-5	2TLA020051R5600
		x	x	x	M12-8	Adam OSSD-Reset M12-8	2TLA020051R5900
AS-i safety monitor (incl. Pluto AS-i and B42 AS-i)	N/A [2]	N/A [2]		N/A [2]	M12-4	Adam AS-i	2TLA020051R6000

1) Pin 5 can be used as a standard info signal or StatusBus.
2) AS-i offers the same advantages using another technology.

2TLC010061V0201

Eva General code

Eva

Compatible Adam	Code description	Code level	Type	Order code
Adam DYN and OSSD	General code. (Eva is interchangeable)	Low level	Eva General code	2TLA020046R0800
	Unique code. (Prevents defeat/fraud)	High level	Eva Unique code	2TLA020046R0900
Adam AS-i	Unique code. (Prevents defeat/fraud)	High level	Eva AS-i	2TLA020051R8000


2TLC010040F0201

JSM D20 Eden slide lock


2TLC010044F0201

FIXA

Accessories

Description	Type	Order code
Mounting plate for conventional door/hatch and folding door. Two pieces are needed for a complete set.	JSM D4H	2TLA040033R3600
Mounting plate for folding doors. Used together with one piece of JSM D4H.	JSM D4J	2TLA042020R4000
Sliding lock for Eden on conventional doors. (Eden is not included.)	JSM D20	2TLA020302R1000
Mounting converting plate from Eden E to Eden OSSD or Eden DYN	DA 3A	2TLA020053R0600
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Safety screwdriver bit	SBIT Safety bit	2TLA020053R5000
Wrench for tightening of M12 connectors according to specified torque: 0.6 Nm.	M12 Torque wrench	2TLA020053R0900
Safety screw to eliminate the risk of manipulation/tampering. 1pc M4 x2 0mm. Length adapted to Eden.	Safety screw SM4 x 20	2TLA020053R4200
Handheld terminal for addressing, configuration and testing of AS-i devices, StatusBus devices, DYNlink devices and conventional PNP devices.	FIXA	2TLA020072R2000


2TLC172727F0201

Distance plate

Spare parts (included with main product on delivery)

Description	Type	Order code
Distance plate in yellow PBT (4 pcs).	DA 1B	2TLA020053R0700
Black distance rings to be mounted in Adam and Eva mounting holes (4 pcs).	DA 2B	2TLA020053R0300

2TLC172575F0201

Smile 12RG Reset button

Reset buttons for local reset

Description	Type	Order code
Reset button for Adam with 5 pins	Smile 12RF	2TLA030053R2600
Reset button for Adam with 8 pins	Smile 12RG	2TLA030053R2700

Technical data
Eden

Technical data

	Eden DYN	Eden OSSD	Eden AS-i
Approvals			
Conformity	CE 2006/42/EC - Machinery 2014/30/EU - EMC 2011/65/EU - RoHS		
	EN ISO 12100:2010, EN ISO 13849-1:2008/AC:2009, EN 62061:2005/A1:2013, EN 60204-:2006+A1:2009, EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007, EN 60947-5- 3:2013, EN ISO 14119:2013, EN 61508:2010	EN ISO 12100:2010, EN ISO 13849-1:2015, EN 62061:2005/A2:2015, EN 60204-1:2006+A1:2009, EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007, EN 60947-5-3:2013, EN ISO 14119:2013, EN 61508:2010	EN ISO 12100:2010, EN ISO 13849-1:2008, EN 62061:2005, EN 60204-1:2006+A1:2009, EN 60664-1:2007, EN 61000-6-4:2007
Functional safety data			
EN/IEC 61508:2010	SIL3, $PFH_D = 4.5 \times 10^{-9}$	SIL3, $PFH_D = 4.5 \times 10^{-9}$	SIL3, $PFH_D = 6.0 \times 10^{-9}$
EN/IEC 62061:2005+A1:2013	SILCL3, $PFH_D = 4.5 \times 10^{-9}$	SILCL3, $PFH_D = 4.5 \times 10^{-9}$	SILCL3, $PFH_D = 6.0 \times 10^{-9}$
EN ISO 13849-1:2008	PL e, Cat. 4, $PFH_D = 4.5 \times 10^{-9}$	PL e, Cat. 4, $PFH_D = 4.5 \times 10^{-9}$	PL e, Cat. 4, $PFH_D = 6.0 \times 10^{-9}$
Electrical data	+24 VDC Tolerance: +14.4...+27.6 VDC	+24 VDC Tolerance: +14.4...+27.6 VDC	+30 VDC (AS-i bus) Tolerance: +26.5...+31.6 VDC
Mechanical data			
Operating temperature	-40°C...+70°C (storage/operation)	-40°C...+70°C (storage/operation)	-40°C...+85°C (storage), -25°C...+55°C (operation)
Protection class	IP67 and IP69K		
Humidity range	35 to 85% (no icing, no condensation)		
Material			
Housing	Polybutylene terephthalate (PBT)		
Moulding	Epoxy		
Weight	Eva: 70 g, Adam: 80 g		
Assured release distance (S_{ar})	25 mm	25 mm	45 mm
Assured operating distance (S_{ao})	10 mm	10 mm	7.5 mm
Rated operating distance (S_n)	15 ± 2mm		
Recommended distance between Adam and Eva	7 mm		
Min distance between two Eden	100 mm		

More information

Fore more information, e.g. the complete technical information, see product manual for:
Eden DYN 2TLC172271M0201
Eden OSSD 2TLC172272M0201
Eden AS-i 2TLC172230M0201

MECHANICAL

DRAWINGS & CUT SHEETS

SECTION CONTENTS

Operator's Kit

An Operator's Kit is provided with each TrojanUVSigna™. The following items are included in the kit:

1. One (1) clear UV face shield.
2. Four (4) pairs of disposable vinyl gloves.
3. One 6 inch (150 mm) galvanized steel funnel for adding hydraulic oil to the Hydraulic System Center (HSC).
4. One (1) 10 micron absolute fiberglass weave filter element for each Hydraulic System Center.
5. One (1) tube of Food Grade Grease (CC-Lube).
6. One (1) tool to service wiper cannisters. Provided to aid in removal of end cap and scroll cage.
7. One (1) heavy duty grease gun features 14 oz. cartridge, suction loader fitting and a bleeder valve to eliminate air pockets, also includes 18" flexible hose and coupler.
8. Four (4) straight unions for bleeding hydraulic lines.
9. Four (4) hex caps for hoses.
10. One (1) Solo™ Lamp Plug tool.
11. One (1) 2cm Signa Sensor Gauge

3M™ Polycarbonate Faceshields

Technical Data Sheet

Main Features

3M™ Polycarbonate Faceshields are designed to be used with all 3M™ Headgear Systems to provide face protection.

The key features include:

- Polycarbonate construction for impact and splash protection
- Easy-Change faceshields mount quickly to 3M Headgear Systems
- Easy-Change feature allows for quick faceshield replacement
- Only compatible with 3M Headgear Systems

Standards

Meets the requirements of the following standards:

- ANSI Z87.1-2003 “High Impact” requirements
- CSA Z94.3-07
- EN166-2001: Protection against liquids (droplets or splashes), Protection against high speed particles (Medium Energy Impact)

Materials

- Faceshield: Polycarbonate

Applications

3M Polycarbonate Faceshields are designed to be used only with 3M Headgear Systems. Polycarbonate faceshields should be used when the wearer is likely to come in contact with either liquid splash or flying particulates provided use is consistent with all instructions and product warnings.

ALL HEADGEAR/FACESHIELD COMBINATIONS MUST BE WORN WITH SAFETY SPECTACLES AND/OR SAFETY GOGGLES.

Typical applications include:

- Chipping, grinding, machining
- Woodworking
- Mechanical work
- Chemical work
- Metal processing
- Masonry
- High pressure washing
- Gas brazing, welding and cutting

In all cases a risk/hazard assessment should be carried out and use limitations considered to ascertain the protection required.

WARNING!

Not for use in:

- Environments that require faceshields above a Shade 5.0

Product must never be altered or modified. The appropriate 3M Headgear System must be used, based on a hazard assessment.

Maintenance, Storage and Disposal

This product should be stored in the packaging provided in dry, clean conditions.

3M™ Polycarbonate Faceshields

Physical Data for 3M™ Polycarbonate Faceshields

Prod# SI#	Description	Product Specifications			Nominal Transmittance		Nominal Ultraviolet Transmittance	
		Height	Width	Thickness	Visible	Infrared	Near UV	Far UV
82579-00000 70-0715-2202-6	WP96R Clear Polycarbonate	22.8cm	36.8cm	1.0mm	88.9%	86.3%	0.7%	0.0%
82582-00000 70-0715-2205-9	WP96X Clear Polycarbonate	22.8cm	46.4cm	1.0mm	88.9%	86.3%	0.7%	0.0%
82583-00000 70-0715-2206-7	WP96XB Medium Green Polycarbonate	22.8cm	46.4cm	1.0mm	26.5%	63.0%	0.1%	0.0%
82584-00000 70-0715-2207-5	WP96XC Dark Green Polycarbonate	22.8cm	46.4cm	1.0mm	14.4%	53.8%	0.1%	0.0%
82585-00000 70-0715-1345-4	WP96XAL Clear Aluminized Polycarbonate	22.8cm	46.4cm	1.0mm	5.4%	3.7%	0.0%	0.0%
82586-00000 70-0715-2208-3	WP96XBAL Med. Green Aluminized Polycarbonate	22.8cm	46.4cm	1.0mm	2.3%	3.2%	0.0%	0.0%
82587-00000 70-0715-1346-2	WP96XCAL Dark Green Aluminized Polycarbonate	22.8cm	46.4cm	1.0mm	1.4%	5.4%	0.0%	0.0%
82543-00000 70-0715-2200-0	~~WP96 Clear Polycarbonate for HGP9 Chin Protector~~	~~17.8cm~~	~~36.8cm~~	~~1.0mm~~	~~88.9%~~	~~86.3%~~	~~0.7%~~	~~0.0%~~
82701-00000 70-0715-2218-2	WP96 Clear Polycarbonate	22.8cm	36.8cm	2.0mm	87.6%	85.4%	0.1%	0.0%
82704-00000 70-0715-2220-8	~~WP96AF Clear Polycarbonate Anti-Fog~~	~~22.8cm~~	~~36.8cm~~	~~2.0mm~~	~~88.0%~~	~~85.4%~~	~~0.1%~~	~~0.0%~~
82525-00000 70-0715-2196-0	WP96B Medium Green Polycarbonate	22.8cm	36.8cm	2.0mm	25.8%	54.7%	0.0%	0.0%
82702-00000 70-0715-2219-0	WP96C Dark Green Polycarbonate	22.8cm	36.8cm	2.0mm	14.6%	58.9%	5.2%	0.0%
82504-00000 70-0715-1341-3	WP96AL Clear Aluminized Polycarbonate	22.8cm	36.8cm	2.0mm	10.6%	6.8%	0.0%	0.0%
82518-00000 70-0715-1344-7	WP96BAL Med. Green Aluminized Polycarbonate	22.8cm	36.8cm	2.0mm	1.2%	3.5%	0.0%	0.0%
82509-00000 70-0715-1343-9	WP96CAL Dark Green Aluminized Polycarbonate	22.8cm	36.8cm	2.0mm	0.6%	2.2%	0.3%	0.0%
82705-10000 70-0715-2221-6	W96IR3 Shade 3.0 Polycarbonate	22.8cm	36.8cm	2.0mm	10.8%	5.2%	0.0%	0.0%
82706-10000 70-0715-2222-4	W96IR5 Shade 5.0 Polycarbonate	22.8cm	36.8cm	2.0mm	1.8%	0.5%	0.0%	0.0%
82600-00000 70-0715-2212-5	WCP96 Clear Polycarbonate with Anti-Fog and Hard Coat	22.8cm	36.8cm	2.0mm	91.7%	84.8”	0.0%	0.0%
82601-00000 70-0715-2213-3	WCP96B Med. Green Polycarbonate with Anti-Fog and Hard Coat	22.8cm	36.8cm	2.0mm	26.0%	64.5%	0.0%	0.0%
82602-00000 70-0715-2214-1	WCP96G Clear, Gold Plated Polycarbonate with Anti-Fog and Hard Coat	22.8cm	36.8cm	2.0mm	18.0%	3.1%	0.0%	0.0%
82603-00000 70-0715-2215-8	WCP96BG Med. Green, Gold Plated Polycarbonate with Anti-Fog and Hard Coat	22.8cm	36.8cm	2.0mm	4.0%	2.1%	0.0%	0.0%
82604-00000 70-0715-2216-6	WCP96CG Dark Green, Gold Plated Polycarbonate with Anti-Fog and Hard Coat	22.8cm	36.8cm	2.0mm	1.1%	0.8%	0.0%	0.0%

Approximate Operating Temperature Range for Polycarbonate Faceshields: -40°C to 130°C

Approximate temperature range refers to the actual temperature of the faceshield. Actual operating temperatures will vary widely based upon exposure to heat and other work environment conditions.

3M
Occupational Health &
Environmental Safety Division
3M Center – Building 235-2W-70
St. Paul, MN 55144-1000
Sales Assistance: 1-800-328-1667
Technical Assistance: 1-800-243-4630
www.3M.com/OccSafety

⚠ WARNING

These head and face protection products help provide limited protection against certain flying particles. **Misuse or failure to follow warnings and instructions may result in serious personal injury, including blindness or death.** For proper use, see supervisor, read instructions and warnings on the package or call 3M OH&ESD Technical Service at 1-800-243-4630.

Hose Kit

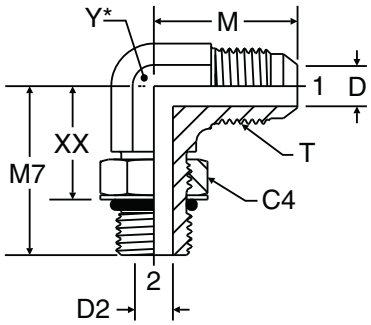
Refer to the Operations and Maintenance User's Manual Instruction and TrojanUV Hose Assembly Field Connection for installation information. These can both be found in the Product Information section of this manual.

The parts below can be found in the start up crate upon delivery		
Part	**Trojan Part Number**	**Qty**
ELBOW, 90D 06JICMX08ORBM 316	907566-06-08-316	4 per bank
FITTING, 06JICF X 06 HOSE SST	446025-0606SST	4 per bank, plus 1
TUBING, HEAT SHRINK 1" YLW	901932-012YLW	Provided for each bank
TUBING, HEAT SHRINK 1" RED	901932-012RED	Provided for each bank
TUBING, HEAT SHRINK 1" BLU	901932-012BLU	Provided for each bank
TUBING, HEAT SHRINK 1" GRN	901932-012GRN	Provided for each bank
The parts below can be found in the bank crates upon delivery		
Part	**Trojan Part Number**	**Qty**
HOSE, 06 STR JICF	907875-06B	4 per bank

C5OX

Straight Thread Elbow
37° Flare / SAE-ORB

SAE 070220



Y* – Across wrench flats

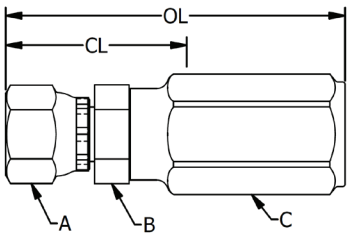
TUBE FITTING PART #	HPD PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	T TUBE END UN/UNF-2A	C4 HEX (in.)	D DRILL (in.)	D2 DRILL (in.)	M (in.)	M7 (in.)	XX AFTER ASSY (in.)	Y (in.)	STANDARD Dynamic Pressure (x 1,000 PSI) -S	-SS	-B
2 C5OX	2503-2-2	1/8	5/16-24	5/16-24	7/16	0.062	0.062	0.78	0.94	0.58	7/16	5.0	6.0	
3 C5OX	2503-3-3	3/16	3/8-24	3/8-24	1/2	0.125	0.125	0.83	0.94	0.61	7/16	5.0	6.0	
4 C5OX	2503-4-4	1/4	7/16-20	7/16-20	9/16	0.172	0.172	0.89	1.03	0.64	7/16	6.0	6.0	
4-2 C5OX	2503-4-2	1/4	5/16-24	7/16-20	7/16	0.062	0.172	0.89	0.92	0.56	7/16	5.0		
4-6 C5OX	2503-6-4	1/4	9/16-18	7/16-20	11/16	0.172	0.297	1.05	1.25	0.82	9/16	6.0	5.4	
4-8 C5OX	2503-4-8	1/4	3/4-16	7/16-20	3/4	0.172	0.391	1.13	1.45	0.96	3/4	6.0	5.4	
5 C5OX	2503-5-5	5/16	1/2-20	1/2-20	5/8	0.234	0.234	0.95	1.13	0.70	9/16	6.0	5.4	
5-4 C5OX	2503-4-5	5/16	7/16-18	1/2-20	9/16	0.234	0.172	0.95	1.13	0.74	9/16	6.0		
5-6 C5OX	2503-6-5	5/16	9/16-18	1/2-20	11/16	0.234	0.297	1.06	1.25	0.79	9/16	6.0		
6 C5OX	2503-6-6	3/8	9/16-18	9/16-18	11/16	0.297	0.297	1.06	1.25	0.82	9/16	6.0	5.4	
6-4 C5OX	2503-4-6	3/8	7/16-20	9/16-18	9/16	0.297	0.172	1.06	1.19	0.80	9/16	6.0	5.4	
6-5 C5OX	2503-5-6	3/8	1/2-20	9/16-18	5/8	0.297	0.234	1.06	1.13	0.72	9/16	6.0		
6-8 C5OX	2503-8-6	3/8	3/4-16	9/16-18	7/8	0.297	0.391	1.14	1.45	0.96	3/4	6.0	5.4	
6-10 C5OX	2503-10-6	3/8	7/8-14	9/16-18	1	0.297	0.484	1.23	1.70	1.24	7/8	6.0		
8 C5OX	2503-8-8	1/2	3/4-16	3/4-16	7/8	0.391	0.391	1.25	1.45	0.96	3/4	6.0	5.4	
8-4 C5OX	2503-4-8	1/2	7/16-20	3/4-16	9/16	0.391	0.172	1.25	1.26	0.88	3/4	6.0	5.4	
8-6 C5OX	2503-6-8	1/2	9/16-18	3/4-16	11/16	0.391	0.297	1.25	1.36	0.89	3/4	6.0	5.4	
8-10 C5OX	2503-10-8	1/2	7/8-14	3/4-16	1	0.391	0.484	1.34	1.70	1.14	7/8	5.0	5.4	
8-12 C5OX	2503-12-8	1/2	1 1/16-12	3/4-16	1 1/4	0.391	0.609	1.42	1.94	1.47	1 1/16	5.0	5.4	
8-16 C5OX	2503-16-8	1/2	1 5/16-12	3/4-16	1 1/2	0.391	0.844	1.52	2.05	1.40	1 5/16	4.0	3.0	
10 C5OX	2503-10-10	5/8	7/8-14	7/8-14	1	0.484	0.484	1.45	1.70	1.14	7/8	5.0	5.4	
10-6 C5OX	2503-6-10	5/8	9/16-18	7/8-14	11/16	0.484	0.297	1.45	1.41	0.98	7/8	5.0		
10-8 C5OX	2503-8-10	5/8	3/4-16	7/8-14	7/8	0.484	0.391	1.45	1.55	1.06	7/8	5.0	5.4	
10-12 C5OX	2503-12-10	5/8	1 1/16-12	7/8-14	1 1/4	0.484	0.609	1.53	1.94	1.29	1 1/16	5.0		
10-16 C5OX	2503-16-10	5/8	1 5/16-12	7/8-14	1 1/2	0.484	0.844	1.64	2.05	1.40	1 5/16	4.0		
12 C5OX	2503-12-12	3/4	1 1/16-12	1 1/16-12	1 1/4	0.609	0.609	1.66	1.94	1.29	1 1/16	5.0	5.4	
12-8 C5OX	2503-8-12	3/4	3/4-16	1 1/16-12	7/8	0.609	0.391	1.66	1.63	1.16	1 1/16	5.0	5.4	
12-10 C5OX	2503-10-12	3/4	7/8-14	1 1/16-12	1	0.609	0.484	1.66	1.78	1.22	1 1/16	5.0	5.4	
12-14 C5OX	2503-14-12	3/4	1 3/16-12	1 1/16-12	1 3/8	0.609	0.718	1.77	2.00	1.35	1 5/16	5.0		
12-16 C5OX	2503-16-12	3/4	1 5/16-12	1 1/16-12	1 1/2	0.609	0.844	1.81	2.05	1.40	1 5/16	4.0	3.0	
12-20 C5OX	2503-20-12	3/4	1 5/8-12	1 1/16-12	1 7/8	0.609	1.078	1.97	2.25	1.60	1 5/8	4.0		
14 C5OX	2503-14-14	7/8	1 3/16-12	1 3/16-12	1 3/8	0.718	0.718	1.73	2.00	1.35	1 5/16	5.0		
16 C5OX	2503-16-16	1	1 5/16-12	1 5/16-12	1 1/2	0.844	0.844	1.81	2.05	1.40	1 5/16	4.0	3.0	
16-12 C5OX	2503-12-16	1	1 1/16-12	1 5/16-12	1 1/4	0.844	0.609	1.81	2.05	1.40	1 5/16	4.0	3.0	
16-14 C5OX	2503-16-14	1	1 3/16-12	1 5/16-12	1 3/8	0.844	0.718	1.81	2.07	1.42	1 5/16	4.0		
16-20 C5OX	2503-20-16	1	1 5/8-12	1 5/16-12	1 7/8	0.844	1.078	2.01	2.25	1.60	1 5/8	4.0	2.5	
16-24 C5OX	2503-24-16	1	1 7/8-12	1 5/16-12	2 1/8	0.844	1.312	2.16	2.39	1.74	1 7/8	3.0		
20 C5OX	2503-20-20	1 1/4	1 5/8-12	1 5/8-12	1 7/8	1.078	1.078	2.06	2.25	1.60	1 5/8	4.0	2.5	
20-16 C5OX	2503-16-20	1 1/4	1 5/16-12	1 5/8-12	1 1/2	1.078	0.844	2.06	2.25	1.60	1 5/8	4.0	2.5	
20-24 C5OX	2503-24-20	1 1/4	1 7/8-12	1 5/8-12	2 1/8	1.078	1.312	2.20	2.39	1.74	1 7/8	3.0		
24 C5OX	2503-24-24	1 1/2	1 7/8-12	1 7/8-12	2 1/8	1.312	1.312	2.33	2.39	1.74	1 7/8	3.0	2.0	
24-20 C5OX	2503-20-24	1 1/2	1 5/8-12	1 7/8-12	1 7/8	1.312	1.078	2.33	2.39	1.74	1 7/8	3.0	2.0	
32 C5OX	2503-32-32	2	2 1/2-12	2 1/2-12	2 3/4	1.781	1.781	3.06	2.89	2.30	2 1/2	2.0	1.5	
32-24 C5OX	2503-32-24	2	1 7/8-12	2 1/2-12	1 7/8	1.781	1.312	3.06	2.89	2.24	2 1/2		1.5	

PULSAR® HYDRAULICS LTD.

Product Data Sheet

3105SS Stainless Steel Reusable fitting

Pulsar 3100 series fittings are field attachable on PULSAR 100R1 hoses. These fittings allow for emergency repairs and making assemblies in the field.



Material:		316SS
Specification:		100R1

	Thread		Hose I.D.	"A"	"B"	"C"	Cut Length "CL"	Over All Length "OL"	Max Operating Pressure
		in	in	In	In	in	in	in	psi
3105SS-06-06	3/8"	9/16"x18	3/8	11/16"	11/16"	7/8"	1.61	2.76	2600

INSULTAB RoHS

PVC HEAT SHRINKABLE TUBING

HS-105

FEATURES

- 2:1 shrink ratio
- Low shrink temperature
- All colors, including clear, are highly flame retardant
- Engineered for total compatibility with PVC jacketed wire and cable
- Resists many chemicals and oils,* chlorine, moisture, salt water and fungus
- Proprietary stabilizers provide outstanding resistance to UV light
- 'Clear' is crystal clear, colors are vivid
- High gloss, matte, metallic, neon, pearlescent "designer" colors and custom color formulations are available
- Highly engineered formulation provides superior strength - 30% stronger than polyolefin
- Available in standard sizes - up to extra large 4" diameters
- Meets RoHS, UL, CSA and Military specifications

* Including chlorinated cleaners, lubricating grease, penetrating oils, electrical insulation oils, and others.

USES

- Applications requiring smooth, tight-fitting, aesthetic coverings, especially for products with irregular shapes
- Protecting products - outdoors and indoors - from UV light, fading, harsh chemicals, chlorinated cleansers, moisture, salt water, fungus, dirt, abrasion and splintering
- Providing "crystal clear" see-through protection that will not become cloudy, yellow or crack over time
- The preferred choice for use with PVC wire and cable
- Insulation and strain relief of wire harnesses, terminals and wire splices
- Applications requiring outstanding dielectric and mechanical protection without damage to enclosed, underlying or adjacent components

SPECIFICATIONS

- Lead free and RoHS compliant
- UL Subject 224 VW-1
- CSA OFT rated for 600 V
- ASTM D 3150
- SAE-AMS-DTL-23053/2 Class 2

45 Industrial Parkway, Woburn, MA 01801 Phone (781) 935-0800 Fax (781) 935-0879 E-mail info@insultab.com Web www.insultab.com

INSULTAB

PVC HEAT SHRINKABLE TUBING

HS-105

TECHNICAL DATA

- Shrink Ratio: 2:1
- Minimum Recommended Shrink Temperature: 100°C (212°F)
- Operating Temperature Range: -20°C to 105°C
- Longitudinal Shrinkage: Approximately 15%
- Physical / Electrical Properties:
  Specific Gravity: 1.32
  Tensile Strength: 3000 psi
  Ultimate Elongation: 300%
  Flammability: UL Subject 224 VW-1
  Brittleness Temperature: -28°C
  Volume Resistivity: 21.5 X 10^{12}
  Dielectric Strength: 1,083 vpm
  Storage: Heat sensitive. Store at 70°F or below.

SPECIFICATIONS

- Lead free and RoHS compliant
- UL Subject 224 VW-1
- CSA OFT rated for 600 V
- ASTM D 3150
- SAE-AMS-DTL-23053/2 Class 2

	Expanded I.D. Minimum		Recovered I.D. Maximum		Recovered Wall Nominal		Standard Packaging (per box) Product on Spools	
Size	in.	mm	in.	mm	in.	mm	ft. / Spool	Total ft. / Box
3/64	.046	1.17	.023	0.58	.020	0.51	* 1,000'	2,000'
1/16	.063	1.60	.032	0.82	.020	0.51	* 1,000'	2,000'
3/32	.093	2.36	.046	1.17	.025	0.64	* 1,000'	2,000'
1/8	.125	3.18	.063	1.60	.025	0.64	* 1,000'	2,000'
3/16	.187	4.75	.093	2.36	.025	0.64	* 1,000'	2,000'
1/4	.250	6.35	.125	3.18	.025	0.64	* 1,000'	2,000'
5/16	.313	7.94	.157	3.99	.028	0.71	* 500'	1,000'
3/8	.375	9.53	.187	4.75	.028	0.71	* 500'	1,000'
1/2	.500	12.70	.250	6.35	.028	0.71	* 250'	500'
1/2	.500	12.70	.250	6.35	.028	0.71	500'	1,000'
5/8	.625	15.88	.313	7.94	.033	0.84	250'	500'
3/4	.750	19.05	.375	9.53	.033	0.84	250'	500'
1	1.000	25.40	.500	12.70	.038	0.97	250'	500'
1 1/4	1.250	31.75	.625	15.88	.041	1.04	250'	500'
1 1/2	1.500	38.10	.750	19.05	.043	1.09	100'	200'
2	2.000	50.80	1.000	25.40	.048	1.22	100'	200'
2 1/2	2.500	63.50	1.250	31.75	.058	1.47	100'	200'
3	3.000	76.20	1.500	38.10	.068	1.73	50'	100'
4	4.000	101.60	2.000	50.80	.073	1.85	50'	100'

* Pressurized Spools

- Standard Colors: Black, White, Red, Blue, Yellow, Clear

TROJAN UV
WATER CONFIDENCE™

COMPONENT SPECIFICATION

DESCRIPTION: HOSE, STR JICF **DOC # 907875G**

1. SPECIFICATION:

Description: Hose assembly with female swivel on one end. The hose assemblies specified below has been tested and must be compatible with Trojan P/N 446025G (field connect fitting) for the no fitting end of the hose.

Greenline Information:

Hose Type : 111CC NOVA 1… Medium-Pressure Single Wire
Specification : 100R1AT, 1SN
Temperature : -40°C to +100°C intermittent to 125°C
Inner Tube : Oil resistant synthetic rubber (NBR)
Cover : Black Oil and Ozone resistant synthetic rubber (Nitrile, Chloroprene, SBR blend) MSHA Approved, High abrasion resistant cover.

End 1 = 4305 series Straight Female JIC 37° - swivel (Greenline part **# 4305)**
End 2 = No Fitting - Must be compatible with Trojan P/N 446025G field connect fitting)

Parker Information:

Hose: Parker **482TC**
End 1 = 43 Series Straight Female JIC 37° - swivel (Parker part **#10643**)
End 2 = No Fitting - Must be compatible with Trojan P/N 446025G field connect fitting)

Material*:* See part number code ***"M".***

Finish: Zinc Plated - Steel
Uncoated - Stainless steel

Pictorial Representation:

Applicable Documents / Standards:
SAE 100R1 TYPE AT / ISO 1436-1 TYPE 1SN/ EN853 TYPE 1SN

Recommended Manufacturer: Fittings and hose are available through Green Line Hose & Fittings Ltd. (primary) or Parker Hannifin Corporation (secondary).

Alternate suppliers may be used provided the components are equivalent to the requirements indicated in this specification and are approved by the Trojan Vendor Management Team.

TROJAN UV WATER CONFIDENCE™

COMPONENT SPECIFICATION

DESCRIPTION: HOSE, STR JICF **DOC # 907875G**

2. PART NUMBER CODE:

907875-	HH	M	LLL
Standard HOSE ASSY,	**Hose I.D. (INCHES)** **06** = 3/8	**Material for straight hose end 1** **B** = 316 Stainless Steel	**Overall hose assembly length** **LLL =** Length in inches

Note: Fitting sizes always match hose size

3. PART DESCRIPTION CODE:

HOSE,	HH	STR JICF	LLL"
	Hose I.D. (INCHES) **06** = 3/8	**End 1 is straight JIC swivel female**	**Overall hose assembly length** **LLL = Length in inches**

Example:
Hose assembly with 3/8" stainless steel JIC swivel female end, 3/8" hose
Part number: 907875-06B78
Part description: HOSE, 06 STR JICF 78"

4. REFERENCES:

Primary Supplier: Green Line (Pulsar):

NOVA 1 is a medium pressure, single wire hose which meets the requirements of SAE J517 100R1AT, ISO 1436-1 and EN 853-1SN. The hose is ideally suited for medium pressure hydraulic lines, return lines, grease lines, water lines and power steering hoses. This hose has a MSHA approved cover for flame resistance in under ground mining applications

Hose Type:	111CC NOVA 1... Medium-Pressure Single Wire
Specification:	100R1AT, 1SN
Temperature:	-40°C to +100°C intermittent to 125°C
Inner Tube:	Oil resistant synthetic rubber (NBR)
Cover:	Black Oil and Ozone resistant synthetic rubber (Nitrile, Chloroprene, SBR blend), High Abrasion Resistant Cover, MSHA approved, Smooth Cover

	Number of Braids	Max Reinforcement OD	Cover OD	Max Working Pressure		Min Burst Pressure		Min Bend Radius	Min Impulse	Weight	Spec Achieved
		mm	mm	*Psi*	*Bar*	*PSI*	*Bar*	mm	Cycles/Bar	Kg/Mt	
111CC-04	1	11.7	12.8	3250	225	13000	900	50	150000/280	.21	100R1AT, 1SN
111CC-06	1	15.7	16.9	2600	180	10400	720	65	150000/225	.32	100R1AT, 1SN
111CC-08	1	19.0	19.9	2300	160	9200	640	90	150000/200	.37	100R1AT, 1SN
111CC-12	1	26.2	27.1	1500	105	6000	420	240	150000/130	.51	100R1AT, 1SN
111CC-16	1	34.1	35.1	1300	87	5200	348	300	150000/108	.83	100R1AT, 1SN
111-20	1	41.7	42.5	900	62	3600	248	420	150000/62	1.13	100R1AT, 1SN
111-24	1	48.0	49.8	725	50	2900	200	500	150000/50	1.44	100R1AT, 1SN

TROJAN UV
WATER CONFIDENCE™

COMPONENT SPECIFICATION

C spec.

DESCRIPTION: HOSE, STR JICF **DOC # 907875G**

Secondary Supplier: Parker Hannifin

482TC

Hydraulic – ToughCover

ISO 1436-1 TYPE 1SN / SAE J517 100R1AT / SAE J1942 / EN 853 TYPE 1SN

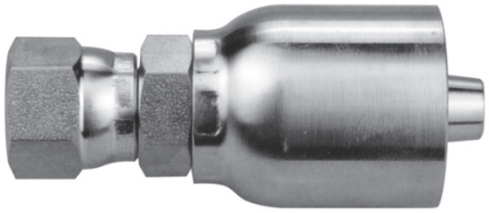
# Part Number	Hose I.D.		Hose O.D.		Working Pressure		Minimum Bend Radius		Weight		Parkrimp	Field Attachable
	inch	mm	inch	mm	psi	MPa	inch	mm	lbs/ft	kg/m	43 Series	42 Series
482TC -4	1/4	6,3	0.53	14	3250	22,7	2	50	0.16	0,24	•	•
482TC-5	5/16	8	0.59	15	3250	22,7	2-1/4	55	0.18	0,27	•	•
482TC -6	3/8	10	0.69	17	3000	21,0	2-1/2	65	0.23	0,34	•	•
482TC -8	1/2	12,5	0.82	21	2500	17,5	3-1/2	90	0.29	0,43	•	•
482TC -10	5/8	16	0.94	24	2000	14,0	4	100	0.33	0,49	•	•
482TC -12	3/4	19	1.09	28	1750	12,2	4-3/4	120	0.42	0,63	•	•
482TC -16	1	25	1.41	36	1275	8,8	6	150	0.63	0,94	•	•

(Compatible with 42 series field attachable fittings)

CRIMP FITTINGS: Green Line (Pulsar)

Specification: This specification is for Crimp fitting supplied by Greenline for the hose 111CC NOVA 1.

Pictorial Representation:



Coupling series	:	4300 Series
Fitting category	:	4300 Series Crimp Couplings

TROJAN UV WATER CONFIDENCE™

COMPONENT SPECIFICATION

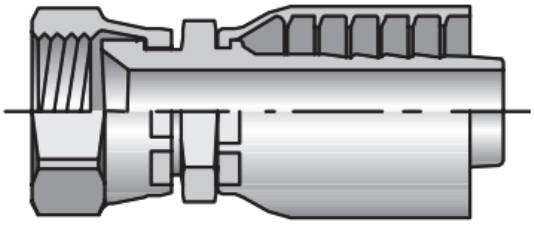
DESCRIPTION: HOSE, STR JICF **DOC # 907875G**

Fitting type	:	One-Piece Non-Skive Crimp Coupling
Hose size	:	3/8"
Material type	:	316 Stainless Steel, Zinc plated steel
Shape	:	Straight
Thread dimensions	:	9/16-18
Thread size	:	-06
Thread type	:	Female JIC 37° Flare
Weight	:	0.18 lb
MANUFACTURER	:	Pulsar Hydraulics Ltd
Manufacturer part numbers	:	4305SS-06-06 316 Stainless steel 4305-06-06 Zinc plated steel

CRIMP FITTINGS: Parker Hannifin

Specification: This specification is for Crimp fitting supplied by Parker for the 482TC hose.

Pictorial Representation:



Coupling series	:	10643 Series
Hose size	:	3/8"
Material type	:	316 Stainless Steel, Zinc plated steel
Shape	:	Straight
Thread dimensions	:	9/16-18
Thread size	:	-06
Thread type	:	Female JIC 37° Swivel
MANUFACTURER	:	Parker Hannifin
Manufacturer part numbers	:	10643-6-6C 316 Stainless steel 10643-6-6 Zinc plated steel

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

			907909-D120V-2R	907909-D120V-4R	907909-D120V-07	907909-NBC-2R	907909-NBC-4R	907909-NBC-07	907909-BPERI-2R	907909-BPERI-4R	907909-BPERI-07	907909-B20L-2R	907909-B20L-4R	907909-B20L-07	UNITS
ITEM	PART NO.	DESCRIPTION	QUANTITY												
10	907937-0NA	PUMP KIT, N AMERICA 120V 60HZ	1	1	1										EA
	907937-NBC	PUMP KIT, NO BATT/CHARGER				1	1	1							EA
20	907924	PUMPHEAD, 253YX EASY LOAD							1	1	1	1	1	1	EA
30	907926	BRACKET, ACTICLEAN 20L							1	1	1	1	1	1	EA
40	907931	TUBE, #35 PERISTALTIC SILICONE	√	√	√	√	√	√	5	5	5	5	5	5	M
50	250119	TIE, CABLE 3.9" BLACK NYLON	1	1	2	1	1	2	1	1	2	1	1	2	EA
60	250121	TIE, CABLE 8.0" BLACK NYLON			1			1			1			1	EA
70	337916-003	COUPLING ASSY, WPR FILL 16"	2			2			2			2			EA
80	907852	HOSE BARB, 3/8"x1/4" NPT NYLON	2			2			2			2			EA
90	013342-BYHB061	COUPLING, QUICK BY HB 3/8 CV		2			2			2			2		EA
100	907929	HANDLE, SHUTOFF ACTICLEAN PUMP			1			1			1			1	EA
110	445053	ADAPTER, PRESSURE INJECTOR			2			2			2			2	EA
120	327066	FITTING, INTER-WIPER 90 DEG EL			2			2			2			2	EA
130	907930	SPRAY WAND, ACTICLEAN PUMP			1			1			1			1	EA
140	907927	SHAFT, ACTICLEAN PUMP							1	1	1	1	1	1	EA
150	013421	SCREW, PLASTIC THUMB							3	3	3	3	3	3	EA
160	DC340601-008	INSTR, ACTICLEAN PUMP 2R EN	1			1			1			1			EA
	DC090601-016	INSTR, ACTICLEAN PUMP G2 EN	1			1			1			1			EA
	DC090601-017	INSTR, ACTICLEAN PUMP G1 EN		1			1			1			1		EA
E2	DC000601-054	INSTR, ACTICLEAN PUMP 3P EN			1			1			1			1	EA
170	017263-103L-001	LABEL, ION LESS S1 EN	1	1	1	1	1	1							EA
180	017289-1B12	LOGO, TROJANUV BLACK 12"W	1	1	1	1	1	1							EA
190	907855-0406805	PIPE NIPPLE, PVC 1/4 x 6"DG	2			2			2			2			EA
200	338168	COUPLER, 1/4 NPT STRAIGHT FEM	2			2			2			2			EA
210	900346	CLEANER, ACTICLEAN GEL 20L										1	1	1	EA
220	017329-101	LABEL, ACTICLEAN NO BATTERY				1	1	1							EA
230	907979	COUNTERSINK HEAD,ANTIFLOATING	√	√	√	√	√	√	1	1	1	1	1	1	EA
240	907980	CLAMP, SOFT HOSE 8 – 16 MM	2	2	1	2	2	1	2	2	1	2	2	1	EA
250	017329-201	LABEL, ACTICLEAN NO CHARGER				1	1	1							EA
260	017323-XXX*	LABEL, ROTATION PINCH OTHER	1	1	1	1	1	1							EA
E1 270	017290-1B-001	LABEL, PROP65 MATERIAL	1	1	1	1	1	1	1	1	1	1	1	1	EA

*XXX – SPECIFIC LANGUAGE AS PER ES0625

√ - NOTE, PUMP KIT (907925) ALREADY INCLUDES THE ANTI-FLOATING COUNTERSINK (907925) AND SILICONE TUBING (907931). THE COUNTERSINK IS REMOVED FROM THE PUMP KIT AND INSTALLED ONTO THE PROVIDED SILICONE TUBING.

TROJAN UV
WATER CONFIDENCE™
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
DWG NO:	**907909G**	REV **E**
SCALE 1:1	SHEET 1 OF 12	SIZE **A**
Template: Normal.dotm, Rev 003	**Current Status: Released**	

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

PART NUMBER CODE (eg. 907909-D12V-07)

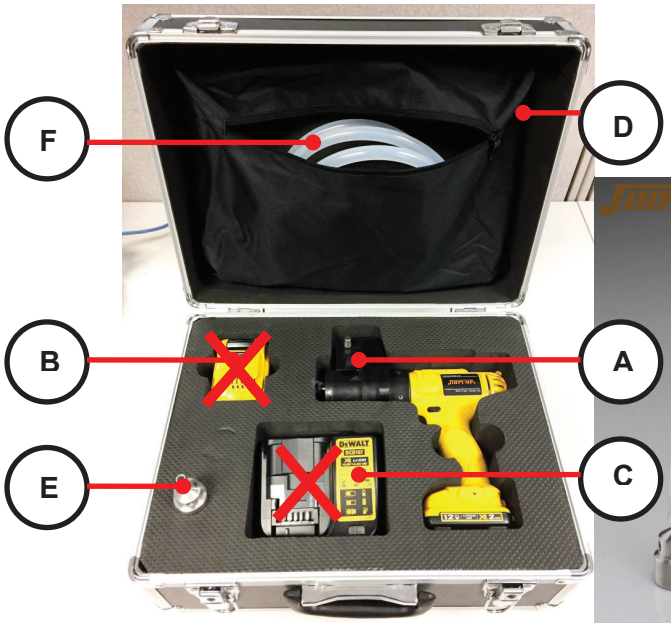
907909	- T	VVVV	- PP
	PUMP TYPE **D** = Drill/Pump **B** = Bracket/Pump	**VOLTAGE TYPE** **120V** – 120V - North America **220V** – 220V – China **CE** – 230V CE Certified **PERI** – Peristaltic Pumphead only / no drill **20L** – Same as "**PERI**", but incl 20L Acti-Clean **NBC** – "No Battery and Charger"	**PRODUCT TYPE** **07** = UV3+07 CANISTER **2R** = UVSIG2R & 6R (w/2ROW CANISTERS - 338048G) **4R** = UVSIG4R & 6R (w/4ROW CANISTERS - 337965G)

PART DESCRIPTION CODE (eg. ACTICLEAN KIT,PERI-PUMP D12V07)

ACTICLEAN KIT,PERI-PUMP	T	VVVV	PP
	PUMP TYPE **D** = Drill/Pump **B** = Bracket/Pump	**VOLTAGE TYPE** **12V** – 120V - North America **22V** – 220V – China **CEV** – CE Certified **PR** - Peristaltic Pumphead only / no drill **NBC** – "No Battery and Charger"	**PRODUCT TYPE** **07** = UV3+07 CANISTER **2R** = UVSIG2R & 6R (w/2ROW CANISTERS - 338048G) **4R** = UVSIG4R & 6R (w/4ROW CANISTERS - 337965G)

JIHPUMP SC-I DRILL/PUMP KIT AS RECEIVED (P/N 907925)

ITEM	QTY	DESCRIPTION
A	1	DRILL / PUMP COMBINATION
B	2	10.8V (12V) DRILL BATTERIES (NOT INCLUDED – STOCKED SEPARATELY)
C	1	12 BATTERY CHARGER (NOT INCLUDED – STOCKED SEPARATELY)
D	1	DRILL / PUMP CASE
E	1	ANTI-FLOATING COUNTERSINK HEAD
F	1	5 METRES OF #35 SILICONE TUBING



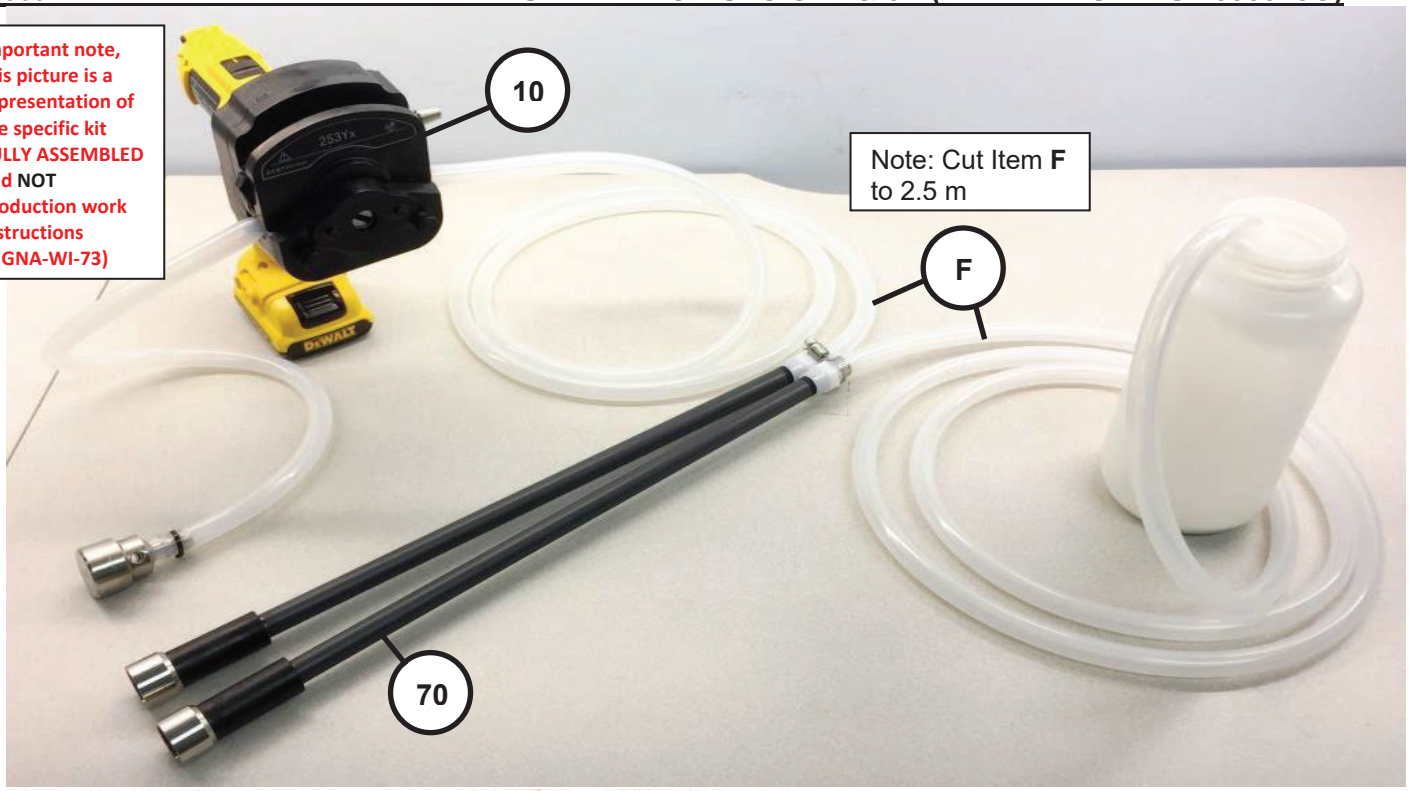
TROJAN UV
WATER CONFIDENCE™
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

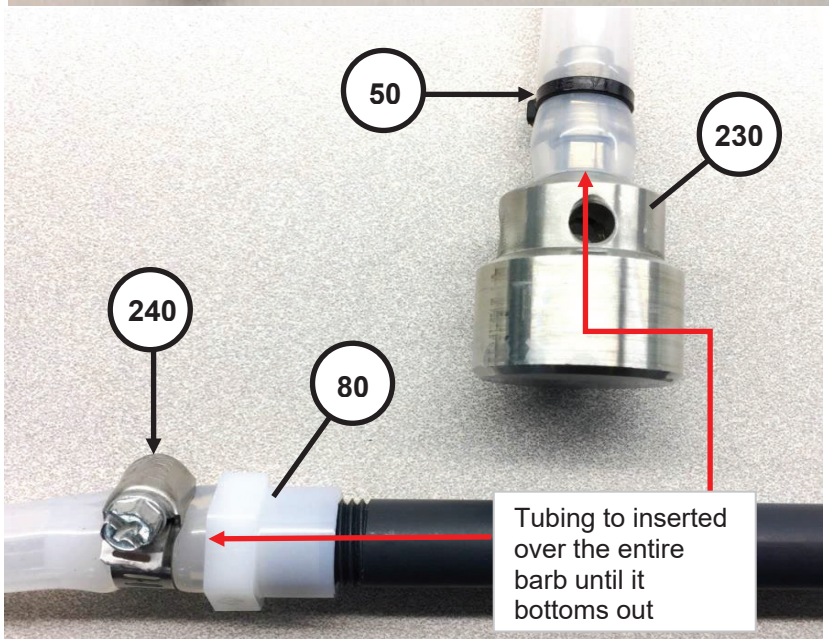
DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
DWG NO:	**907909G**	REV **E**
SCALE 1:1	SHEET 2 OF 12	SIZE **A**
Template: Normal.dotm, Rev 003	**Current Status: Released**	

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

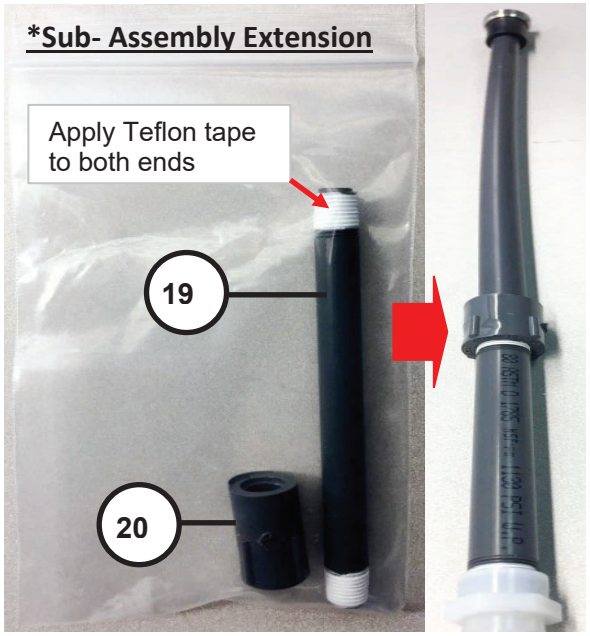
907909-DXXXV-2R - ACTICLEAN DRILL PUMP KIT FOR UVSIG2R & 6R (w/2R CANISTERS - 338048G)

Important note, this picture is a representation of the specific kit FULLY ASSEMBLED and NOT production work instructions (SIGNA-WI-73)





***Sub- Assembly Extension**



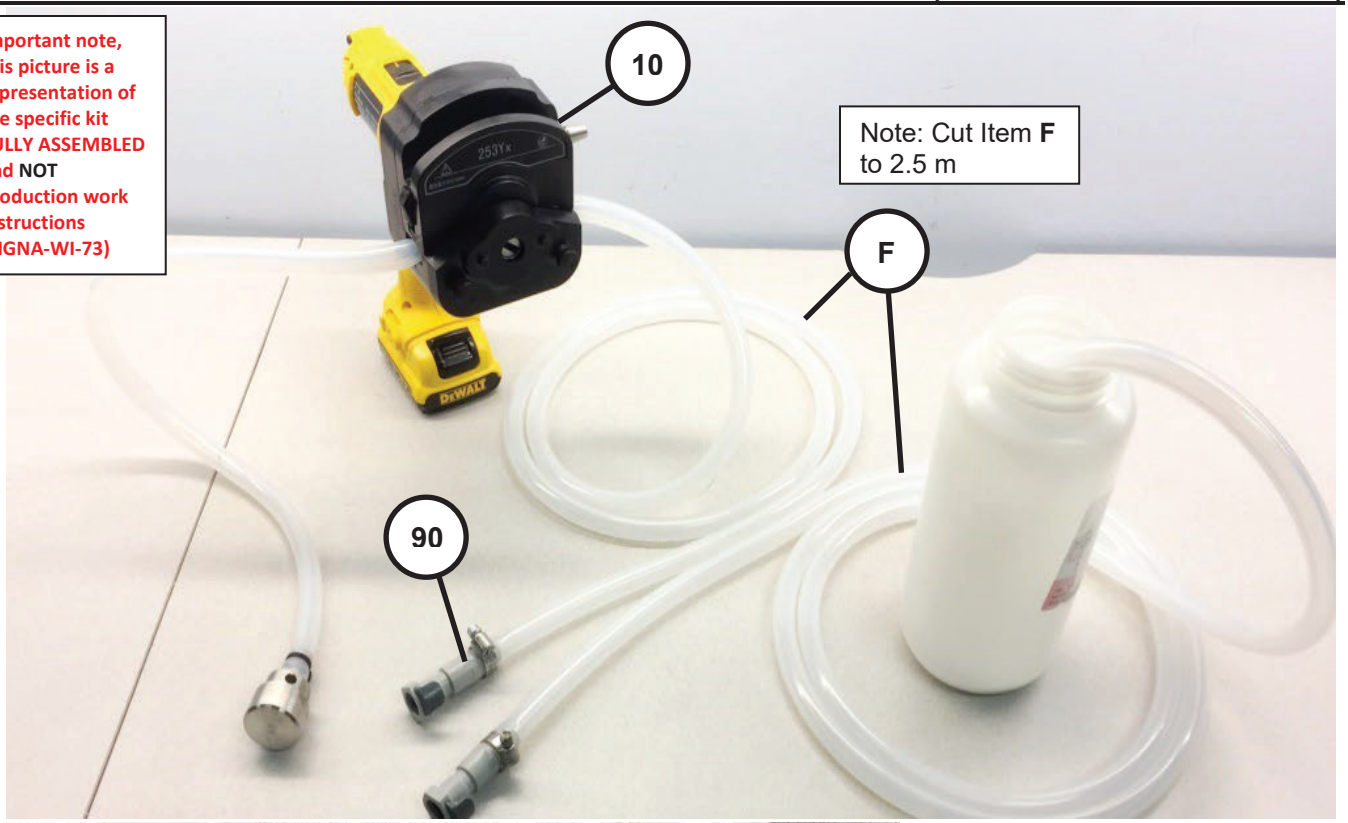
* The Sub-Assembly Extension is an option for the operator to extend the wand **6 more inches** as the wand can fall short on some banks during filling of the wiper collars. The parts come included with the overall kit.

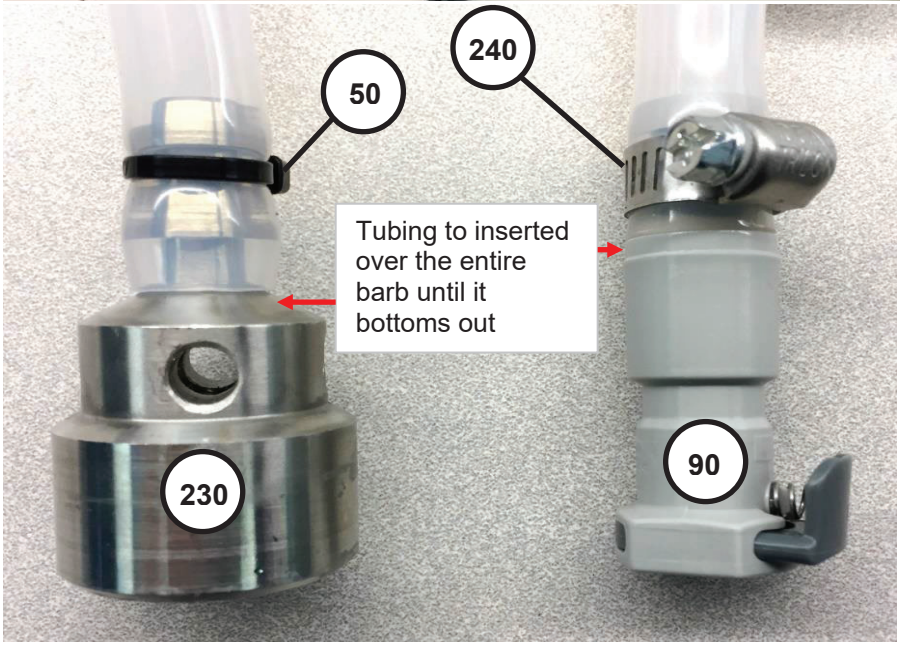
TROJAN UV WATER CONFIDENCE™ 3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7	DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
	DWG NO:	**907909G**	REV **E**
COPYRIGHT BY TROJAN TECHNOLOGIES 2015. ALL RIGHTS RESERVED	SCALE 1:1	SHEET 3 OF 12	SIZE **A**
	Template: Normal.dotm, Rev 003	**Current Status: Released**	

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

907909-DXXXV-4R - ACTICLEAN DRILL PUMP KIT FOR UVSIG4R & 6R (w/4R CANISTERS - 337965G)

Important note, this picture is a representation of the specific kit FULLY ASSEMBLED and NOT production work instructions (SIGNA-WI-73)





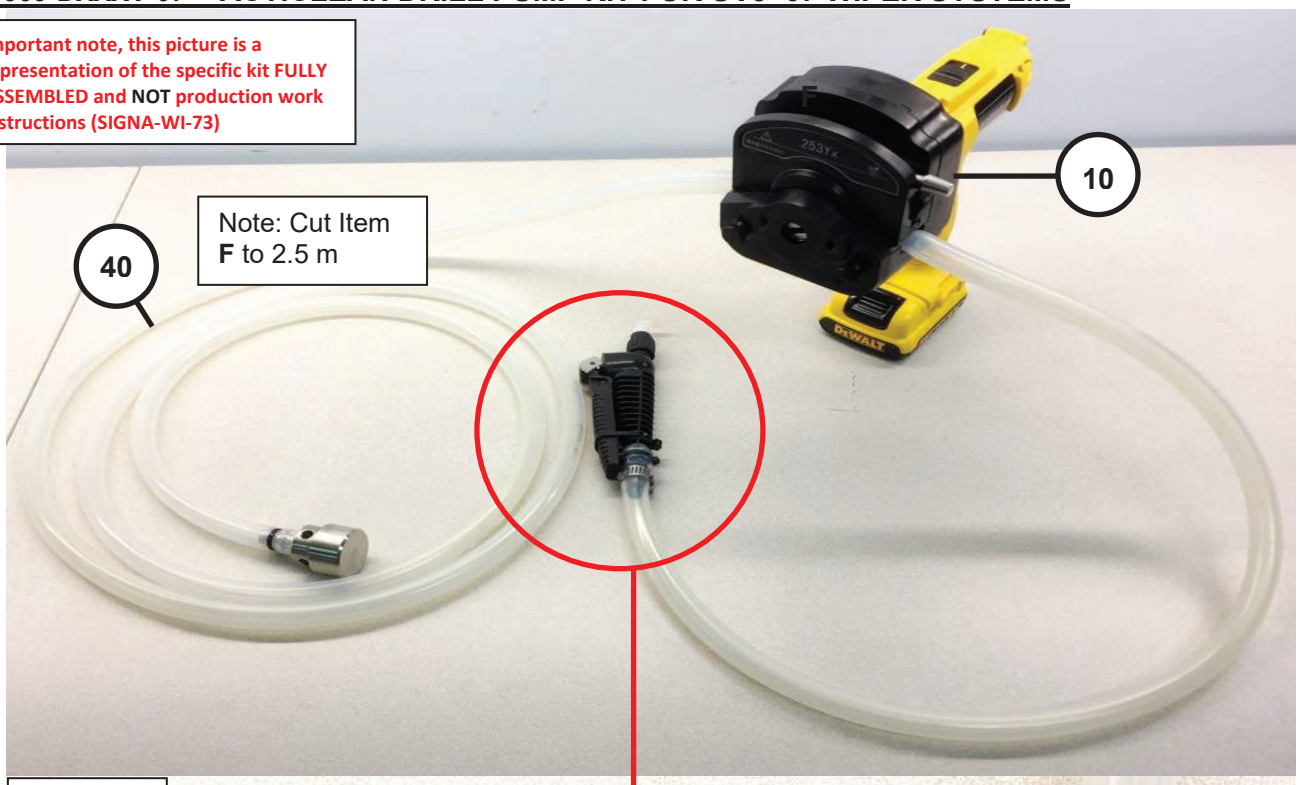
TROJAN UV
WATER CONFIDENCE™
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
DWG NO:	**907909G**	REV **E**
SCALE 1:1	SHEET 4 OF 12	SIZE **A**
Template: Normal.dotm, Rev 003	**Current Status: Released**	

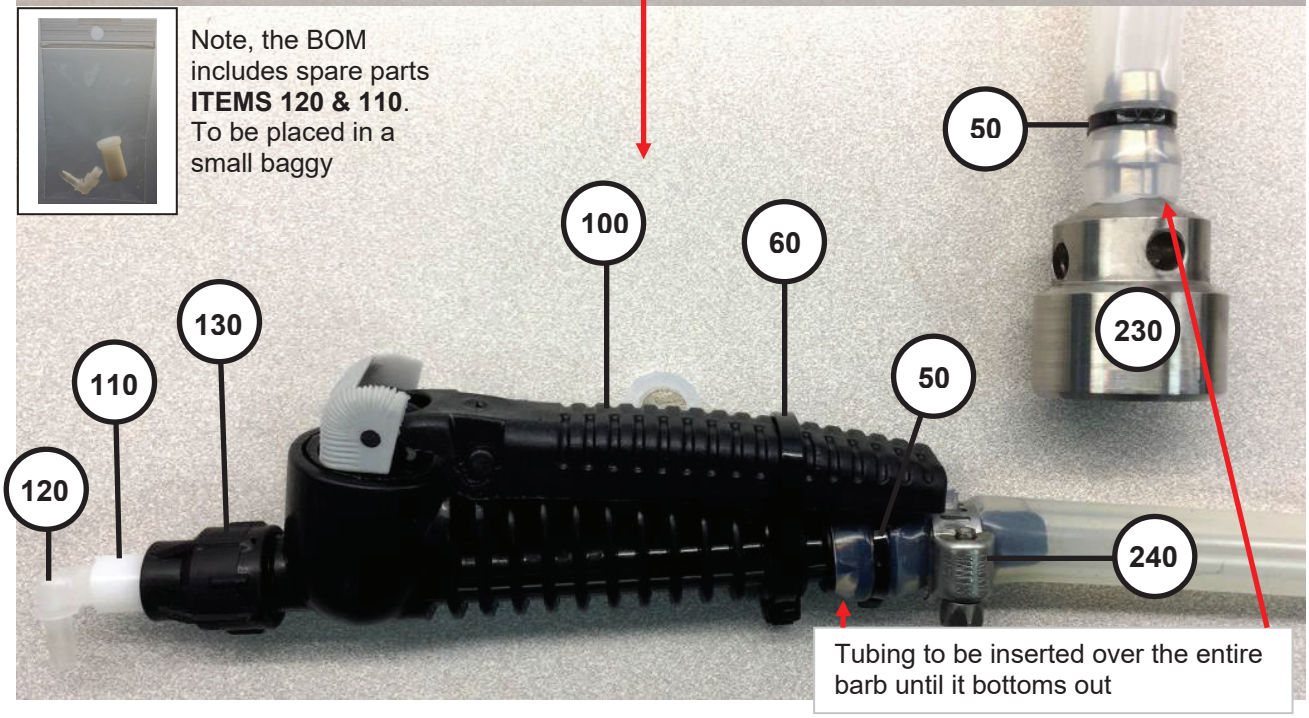
REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

907909-DXXXV-07 - ACTICLEAN DRILL PUMP KIT FOR UV3+07 WIPER SYSTEMS

Important note, this picture is a representation of the specific kit FULLY ASSEMBLED and NOT production work instructions (SIGNA-WI-73)



Note, the BOM includes spare parts **ITEMS 120 & 110**. To be placed in a small baggy

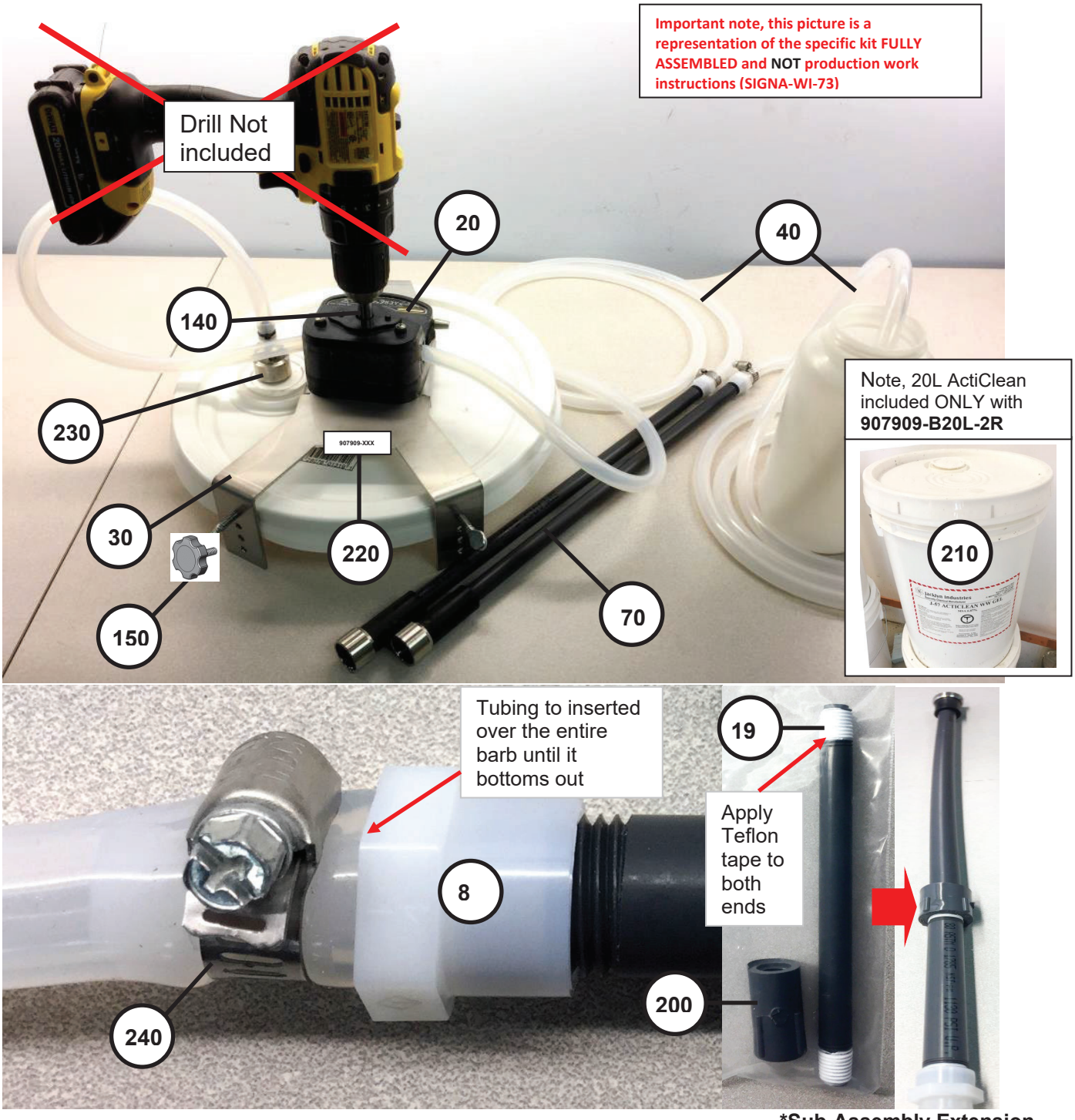


TROJAN UV
WATER CONFIDENCE™
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
DWG NO:	**907909G**	REV **E**
SCALE 1:1	SHEET 5 OF 12	SIZE **A**
Template: Normal.dotm, Rev 003	**Current Status: Released**	

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

907909-BPERI-2R - ACTICLEAN BRACKET PUMP KIT FOR UVSIG2R & 6R (w/2R CANISTERS - 338048G)

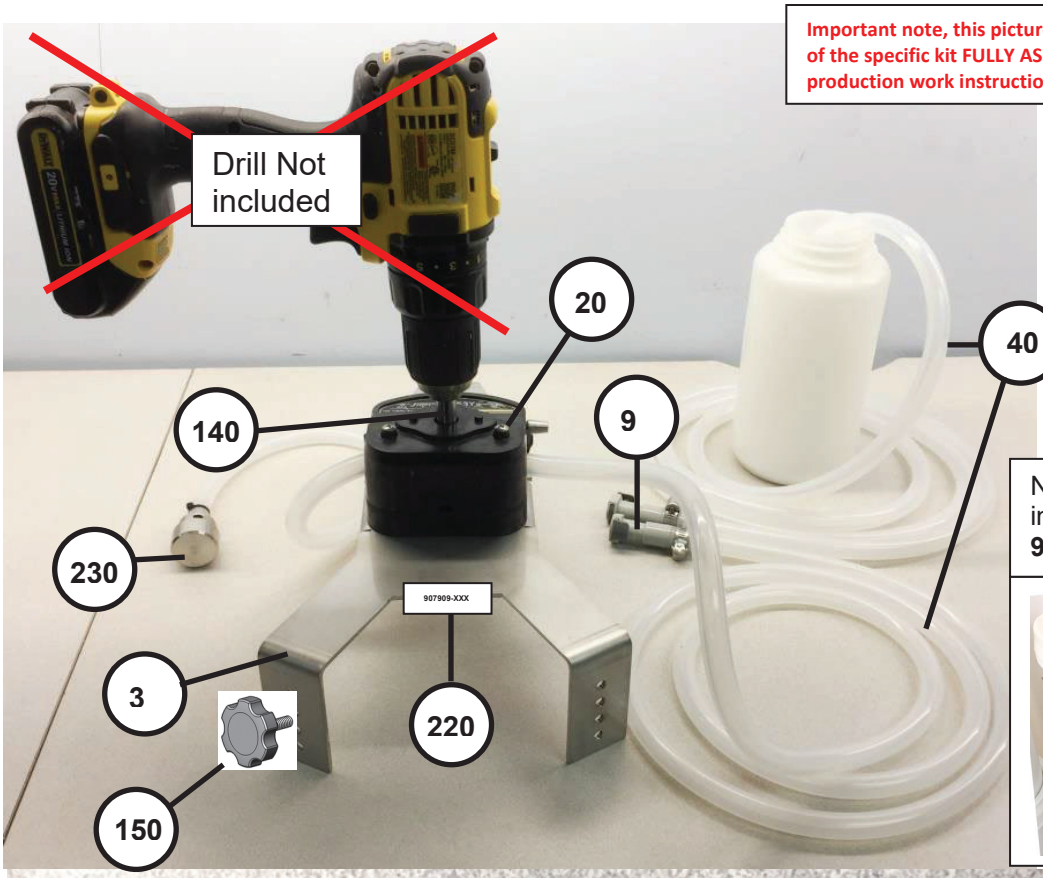


***Sub-Assembly Extension**

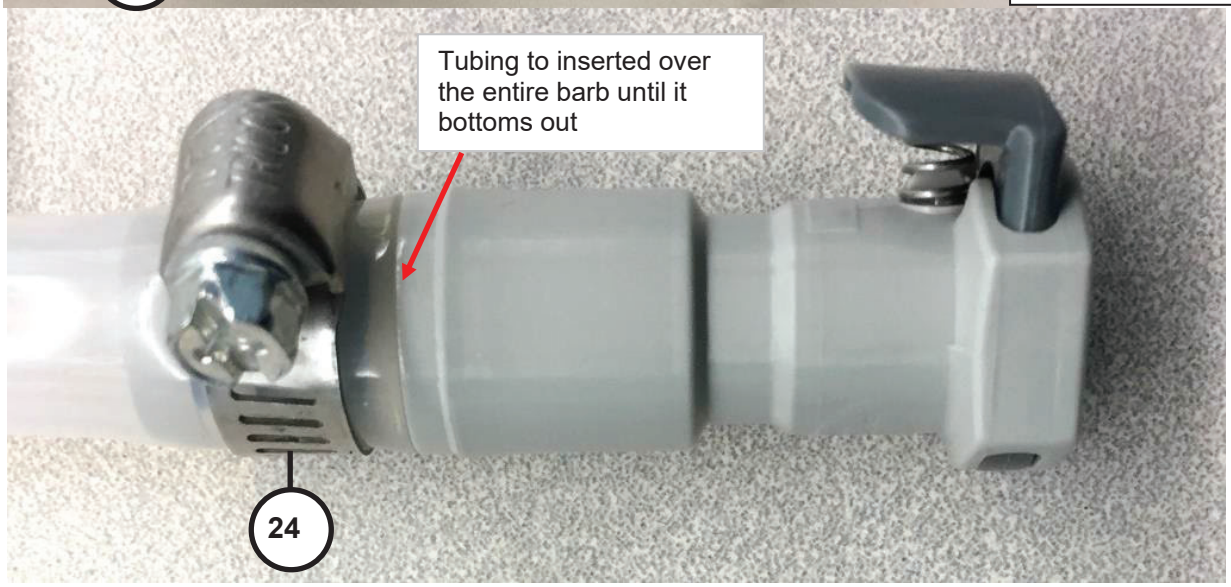
TROJAN UV WATER CONFIDENCE™ 3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7	DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
	DWG NO:	**907909G**	REV **E**
	SCALE 1:1	SHEET 6 OF 12	SIZE **A**
	Template: Normal.dotm, Rev 003	**Current Status: Released**	

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

907909-BPERI-4R - ACTICLEAN BRACKET PUMP KIT FOR UVSIG4R & 6R (w/4R CANISTERS - 337965G)



Note, 20L ActiClean included ONLY with **907909-B20L-4R**



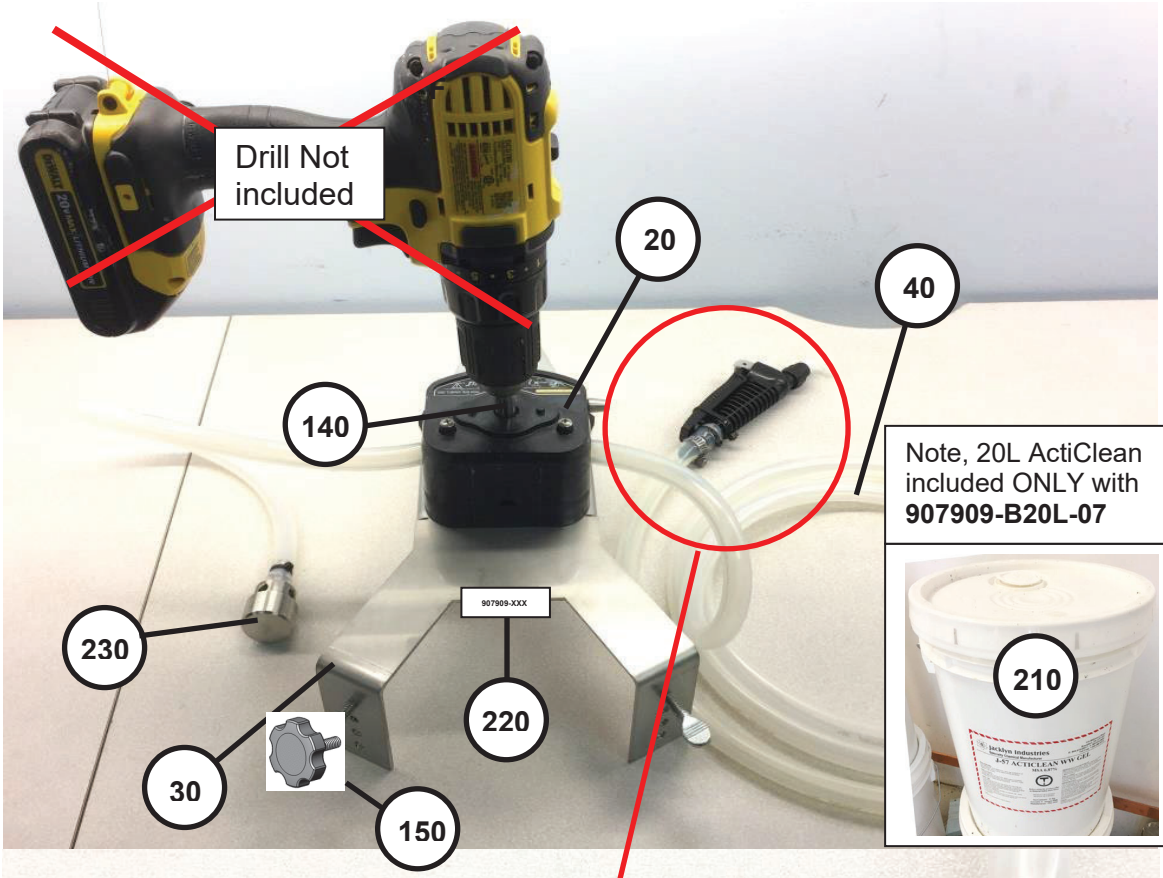
TROJAN UV
WATER CONFIDENCE™
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
DWG NO:	**907909G**	REV **E**
SCALE 1:1	SHEET 7 OF 12	SIZE **A**
Template: Normal.dotm, Rev 003	**Current Status: Released**	

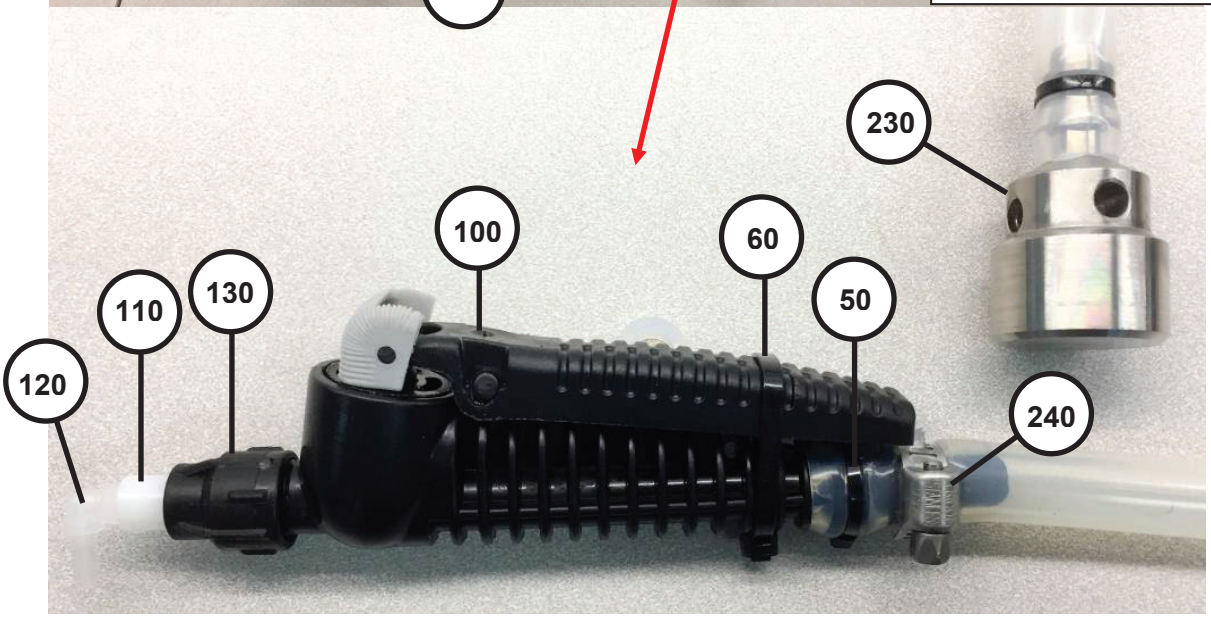
REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

907909-BPERI-07 - ACTICLEAN BRACKET PUMP KIT FOR UV3+07 WIPER SYSTEMS

Important note, this picture is a representation of the specific kit FULLY ASSEMBLED and NOT production work instructions (SIGNA-WI-73)



Note, 20L ActiClean included ONLY with **907909-B20L-07**



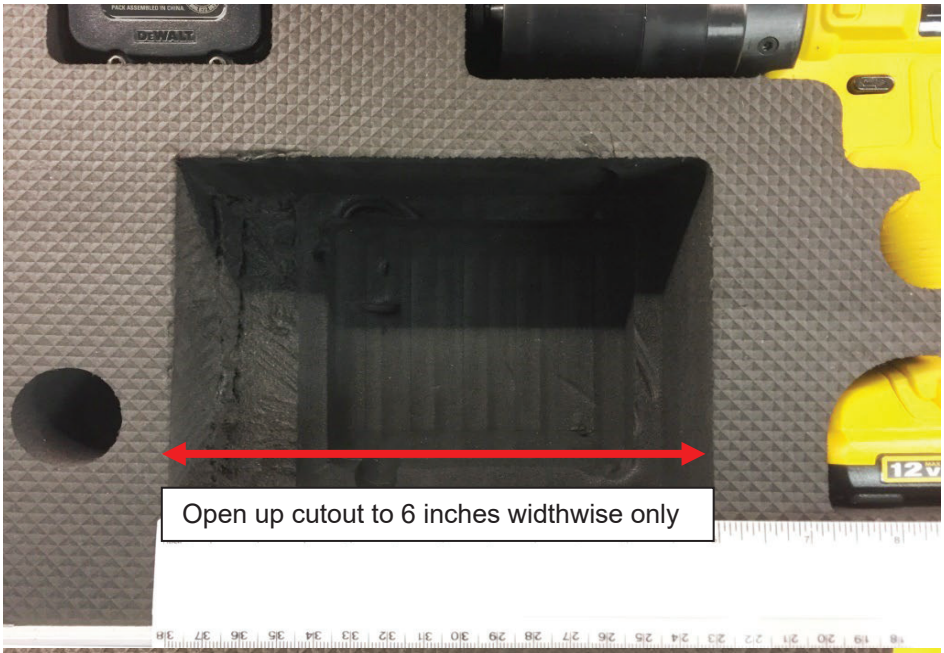
TROJAN UV
WATER CONFIDENCE™
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
DWG NO:	**907909G**	REV **E**
SCALE 1:1	SHEET 8 OF 12	SIZE **A**
Template: Normal.dotm, Rev 003	**Current Status: Released**	

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

Foam Insert Modification for Battery Charger Variations (North America)

Because the battery charger is available in variable sizes, the foam insert of the case needs modification as the insert hole size is specifically a smaller size to accommodate the Chinese battery charger that it was originally intended for. The North American battery charger is larger width-wise by 2 inches.



TROJAN UV WATER CONFIDENCE™ 3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7	DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
	DWG NO:	**907909G**	REV **E**
	SCALE 1:1	SHEET 9 OF 12	SIZE **A**
	Template: Normal.dotm, Rev 003	**Current Status: Released**	

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

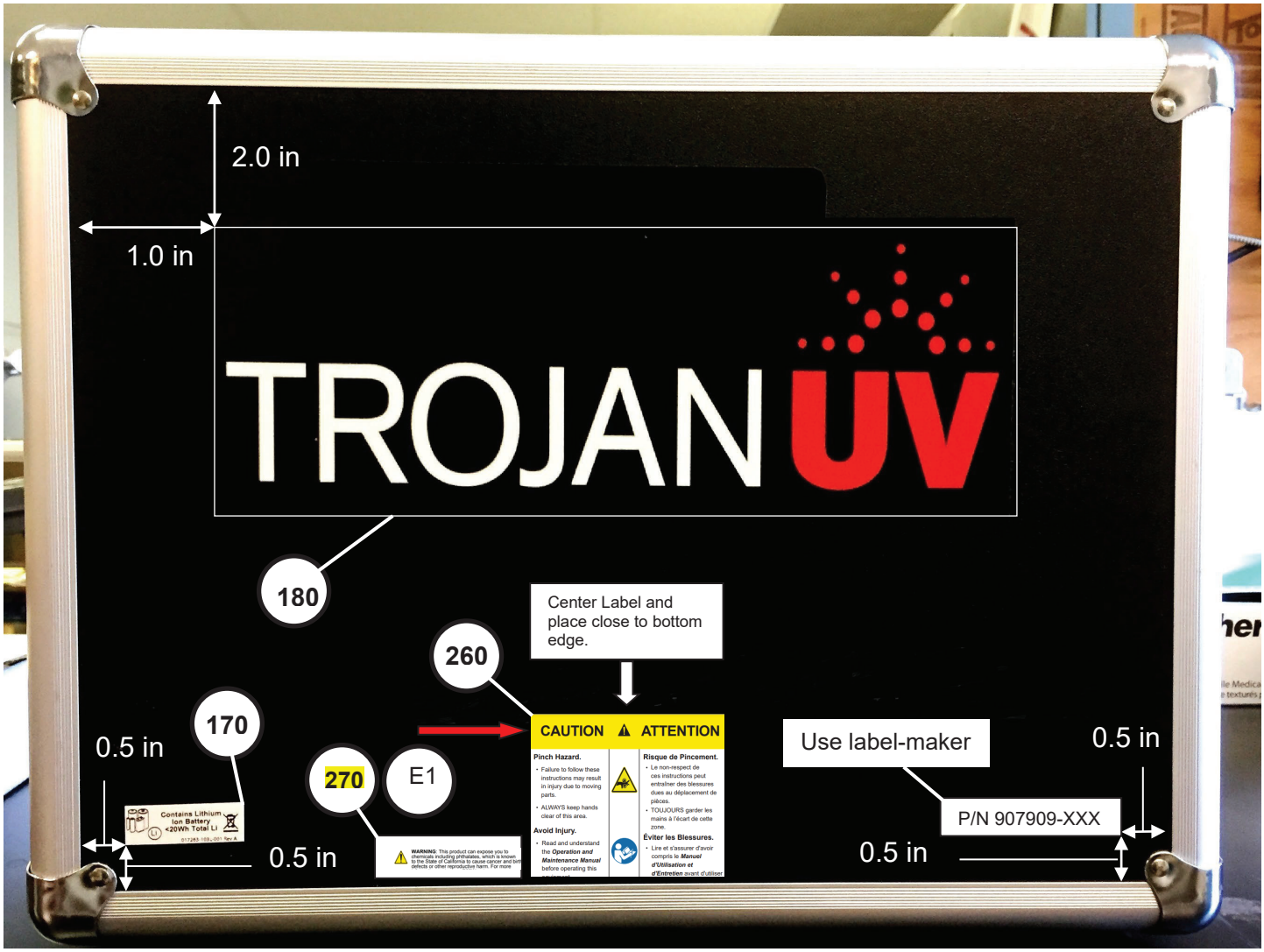
LABEL PLACEMENT FOR KITS 907909-NBC-2R/4R/07

TROJAN UV
WATER CONFIDENCE™
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
DWG NO:	**907909G**	REV **E**
SCALE 1:1	SHEET 10 OF 12	SIZE **A**
Template: Normal.dotm, Rev 003	**Current Status: Released**	

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

LABEL PLACEMENTS ON CASE



* Note, the "CAUTION" portion of the label will require production to choose the correct language based on customer designation.
XXX – SPECIFIC LANGUAGE AS PER ES0625

TROJAN UV
WATER CONFIDENCE™
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
DWG NO:	**907909G**	REV **E**
SCALE 1:1	SHEET 11 OF 12	SIZE **A**
Template: Normal.dotm, Rev 003	**Current Status: Released**	

REV	REVISION DESCRIPTION	LOG NO.	REV BY	CHK BY	APPD BY	DATE YYYY-MM-DD
E	1. ADD LABEL 017290-1B-001 (PROP65) TO BOM 2. UPDATE "INSTR, ACTICLEAN PUMP 3PLUS EN" PART NUMBER.	23-0020	JTL	MH	RSH	2023-01-18

REVISION HISTORY:
REV C (EN 20-0483):
OBSOLETED KITS:

ITEM	PART NO.	DESCRIPTION	QUANTITY													UNITS
			907909-D120V-2R	907909-D120V-4R	907909-D120V-07	907909-D220V-2R	907909-D220V-4R	907909-D220V-07	907909-DCE-2R	907909-DCE-4R	907909-DCE-07	907909-BPERI-2R	907909-BPERI-4R	907909-BPERI-07	907909-B20L-2R	907909-B20L-4R	907909-B20L-07	

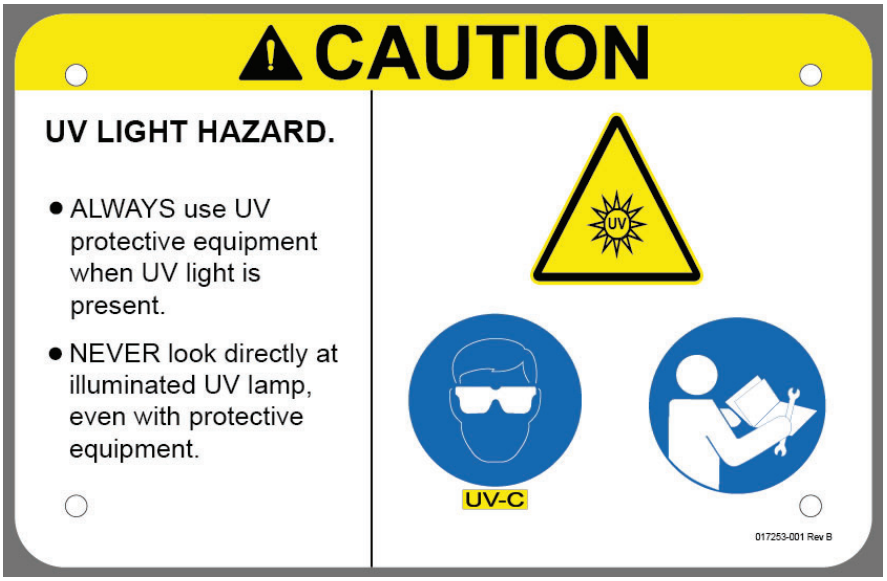
TROJAN UV
WATER CONFIDENCE™
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

DESCRIPTION:	**ACTICLEAN KIT, PERI-PUMP**	
DWG NO:	**907909G**	REV **E**
SCALE 1:1	SHEET 12 OF 12	SIZE **A**
Template: Normal.dotm, Rev 003	**Current Status: Released**	

Warning Sign - UV Light

Custom made CAUTION label indicating UV LIGHT hazard which requires wearing proper eye & skin protection as mandatory actions.

Metal sign applicable for all weather outdoor hanging/posting at site.



INSTRUCTION

PRODUCT LINE:	TROJANUVSIGNA® (All Types) TROJANUVFLEX® (All Types) TROJANUVTORRENT™ (All Types) TROJANUVSONUS™	**DOCUMENT NUMBER:**	DC000601-017
TOPIC:	INSTRUCTION, TROJANUV SOLO LAMP® CABLE INSTALLATION GUIDELINE	**EDITION/REVISION:**	02-02

1. OVERVIEW

The TrojanUV Solo Lamp® Plug is a unique design integrating the plug and cable and has been specifically designed as an integral part of the TrojanUV Solo Lamp® technology. The lamp plug is UL recognized for use in TrojanUV systems.

1.1 TrojanUV Solo Lamp Cable Details

General Description	Multi-conductor Cable, Sunlight Resistant, Direct Burial, Oil Resistant, No Shield
Number of Conductors	4 current carrying conductors
Gauge	14AWG copper
Voltage Rating	600V
Temperature Rating	75°C (167°F) Wet, 90°C (194°F) Dry
Nominal Cable O.D	0.378" (9.6mm)
Min. Bend Radius	4.86" (123.4mm)
Flame Rating	c(UL) FT-4
Approvals	UL TC -WTTC c(UL) FT-4
Minimum required ampacity in this application	7A

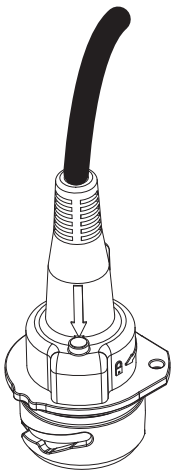


Figure 1 Lamp Plug for TrojanUV Solo® Lamp

2. INSTALLATION GUIDELINES

NOTICE

The following information is a guide for proper installation of the TrojanUV Solo Lamp Cable.

The information stated below is the minimum requirement for conduit and cable tray sizing. Where possible, it is recommended to use a larger conduit or cable tray.

Lamp Cable routing shall NOT be in the same conduit/tray as communication cables or signal wiring from peripheral devices such as flow, level or UVT sensors, gate control, etc. These cables should be routed separately or physically separated (i.e. by a divider in the tray) to reduce potential noise being induced from the lamp cables.

2.1 Installation of Ladder, Ventilated Trough, Wire Mesh, Solid Bottom Cable Trays or Concrete Trough

Minimum Inside Width of Cable Tray or Trough		**Maximum number of lamp cables** *Note: Cables shall be spaced evenly and utilize the full area of the cable tray*	
		Column A	**Column B**
mm	**in.**	**Ladder, Ventilated Trough, Wire Mesh, Solid Bottom Cable Trays or Concrete Trough without Lids/Covers**	**Ladder, Ventilated Trough, Wire Mesh, Solid Bottom Cable Trays or Concrete with Lids/Covers**
50	2	16	10
100	4	31	21
150	6	48	31
200	8	62	42
225	9	70	47
300	12	98	63
400	16	129	84
450	18	146	94
500	20	162	105
600	24	198	126
750	30	244	157
900	36	294	189

Notes: *1) Open grating is not considered a lid/cover.*

2) Solid grating is to be considered a lid/cover.

3) When hydraulic hoses and UV System interconnect wiring is installed together with lamp cables, the space allocated for lamp cables shall not be reduced below the minimum inside width of cable tray listed in the above table

4) Any standard ventilated or solid cable tray cover is to be considered a lid/cover.

5) Standard depth of cable tray is 75mm (3 inches). Deeper cable tray does not affect the maximum number of lamp cables.

6) When a cable tray is placed within a trough, the cable tray width shall be the minimum inside width.

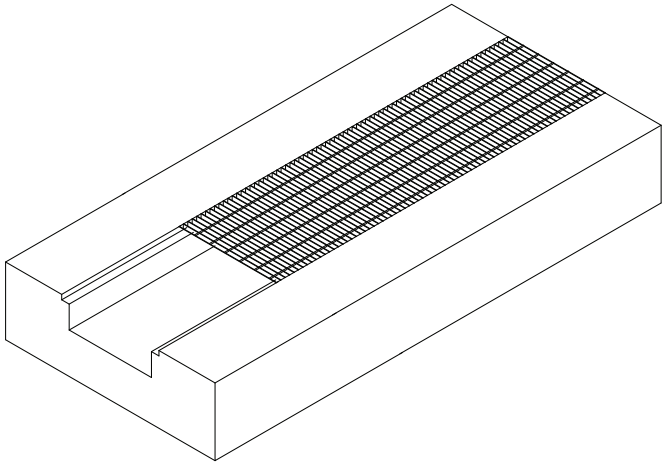


Figure 2 Trough with Open Grating

Refer to Column A

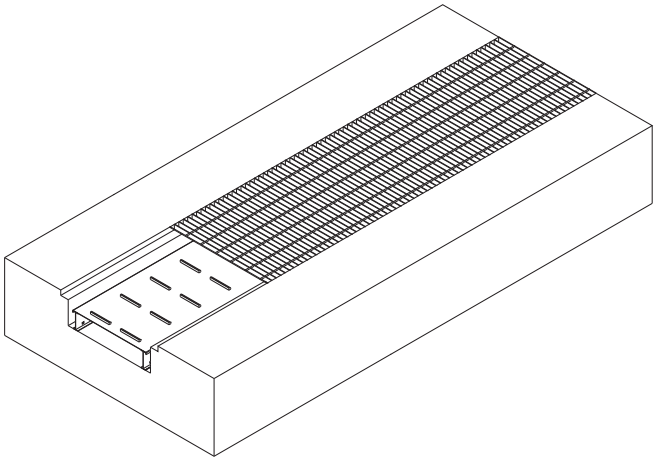


Figure 3 Covered Cable Tray within Trough with Open Grating

Refer to Column B

2.2 Installation of Conduit

When the TrojanUV Solo Lamp Cable is installed in conduit:

a. Conduit fill shall never exceed 20% of the total cross sectional area of the conduit being used.

b. No more than twenty-four (24) lamp cables shall be installed per conduit.

Conduit Size		**Maximum number of lamp cables** *Note: Fill may vary depending on conduit style and manufacturer's specifications*	
mm	**in.**	**Rigid PVC Conduit**	**Electrical Metallic Tubing (EMT)**
27	1	1	1
35	1.25	2	2
41	1.5	3	3
53	2	5	5
63	2.5	8	10
78	3	12	15
91	3.5	16	20
103	4	21	24
129	5	24	-
155	6	24	-
200	8	24	-

3. ASSISTANCE

If you require technical assistance, please contact the Technical Assistance Center (TAC) using the contact information below:

North America: 1-866-388-0488
All other areas: 1-519-457-2318
E-mail: tac@trojantechnologies.com

At the time of publishing, the information within this document is current. Due to continuous improvements, we may have future changes and recommendations which will be sent via product bulletins.

TrojanUV Solo Lamp™ Specification

General Description

1. Ultraviolet (UV) lamps will be high intensity low pressure amalgam TrojanUV Solo Lamps with nominal input wattage of 1000 Watts. Lamps that are not amalgam type will not be allowed.
2. The filament shall be significantly rugged to withstand shock and vibration.
3. Electrical connections for the lamp will consist of four (4) pins at one end of the lamp only.
4. Lamps without maintenance coating or that do not have four (4) pins are considered instant-start and are not acceptable due to reduced reliability and increased maintenance and operating costs.
5. Lamp wiring shall be Teflon-insulated stranded wire.
6. Lamps will be rated to produce zero levels of ozone.
7. Lamp data in sufficient detail to allow comparison with these specifications shall be submitted for evaluation and consideration a minimum of fifteen (15) days prior to bid.

Performance Requirements

8. Lamps will be operated by electronic lamp drivers with variable output capabilities enabling lamp dimming from 100% to 30% of nominal power.
9. Lamp aging characteristics (maintenance of UV output over time) will be independently validated in accordance with industry protocols including NWRI *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (May 2003).
10. The lamp assembly will be designed to enable operation at optimum lamp efficiency across varying water temperatures and lamp power levels.
11. The lamp shall withstand a minimum of four (4) on/off cycles per day without reducing lamp life, warranty or causing any damage to the lamp.

Warranty

12. UV lamps to be warranted for 15,000 hours when operated in automatic mode, pro-rated after 9,000 hours. On/off cycles are limited to four (4) per day.
13. If a lamp fails prior to 9,000 hours a new lamp will be provided free of charge. Lamps that fail between 9,000 and 15,000 hours will be subject to a credit based on the unused portion of the lamp life.

TrojanUV Solo Lamp™ Driver Specification

General Description

1. The lamp driver shall power two (2) amalgam lamps.
2. Failure of one lamp shall not affect operation of the other lamp.
3. The lamp driver shall be programmed-start type utilizing filament preheat followed by a high voltage pulse to ignite the lamp.
4. The communication protocol shall be Modbus implemented on RS485 electrical interface.
5. The lamp driver shall be UL, CE, RoHS compliant.
6. Driver data in sufficient detail to allow comparison with these specifications shall be submitted for evaluation and consideration a minimum of fifteen (15) days prior to bid.

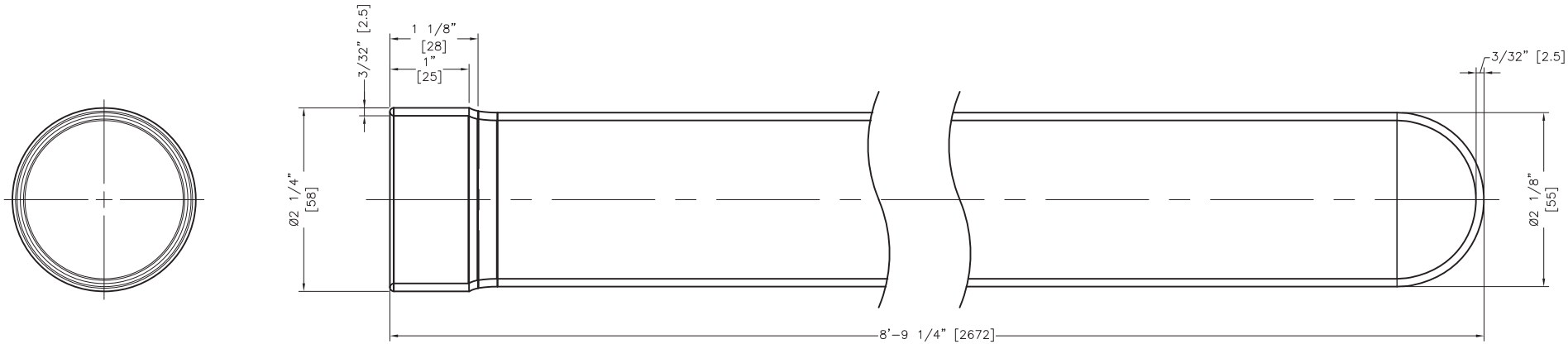
Performance Requirements

7. The lamp driver shall have a power factor correction circuit to ensure minimum 99% power factor and less than 5% total harmonic distortion (THD) current at the maximum power level and nominal input voltage.
8. The lamp driver electrical conversion efficiency shall be minimum 95% at the maximum power level.
9. During lamp operation, variable filament heating current shall be provided according to a predetermined curve to maintain optimum filament temperature and amalgam temperature to ensure maximum lamp life and optimum lamp efficiency across varying water temperatures and lamp power levels.
10. A ground fault in the output circuit shall be detected and communicated as a warning to the external controls system but the corresponding lamp must operate undisturbed.
11. Local visual diagnostic shall be implemented with LEDs to indicate: lamp driver status, lamp status (on, idle, preheat, fault), power, communication status.
12. To facilitate trouble shooting and improve equipment reliability, a minimum of the following external protections / status / warnings and alarms must be implemented:

    Lamp status, lamp driver status, lamp driver high temperature, input voltage out of range, lamp arc circuit open / short / out of range, lamp filament open circuit / out of range, end of lamp life (EOLL), ground fault, lamp circuit leakage (water in the sleeve), communication time-out.

Warranty

13. The lamp driver will be warranted for ten (10) years, pro-rated after 1 year.



END VIEW
SCALE:AS SHOWN

SIDE VIEW
SCALE:AS SHOWN

NOTES:

1. MATERIAL: QUARTZ FD-7, OR EQUIVALENT.
2. [ ] INDICATES mm UNLESS OTHERWISE NOTED.

DESCRIPTION: TROJANUVSIGNA, QUARTZ SLEEVE			STD. DRAWING NO. SG0031
DRAWN BY : MMB	DATE : 21FE05		REFERENCE NO. 908041G
CHECKED BY : JN	DATE : 21FE08		
APPROVED BY : AJS	DATE : 21FE09	DWG NO. D01	REV. B
SCALE (8.5x11) : NOT TO SCALE	LOG NUMBER : N/A		

ELECTRICAL

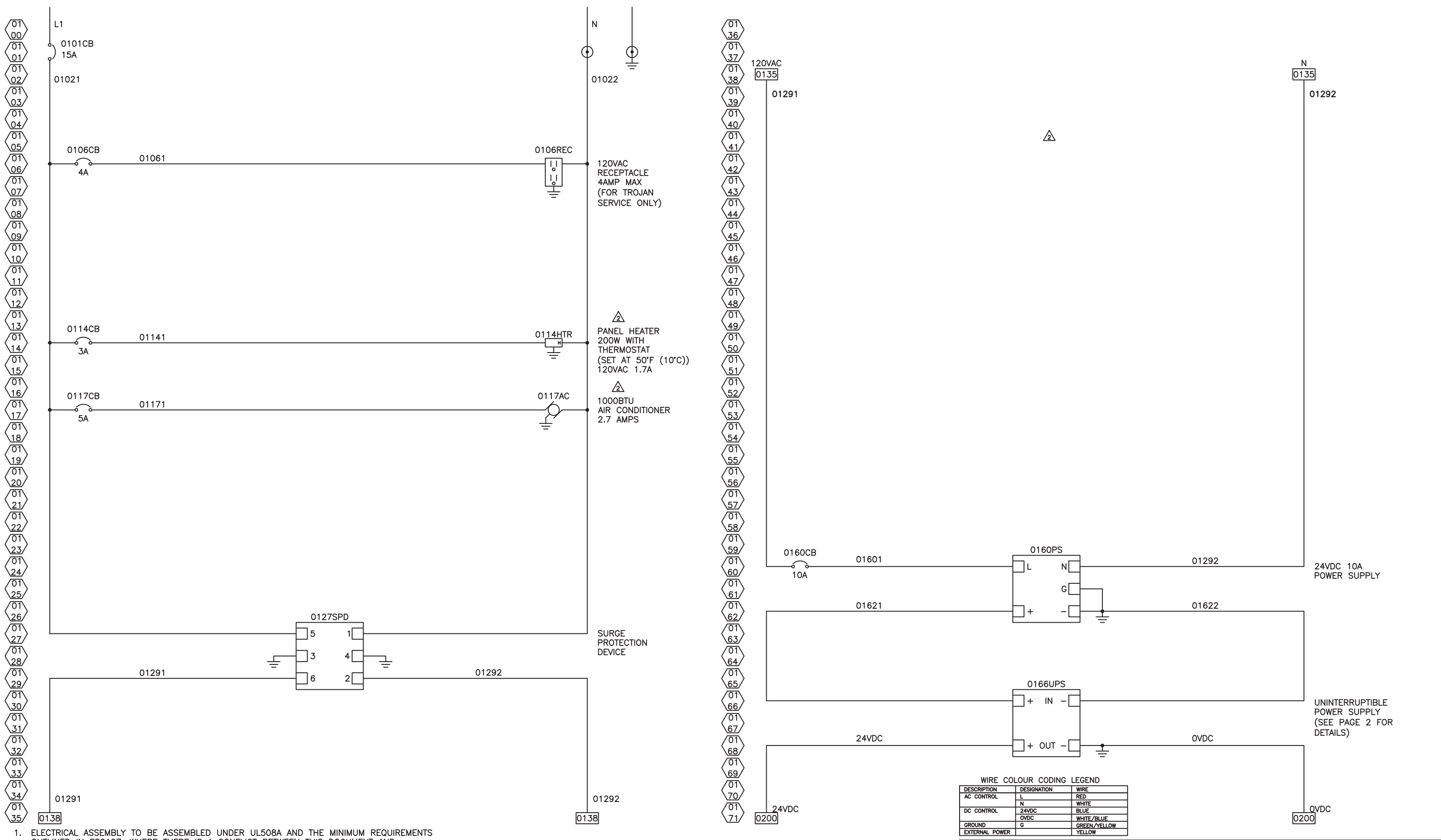
DRAWINGS & CUT SHEETS

SECTION CONTENTS

System Control Center (SCC)

REV	REVISION DESCRIPTION	LOG NO.	REV'D BY	CHK'D BY	APPRV'D BY	DATE YYYY-MM-DD
2	RELEASE FOR RE-SUBMITTAL	--	PL	BJR	LF	2023-10-05

DISCONNECTING MEANS BY OTHERS
SCC PANEL RATING: 120VAC 1.5KVA 12A 1PH 2WIRE +GND 60HZ



WIRE COLOUR CODING LEGEND

DESCRIPTION	DESIGNATION	WIRE
AC CONTROL	L	RED
	N	WHITE
DC CONTROL	24VDC	BLUE
	0VDC	WHITE/BLUE
GROUND	G	GREEN/YELLOW
EXTERNAL POWER		YELLOW

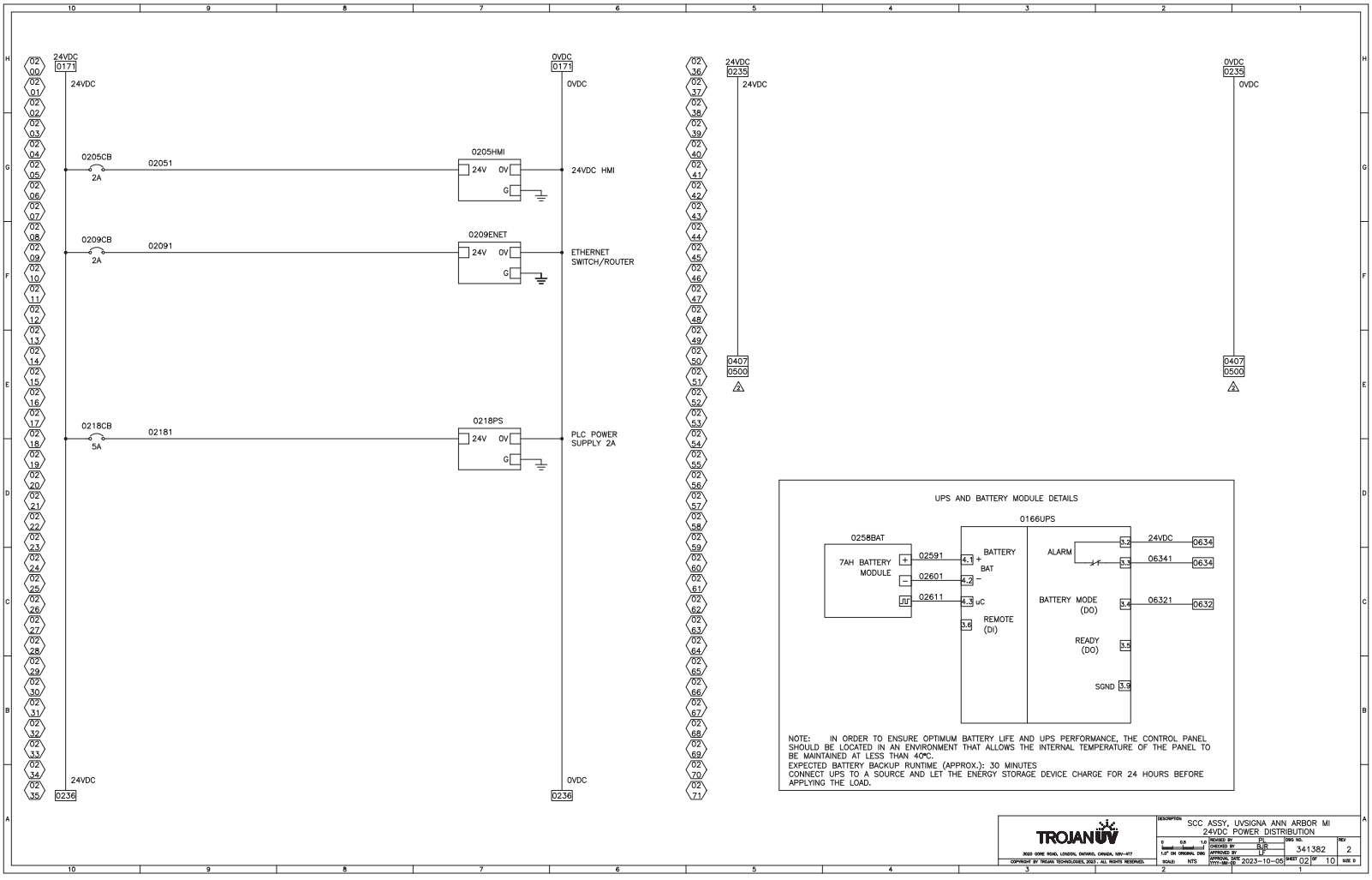
1. ELECTRICAL ASSEMBLY TO BE ASSEMBLED UNDER UL508A AND THE MINIMUM REQUIREMENTS OUTLINED IN ES0127. WHERE THERE IS A CONFLICT BETWEEN THIS DOCUMENT AND REQUIREMENTS OF ES0127, THE INFORMATION PRESENTED IN THIS DOCUMENT WILL BE USED.
2. ENCLOSURE ENVIRONMENTAL RATING – UL TYPE 4X (IP66).
3. MINIMUM WIRE SIZE FOR CONTROL WIRE IS 16AWG STRANDED COPPER UNLESS WIRE CABLE OR HARNESS IS PROVIDED FOR COMPONENTS BY MANUFACTURER OR PER TROJAN DESIGN.

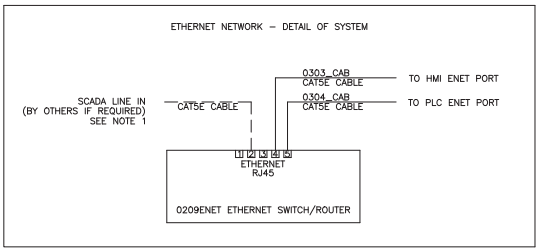
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: 2 PL DEC ± N/A
3 PL DEC ± N/A
ANGLE DEG ± N/A
REMOVE ALL BURRS, ALL CORNERS
R 0.010 OR BREAK EDGE
– CRITICAL CHARACTERISTIC

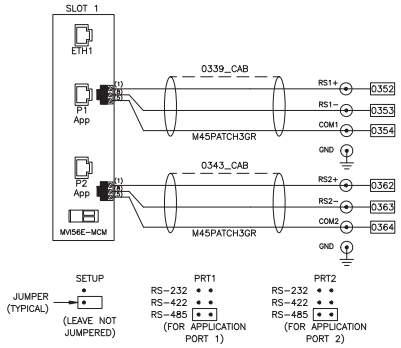
TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V-4T7

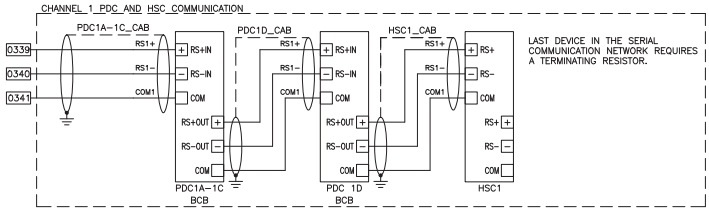
DESCRIPTION: SCC ASSY, UVSIGNA ANN ARBOR MI
POWER DISTRIBUTION

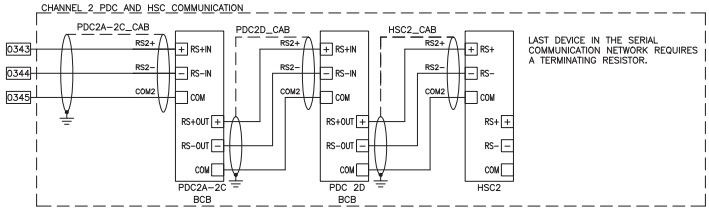
THIRD ANGLE PROJECTION
1.0" ON ORIGINAL DWG
SCALE: NTS
DWG NO. 341382 | REV 2
SHEET 01 OF 10 | SIZE D


24VDC
0171
24VDC
0205CB
2A
02051
0205HMI
24V
0V
G
24VDC HMI
0209CB
2A
02091
0209ENET
ETHERNET
SWITCH/ROUTER
0218CB
5A
02181
0218PS
PLC POWER
SUPPLY 2A
24VDC
0236
0VDC
0171
0VDC
0236
24VDC
0235
24VDC
0407
0500
0VDC
0235
0VDC
0407
0500
UPS AND BATTERY MODULE DETAILS
0166UPS
0258BAT
7AH BATTERY
MODULE
02591
02601
02611
BATTERY
BAT
uC
REMOTE
(DI)
ALARM
24VDC
06341
BATTERY MODE
(DO)
06321
READY
(DO)
SGND
NOTE: IN ORDER TO ENSURE OPTIMUM BATTERY LIFE AND UPS PERFORMANCE, THE CONTROL PANEL SHOULD BE LOCATED IN AN ENVIRONMENT THAT ALLOWS THE INTERNAL TEMPERATURE OF THE PANEL TO BE MAINTAINED AT LESS THAN 40°C.
EXPECTED BATTERY BACKUP RUNTIME (APPROX.): 30 MINUTES
CONNECT UPS TO A SOURCE AND LET THE ENERGY STORAGE DEVICE CHARGE FOR 24 HOURS BEFORE APPLYING THE LOAD.
TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N-1Z7
COPYRIGHT BY TROJAN TECHNOLOGIES, 2023 - ALL RIGHTS RESERVED.
DESCRIPTION
SCC ASSY, UVSIGNA ANN ARBOR MI
24VDC POWER DISTRIBUTION
DRAWN BY FL
CHECKED BY RJR
APPROVED BY LF
APPROVAL DATE 2023-10-05
DWG NO. 341382
REV 2
SHEET 02 OF 10
SIZE D
SCALE: NTS





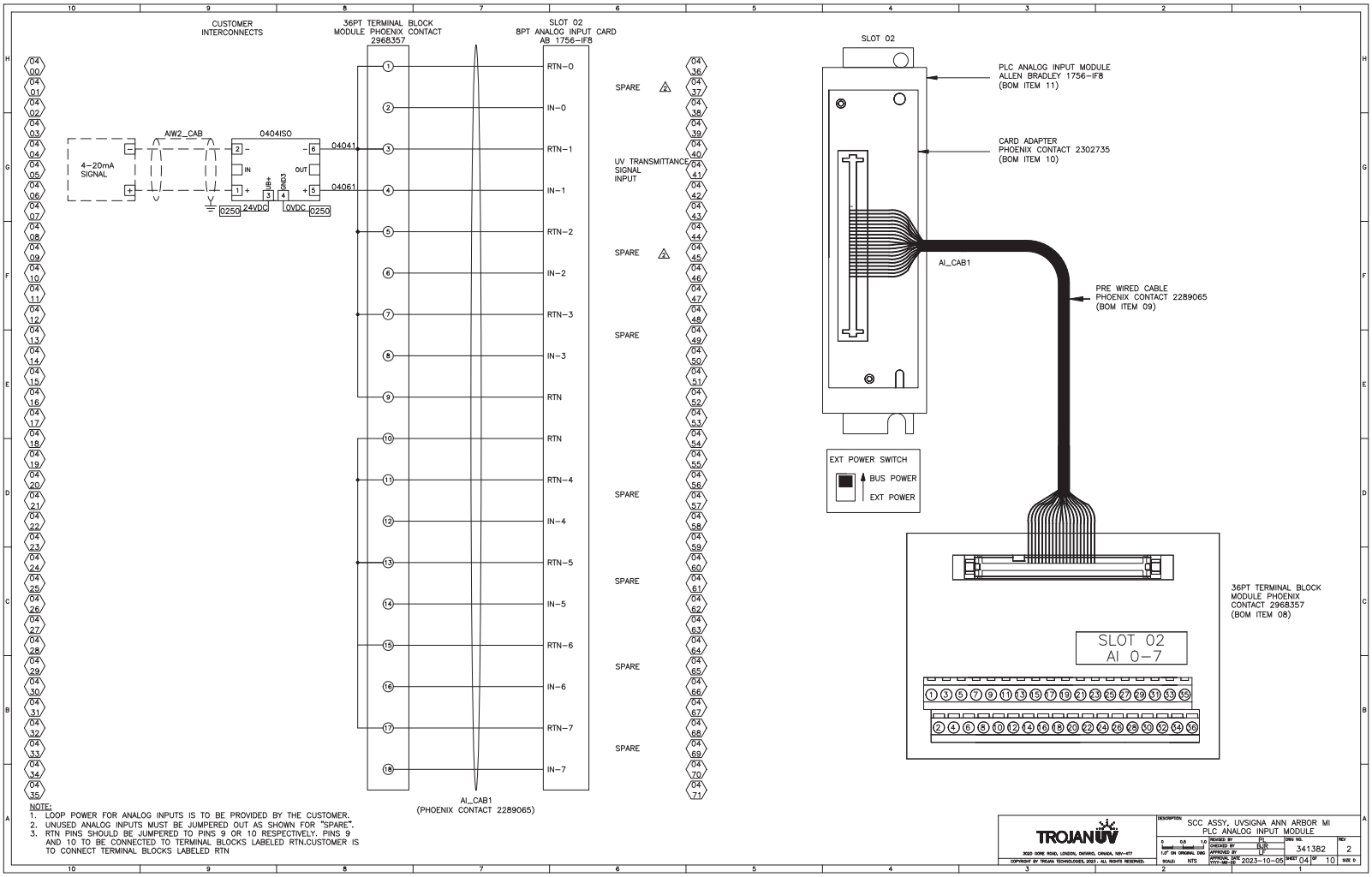




NOTE:
1. ETHERNET CABLE TO BE SHIELDED AND PROPERLY GROUNDED

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N-1Z7

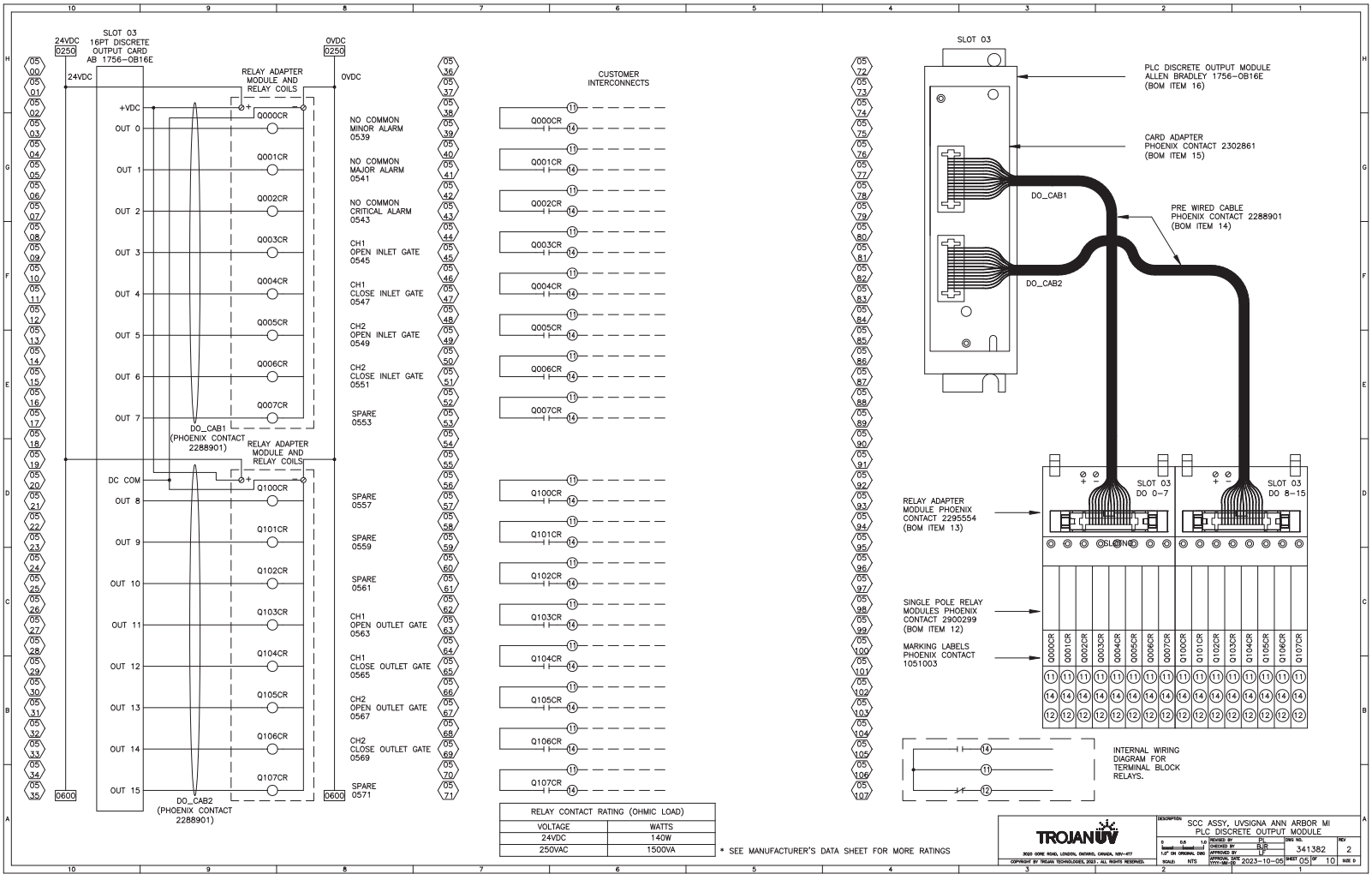
DESCRIPTION: SCC ASSY, UVSIGNA ANN ARBOR MI COMMUNICATIONS DIAGRAM
DRAWN BY: PL
CHECKED BY: BJR
APPROVED BY: LF
APPROVAL DATE: 2023-10-05
DWG NO.: 341382
REV: 2
SHEET 03 OF 10
SIZE: D
SCALE: NTS



NOTE:
1. LOOP POWER FOR ANALOG INPUTS IS TO BE PROVIDED BY THE CUSTOMER.
2. UNUSED ANALOG INPUTS MUST BE JUMPERED OUT AS SHOWN FOR "SPARE".
3. RTN PINS SHOULD BE JUMPERED TO PINS 9 OR 10 RESPECTIVELY. PINS 9 AND 10 TO BE CONNECTED TO TERMINAL BLOCKS LABELED RTN.CUSTOMER IS TO CONNECT TERMINAL BLOCKS LABELED RTN

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N-1Z7

DESCRIPTION: SCC ASSY, UVSIGNA ANN ARBOR MI PLC ANALOG INPUT MODULE
DRAWN BY: PL
CHECKED BY: BJR
APPROVED BY: LF
APPROVAL DATE (YYYY-MM-DD): 2023-10-05
DWG NO.: 341382
REV: 2
SHEET: 04 OF 10
SIZE: D
SCALE: NTS



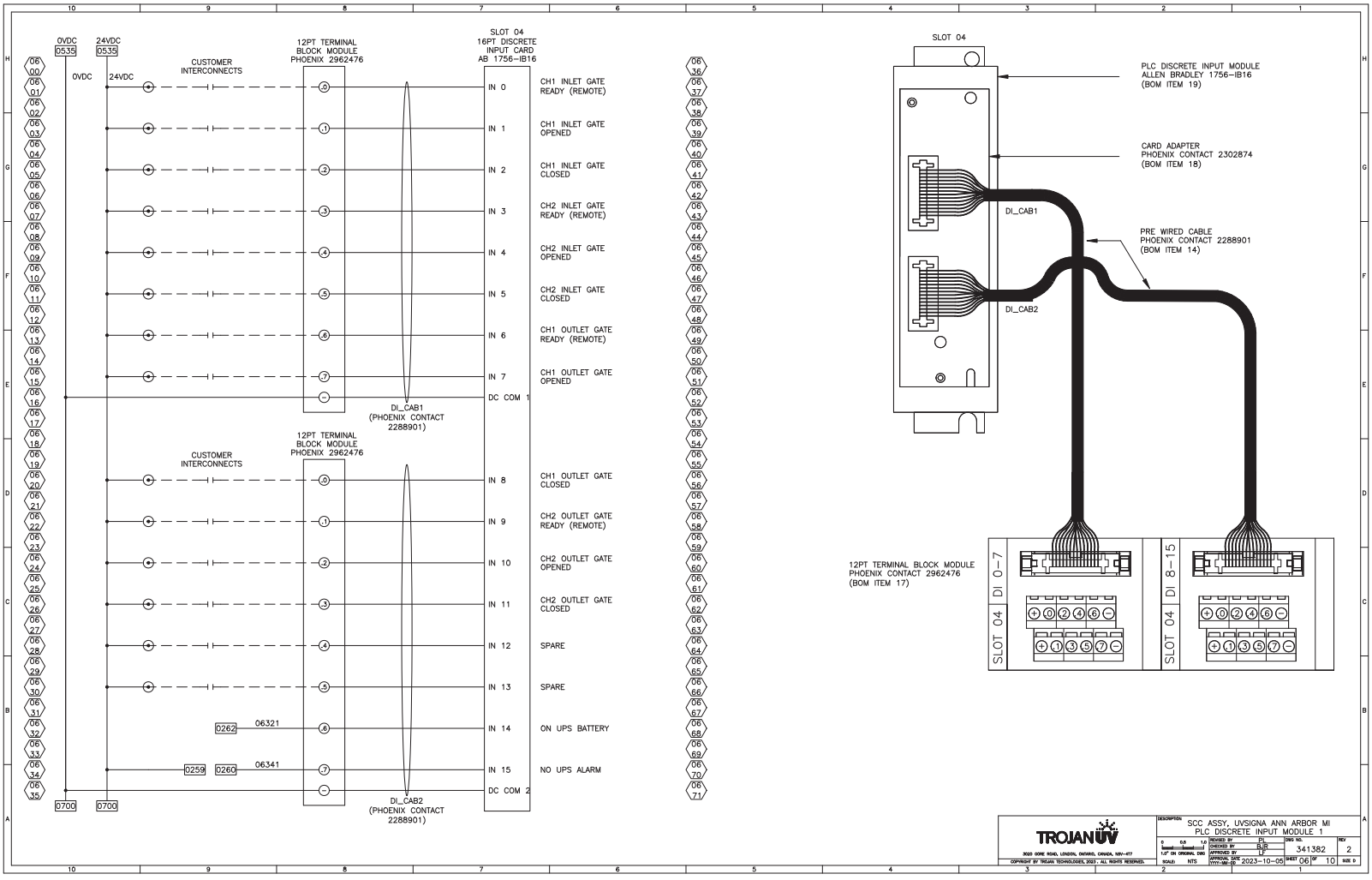
RELAY CONTACT RATING (OHMIC LOAD)	
VOLTAGE	WATTS
24VDC	140W
250VAC	1500VA

* SEE MANUFACTURER'S DATA SHEET FOR MORE RATINGS

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N-1Z7

DESCRIPTION: SCC ASSY, UVSIGNA ANN ARBOR MI
PLC DISCRETE OUTPUT MODULE

DRAWN BY	EL
CHECKED BY	BJR
APPROVED BY	LF
APPROVAL DATE (YYYY-MM-DD)	2023-10-05
DWG NO.	341382
REV	2
SCALE	NTS
SHEET	05 OF 10
SIZE	D

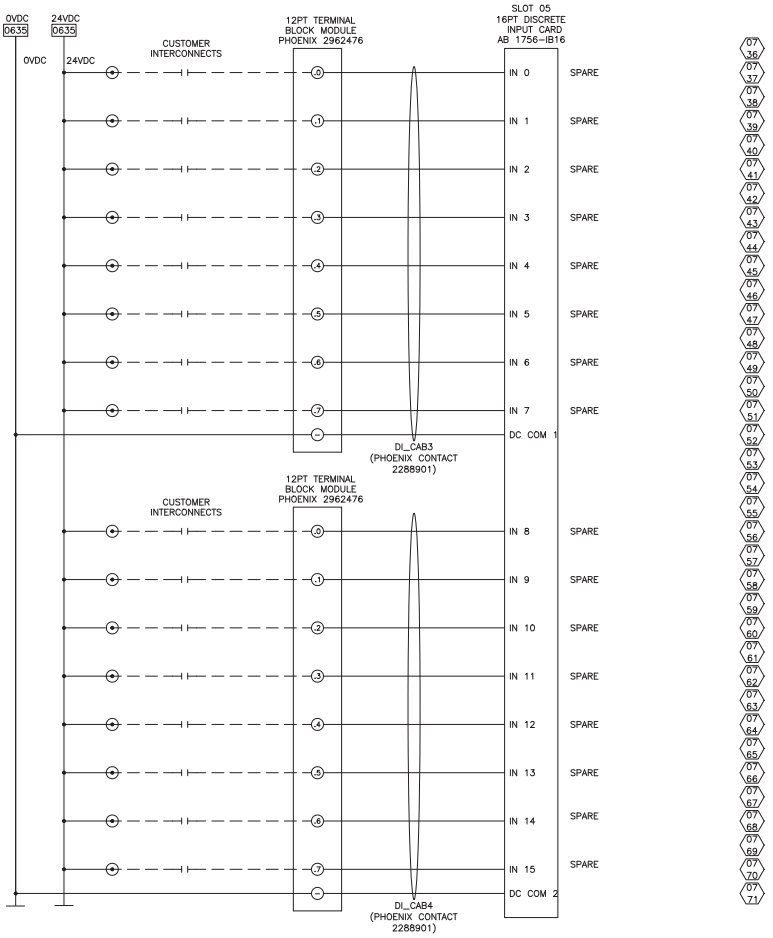


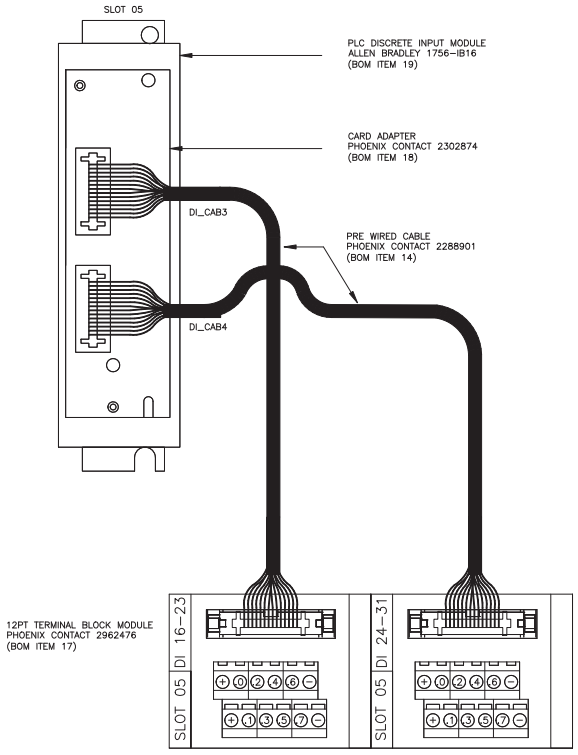
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N-1Z7

DESCRIPTION: SCC ASSY, UVSIGNA ANN ARBOR MI
PLC DISCRETE INPUT MODULE 1

DRAWN BY	PL
CHECKED BY	BJR
APPROVED BY	LF
APPROVAL DATE (YYYY-MM-DD)	2023-10-05
DWG NO.	341382
REV	2
SHEET	06 OF 10
SIZE	D
SCALE	NTS



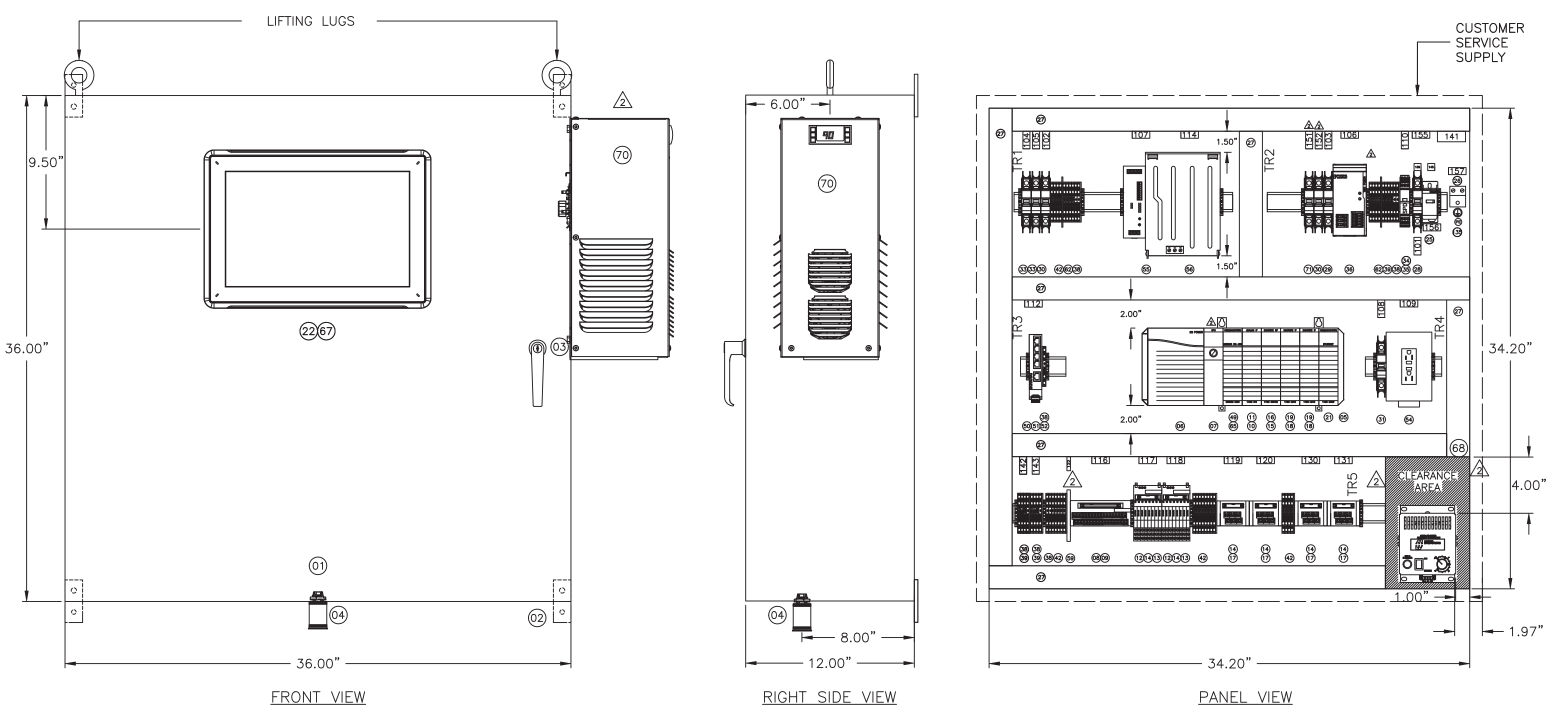


TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N-1Z7

DESCRIPTION: SCC ASSY, UVSIGNA ANN ARBOR MI
PLC DISCRETE INPUT MODULE 2

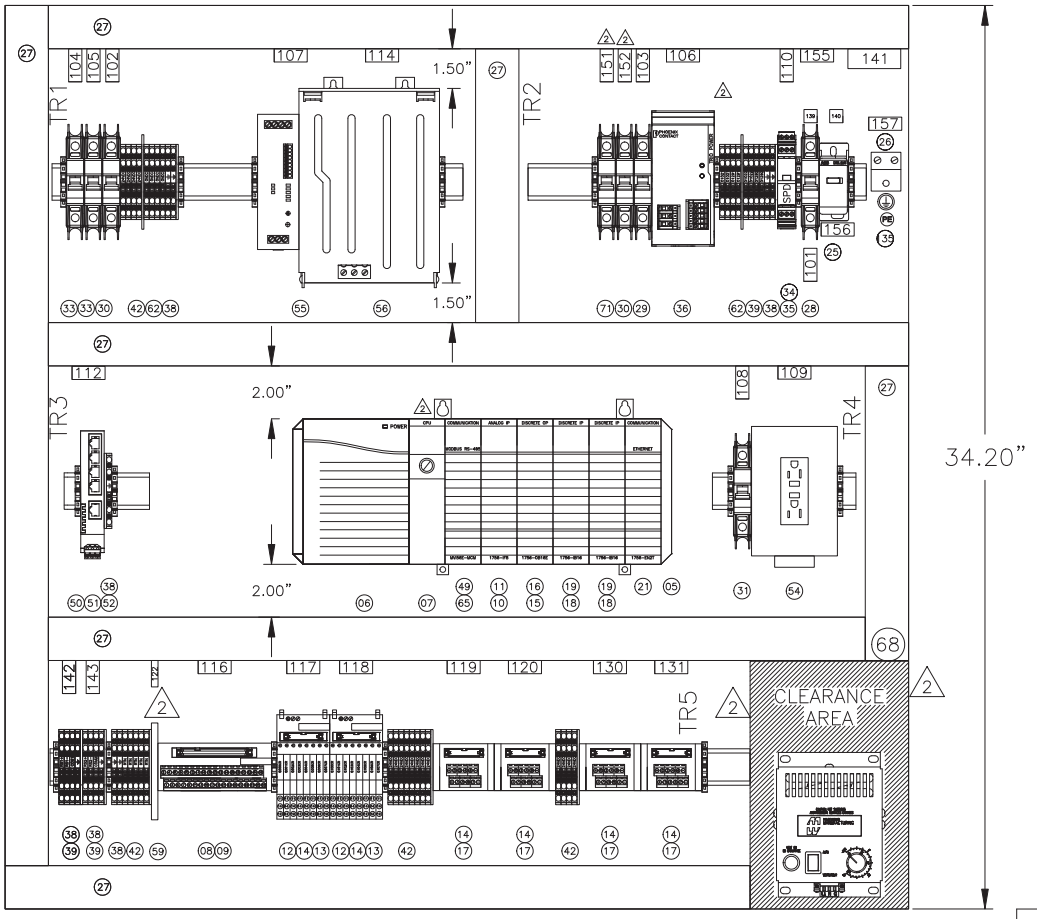
DRAWN BY	FL
CHECKED BY	BJR
APPROVED BY	LF
APPROVAL DATE (YYYY-MM-DD)	2023-10-05
DWG NO.	341382
REV	2
SHEET	07 OF 10
SIZE	D
SCALE:	NTS



TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V-4T7

DESCRIPTION	SCC ASSY, UVSIGNA ANN ARBOR MI PANEL LAYOUT		
0 0.5 1.0 — 1.0" ON ORIGINAL DWG	REVISED BY: PL	DWG NO. 341382	REV 2
	CHECKED BY: BJR		
	APPROVED BY: LF		
SCALE: NTS	APPROVAL DATE YYYY-MM-DD: 2023-10-05	SHEET 08 OF 10	SIZE D



TERMINAL COLOUR CODING LEGEND

VOLTAGE	COLOUR
LINE	GREY
NEUTRAL	GREY
24VDC	BLUE
GND	GREEN/YELLOW
RS-485	GREY

TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N-1Z7

DESCRIPTION: SCC ASSY, UVSIGNA ANN ARBOR MI TERMINAL LAYOUT

REVISED BY	FL
CHECKED BY	BJR
APPROVED BY	LF
APPROVAL DATE (YYYY-MM-DD)	2023-10-05
SCALE: NTS	

DWG NO. 341282 REV 2

SHEET 09 OF 10 SIZE D

NOTE:

1. USE APPROPRIATE NUMBER POSITION TERMINAL BLOCK JUMPERS.
2. SD CARD THAT IS INCLUDED WITH THE PLC CPU IS TO BE INSERTED IN HMI SD CARD SLOT.
3. TROJAN ONLY: REFERENCE LABEL BATTERY COMPONENT LIST ES0684 FOR BATTERY LABEL APPLICATION
4. ACCORDING TO UL 508A, SECTION 54, ALL FIELD WIRING CONDUCTORS, EXTERNAL TO THE PANEL SHALL BE "COPPER CONDUCTORS ONLY" AND TEMPERATURE RATINGS FOR THE FIELD WIRING CONDUCTORS RATED LESS THAN 100 AMPS SHALL BE 75°C(167°F).
REFER THE FOLLOWING BELOW MENTIONED DETAILS FOR FIELD WIRING TERMINATION TIGHTENING TORQUE.

A.
MAIN CIRCUIT BREAKER 2.8 N–m (24.78 lb–in).
B.
DISTRIBUTION BLOCK 3.5– 5 N–m (31–44 lb–in).
C.
GROUND LUG 5.65 N–m (50 lb–in).

5.
AIR CONDITIONER SHALL BE DI–01A–126–4X WITH 316SST SHROUD & CHASSIS OPTION.

△2

	ITEM	QTY	NAMEPLATE TYPE	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3
	157	1	915433–1250502A	TORQUE	50 lb.in	
	156	1	915433–1250502A	TORQUE	31–44 lb.in	
	155	1	915433–1250502A	TORQUE	24.78 lb.in	
	154					
	153					
△2	152	1	915433–1250502A	0114CB	HEATER PWR	
△2	151	1	915433–1250502A	0117CB	A/C POWER	
	150					
	149					
	148					
△2	147					
	146					
△2	145					
	144					
	143	1	915433–1250502A	CH2 PDC&HSC	RS485	
	142	1	915433–1250502A	CH1 PDC&HSC	RS485	
	141	1	915433–2000752A	INCOMING SUPPLY	120V 1PH 60Hz	
	140	1	915433–0500501A	N		
	139	1	915433–0500501A	L1		
	138					
	137					
	136					
	135	A/R	915433–GND			
	134					
	133					
	132					
	131	1	915433–1250502A	SLOT 05	DI 24–31	
	130	1	915433–1250502A	SLOT 05	DI 16–23	
	129					
	128					
	127					
	126					
	125					
	124					
△2	123					
	122	1	915433–1000251A	0404ISO		
△2	121					
	120	1	915433–1250502A	SLOT 04	DI 8–15	
	119	1	915433–1250502A	SLOT 04	DI 0–7	
	118	1	915433–1250502A	SLOT 03	DO 8–15	
	117	1	915433–1250502A	SLOT 03	DO 0–7	
	116	1	915433–1250502A	SLOT 02	AI 0–7	
	115					
	114	1	915433–1250501A	0258BAT		
	113					
	112	1	915433–1250501A	0209ENET		
	111					
	110	1	915433–1250501A	0127SPD		
	109	1	915433–1250502A	0106REC	4A MAX	
	108	1	915433–1250502A	0106CB	RECEPTACLE	
	107	1	915433–1250501A	0166UPS		
	106	1	915433–1250501A	0160PS		
	105	1	915433–1250502A	0209CB	DATA COMM	
	104	1	915433–1250502A	0205CB	HMI PS	
	103	1	915433–1250502A	0160CB	24VDC PS	
	102	1	915433–1250502A	0218CB	PLC	
	101	1	915433–1250502A	0101CB	MAIN	

	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
	76					
	75					
	74					
	73					
	72					
△2	71	1	BREAKER, 3A 1P AC/DC C ABB	ABB	SU201M–C3	917139–MC1030
△2 NOTE 5	70	1	AIR–CONDITIONER, 1000BTU/Hr 120VAC 4X 316SST	ISC	CUSTOM	–
	69					
△2	68	1	HEATER, FAN 200W/120VAC	HAMMOND	FLHTF200A115	916658–003
	67	1	MEMORY CARD, SD 32GB	SANDISK	SDSDB–032G–A46	917434–008
	66					
NOTE 3	65	1	PLC, AB CNTL MODBUS INTERFACE	PROSOFT	MVI56E–MCM	916505
	64					
	63					
△2	62	2	TERM BLK, PART PLT ATP ST QU	PHOENIX CONTACT	3030815	916050–3030815
	61					
	60					
△2	59	1	ISOLATOR, CURR 4W 4–20mA 30V	PHOENIX CONTACT	2864406	915371
	58					
	57					
NOTE 3	56	1	UPS, IQ BATTERY 24V 7AH	PHOENIX CONTACT	1274118	913905–118
NOTE 3	55	1	UPS, QUINT4 24V 20A	PHOENIX CONTACT	2907071	913905–071
	54	1	DUPLEX RECEPTACLE 120VAC WITH GFI	PHOENIX CONTACT	5600462	914817
	53					
	52	1	SWITCH, ENET FL SW 1005N–5PORT	PHOENIX CONTACT	1085039	919022–1085039
	51	1	CABLE, ENET RJ45 SHIELDED 3FT	STARTECH	S45PATCH3BL	913756–003S
	50	1	CABLE, ENET RJ45 SHIELDED 6FT	STARTECH	S45PATCH6BL	913756–006S
	49	2	CABLE, ENET RJ45 STRAIGHT 3FT	STARTECH	M45PATCH3GR	913756–003
	48					
	47	A/R	DIN RAIL, PERF 35X7.5 PHOENIX	PHOENIX CONTACT	0801733	914147
	46	A/R	TERM BLK, END STOP PHOENIX	PHOENIX CONTACT	3022276	916050–3022276
	45	A/R	TERM BLK, MARKER ZB5 PHOENIX	PHOENIX CONTACT	1050004	916050–1050004
	44	A/R	TERM BLK, END PLATE D–ST 4CON	PHOENIX CONTACT	3030514	916050–3030514
NOTE 1	43	A/R	TERM BLK, JUMPER 2.5mm PNX	PHOENIX CONTACT	–	916050G
	42	25	TERM BLK, PIT 2.5 QUATTRO BLU	PHOENIX CONTACT	3209581	916049–3209581
	41					
	40					
△2	39	14	TERM BLK, PIT 2.5 QUATTRO GRY	PHOENIX CONTACT	3209578	916049–3209578
△2	38	9	TERM BLK, PIT 2.5 PE QUAT GND	PHOENIX CONTACT	3209594	916049–3209594
	37					
	36	1	PS, 24VDC 1P TRIO 10A	PHOENIX CONTACT	2866323	916051–323
	35	1	SPD, 120V 20A 1PH PHOENIX	PHOENIX CONTACT	2907922	917624–120
	34	1	SPD, BASE 1PH SCREW PHOENIX	PHOENIX CONTACT	2907924	917624–001
	33	2	BREAKER, 2A 1P AC/DC C ABB	ABB	SU201M–C2	917139–MC1020
△2	32					
	31	1	BREAKER, 4A 1P AC/DC C ABB	ABB	SU201M–C4	917139–MC1040
△2	30	2	BREAKER, 5A 1P AC/DC C ABB	ABB	SU201M–C5	917139–MC1050
	29	1	BREAKER, 10A 1P AC/DC C ABB	ABB	SU201M–C10	917139–MC1100
NOTE 4	28	1	BREAKER, 15A 1P AC/DC C ABB	ABB	SU201M–C15	917139–MC1150
	27	A/R	WIRE DUCT, TYPE F LT GRY1.5x3	PANDUIT	F1.5X3LG6 / C1.5LG6	913437–006
NOTE 4	26	1	LUG, GND 600V 2CON	ILSCO	AU–0	914278
NOTE 4	25	1	DIST BLOCK, 115A TE	TE CONNECTIVITY	DBL125	917305–125
	24					
	23					
NOTE 3	22	1	PLC, HMI BEIJER X2 EXTREME 15"	BEIJER	640015605	917483–015
	21	1	PLC, AB CNTL ETHERNET	ALLEN–BRADLEY	1756–EN2T	913135
	20					
	19	2	PLC, AB CNTL LOGIX MODULE 16DI	ALLEN–BRADLEY	1756–IB16	913138
	18	2	PLC, AB CNTL ADAPTER 16DI	PHOENIX CONTACT	2302874	914268–002
	17	4	PLC, WIRING SYS TERMINAL MODULE 12P	PHOENIX CONTACT	2962476	914045–012
	16	1	PLC, AB CNTL LOGIX MODULE 16DO	ALLEN–BRADLEY	1756–OB16E	913136
	15	1	PLC, AB CNTL ADAPTER 16DO/4AO	PHOENIX CONTACT	2302861	914268–001
	14	6	PLC, WIRING SYS CABLE 14P 0.5M	PHOENIX CONTACT	2288901	914046–005
	13	2	PLC, WIRING SYS RELAY ADAPT	PHOENIX CONTACT	2295554	914044
	12	16	RELAY, 6A 24VDC SPDT PIT PC / BLANK MARKER	PHOENIX CONTACT	2900299 / 1051003	915403–112
	11	1	PLC, AB CNTL LOGIX MODULE 8AI	ALLEN–BRADLEY	1756–IF8	913137
	10	1	PLC, AB CNTL ADAPTER 8AI	PHOENIX CONTACT	2302735	914268–003
	09	1	PLC, AB CABLE 50POS 0.5M	PHOENIX CONTACT	2289065	914046–009
	08	1	PLC, AB CNTL WIRING SYS 50P	PHOENIX CONTACT	2968357	914265–001
△2 NOTE 2	07	1	PLC, AB CNTL CPU L73	ALLEN–BRADLEY	1756–L73	916624–003
	06	1	PLC, AB CNTL PS 2.8A 24VDC	ALLEN–BRADLEY	1756–PB72	914261
	05	1	PLC, AB CNTL CHASSIS 7SLOT	ALLEN–BRADLEY	1756–A7	913141–007
	04	1	VENT, DRAIN TYPE 4X	HOFFMAN	AVDR4NM	901841
	03	1	HANDLE, LOCKABLE TYPE 4X WITH 3–POINT LATCH	CUSTOM	CUSTOM	
	02	1	WALLMOUNT BRACKETS, STAINLESS STEEL	RALSTON	V–SSWMB	
	01	1	ENCLOSURE, 36" X 36" X 12", 316SST TYPE 4X	HAMMOND OR EQUIV	HAMMOND OR EQUIVALENT	917506

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V–4T7

DESCRIPTION: SCC ASSY, UVSIGNA ANN ARBOR MI BILL OF MATERIALS

0 0.5 1.0 / 1.0" ON ORIGINAL DWG	REVISED BY: PL	DWG NO.: 341382	REV: 2
	CHECKED BY: BJR		
	APPROVED BY: LF		
SCALE: NTS	APPROVAL DATE YYYY–MM–DD: 2023–10–05	SHEET 10 OF 10	SIZE D

Miniature Circuit Breaker SU200M
for branch circuit protection acc. to UL 489

The miniature circuit breaker SU 200 M is ABB's solution for UL 489 branch circuit protection up to 480 Y/277 V AC and 96 V DC. This circuit breaker is an all-round device for AC and DC applications for universal use in North American and global markets due to its approvals acc. to the international standards UL, CSA and IEC. Moreover, SU 200 M is fully compatible with System pro *M* compact® UL 489 accessories.

Features

- High performance MCB with 10 kA interrupting capacity acc. to UL 489 / CSA 22.2 No. 5 and 15 kA breaking capacity acc. to IEC/EN 60947-2
- Certified up to I_n = 40 A at 480 Y/277 V AC acc. to UL 489 / CSA 22.2 No. 5
- Certified for AC and DC use acc. to UL and CSA
- 40 °C reference temperature acc. to UL and CSA
- Current limiting acc. to UL 489
- Clear contact position indication in red/green ("real CPI")

Standards and approvals

Standards	
UL 489	
CSA 22.2 No. 5	
IEC/EN 60947-2	
Approvals	
UL 489	US
CSA 22.2 No. 5	CA
VDE	DE
CCC	CN

General Data		
Standards		UL 489, CSA 22.2 No. 5, IEC/EN 60947-2
Poles		1P, 2P, 3P, 4P
Tripping characteristics		C, K, Z
Rated current I_n		0.2 - 63 A
Rated frequency f		50 / 60 Hz, DC (0 Hz)
Rated insulation voltage U_i acc. to IEC/EN 60664-1		250 V AC (phase to ground), 440 V AC (phase to phase)
Overvoltage category		III
Pollution degree		3
IEC/EN 60947-2		
Rated operational voltage U_e		1P: 230 V AC; 2P, 3P, 4P: 400 V AC
Max. power frequency recovery voltage U_{max}	AC	1P: 253 V AC; 2P, 3P, 4P: 440 V AC
Min. operating voltage		12 V AC, 12 V DC
Rated ultimate short-circuit breaking capacity I_{cu}		15 kA
Rated service short-circuit breaking capacity I_{cs}		≤ 40 A: 11.25 kA > 40 A: 7.5 kA
Rated impulse withstand voltage U_{imp} (1.2/50µs)		4 kV (test voltage 6.2 kV at sea level, 5 kV at 2,000 m)
Dielectric test voltage		2 kV (50 / 60Hz, 1 min.)
Reference temperature for tripping characteristics		30 °C
Electrical endurance		I_n < 30 A: 20,000 ops (AC), I_n ≥ 30 A: 10,000 ops. (AC); 1 cycle (2 s - ON, 13 s - OFF, I_n ≤ 32 A), 1 cycle (2 s - ON, 28 s - OFF, I_n > 32 A)
UL / CSA		
Rated voltage	AC	1P: 277 V AC up to 40 A for C, Z char.,
	AC	277 V AC up to 35 A for K char., 240 V AC
	AC	2P, 3P, 4P: 480 Y / 277 V AC up to 40 A for C, Z char.,
	AC	480 Y / 277 V AC up to 35 A for K char., 240 V AC
	DC	1P: 48 V DC; 2P: 96 V DC (2p in series)
Rated interrupting capacity acc. to UL 1077		–
Short-circuit current rating acc. to UL 489		10 kA
Application		–
Reference temperature for tripping characteristics		40 °C
Electrical endurance		6,000 ops (AC), 6,000 ops. (DC); 1 cycle (1 s - ON, 9 s - OFF)
Mechanical data		
Housing		Insulation group II, RAL 7035
Toggle		Insulation group II, black, sealable
Contact position indication		Real CPI (green OFF / red ON)
Protection degree acc. to DIN EN 60529		IP20*, IP40 in enclosure with cover
Mechanical endurance		20,000 ops.
Shock resistance acc. to IEC/EN 60068-2-27		25 g - 2 shocks - 13 ms
Vibration resistance acc. to IEC/EN 60068-2-6		5g - 20 cycles at 5…150…5 Hz with load 0.8 I_n
Environmental conditions (damp heat cyclic) acc. to IEC/EN 60068-2-30		28 cycles with 55°C/90-96% and 25°C/95-100%
Ambient temperature		-25 ... +55°C
Storage temperature		-40 ... +70 °C
Installation		
Terminal		Failsafe bi-directional cylinder-lift terminal
Cross-section of conductors (top/bottom)		solid, stranded: 35 mm² / 35 mm² flexible: 25 mm² / 25 mm² 18 – 4 AWG
Cross-section of busbars (top/bottom)		10 mm² / 10 mm² 18 – 8 AWG
Torque		2.8 Nm AWG 18-16: 13.3 in-lbs. AWG 14-10: 17.7 in-lbs. AWG 8-4: 39.8 in-lbs.
Screwdriver		No. 2 Pozidrive
Mounting		On DIN rail 35 mm acc. to EN 60715 by fast clip
Mounting position		any
Supply		optional
Dimensions and weight		
Mounting dimensions acc. to DIN 43880		Mounting dimension 3
Pole dimensions (H x D x W)		111 x 69 x 17.5 mm
Pole weight		approx. 125 g
Combination with auxiliary elements		
Auxiliary contact		Yes
Signal contact		Yes
Shunt trip		Yes

Tripping characteristics

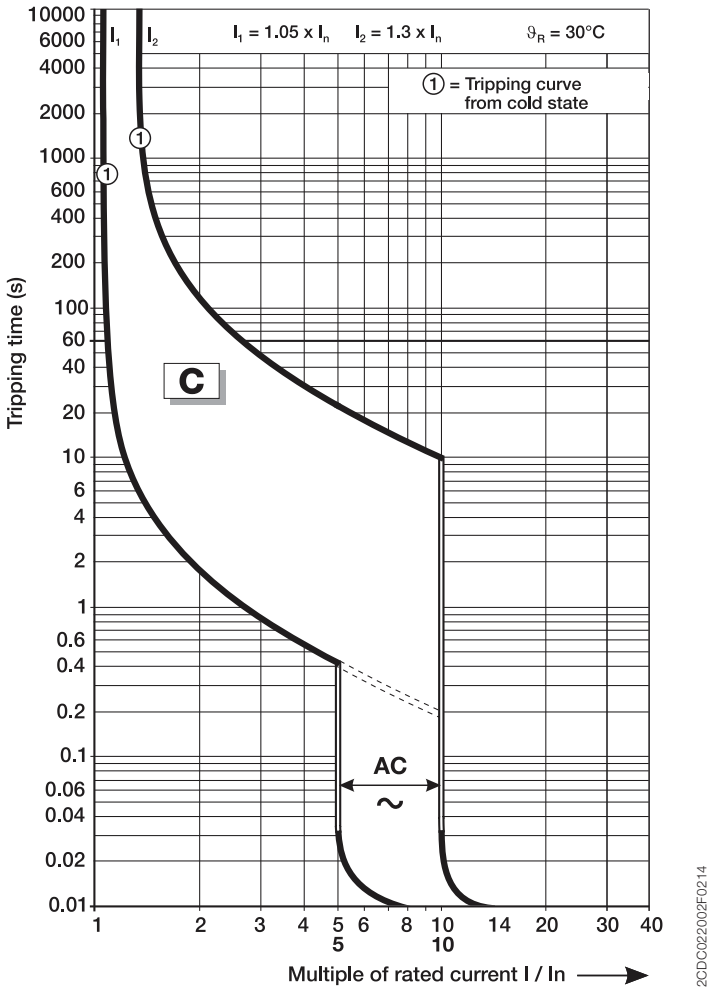
Acc. to	Tripping characte-ristics	Rated current	Thermal release [1]			Electromagnetic release [2]		
			Currents: conventional non-tripping current	conventional tripping current	Tripping time	Range of instantaneous tripping		Tripping time
		I_n	I_1	I_2				
IEC/EN 60947-2	C	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$5 \cdot I_n$	$10 \cdot I_n$	> 0.2 s < 0.2 s
	K	0.2 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$10 \cdot I_n$	$14 \cdot I_n$	> 0.2 s < 0.2 s
	Z	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$2 \cdot I_n$	$3 \cdot I_n$	> 0.2 s < 0.2 s

[1] The thermal releases are calibrated to a nominal reference ambient temperature of 30 °C.
In the case of higher ambient temperatures, the current values fall by approx. 6 % for each 10 K temperature rise.

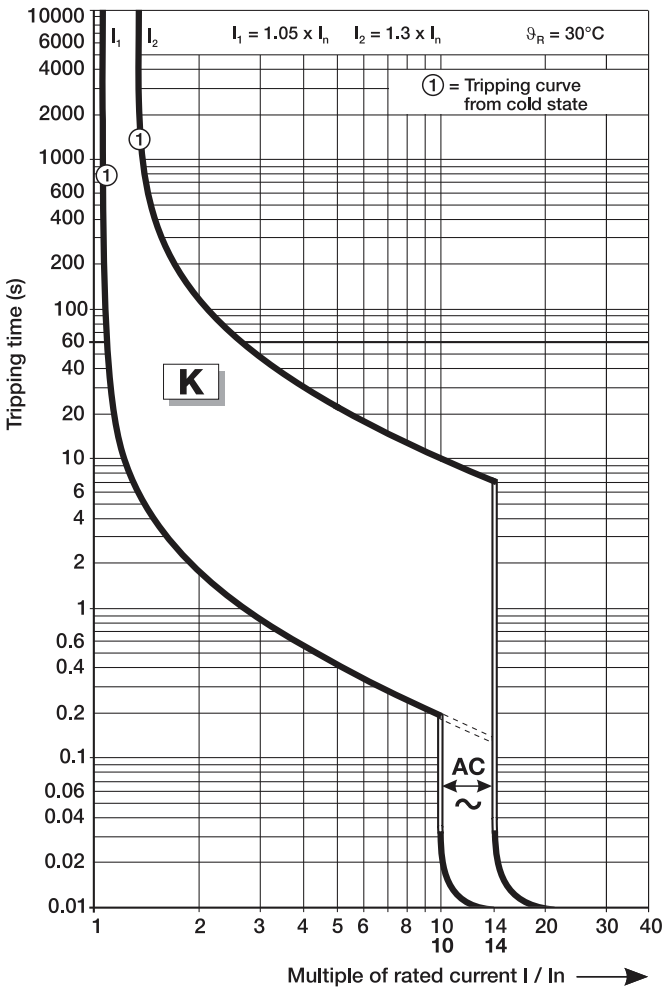
[2] The indicated tripping values of electromagnetic tripping devices apply to a frequency of 50/60 Hz. The thermal release operates independent of frequency.

[3] As from operating temperature (after I_1 > 1h)

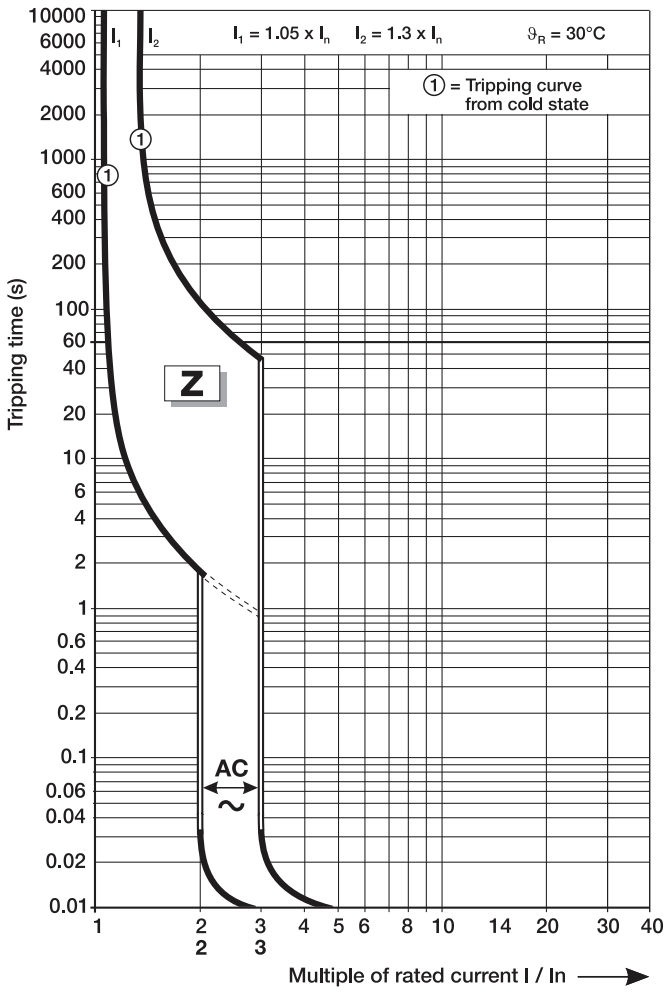
C characteristic



K characteristic



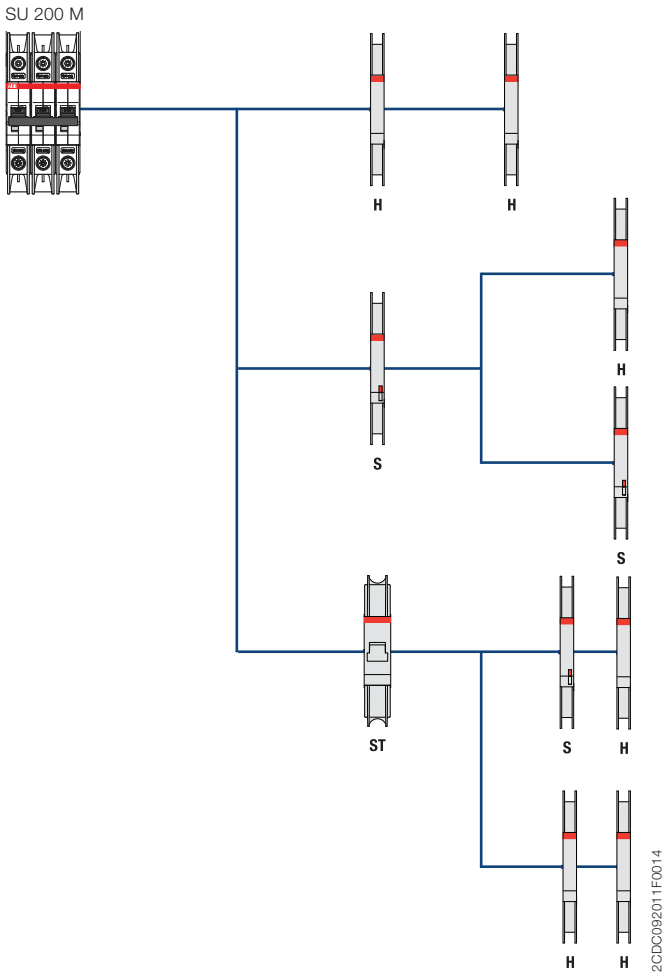
Z characteristic



SCC Item 71
Breaker, 3A 1P AC/DC C - ABB SU201M-C3 / Trojan P/N 917139-MC1030 pg. 5/6

Type	Voltage	Current	Power Factor	Phase	I_{peak}	I^2t
		A			kA	kA^2S
SU203M-K0.2	480Y/277	10000	0.45-0.5	3	0.026	0.008
SU203M-K7	480Y/277	4095	0.45-0.5	3	2.3	11.9
SU203M-K7	480Y/277	7500	0.45-0.5	3	3.4	16.7
SU203M-K7	480Y/277	10000	0.45-0.5	3	4.6	19.0
SU203M-K20	480Y/277	4095	0.45-0.5	3	2.9	18.1
SU203M-K20	480Y/277	7500	0.45-0.5	3	4.3	28.1
SU203M-K20	480Y/277	10000	0.45-0.5	3	6.4	34.6
SU203M-K35	480Y/277	4095	0.45-0.5	3	3.4	27.9
SU203M-K35	480Y/277	7500	0.45-0.5	3	4.7	33.1
SU203M-K35	480Y/277	10000	0.45-0.5	3	9.0	72.0
SU203M-C40	480Y/277	4095	0.45-0.5	3	3.4	22.8
SU203M-C40	480Y/277	7500	0.45-0.5	3	5.1	42.5
SU203M-C40	480Y/277	10000	0.45-0.5	3	9.3	74.6
SU201M-K0.2	277	10000	0.45-0.5	1	0.7	0.092
SU201M-K7	277	4095	0.45-0.5	1	2.5	10.5
SU201M-K7	277	7500	0.45-0.5	1	3.4	16.9
SU201M-K7	277	10000	0.45-0.5	1	3.4	14.5
SU201M-K20	277	4095	0.45-0.5	1	2.8	14.7
SU201M-K20	277	7500	0.45-0.5	1	4.1	23.5
SU201M-K20	277	10000	0.45-0.5	1	4.7	32.5
SU201M-K35	277	4095	0.45-0.5	1	3.0	19.8
SU201M-K35	277	7500	0.45-0.5	1	4.7	36.5
SU201M-K35	277	10000	0.45-0.5	1	4.4	22.1
SU201M-C40	277	4095	0.45-0.5	1	3.6	22.9
SU201M-C40	277	7500	0.45-0.5	1	5.3	52.6
SU201M-C40	277	10000	0.45-0.5	1	5.9	44.9
SU203M-K63	240	4095	0.45-0.5	3	3.6	19.9
SU203M-K63	240	7500	0.45-0.5	3	5.1	33.0
SU203M-K63	240	10000	0.45-0.5	3	6.3	43.3
SU201M-K63	240	4095	0.45-0.5	1	3.9	33.8
SU201M-K63	240	7500	0.45-0.5	1	5.2	43.8
SU201M-K63	240	10000	0.45-0.5	1	6.5	61.8

Accessory overview

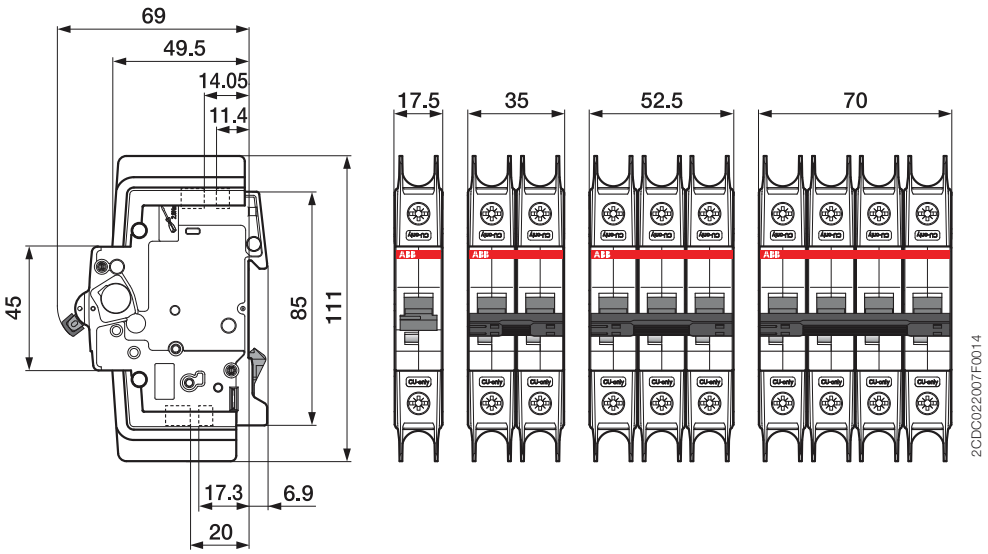


H	Auxiliary contact (change-over contact)	S2C-H6RU
S/H	Signal contact	S2C-S6RU
ST	Shunt trip	S2C-A...U

The certification of the Accessories has been done with one accessory only.

The number of electrical operations is limited to 4,000 operations for the maximum combinations and the combinations including shunt trips.

Dimensional drawing



SCC Item 70
AIR-CONDITIONER, 1000BTU/Hr 120VAC 4X 316SST - ISC - CUSTOM pg. 1/2

Enclosure Air Conditioners - 1,000 BTUH

High quality design and construction are what set the Delta-T's Diamond Series apart from other small enclosure cooling products. These units are well-suited for enclosures in tight spaces where other cooling solutions will not fit.

Delta-T Air Conditioners excel in a wide range of applications such as Metalworking, Paper & Pulp and Plastics, Food Processing, Industrial Automation, Petro-Chemical, Pharmaceutical, Cement, Transportation & Telecommunications.

Condensate Management System

Delta-T Air Conditioners dispose of condensate by routing refrigerant hot gas through our condensate boil off pan. This causes water to evaporate which results in:

- Condensate being eliminated before it can escape the unit
- Increased unit efficiency by pre-cooling refrigerant
- Lower running amps which makes our industrial air conditioners more energy efficient
- No need for inefficient external drain tubes or drip pans

Energy Efficiency

- Thermal Expansion Valve to maintain cooling capacity over a broad ambient temperature range
- Low Running Amps reduces stress on electrical systems
- Pressure operated blower control reduces power inrush and saves energy
- Highly efficient compressor with anti short cycle protection
- Compressor run capacitors reduce power inrush, save energy and increase compressor life

UL/cUL Listed;
File No. SA8067

Indoor/Outdoor NEMA Type 12, 4, and 4X Available

*See second page for OPTIONS

Model	BTUH/hour	Material	Voltage/ Phase/Hz.	Running Amps	Max Ambient Temperature	Dimensions H x W x D	Ship (lbs.) Weight
DI-01A-126-12	1,000	Powder Coated Steel	120/1/60	2.7	131°F	17" x 7" x 7"	30/43
DI-01A-126-04	1,000	Powder Coated Steel	120/1/60	2.7	131°F	17" x 7" x 7"	30/43
DI-01A-126-4X	1,000	Stainless Steel	120/1/60	2.7	131°F	17" x 7" x 7"	30/43

Superior Design

- Designed specifically for easy maintenance and service
- Narrow body style fits on 7" enclosure
- Fully insulated & sealed cabinet
- Sloped top to allow for water runoff
- Designed with rigid chassis and seam welded shroud

Digital Temperature Controller

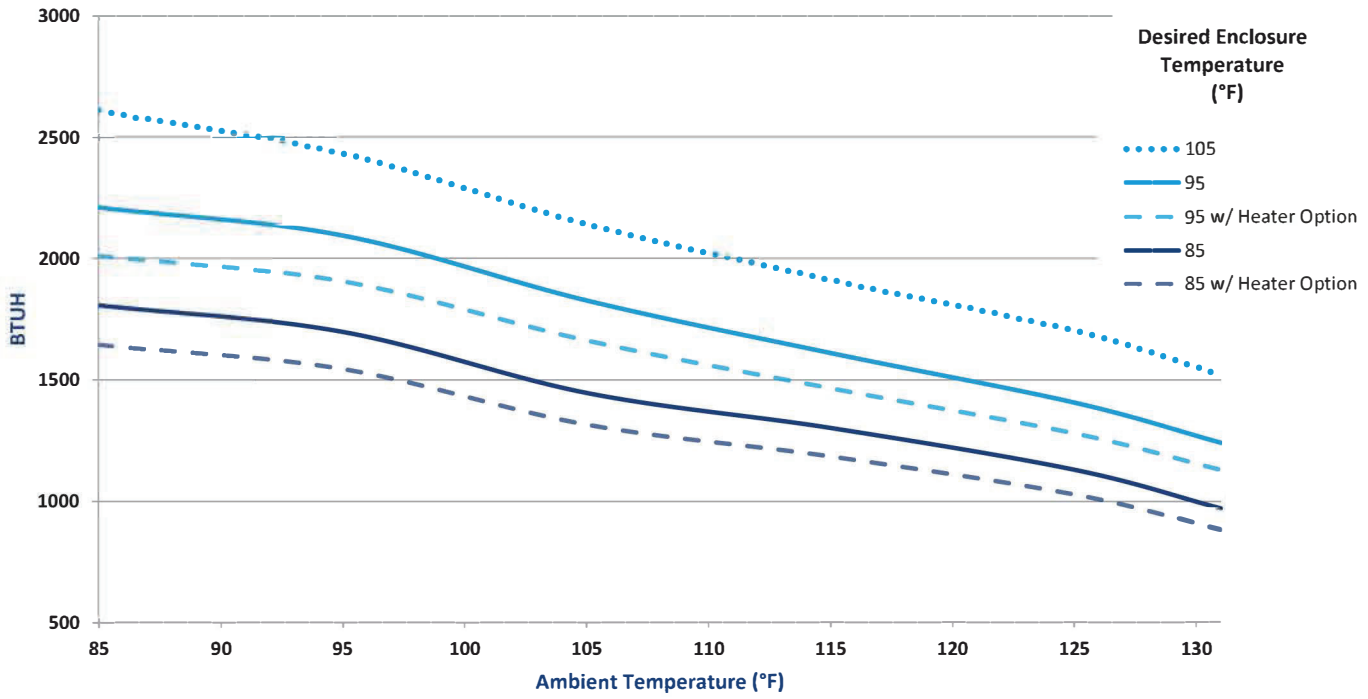
- Intuitive interface that simplifies maintenance
- Can be programmed for Fahrenheit or Celsius
- Programmable set point and temperature operating controls
- System status indication, visible error and alarm messaging

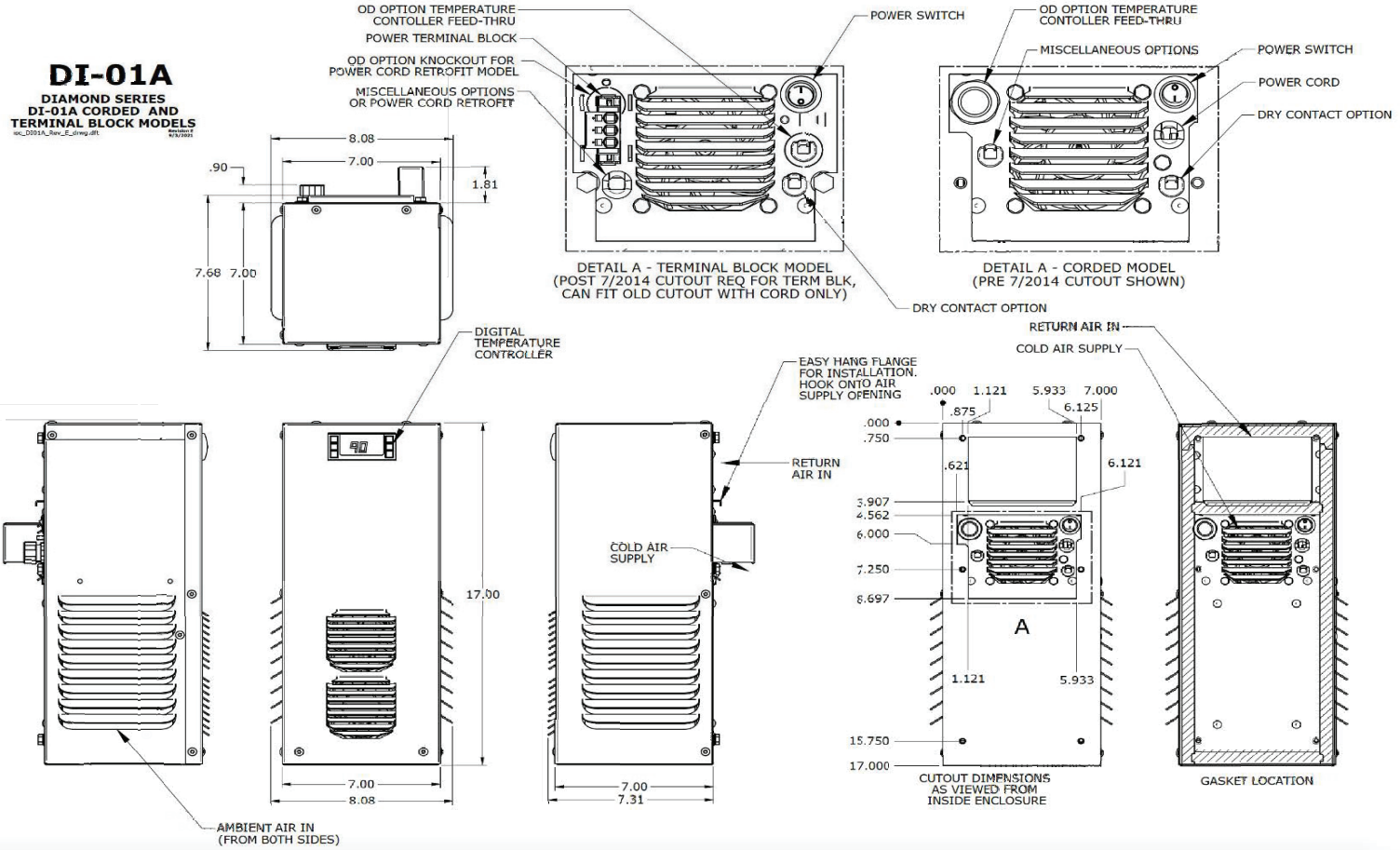
SCC Item 70

AIR-CONDITIONER, 1000BTU/Hr 120VAC 4X 316SST - ISC - CUSTOM pg. 2/2

- Total Corrosive Protection Package
- Integrated Enclosure Heater System
- Dry Contact Alarm Capabilities
- Custom Paint Colors & Designs
- Low Ambient Package
- Remote Control Option
- 316 Stainless Steel Shroud & Chassis
- Open Door Kill Switch
- Remote Temperature Probe
- Ethernet/IP Controller Output
- Mounting Plates for existing enclosures

DI-01A PERFORMANCE CURVE





HAMMOND MANUFACTURING

Quality Products. Service Excellence.

125-800 W Fan Heater with Thermostat *FLH Series*

Features

- Designed to prevent condensation or maintain minimum temperature in enclosures.
- Built in Thermostat. (-18 C to +38 C) (0 F to +100 F)
- Fan Auto/On switch with pilot light for Heat On indication
- 20 CFM airflow
- High temperature safety protection
- Aluminum alloy outer casing
- Connection via terminal block.

Part No.	Watts	Voltage	Hz	Overall Dimensions Height x Width x Depth	Ship Wt. lbs
FLHTF125A115	125 W	120 V	60	5.5" x 4.0" x 5.3"	2.2
FLHTF125A230	105/125 W	220/240 V	50/60	5.5" x 4.0" x 5.3"	2.2
FLHTF200A115	200 W	120 V	60	5.5" x 4.0" x 5.3"	2.2
FLHTF200A230	165/200 W	220/240 V	50/60	5.5" x 4.0" x 5.3"	2.2
FLHTF400A115	400 W	120 V	60	7.5" x 4.0" x 5.3"	3
FLHTF400A230	335/400 W	220/240 V	50/60	7.5" x 4.0" x 5.3"	3
FLHTF800A115	800 W	120 V	60	7.5" x 4.0" x 5.3"	3
FLHTF800A230	670/800 W	220/240 V	50/60	7.5" x 4.0" x 5.3"	3

Data subject to change without notice.

ProSoft® TECHNOLOGY

DATASHEET

Modbus Master/Slave Communication Module
MVI56E-MCM/MCMXT

The MVI56E Enhanced Modbus Master/Slave Communication Modules allow Rockwell Automation® ControlLogix® processors to easily interface with devices using the Modbus RTU/ASCII serial communications protocol.

The MVI56E-MCM and MVI56E-MCMXT act as input/output modules on the ControlLogix backplane, making Modbus data appear as I/O data to the processor. Data transfer to and from the processor is asynchronous from the communications on the Modbus network. Two independently configurable serial ports can operate on the same or different Modbus networks. Each port can be configured as a Modbus Master or Slave, sharing the same user-controlled 10,000-word database.

The two modules are functionally the same. The MVI56E-MCM is designed for standard process applications. The MVI56E-MCMXT is designed for the Logix-XT™ control platform, allowing it to operate in extreme environments. It can tolerate higher operating temperatures, and it also has a conformal coating to protect it from harsh or caustic conditions.

Features	Benefits
Backward Compatibility	♦ All MVI56E products are backward-compatible with earlier MVI56 modules allowing direct replacement without the need to change existing controller programs ♦ Enjoy Enhanced features and flexibility without incurring expensive reprogramming costs
RSLogix™ 5000 Integrated	♦ Module configuration and communication is integrated within RSLogix™ 5000 ♦ No additional programming or configuration software is required ♦ Add-On Instruction for RSLogix 5000 version 16 or higher cuts development time and costs
CIPconnect® -enabled	♦ ProSoft Configuration Builder software (PCB), with CIPconnect®, facilitates remote user access across the ControlLogix backplane through Rockwell Automation's 1756-ENBT module ♦ Configure, diagnose, and analyze process data and communications status ♦ CIPconnect can bridge through multiple ENBT/CNBT links to connect to MVI56E-MCMs installed in remote chassis for configuration and diagnostics
4-digit LED Display	♦ A scrolling display for easily-understood, plain English diagnostic and error information ♦ See critical configuration and status information without connecting to the port

Configuration

All module configuration is defined in the Sample Ladder Logic. The sample ladder is fully commented, and includes user-defined data types, ladder rungs and controller tags. For most applications, the sample ladder can be used without modification.

The MVI56E-MCM Setup Guide and sample configuration provide a quick and easy example with step-by-step instructions on how to move data through the module from the MCM network to the processor.

inRAx®

General Specifications

- Backward-compatible with previous MVI56-MCM version
- Single Slot - 1756 ControlLogix® backplane compatible
- 10/100 MB Ethernet port for network configuration and diagnostics with Auto Cable Crossover Detection
- User-definable module data memory mapping of up to 10,000 16-bit registers
- CIPconnect®-enabled network diagnostics and monitoring using ControlLogix 1756-ENxT modules and EtherNet/IP® pass-thru communications
- Sample Ladder Logic or Add-On Instruction (AOI) used for data transfers between module and processor and for module configuration
- 4-character, scrolling, alphanumeric LED display of status and diagnostic data in plain English
- ProSoft Discovery Service (PDS) software finds the module on the network and assigns a temporary IP address to facilitate module access

Functional Specifications

The MVI56E-MCM will operate on a Local or Remote rack (For remote rack applications with smaller data packet size please refer to the MVI56E-MCMR product)

- CIPconnect® enabled for module and network configuration using 1756-ENxT module with EtherNet/IP pass-through communications
- Supports Enron version of Modbus protocol for floating-point data transactions
- 4-digit LED Display for English based status and diagnostics information
- PCB includes powerful Modbus network analyzer
- Special functions (command control, event commands, status, and so on) are supported by message transfer (unscheduled) using the MSG instruction
- Error codes, network error counters, and port status data available in user data memory

Slave Specifications

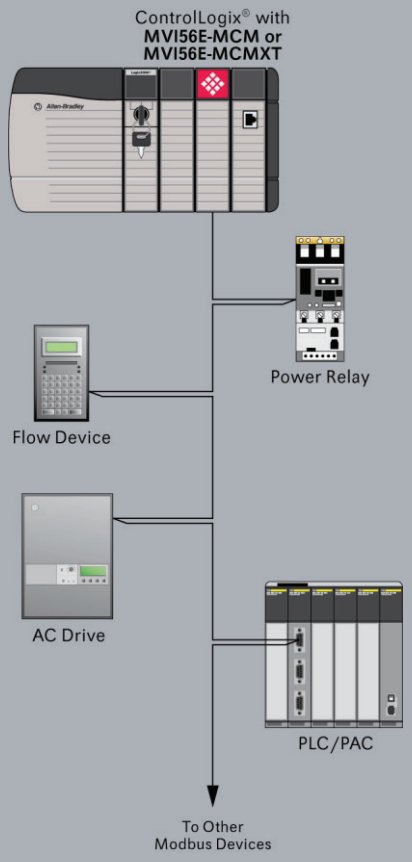
The MVI56E-MCM module accepts Modbus function code commands of 1, 2, 3, 4, 5, 6, 8, 15, 16, 17, 22, and 23 from an attached Modbus Master unit. A port configured as a Modbus Slave permits a remote Master to interact with all data contained in the module. This data can be derived from other Modbus Slave devices on the network, through a Master port, or from the ControlLogix processor.

Master Specifications

A port configured as a virtual Modbus Master device on the MVI56E-MCMR module actively issues Modbus commands to other nodes on the Modbus network. Three hundred twenty five (325) commands are supported on each port. Additionally, the Master ports have an optimized polling characteristic that polls Slaves with communication problems less frequently. The ControlLogix processor ladder logic can issues commands directly from ladder logic or actively select commands from the command list to execute under ladder logic control.

ProSoft® TECHNOLOGY

ControlLogix™ Modbus Integration



Modbus General Specifications

Communication Parameters	Baud Rate: 110 baud to 115.2 kbps Stop Bits: 1 or 2 Data Size: 7 or 8 bits Parity: None, Even, Odd RTS Timing delays: 0 to 65535 milliseconds
Modbus Modes	RTU mode (binary) with CRC-16 ASCII mode with LRC error checking
Floating Point Data	Floating point data movement supported, including configurable support for Enron and Daniel implementations
Modbus Function Codes	1: Read Coils Status 2: Read Input Status 3: Read Holding Registers 4: Read Input Registers 5: Force (Write) Single Coil 6: Preset (Write) Single Register 8: Diagnostics 15: Force (Write) Multiple Coils 16: Preset (Write) Multiple Data Registers 17: Report Slave ID 22: Mask Write 4x Register 23: Read/Write 4x Registers

Modbus Master Specifications

Command List	Up to 325 commands per Master port, each fully configurable for function code, slave address, register to/from addressing and word/bit count.
Optimized Polling	Configuration options allow Master ports and commands to be optimized to poll slaves with communication problems less frequently.
Command Status/Error Monitoring	Command Status or Error codes are generated for each command as it executes, allowing careful monitoring of communication health between the Master and its Slaves.
Slave Polling Control	Master Port maintains a Slave Status list of all network Slaves. Polling of each Slave may be disabled and enabled using this list.

Modbus Slave Specifications

Full Memory Access	A port configured as a Modbus Slave permits a remote Master to read from or write to any of the 10,000 registers that make up the user memory database.
Multi-source Slave Data	Data presented at the Slave port can be derived from other Modbus Slave devices on a different network through the module's Master port or from the processor tag database.
Node Address	1 to 247 (software selectable)
Status Data	Slave port error codes, counters and statuses are available separately for each port when configured as a Slave

Hardware Specifications

General	
Specification	**Description**
Backplane Current Load	800 mA @ 5 Vdc 3 mA @ 24 Vdc
Operating Temperature	0°C to 60°C (32°F to 140°F) - MVI56E-MCM -25°C to 70°C (-13°F to 158°F) - MVI56E-MCMXT
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Extreme/Harsh Environment	MVI56E-MCMXT comes with conformal coating
Shock	30 g operational 50 g non-operational Vibration: 5 g from 10 to 150 Hz
Relative Humidity	5% to 95% (without condensation)
LED Indicators	Battery Status (ERR) Application Status (APP) Module Status (OK)
4-Character, Scrolling, Alpha-Numeric LED Display	Shows Module, Version, IP, Port Master/Slave Setting, Port Status, and Error Information
Debug/Configuration Ethernet port (E1 - Config)	
Ethernet Port	10/100 Base-T, RJ45 Connector, for CAT5 cable Link and Activity LED indicators Auto-crossover cable detection
Serial Application ports (P1 & P2)	
Full hardware handshaking control, providing radio, modem, and multi-drop support	
Software configurable communication parameters	Baud rate: 110 baud to 115.2 kbps RS-232, 485 and 422 Parity: none, odd or even Data bits: 5, 6, 7, or 8 Stop bits: 1 or 2 RTS on/off delay: 0 to 65535 milliseconds
Serial Applications Ports (P1, P2)	RJ45 (DB-9M with supplied adapter cable) Configurable RS-232 hardware handshaking 500V Optical isolation from backplane RS-232, RS-422, RS-485 jumper-select, each port RX (Receive) and TX (Transmit) LEDs, each port
Shipped with Unit	RJ45 to DB-9M cables for each serial port 5 foot Ethernet Straight-Thru Cable (Gray)

Agency Approvals and Certifications

Agency
RoHS
ATEX
CSA
CE
CSA CB Safety
cULus
GOST-R
Lloyds

Additional Products

ProSoft Technology® offers a full complement of hardware and software solutions for a wide variety of industrial communication platforms. For a complete list of products, visit our web site at: www.prosoft-technology.com

Ordering Information

To order this product, please use the following:

Modbus Master/Slave Communication Module for ControlLogix®

MVI56E-MCM or MVI56E-MCMXT

To place an order, please contact a local ProSoft distributor.

A list of ProSoft-authorized distributors is available on our website at:

www.prosoft-technology.com.

From the main menu, select Distributors and the Country for region-specific information.

Extract from the online catalog

MINI MCR-SL-I-I

Order No.: 2864406

http://eshop.phoenixcontact.ca/phoenix/treeViewClick.do?UID=2864406

MCR 3-way isolating amplifier, for electrical isolation of analog signals, with screw connection, input signal: 0(4) mA ... 20 mA, output signal: 0(4) mA ... 20 mA

Commercial data	
Pack	1 pcs.
Customs tariff	85389091
Catalog page information	Page 357 (IF-2011)

Product notes

WEEE/RoHS-compliant since: Mar/09/2006

Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation at http://www.download.phoenixcontact.com. The General Terms and Conditions of Use apply to Internet downloads.

Product description

The 6.2 mm wide standard signal 3-way isolating amplifier MINI MCR-SL-I-I(-SP) is used for electrical isolation, amplification and filtering of standard signals.

On the input and output side, the analog standard signals 0...20 mA or 4...20 mA are available, electrically isolated.

Power (19.2 V DC to 30 V DC) can be supplied through connection terminal blocks on the modules or in conjunction with the DIN rail connector.

Technical data

Input data

Configurable/programmable	No
Current input signal	0 mA ... 20 mA
	4 mA ... 20 mA
Max. input current	50 mA
Input resistance current input	Approx. 50 Ω

Output data

Configurable/programmable	No
Current output signal	0 mA ... 20 mA
	4 mA ... 20 mA
Max. output current	28 mA
Load/output load current output	< 500 Ω (at 20 mA)

Power supply

Nominal supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (to bridge the supply voltage, the DIN rail connector (ME 6,2 TBUS-2 1,5/5-ST-3,81 GN, Order No. 2869728) can be used. It can be snapped onto a 35 mm DIN rail according to EN 60715)
Max. current consumption	< 20 mA
Power consumption	< 450 mW

Connection data

Connection method	Screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	2.5 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	2.5 mm²
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	12
Stripping length	12 mm
Screw thread	M3

General data

No. of channels	1
Width	6.2 mm

Height	93.1 mm
Depth	102.5 mm
Maximum transmission error	≤ 0.1 % (of final value)
Maximum temperature coefficient	< 0.01 %/K
Temperature coefficient, typical	< 0.002 %/K
Limit frequency (3 dB)	Approx. 100 Hz
Step response (10-90%)	Approx. 3.2 ms
Protective circuit	Transient protection
Ambient temperature (operation)	-20 °C ... 65 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Degree of protection	IP20
Electrical isolation	Basic insulation according to EN 61010
Surge voltage category	II
Pollution degree	2
Rated insulation voltage	50 V AC/DC
Test voltage, input/output/supply	1.5 kV (50 Hz, 1 min.)
Electromagnetic compatibility	Conformance with EMC Directive 2004/108/EC
Noise emission	EN 61000-6-4
Noise immunity	EN 61000-6-2:2005
Color	green
Housing material	PBT
Mounting position	Any
Assembly instructions	The DIN rail bus connector (TBUS) can be used for bridging the supply voltage. It can be snapped onto a 35 mm EN 60715 DIN rail.
Conformance	CE-compliant
ATEX	Ex II 3 G Ex nA IIC T4 Gc X
UL, USA / Canada	UL 508 Recognized
	Class I, Div. 2, Groups A, B, C, D T5
GL	GL EMC 2 D

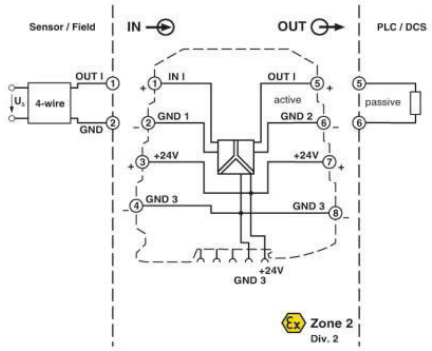
Certificates

Certification	CUL, GL, UL

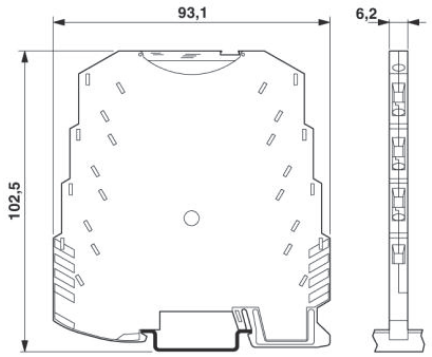
Certification Ex:	CUL-EX LIS, UL-EX LIS

Drawings

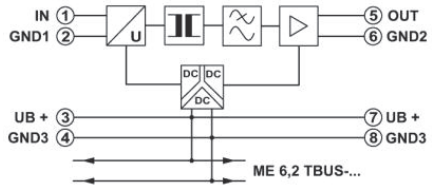
Block diagram



Dimensioned drawing



Circuit diagram



Uninterruptible power supply - QUINT4-UPS/24DC/24DC/20 - 2907071

Please be informed that the data shown in this PDF Document is generated from our Online Catalog. Please find the complete data in the user's documentation. Our General Terms of Use for Downloads are valid (http://phoenixcontact.com/download)

QUINT UPS with IQ Technology, for DIN rail mounting, input: 24 V DC, output: 24 V DC / 20 A, charging current: 5 A

Product Description

The intelligent QUINT UPS for integration into established industrial networks: your systems continue to be supplied with uninterrupted power, even in the event of a mains failure. The battery management system with IQ Technology and a powerful battery charger ensures superior system availability.

Why buy this product

- Easy integration into networks using PROFINET, EtherNet/IP, EtherCAT® and USB interfaces
- Evaluation of state of health (SOH) and state of charge (SOC), thanks to the intelligent battery management system (BMS)
- Automatic recognition of the battery capacities and technologies (VRLA-WTR, LI-ION)
- Monitoring of output current and voltage, as well as manual connection and disconnection of the system
- SFB Technology selectively trips standard miniature circuit breakers. Loads connected in parallel continue working.

RoHS

Key Commercial Data

Packing unit	1 STK
GTIN	4 055626 171272
GTIN	4055626171272

Technical data

Dimensions

Width	40 mm
Height	130 mm
Depth	125 mm
Width with alternative assembly	123 mm
Height with alternative assembly	130 mm
Depth with alternative assembly	42 mm

Ambient conditions

Degree of protection	IP20

Uninterruptible power supply - QUINT4-UPS/24DC/24DC/20 - 2907071

Technical data

Ambient conditions

Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C Derating: 2.5 %/K)
Ambient temperature (start-up type tested)	-40 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	≤ 95 % (at 25 °C, non-condensing)
Climatic class	3K3 (EN 60721)
Degree of pollution	2
Installation height	≤ 4000 m

Input data

Input voltage	24 V DC
Input voltage range	18 V DC ... 30 V DC
Electric strength, max.	35 V DC (Protected against polarity reversal)
Internal input fuse	no
Inrush surge current	≤ 8 A (≤ 4 ms)
Reverse polarity protection	yes
Fixed connect threshold	22 V DC
Switch-on time	max. 3 s
Voltage drop, input/output	0.4 V DC

Output data (general)

Short-circuit-proof	yes
No-load proof	yes
Switch-over time	0 ms
UPS connection in parallel	no
UPS connection in series	no
Energy storage device connection in parallel	Yes, 5 (observe line protection)
Energy storage device connection in series	no
Efficiency	typ. 98 %

Output data (mains operation)

Output voltage range	18 V DC ... 30 V DC (U_{OUT} = U_{IN} - 0.4 V DC)
	18 V DC ... 32 V DC
Static Boost ($I_{Stat.Boost}$)	25 A
Dynamic Boost ($I_{Dyn.Boost}$)	30 A (5 s)
Selective Fuse Breaking (I_{SFB})	120 A (15 ms)

Output data (battery operation)

Output voltage range	19 V DC ... 28 V DC (U_{OUT} = U_{BAT} - 0.4 V DC)
Static Boost ($I_{Stat.Boost}$)	25 A
Dynamic Boost ($I_{Dyn.Boost}$)	30 A (5 s)
Selective Fuse Breaking (I_{SFB})	120 A (15 ms)

Energy storage (battery)

Uninterruptible power supply - QUINT4-UPS/24DC/24DC/20 - 2907071

Technical data

Energy storage (battery)

Battery technology	VRLA, VRLA-WTR, LI-ION
End-of-charge voltage (temperature-compensated)	25 V DC ... 32 V DC
Max. capacity	135 Ah
Nominal capacity (without additional charger)	3 Ah ... 135 Ah
Charging current (configurable)	max. 5 A
Charging time	165 min. (12 Ah)
Buffer time	22 min. (12 Ah)
Temperature compensation (configurable)	42 mV/K
Charge characteristic curve	IU_0U
Temperature sensor	yes
IQ-Technology	yes

General data

Inflammability class in acc. with UL 94 (housing / terminal blocks)	V0
MTBF (IEC 61709, SN 29500)	> 1940000 h (25 °C)
	> 1157000 h (40 °C)
	> 568100 h (60 °C)
Weight	0.6 kg
Environmental protection directive	RoHS
	WEEE
	Reach

Connection data, input

Connection method	Screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	4 mm²
Single conductor/terminal point, stranded, with ferrule, min.	0.2 mm²
Single conductor/terminal point, stranded, with ferrule, max.	4 mm²
Conductor cross section AWG min.	30
Conductor cross section AWG max.	10
Stripping length	8 mm
Tightening torque, min	0.5 Nm
Tightening torque max	0.6 Nm

Connection data, output

Connection method	Screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	4 mm²

Uninterruptible power supply - QUINT4-UPS/24DC/24DC/20 - 2907071

Technical data

Connection data, output

Single conductor/terminal point, stranded, with ferrule, min.	0.2 mm²
Single conductor/terminal point, stranded, with ferrule, max.	4 mm²
Conductor cross section AWG min.	30
Conductor cross section AWG max.	10
Stripping length	8 mm
Tightening torque, min	0.5 Nm
Tightening torque max	0.6 Nm

Connection data for battery

Connection method	Screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	4 mm²
Conductor cross section AWG min.	30
Conductor cross section AWG max.	12
Stripping length	8 mm
Tightening torque, min	0.5 Nm
Tightening torque max	0.6 Nm

Connection data for signaling

Connection method	Push-in technology
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	1 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	1 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	16
Stripping length	8 mm

Standards and Regulations

Electromagnetic compatibility	Conformance with EMC Directive 2014/30/EU
Noise emission	Additional basic standard EN 61000-6-5 (immunity in power station), IEC/EN 61850-3 (energy supply)
Noise immunity	Immunity according to EN 61000-6-2 (industrial)
Standards/regulations	EN 61000-4-2
Contact discharge	4 kV (Test Level 2)
Standards/regulations	EN 61000-4-3
Frequency range	80 MHz ... 1 GHz
Test field strength	10 V/m (Test Level 3)
Frequency range	1.4 GHz ... 2 GHz
Test field strength	3 V/m (Test Level 2)
Standards/regulations	EN 61000-4-4

Uninterruptible power supply - QUINT4-UPS/24DC/24DC/20 - 2907071

Technical data

Standards and Regulations

Comments	Criterion B
Standards/regulations	EN 61000-4-6
Frequency range	0.15 MHz ... 80 MHz
Voltage	10 V (Test Level 3)
Standards/regulations	EN 61000-4-8
Low Voltage Directive	Conformance with Low Voltage Directive 2014/35/EC
Standard – Safety extra-low voltage	IEC 61010-1 (SELV)
	IEC 61010-2-201 (PELV)
UL approvals	UL/C-UL Listed UL 61010-1
	UL/C-UL Listed UL 61010-2-201
	UL/C-UL Listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D T4 (Hazardous Location)
Shock	18 ms, 30g, in each space direction (according to IEC 60068-2-27)
Vibration (operation)	2.3g
Overvoltage category (EN 61010-1)	II (≤ 4000 m)

Environmental Product Compliance

REACh SVHC	Lead 7439-92-1

Approvals

Approvals

Approvals

UL Listed / cUL Listed / EAC / cULus Listed

Ex Approvals

UL Listed / cUL Listed / cULus Listed

Approval details

UL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 123528

cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 123528

Uninterruptible power supply - QUINT4-UPS/24DC/24DC/20 - 2907071

Approvals

EAC		RU C-DE.A*30.B.01082

cULus Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm

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Flachsmarktstr. 8
32825 Blomberg
Germany
Tel. +49 5235 300
Fax +49 5235 3 41200
http://www.phoenixcontact.com

Power supply unit - TRIO-PS/1AC/24DC/5 - 2866310

DIN rail power supply unit, primary-switched mode, 1-phase, output: 24 V DC / 5 A

Product description

TRIO POWER is the DIN-rail-mountable power supply unit with basic functions. With an output voltage of 5 V DC, 12 V DC, 24 V DC, and 48 V DC and 1- and 3-phase versions with 60 W or 960 W, it is particularly suited for use in series production in mechanical engineering. The wide-range input and international certification package allow worldwide implementation.
The high MTBF of 500,000 h stands for high supply reliability. The devices can be connected in parallel to increase the capacity and redundancy. The clear LED signaling and the device connection with double terminal block for plus and minus for fast potential distribution are further advantages of this device series. A third minus terminal block simplifies the grounding on the secondary side. All power supply units are idle-proof and short-circuit-proof and provide a regulated and adjustable output voltage.

Why buy this product

- Use the third negative terminal block as a grounding terminal block and minimize installation costs
- Rugged design with metal housing and wide temperature range from -25 to +70°C
- Maximum operational reliability thanks to high MTBF (mean time between failures) of more than 500,000 hours and high dielectric strength of up to 300 V AC
- Compensation of voltage drops by means of output voltage that can be adjusted on the front

Key commercial data

Packing unit	1 pc
GTIN	4 046356 046640
Weight per Piece (excluding packing)	781.7 GRM
Custom tariff number	85044081
Country of origin	China

Technical data

Dimensions

Width	40 mm
Height	130 mm
Depth	115 mm

Input data

Power supply unit - TRIO-PS/1AC/24DC/5 - 2866310

Technical data

Input data

Nominal input voltage range	100 V AC ... 240 V AC
Input voltage range AC	85 V AC ... 264 V AC (derating < 90 V AC: 2.5% per Kelvin)
Short-term input voltage	300 V AC
AC frequency range	45 Hz ... 65 Hz
Current consumption	1.65 A (120 V AC)
Current consumption	0.9 A (230 V AC)
Inrush surge current	< 15 A
Power failure bypass	> 20 ms (120 V AC)
Power failure bypass	> 110 ms (230 V AC)
Input fuse	3.15 A (slow-blow, internal)
Power factor (cos phi)	0.72
Type of protection	Transient surge protection
Protective circuit/component	Varistor

Output data

Nominal output voltage	24 V DC ±1%
Setting range of the output voltage	22.5 V DC ... 29.5 V DC (> 24 V constant capacity)
Output current	5 A (-25°C ... 55°C)
Derating	55 °C ... 70 °C (2.5%/K)
Connection in parallel	Yes, for redundancy and increased capacity
Connection in series	Yes
Max. capacitive load	Unlimited
Current limitation	Approx. 10 A (for short-circuit)
Control deviation	< 1 % (change in load, static 10% ... 90%)
Control deviation	< 2 % (change in load, dynamic 10% ... 90%)
Control deviation	< 0.1 % (change in input voltage ±10%)
Residual ripple	< 20 mV_{PP}
Peak switching voltages nominal load	< 30 mV_{PP}
Maximum power dissipation NO-Load	1.1 W
Power loss nominal load max.	18 W

General data

Net weight	0.6 kg
Operating voltage display	Green LED
Efficiency	> 89 % (for 230 V AC and nominal values)
Insulation voltage input/output	4 kV AC (type test)
Insulation voltage input/output	2 kV AC (routine test)
Degree of protection	IP20
Protection class	I, with PE connection
MTBF (IEC 61709, SN 29500)	> 2031000 h (According to EN 29500)
Ambient temperature (operation)	-25 °C ... 70 °C (> 55° C derating)
Ambient temperature (storage/transport)	-40 °C ... 85 °C

Power supply unit - TRIO-PS/1AC/24DC/5 - 2866310

Technical data

General data

Max. permissible relative humidity (operation)	95 % (at 25 °C, no condensation)
Mounting position	horizontal DIN rail NS 35, EN 60715
Assembly instructions	Can be aligned: Horizontally 0 mm, vertically 50 mm
Electromagnetic compatibility	Conformance with EMC Directive 2004/108/EC
Noise immunity	EN 61000-6-2:2005
Low Voltage Directive	Conformance with LV directive 2006/95/EC
Standard – Electrical equipment of machines	EN 60204
Standard - Electrical safety	EN 60950-1/VDE 0805 (SELV)
Shipbuilding approval	Germanischer Lloyd (EMC 2)
Standard – Electronic equipment for use in electrical power installations and their assembly into electrical power installations	EN 50178/VDE 0160 (PELV)
Standard – Safety extra-low voltage	EN 60950-1 (SELV)
Standard – Safety extra-low voltage	EN 60204 (PELV)
Standard - Safe isolation	DIN VDE 0100-410
Standard - Safe isolation	DIN VDE 0106-1010
Standard – Protection against electric shock	DIN 57100-410
Standard – Protection against shock currents, basic requirements for protective separation in electrical equipment	DIN VDE 0106-101
Standard – Limitation of mains harmonic currents	EN 61000-3-2
UL approvals	UL/C-UL listed UL 508
UL approvals	UL/C-UL Recognized UL 60950
Surge voltage category	III

Connection data, input

Connection method	Screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	2.5 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	2.5 mm²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	14
Stripping length	9 mm
Screw thread	M2,5

Connection data, output

Connection method	Screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	2.5 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	2.5 mm²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	14

Power supply unit - TRIO-PS/1AC/24DC/5 - 2866310

Technical data

Connection data, output

Stripping length	9 mm

Signaling

Status display	"DC OK" LED green
Note on status display	U_{OUT} > 21.5 V: LED lights up

Classifications

eCl@ss

eCl@ss 4.0	27040702
eCl@ss 4.1	27040702
eCl@ss 5.0	27049002
eCl@ss 5.1	27049002
eCl@ss 6.0	27049002
eCl@ss 7.0	27049002
eCl@ss 8.0	27049002

ETIM

ETIM 2.0	EC001039
ETIM 3.0	EC001039
ETIM 4.0	EC000599
ETIM 5.0	EC002540

UNSPSC

UNSPSC 6.01	30211502
UNSPSC 7.0901	39121004
UNSPSC 11	39121004
UNSPSC 12.01	39121004
UNSPSC 13.2	39121004

Approvals

Approvals

Approvals

UL Recognized / UL Listed / cUL Recognized / cUL Listed / GL / cULus Recognized / cULus Listed

Ex Approvals

Approvals submitted

Power supply unit - TRIO-PS/1AC/24DC/5 - 2866310

Approvals

Approval details

UL Recognized

UL Listed

cUL Recognized

cUL Listed

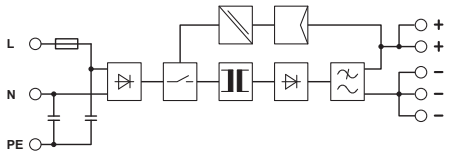
GL

cULus Recognized

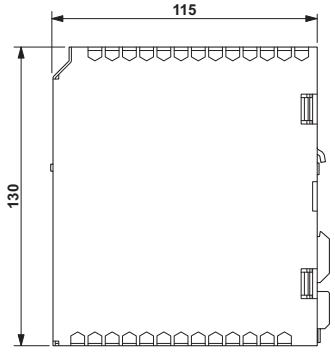
cULus Listed

Drawings

Block diagram



Dimensioned drawing



SU201M-C15

SCC Item 28
Breaker, 15A 1P AC/DC C ABB - ABB SU201M-C15 - Page 1/3

General Information

Extended Product Type:	SU201M-C15
Product ID:	2CDS271337R0154
EAN:	4016779930864
Catalog Description:	Miniature Circuit Breaker - SU200M - 1P - C
Long Description:	SU201M-C15 Miniature Circuit Breaker C-Char., 10kA, 15A, 1P UL489

Additional Information

Actuator Material:	Insulation Group II, Black, Sealable
Ambient Air Temperature:	Operation -25 ... +55 °C Storage -40 ... +70 °C
Built-In Depth (t_2):	69 mm
Connecting Capacity:	Busbar 10 / 10 mm² Flexible with Ferrule 0.75 ... 25 mm² Flexible 0.75 ... 25 mm² Rigid 0.75 ... 35 mm² Stranded 0.75 ... 35 mm²
Connecting Capacity UL/CSA:	Busbar 18-8 AWG Conductor 18-4 AWG
Contact Position Indication:	Red ON / Green OFF
Country of Origin:	Bulgaria (BG)
Customs Tariff Number:	85362010
Data Sheet, Technical Information:	2CDC002177D0202
Declaration of Conformity - CE:	2CDK400595D2702
Degree of Protection:	IP20
EAN:	4016779930864
EPLAN Catalog Tree:	Electrical engineering / Protection devices / General
EPLAN Function Definition:	Circuit breaker / Single circuit breaker / Circuit breaker 1_2
ETIM 5:	EC000042 - Miniature circuit breaker (MCB)
ETIM 6:	EC000042 - Miniature circuit breaker (MCB)
Environmental Conditions:	28 cycles with 55 °C / 90-96 % and 25 °C / 95-100 %
Housing Material:	Insulation Group I, RAL 7035
Installation Size:	acc. to DIN 43880 3
Instructions and Manuals:	2CDC002177D0202
Interrupting Rating acc. to UL1077:	(277 V AC) 10 kA
Invoice Description:	SU201M-C15 Miniature Circuit Breaker C-Char., 10kA, 15A, 1P
Maximum Operating Voltage UL/CSA:	277 V AC 48 V DC
Mechanical Endurance:	20000 cycle
Minimum Order Quantity:	1 piece
Mounting Position:	Any
Mounting on DIN Rail:	TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715 TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715
Number of Poles:	1
Number of Protected Poles:	1
Overvoltage Category:	III

Package Level 1 Gross Weight:	1.3 kg
Package Level 1 Height:	82 mm
Package Level 1 Length:	191 mm
Package Level 1 Units:	10 piece
Package Level 1 Width:	121 mm
Package Level 2 EAN:	4016779937689
Package Level 2 Gross Weight:	16 kg
Package Level 2 Height:	210 mm
Package Level 2 Length:	395 mm
Package Level 2 Units:	72 piece
Package Level 2 Width:	35 mm
Pole Net Weight:	0.125 kg
Pollution Degree:	3
Power Loss:	2,4 W at Rated Operating Conditions per Pole 2,4 W
Power Supply Connection:	Arbitrary
Product Main Type:	SU200M
Product Name:	Miniature Circuit Breaker
Product Net Depth:	69 mm
Product Net Height:	111 mm
Product Net Weight:	0.125 kg
Product Net Width:	17.5 mm
Rated Current (I_n):	15 A
Rated Frequency (f):	50 Hz 60 Hz DC Hz
Rated Insulation Voltage (U_i):	acc. to IEC/EN 60664-1 440 V
Rated Operational Voltage:	acc. to IEC 60947-2 230 V AC
Rated Service Short-Circuit Breaking Capacity (I_{cs}):	(230 V AC) 11.3 kA
Rated Ultimate Short-Circuit Breaking Capacity (I_{cu}):	(230 V AC) 15 kA
Recommended Screw Driver:	Pozidriv 2
Remarks:	IP40 in enclosure with cover
Resistance to Shock acc. to IEC 60068-2-27:	25g / 2 shocks / 13 ms
Resistance to Vibrations acc. to IEC 60068-2-6:	5g, 20 cycles at 5 ... 150 ... 5 Hz with load 0.8 In
RoHS Information:	2CDK400596D0201
RoHS Status:	Following EU Directive 2002/95/EC August 18, 2005 and amendment
Screw Terminal Type:	Failsafe Bi-directional Cylinder-lift Terminal
Selling Unit of Measure:	piece
Standards:	CSA 22.2 No. 5 IEC/EN 60947-2 UL 489
Terminal Type:	Screw Terminals
Tightening Torque:	2.8 N·m
Tripping Characteristic:	C
UNSPSC:	39121614
Width in Number of Modular Spacings:	1

eClass:	7.0 27141901
Accessories Available:	Yes
Interrupting Rating acc. to UL489:	(277 V AC) 10 kA (48 V DC) 10 kA

PRODUCT-DETAILS

DBL125

DBL125 Screw Clamp Power distribution Terminal Blocks

General Information

Extended Product Type	DBL125
Product ID	1SNL312510R0000
EAN	3472599856585
Catalog Description	DBL125 Screw Clamp Power distribution Terminal Blocks
Long Description	- 8 connections: distribute unipolar and multipolar power lines, or combine several inputs - Mount it on Din rail or plate and save up to 50% rail space compared to conventional copper bars - Reduce the assembly time by 80% by avoiding to use fastening and isolating components - Increase the number of outputs by using the optional input and connecting two DBL together - Easy identification with the reversible cover and delivered pre-printed markers L1, L2, L3, N, PE, +, –.

Ordering

Color	Grey
Minimum Order Quantity	1 piece
Customs Tariff Number	85369010

Popular Downloads

Data Sheet, Technical Information	1SNC166013D0201
Instructions and Manuals	1SNC166001B0201

Dimensions

Product Net Width	28.2 mm
Product Net Height	75 mm
Product Net Depth / Length	50.7 mm
Product Net Weight	122 g

Technical

Rated Cross-Section	35 mm²
Spacing	28.2 mm
Connection Type	Screw Clamp
Function	Feed-through
Number of Levels	1
Connecting Capacity Main Circuit	Screw Clamp / Rigid 1x 10 ... 35 mm²
Rated Current (I_n)	Main Circuit 125 A
Rated Short-time Withstand Current (I_{cw})	for 1 s 4200 A
Rated Impulse Withstand Voltage (U_{imp})	8000 V
Dielectric Test Voltage	2200 V
Pollution Degree	3
Power Loss	4 W
Degree of Protection	acc. to IEC 60529, IEC 60947-1, EN 60529 Main Terminals IP20
Insulation Material	Polyamide
Mounting on DIN Rail	TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715 TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715
Tightening Torque	Main Circuit 3.5 ... 5 N·m

Technical UL/CSA

Maximum Operating Voltage UL/CSA	Main Circuit 1000 V
Connecting Capacity UL/CSA	Stranded 2 AWG
Flammability According to UL94	V-0
Short-Circuit Current Rating (SCCR)	100 kA

Environmental

Ambient Air Temperature	Operation -55 ... +110 °C Storage -55 ... +110 °C
RoHS Status	Following EU Directive 2002/95/EC August 18, 2005 and amendment

Certificates and Declarations (Document Number)

BV Certificate	1SND166008A0200
CB Certificate	1SND166005A0201
CSA Certificate	1SND166007A0201
cUL Certificate	1SND166006A0201
Declaration of Conformity - CE	1SND225005U1000
EAC Certificate	1SND161011A1100
Environmental Information	1SND220095E1000
Instructions and Manuals	1SNC166001B0201
RoHS Information	1SND230557F0201

Classifications

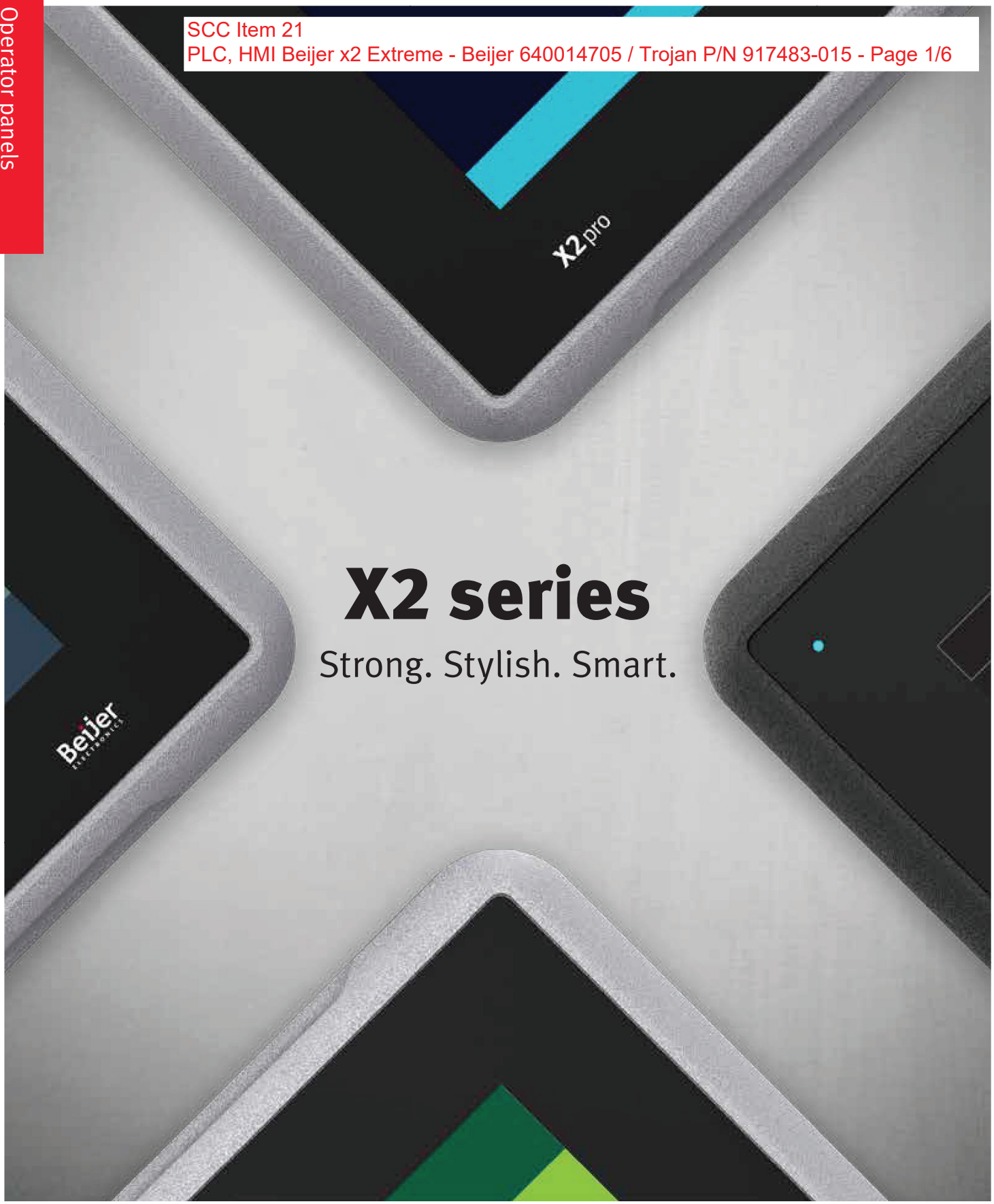
Object Classification Code	X
ETIM 4	EC000276 - Distribution terminal block
ETIM 5	EC000276 - Distribution terminal block
ETIM 6	EC000276 - Distribution terminal block

Container Information

Package Level 1 Units	1 piece
Package Level 1 Width	57 mm
Package Level 1 Depth / Length	95 mm
Package Level 1 Height	37 mm
Package Level 1 Gross Weight	0.14 kg
Package Level 1 EAN	3472599856585
Package Level 2 Units	75 piece
Package Level 2 Width	230 mm
Package Level 2 Depth / Length	380 mm
Package Level 2 Height	310 mm
Package Level 2 Gross Weight	10.5 kg

Categories

Low Voltage Products and Systems → Connection Devices → Terminal Blocks → SNK Series



X2 series

Strong. Stylish. Smart.

Beijer
ELECTRONICS

X2 series

Strong. Stylish. Smart.

The X2 series is the next generation of HMIs from Beijer Electronics. Six product families combine great design with strong performance to power your HMI solutions. Create smart integrated solutions boosted by iX HMI software and WARP Engineering Studio.

2 YEAR WARRANTY

We offer a two-year standard warranty for all operator panels in the X2 series.

One family, one great design

X2 panels offer a slim, modern design. Consistent across the entire range, adding visual quality to your solution.

All the performance you need

Power-efficient ARM9 processors all the way up to the latest quad core ARM Cortex-A9 processors deliver fast program execution and screen change. It gives you all the performance you need.

Robust reliability

The robust die cast aluminum body offers great resistance to mechanical stress. We've redesigned the electronics and made other improvements to further enhance solid operation.

Prepared for any environment

X2 panels operate in wide temperature ranges. They offer strong ingress protection and in addition, they hold all the certificates you need to perform in the field.

Integrated CODESYS control

The X2 series offer integrated CODESYS IEC 61131-3 PLC functionality directly in the panel by multicore processors for fast, safe program execution.

A simple path forward

It's easy to upgrade your existing iX HMI solution to the X2 series.

X2 extreme

Rugged HMIs for tough environments

X2 extreme panels are certified by all major classification societies. Designed to perform in rugged marine environments and in hazardous areas where gases, vapors and dust are present. Extended environmental capabilities include operating temperatures from -30°C to +70°C, high vibrations and high-pressure wash-downs. X2 extreme panels are available with optional high brightness display, integrated CODESYS PLC functionality and in a fully sealed version.

X2 extreme panels are available in 7, 12 and 15 inches, all in 3 versions. A standard version, a high performance version with high brightness display and integrated CODESYS PLC functionality, and a fully sealed version.

See page 28-29 for technical data.

Features X2 extreme

Wide screen format
X2 panels offer wide screen format, designed to succeed the traditional 4:3 square aspect ratio.

UL, CE, FCC and KCC certificates
The entire X2 range offers a strong standard certification with UL, CE, FCC and KCC certificates.

iX software – why you'll love our hardware
The iX software gives you smart communication tools. iX combines top-class vector graphics and easy-to-use functions that provide reliable operation, and almost limitless connectivity to your other equipment.

Fast forward engineering with WARP
Create integrated HMI, control, drives and data communication solutions with WARP Engineering Studio. WARP automatically configures all hardware, software and communication in your application.

Non-branded front
For customers requesting a non-branded HMI solution we offer X2 panels without the family name and Beijer Electronics logo on the front.

Powerful ARM Cortex-A9 processor
Powerful dual or quad core ARM Cortex-A9 processor delivers fast screen changes and program execution in demanding applications.

Robust aluminum housing
Robust aluminum housing with IP66, NEMA 4X/12 and UL Type 4X/12 front. Resistant to direct rain, snow or high-pressure wash-downs, dirt, grime and dust.

Extreme operating temperature -30°C to +70°C
Extreme -30°C to +70° C operating temperature range guarantees trouble-free use in the harshest environments.

Marine certifications
The X2 panels meet extended classes of marine certifications not normally carried by HMIs, making them suitable for all onboard locations.

Integrated CiX CAN bus
It's easy to interface with controllers using the integrated CiX bus.

SD memory card
Card holder and USB connection are located behind the lid on the back of the panel for smart memory expansion, project backup and application loading.

Dimmable backlight
Comfortable and safe operation in high and low ambient light conditions. Backlight is continuously dimmable to less than one cd/m².

High brightness display
The high performance version features 1,000 cd/m² backlight providing excellent readability in high ambient light levels such as sunlight.

Add control by CODESYS
The high performance version offers integrated CODESYS IEC 61131-3 PLC functionality running on dedicated CPU cores for safe and fast program execution. Just add remote I/Os for a scalable, cost-effective solution.

Certified for hazardous environments
Certified for use in hazardous areas where gases, vapors and dust are present.

Internal isolation
Internal isolation conforms to marine standards for both burst and surge immunity.

High vibration
Panels are tested to 4 g RMS sweep sine for vibration and 40 g 11 ms half sine for shock.

Extensive testing
We perform extensive testing to ensure our panels meet high environmental standards and guarantee reliable operation in challenging environments.

Fully sealed version
A fully sealed version for all sizes holds IP66, NEMA 4X/12 and UL Type 4X/12 ingress protection rating for the entire product. Equipped with M12 connectors, X2 extreme conforms to ATEX Zone 2 and ATEX Zone 22 certification.

X2 extreme is scheduled for release in mid 2017. Please refer to www.beijerelectronics.com for our current range of rugged HMIs.

iX software – why you'll love our hardware

The iX software gives you smart communication tools. It combines top-class vector graphics and easy-to-use functions that provide reliable operation, and almost limitless connectivity to your other equipment.

Efficient workflow

Speed up engineering in an intuitive development environment filled with shortcuts. Pre-styled objects, a customizable workspace, a component library and a smart property grid are some of the features that'll boost your workflow. Share your customized objects and advanced script modules with colleagues.

Complete HMI functionality

It's easy to get your application up and running. All essential functions you need are included such as data logging, recipes, alarms, trends and audit trail. Take advantage of ready-made objects with built-in functionality, vector-based symbols and graphics that can be easily inserted into the screen.

Functionality for advanced users

iX has support for .NET technology, providing options to design specialized functionality. Use C# scripting or .NET components. Take advantage of third party objects and import .NET assemblies to extend the functionality further. Control and exchange data with multiple controllers and enjoy connectivity via SQL, FTP, OPC and web.

Connect to all automation brands

An extensive driver list enables communication with hundreds of unique PLCs and automation equipment from all major manufacturers. Share information easily between users and have safe control of complex systems, even over long distances. Transfer files and control panels remotely with FTP and VNC servers.

Beijer · CAN · Allen-Bradley · Schneider Electric · BECKHOFF · Mitsubishi Electric · ABB · SIEMENS · IDEC · OMRON · EMERSON · Eurotherm · Modbus · EtherNet/IP · EtherCAT

Download iX HMI software
Go to smartstore.beijerelectronics.com and try out the free demo version of iX.

Fast forward engineering

Create integrated HMI, control, drives and data communication solutions with WARP Engineering Studio. WARP automatically configures all hardware, software and communication in your application. What used to take days to set up, can be up and running in a few minutes.

Features

- Seamless integration of Beijer Electronics products
- Structured and integrated workflow with drag & drop
- Auto-configuration of all hardware, software and communication settings
- Simply draw lines to interconnect devices
- Avoid mistakes and work failsafe with auto-resolve
- Access all individual application program editors automatically
- Smart objects with embedded functionality such as PLC code or HMI screens
- Easy distribution, backup and recovery of projects
- Shortcuts to important documentation
- Generate bill of material for simplified purchase

Save time with smart objects

A great feature of WARP Engineering Studio is the introduction of smart objects. A smart object includes ready-made, embedded functionality such as PLC code, HMI screens, etc. Drag a smart object into your workspace and just drop it on a device. All embedded code is then injected into the targeted devices. Smart and time-saving.

Industrial apps in Smart Store

The future of automation engineering is object-oriented, visual and user-community based. With the introduction of our Smart Store, you will find a growing multitude of industrial apps – smart objects, software and software updates that you can download and use immediately.

Download WARP Engineering Studio
Go to smartstore.beijerelectronics.com and try out the full version of WARP Engineering Studio for free.

Technical data - X2 extreme

SCC Item 21
PLC, HMI Beijer x2 Extreme - Beijer 640014705 / Trojan P/N 917483-015 - Page 5/6

	X2 extreme 7 / X2 extreme 7 HP
General description	
Part number	TBD
Certifications	
General	CE, FCC, KCC TBD
Marine	DNV, KR, GL, LR, ABS, CCS TBD
UL	UL 61010/Class I Div 2, ATEX Zone 2, IECEx Zone 2, Zone 22
Mechanical	
Mechanical size	204 × 143 × 50 mm (estimated)
Touch type	Resistive
Cut-out size	189 × 128 mm (estimated)
Weight	1 kg (estimated)
Housing material	Powder-coated aluminum
Power	
Input voltage	24 VDC (18 to 32 VDC) or 12 VDC (9 to 16 VDC) (HP: 24 VDC (18 to 32 VDC))
Power consumption	TBD
Input fuse	Internal DC fuse
System	
CPU	i.MX6 version TBD
RAM	TBD
FLASH	TBD
Display	
Size diagonal	7" diagonal
Resolution	800 × 480 pixels
Backlight	LED Backlight
Backlight life time	TBD
Backlight brightness	TBD (HP: >= 1000 cd/m² TBD)
Backlight dimming	TBD (HP: Marine)
Display type	TFT-LCD with LED backlight
Display pixel error	Class I (ISO9241-307)
Softcontrol	
Codesys runtime version	- (HP: 3.5)
Codesys EtherCAT	- (HP: Yes)
Codesys Modbus Ethernet	- (HP: Yes)
Codesys Modbus RTU	- (HP: Yes)
Communication serial	
Number of serial ports	2
Serial port 1	TBD
Serial port 2	TBD
Serial port 3	-
Ethernet communication	
Number of ethernet ports	2
Ethernet port 1	1 × 10/100 Base-T (shielded RJ45)
Ethernet port 2	1 × 10/100 Base-T (shielded RJ45)
Expansion interface	
Expansion port	No, however has integrated CAN Bus
SD card	SD and SDHC
USB	2 × USB 2.0 500mA
Environmental	
Operating temperature	-30°C to +70°C
Storage temperature	-40°C to +80°C
Shock	40g, half-sine, 11ms
Vibration	4g
Sealing front	IP66, NEMA 4X/12 and UL Type 4X/12
Sealing back	IP20
Humidity	5% – 85% non-condensed

TBD: To be determined
Preliminary data – X2 extreme is scheduled for release in mid 2017.

X2 extreme 12 / X2 extreme 12 HP	X2 extreme 15 / X2 extreme 15 HP
TBD	
CE, FCC, KCC TBD	
DNV, KR, GL, LR, ABS, CCS TBD	
UL 61010/Class I Div 2, ATEX Zone 2, IECEx Zone 2, Zone 22	
340 × 242 × 57mm (estimated)	410 × 286 × 61mm (estimated)
Resistive	
324 × 226 mm (estimated)	394 × 270 mm (estimated)
2.6 kg (estimated)	3.8 kg (estimated)
Powder-coated aluminum	
24 V DC (18 to 32 VDC)	
TBD	
Internal DC fuse	
i.MX6 version TBD	
TBD	
TBD	
12.1" diagonal	15.4" diagonal
1280 × 800 pixels	
LED Backlight	
TBD	
TBD (HP: >= 1000 cd/m² TBD)	
TBD	
TFT-LCD with LED backlight	
Class I (ISO9241-307)	
- (HP: 3.5)	
- (HP: Yes)	
- (HP: Yes)	
- (HP: Yes)	
2	
TBD	
TBD	
-	
2	
1 × 10/100 Base-T (shielded RJ45)	
1 × 10/100 Base-T (shielded RJ45)	
No, however has integrated CAN Bus	
SD and SDHC	
2xUSB 2.0 500mA	
-30°C to +70°C	
-40°C to +80°C	
40g, half-sine, 11ms	
4g	
IP66, NEMA 4X/12 and UL Type 4X/12	
IP20	
5% – 85% non-condensed	

TBD: To be determined
Preliminary data – X2 extreme is scheduled for release in mid 2017.

A simple path forward

It's easy to upgrade your existing iX HMI solution

Hardware upgrade to X2 series

Use the migration tables to find the right panel when you want to upgrade your existing iX HMI solution to the X2 panel series.

From iX HMI Industrial to X2 pro

iX HMI panel	X2 panel	Comment
iX T4A	X2 pro 4	-
iX T7A	X2 pro 7	-
iX T10A	X2 pro 10	Different cut-out size
iX T7B	X2 pro 7	-
iX T12B	X2 pro 12	-
iX T15B	X2 pro 15	-
-	X2 pro 21	-

From iX HMI Marine to X2 marine

iX HMI panel	X2 panel	Comment
iX T7AM	X2 marine 7	-
-	X2 marine 7 HB	-
-	X2 marine 7 SC	New 7-inch panel with integrated control
-	X2 marine 7 HB SC	New 7-inch panel with integrated control and high brightness display
iX T15BM	X2 marine 15	-
iX T15BM-HB	X2 marine 15 HB	-
-	X2 marine 15 SC	New 15-inch panel with integrated control
-	X2 marine 15 HB SC	New 15-inch panel with integrated control and high brightness display

From iX HMI SoftControl to X2 control

iX HMI panel	X2 panel	Comment
iX T4A-SC	X2 control 4	-
iX T7A-SC	X2 control 7	-
iX T10A-SC	X2 control 10	Different cut-out size
iX T7B-SC	X2 control 7	-
iX T12B-SC	X2 control 12	-
iX T15B-SC	X2 control 15	-

From iX HMI SoftMotion to X2 motion

iX HMI panel	X2 panel	Comment
-	X2 motion 4	New 4-inch panel with integrated motion and control
iX T7B-SM	X2 motion 7	-
-	X2 motion 10	New 10-inch panel with integrated motion and control
iX T12B-SM	X2 motion 12	-
iX T15B-SM	X2 motion 15	-
-	-	-

From iX HMI TxF-2 series to X2 base

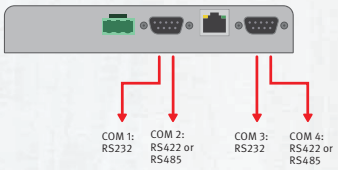
iX HMI panel	X2 panel	Comment
iX T5F-2	X2 base 5	-
iX T7F-2	X2 base 7	-
iX T10F-2	X2 base 10	-

iX application upgrade

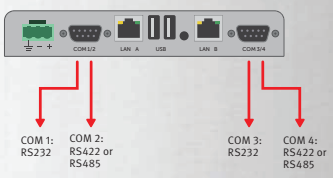
X2 panels are software compatible with iX 2.20 SP2 and forwards. Watch the video on www.beijerelectronics.com/X2 to see how easily you update an existing iX application to an X2 panel.

Serial port layout

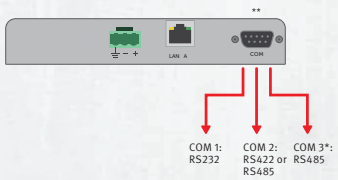
TxA



TxB

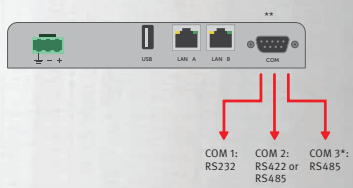


X2 pro 4 and X2 pro 7



** COM3 can only be used if COM2 is RS485*

X2 pro 10, X2 pro 12 and X2 pro 15



** COM3 can only be used if COM2 is RS485*

*** CAB150 splitter cable provides the connectivity for the three serial ports.*

If you use COM3 for RS232 in TxA or TxB:
- Change to COM 1

If you use 2 × RS485:
- Change COM4 to COM3
- COM 2 needs to be RS485

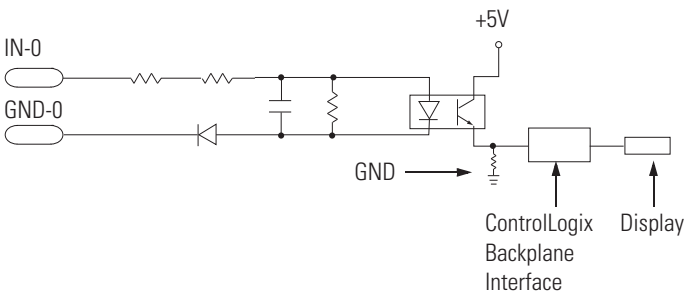
OPC DA communication

- OPC DA communication is not supported in X2 platform
- Change to OPC UA instead

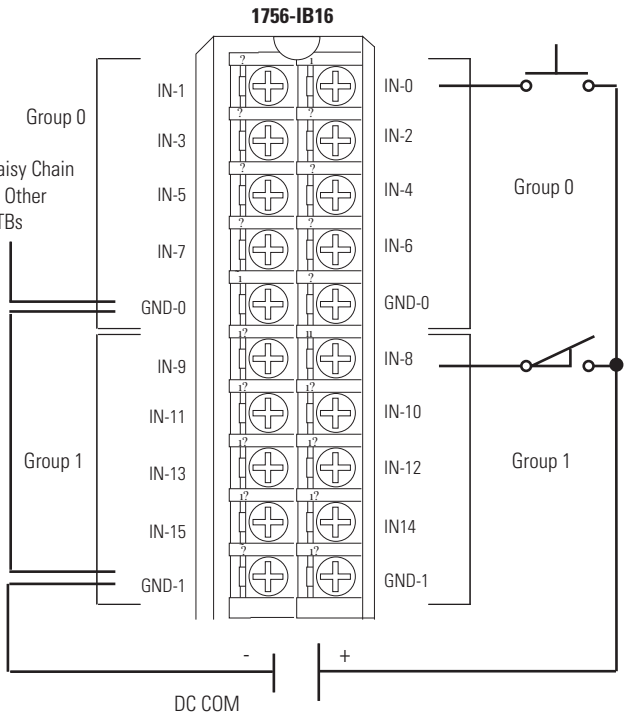
1756-IB16

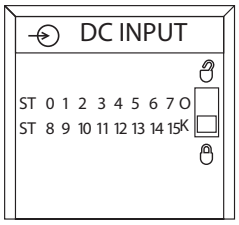
ControlLogix DC (10...31.2V) input module

Simplified Schematic



1756-IB16





Attribute	1756-IB16
Inputs	16 (8 points/group)
Voltage category	12/24V DC sink
Operating voltage range	10...31.2V DC
Input voltage, nom	24V DC
Input delay time OFF to ON ON to OFF	 Hardware delay: 290 µs nom/1 ms max + filter time User-selectable filter time: 0, 1, or 2 ms Hardware delay: 700 µs nom/2 ms max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	100 mA
Current draw @ 24V	2 mA
Power dissipation, max	5.1 W @ 60 °C (140 °F)
Thermal dissipation	17.39 BTU/hr
Off-state voltage, max	5V
Off-state current, max	1.5 mA
On-state current, min	2 mA @ 10V DC
On-state current, max	10 mA @ 31.2V DC

Attribute	1756-IB16
Inrush current, max	250 mA peak (decaying to < 37% in 22 ms, without activation)
Input impedance, max	3.12 kΩ @ 31.2V DC
Cyclic update time	200 μs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T3C
IEC temperature code	T3
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Attribute	1756-IB16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports

Attribute	1756-IB16
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10Vrms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certification[1]	1756-IB16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T3 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Extract from the online catalog

FLKM 14-PA-AB/1756/IN/EXTC

Order No.: 2302874

The illustration shows the version FLKM 50-PA-AB/1756/IN/EXTC

http://eshop.phoenixcontact.ca/phoenix/treeViewClick.do?UID=2302874

VARIOFACE front adapter, for Allen Bradley ControlLogix and Honeywell PlantScape, input card IA 16, IB 16, IC 16, IN 16.The front adapters are pushed into the high 1756-TBE hoods (not supplied as standard).

Commercial data	
EAN	4 017918 917531
Pack	1 pcs.
Customs tariff	85369010
Catalog page information	Page 207 (IF-2011)

Product notes

WEEE/RoHS-compliant since: Jul/11/2006

Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation at http://www.download.phoenixcontact.com. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General

Nominal voltage U_N	< 50 V AC
	60 V DC
Channels which can be connected	16
Connection type, plug connector	IDC/FLK pin strip (2.54 mm)

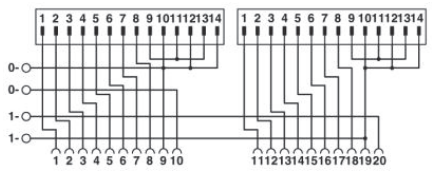
Number of plug connectors	2
No. of positions, plug connector	14
Number of positions	14
Ambient temperature (operation)	-20 °C ... 50 °C
Ambient temperature (storage/transport)	-20 °C ... 70 °C
Mounting position	Any
Standards/regulations	IEC 60664
	DIN EN 50178
	IEC 62103
Max. permissible current	1 A (per path)
Pollution degree	2
Surge voltage category	II
Supported controller	ALLEN-BRADLEY ControlLogix
Supported I/O card	1756-IN16
	1756-IA16
	1756-IB16
	1756-IC16
Supported controller	HONEYWELL PlantScape
Supported I/O card	TC-IDA 161

Certificates

Certification	CUL, UL

Drawings

Circuit diagram

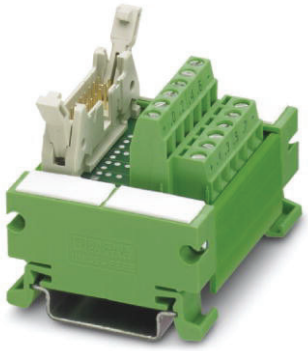


Connection scheme: FLKM 14-PA-AB/1756/IN/EXTC

Extract from the online catalog

UM 45-FLK14/PLC

Order No.: 2962476



http://eshop.phoenixcontact.ca/phoenix/treeViewClick.do?UID=2962476

VARIOFACE COMPACT LINE, interface module for 8 channels, for assembly on DIN rail NS 35/7.5, screw connection

Product notes

WEEE/RoHS-compliant since: Jul/14/2006

Commercial data	
EAN	4 017918 087173
Pack	1 pcs.
Customs tariff	85369010
Catalog page information	Page 199 (IF-2007)

Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation at http://www.download.phoenixcontact.com. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General data

Nominal voltage U_N	25 V AC (50 V DC)
Max. current carrying capacity per branch	1 A
Max. total current of voltage supply	3 A
Number of positions	14
Width	59 mm

Height	45 mm
Depth	50 mm
Ambient temperature (operation)	-20 °C ... 50 °C
Ambient temperature (storage/transport)	-20 °C ... 70 °C
Test voltage	500 V (50 Hz, 1 min.)
Mounting position	Any
Standards/regulations	IEC 60664
	DIN EN 50178
Pollution degree	2
Surge voltage category	II

Connection data for connection 1

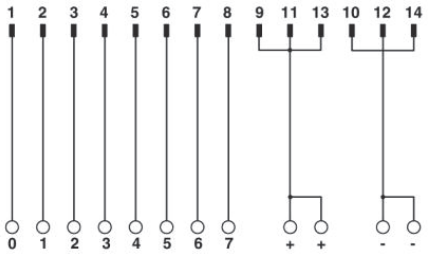
Connection name	Field level
Connection method	Screw connection
Conductor cross section solid min.	0.14 mm²
Conductor cross section solid max.	1.5 mm²
Conductor cross section stranded min.	0.14 mm²
Conductor cross section stranded max.	1.5 mm²
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	14
Stripping length	6 mm
Screw thread	M3

Certificates

Certification	CUL, GOST, UL

Drawings

Circuit diagram

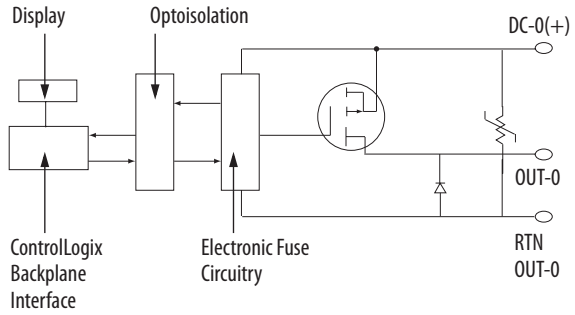


UM 45-FLK14/PLC connection scheme

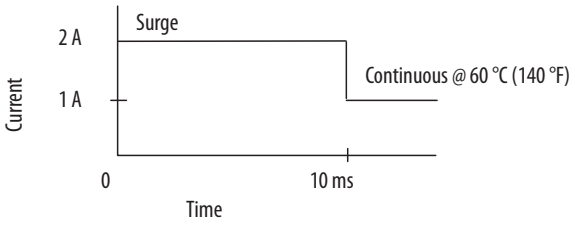
1756-OB16E

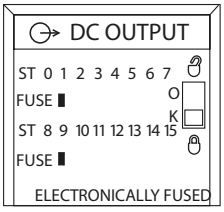
ControlLogix DC (10...31.2V) electronically-fused output module

Simplified Schematic



Surge Current Chart





1756-OB16E

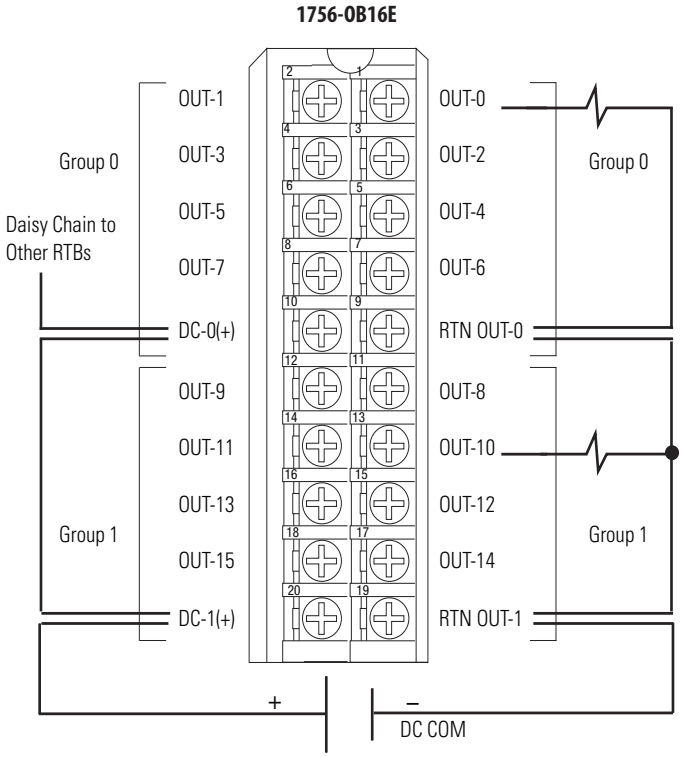


Table 128 - Technical Specifications - 1756-OB16E

Attribute	1756-OB16E
Outputs	16 electronically fused (8 points/group)
Voltage category	12/24V DC source
Operating voltage range	10…31.2V DC
Output delay time Off to On On to Off	 70 µs nom/1 ms max 360 µs nom/1 ms max
Current draw @ 5.1V	250 mA
Current draw @ 24V	2 mA
Total backplane power	1.32 W
Power dissipation, max	4.1 W @ 60 °C (140 °F)
Thermal dissipation	13.98 BTU/hr
Off-state leakage current per point, max	1 mA per point

Table 128 - Technical Specifications - 1756-OB16E (continued)

Attribute	1756-OB16E
On-state voltage drop, max	400 mV DC @ 1 A
Current per point, max	1 A @ 60 °C (140 °F)
Current per module, max	8 A @ 60 °C (140 °F)
Surge current per point	2 A for 10 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	3 mA per point
Scheduled outputs	Synchronization within 16.7 s max, reference to the Coordinated System Time
States in Fault mode per point	Hold last state, On or Off (Off is default)
States in Program mode per point	Hold last state, On or Off (Off is default)
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Module keying	Electronic, software configurable
Fusing	Electronically fused per group
Removable terminal block	1756-TBNH 1756-TBSH
RTB keying	User-defined mechanical
Slot width	1
Wire category	1(1)
North American temperature code	T4
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Table 129 - Environmental Specifications - 1756-OB16E

Attribute	1756-OB16E
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11 (IEC 61000-6-4): Class A

Table 129 - Environmental Specifications - 1756-OB16E (continued)

Attribute	1756-OB16E
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80… 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Table 130 - Certifications - 1756-OB16E

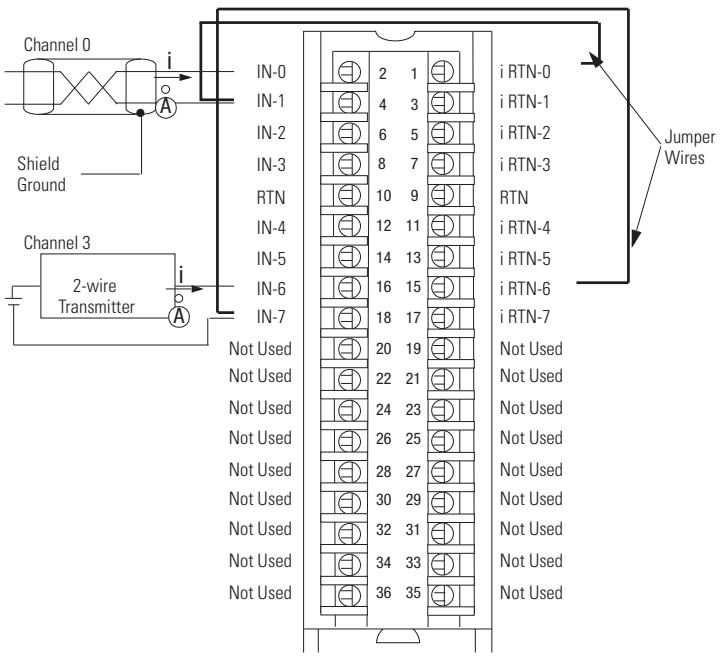
Certification(1)	1756-OB16E
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X Gc
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-IF8

ControlLogix voltage/current analog input module

1756-IF8 Differential Current



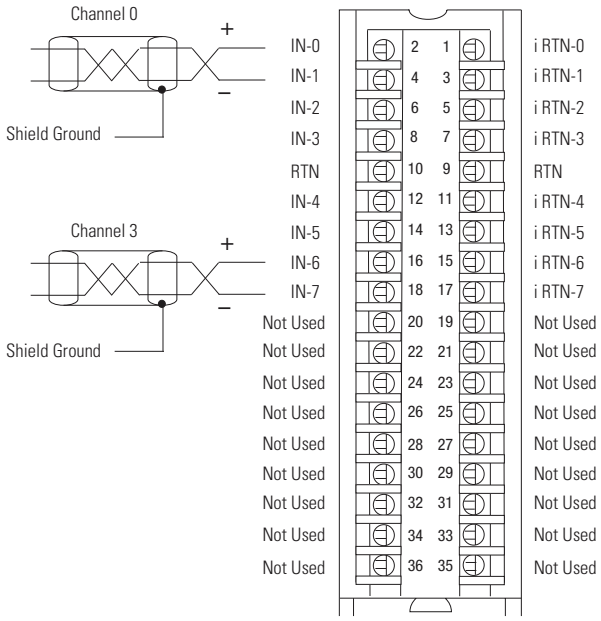
- Use this table when wiring your module in Differential mode.

This channel	Uses these terminals
Channel 0	IN-0 (+), IN-1 (-), i RTN-0
Channel 1	IN-2 (+), IN-3 (-), i RTN-2
Channel 2	IN-4 (+), IN-5 (-), i RTN-4
Channel 3	IN-6 (+), IN-7 (-), i RTN-6

- All terminals marked RTN are connected internally.
- A 249 Ω current loop resistor is located between IN-*x* and i RTN-*x* terminals.
- If multiple (+) or multiple (-) terminals are tied together, connect that tie point to a RTN terminal to maintain the module's accuracy.
- Place additional loop devices (such as strip chart recorders) at the A location in the current loop.

IMPORTANT: When operating in 2 channel, High Speed mode, only use channels 0 and 2.

1756-IF8 Differential Voltage



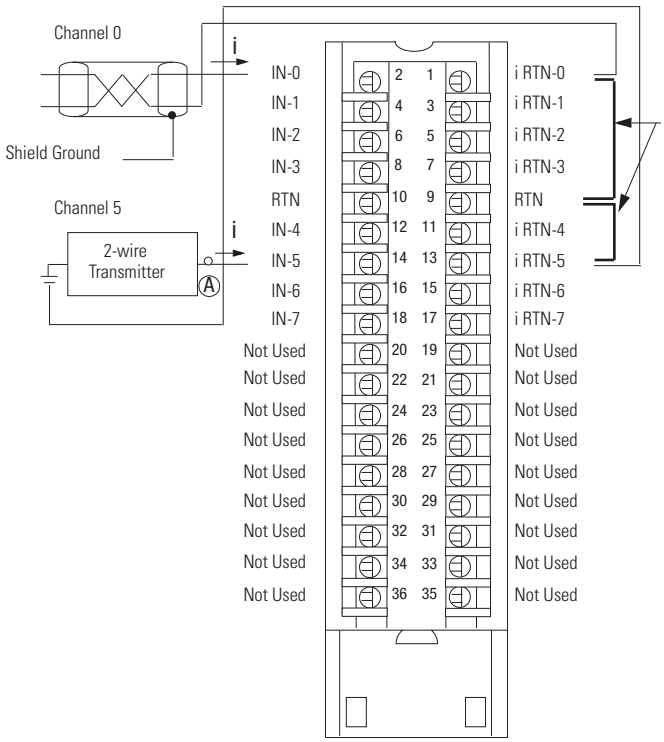
- Use this table when wiring your module in Differential mode.

This channel	Uses these terminals
Channel 0	IN-0 (+), IN-1 (-)
Channel 1	IN-2 (+), IN-3 (-)
Channel 2	IN-4 (+), IN-5 (-)
Channel 3	IN-6 (+), IN-7 (-)

- All terminals marked RTN are connected internally.
- If multiple (+) or multiple (-) terminals are tied together, connect that tie point to a RTN terminal to maintain the module's accuracy.
- Terminals marked RTN or i RTN are not used for differential voltage wiring.

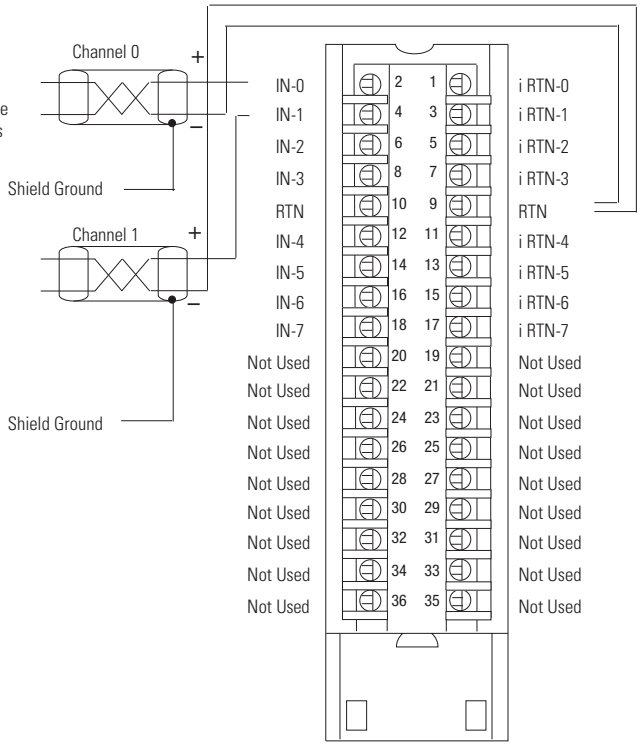
IMPORTANT: When operating in 2 channel, High Speed mode, only use channels 0 and 2.

1756-IF8 Single-ended Current



- All terminals marked RTN are connected internally.
- For current applications, all terminals marked iRTN must be wired to terminals marked RTN.
- A 249 Ω current loop resistor is located between IN-*x* and i RTN-*x* terminals.
- Place additional loop devices (such as strip chart recorders) at the A location in the current loop.

1756-IF8 Single-ended Voltage



- All terminals marked RTN are connected internally.
- Terminals marked i RTN are not used for single-ended voltage wiring.

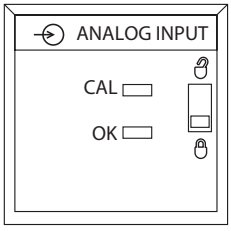


Table 49 - Technical Specifications - 1756-IF8

Attribute	1756-IF8
Inputs	8 single-ended 4 differential 2 high-speed differential
Input range	±10V 0…10V 0…5V 0…20 mA
Resolution	±10.25V: 320 μV/count (15 bits plus sign bipolar) 0…10.25V: 160 μV/count (16 bits) 0…5.125V: 80 μ/V count (16 bits) 0…20.5mA: 0.32 μA/count (16 bits)
Current draw @ 5.1V	150 mA
Current draw @ 24V	40 mA
Total backplane power	1.73 W
Power dissipation, max	Voltage: 1.73 W Current: 2.33 W
Thermal dissipation	Voltage: 5.88 BTU/hr Current: 7.92 BTU/hr
Input impedance	Voltage: >1 MΩ Current: 249 Ω
Open circuit detection time	Differential voltage: Positive full scale reading within 5 s Single-ended/diff. current: Negative full scale reading within 5 s Single-ended voltage: Even numbered channels go to positive full scale reading within 5 s, odd numbered channels go to negative full scale reading within 5 s
Overvoltage protection, max	Voltage: 30V DC Current: 8V DC
Normal mode noise rejection	>80 dB @ 50/60 Hz(1)
Common mode noise rejection	>100 dB @ 50/60 Hz
Calibrated accuracy 25 °C (77 °F)	Voltage: Better than 0.05% of range Current: Better than 0.15% of range
Calibration interval	12 months
Offset drift	45 μV/°C
Gain drift with temperature	Voltage: 15 ppm/°C Current: 20 ppm/°C
Module error	Voltage: 0.1% of range Current: 0.3% of range
Module input scan time, min	8 pt single-ended (floating point): 16…488 ms 4 pt differential (floating point): 8…244 ms 2 pt differential (floating point): 5…122 m(1)
On-board data alarming	Yes
Scaling to engineering units	Yes
Real-time channel sampling	Yes
Data format	Integer mode (left justified, 2s complement) IEEE 32-bit floating point
Module conversion method	Sigma-Delta
Isolation voltage	250V (continuous), reinforced insulation type, inputs-to-backplane No isolation between individual inputs Routine tested at 1350V AC for 2 s

Table 49 - Technical Specifications - 1756-IF8 (Continued)

Attribute	1756-IF8
Module keying	Electronic, software configurable
Removable terminal block	1756-TBCH 1756-TBS6H
RTB keying	User-defined mechanical
Slot width	1
Wire category	2(2)
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Notch filter dependent.
(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Table 50 - Environmental Specifications - 1756-IF8

Attribute	1756-IF8
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80… 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz
EFT/B immunity IEC 61000-4-4	±2 kV at 5 kHz on shielded signal ports
Surge transient immunity IEC 61000-4-5	±2 kV line-earth (CM) on shielded signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz on shielded signal ports

Table 51 - Certifications - 1756-IF8

Certification[1]	1756-IF8
UL	UL Listed Industrial Control Equipment. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X Gc
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Extract from the online catalog

FLKM 50-PA-AB/1756/EXTC

Order No.: 2302837

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Technical data

General

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No. oEhol sTsoul Xhlf c aouueaTor	70
Nf U=er oEhol sTsoul	70
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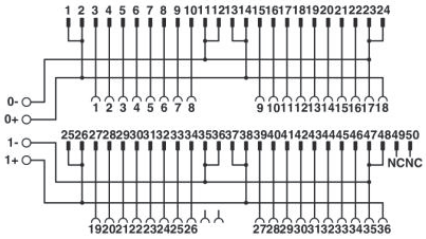
	D87, -PCD, P
	D87, -PVD, P
	D87, -OC32
	D87, -P6H
	D87, -P6D,
	D87, -V?F
	D87, -< 02/ I
	D87, -P6HV
?f hhorTed aouTroller	VONl ° (l xx k LnuT?anhe
?f hhorTed PO anrd	RF-PA) D, D
	RF-PAY D, D
	RF-PAJ D, D
	RF-OAA 32D
	RF-PP V D, D

Certificates

F erTsTsanTsou	F 5 x X5 x

Drawings

F sraf sTdsncrnU

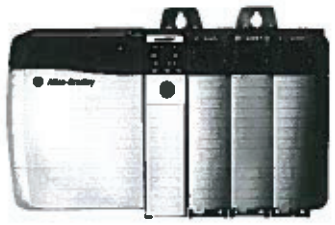


F ouueaTsou l a4eU e: 6xJ < 70-k / -/ CiD87, il YRF

Technical Data

Allen-Bradley

1756 ControlLogix Controllers



ControlLogix Controller Catalog Numbers
1756-L61, 1756-L62, 1756-L63, 1756-L63XT, 1756-L64, 1756-L65, 1756-L71, 1756-L72, 1756-L73, 1756-L73XT, 1756-L74, 1756-L75

GuardLogix Controller Catalog Numbers
1756-L61S, 1756-L62S, 1756-L63S, 1756-LSP, 1756-L71S, 1756-L72S, 1756-L73S, 1756-L7SP, 1756-L73SXT, 1756-L7SPXT

ControlLogix Redundancy Catalog Numbers 1756-RM, 1756-RMXT, 1756-RM2, 1756-RM2XT

1756 ControlLogix Controllers

The ControlLogix® controller provides a scalable controller solution that is capable of addressing a large amount of I/O points. The ControlLogix controller can be placed into any slot of a ControlLogix I/O chassis and multiple controllers can be installed in the same chassis.

ControlLogix controllers can monitor and control I/O across the ControlLogix backplane, as well as over network links. To provide communication for a ControlLogix controller, install the appropriate communication interface module into the chassis.

1756-L7*x* ControlLogix Controllers Features and Specifications

Feature	1756-L71, 1756-L72, 1756-L73, L73XT, 1756-L74, 1756-L75
Controller tasks	• 32 tasks • 100 programs/task • Event tasks: all event triggers
Built-in communication ports	1 port USB(1)
Communication options	• EtherNet/IP • ControlNet • DeviceNet • Data Highway Plus™ • Remote I/O • SynchLink™ • Third-party process and device networks
USB port communication	Programming, configuration, firmware flash and on-line edits only
Controller connections supported, max	500
Network connections, per network module	• 100 ControlNet (1756-CN2/A) • 40 ControlNet (1756-CNB/D, 1756-CNB/E) • 128 ControlNet (1756-CN2/B) • 256 EtherNet/IP; 128 TCP (1756-EN2*x*) • 128 EtherNet/IP; 64 TCP (1756-ENBT)
Controller redundancy	Full support
Integrated motion	• SERCOS interface • Analog options (encoder input, LDT input, SSI input) • EtherNet/IP (CIP Motion)
Programming languages	• Relay ladder • Structured text • Function block • SFC

(1) The USB port is intended for temporary local programming purposes only and not intended for permanent connection. Do not use the USB port in hazardous locations.

Table 1 - Technical Specifications - 1756-L7*x* ControlLogix Controllers

Attribute	1756-L71	1756-L72	1756-L73	1756-L74	1756-L75
User memory	2 MB	4 MB	8 MB	16 MB	32 MB
I/O memory	0.98 MB				
Optional nonvolatile memory storage	1 GB (1784-SD1 ships with every controller) 2 GB (1784-SD2)				
Digital I/O, max	128,000				
Analog I/O, max	4000				
Total I/O, max	128,000				
Energy storage module	• 1756-ESMCAP capacitor energy storage module (removable, ships installed with every controller) • 1756-ESMNSE capacitor energy storage module (removable, no residual WallClockTime power backup) • 1756-ESMNRM capacitor energy storage module (nonremovable, secures controller by preventing USB connection an d SD card use)				
Current draw @ 1.2V DC	5 mA				
Current draw @ 5.1V DC	800 mA				
Power dissipation	2.5 W				
Thermal dissipation	8.5 BTU/hr				
Isolation voltage	30V (continuous), basic insulation type, USB port-to-system Type tested at 500V AC for 60 s				
USB port(1)	USB 2.0, full speed (12 Mbps)				
Weight, approx	0.25 kg (0.55 lb)				
Slot width	1				
Module location	Chassis-based, any slot				
Chassis	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17				
Power supply, standard	1756-PA72, 1756-PA75, 1756-PB72, 1756-PB75				
Power supply, redundant	1756-PA75R, 1756-PB75R, 1756-PSCA2				
Wire category(2)	3 - on USB port				
North American temperature code	T4A				
IEC temperature code	T4				
Enclosure type rating	None (open-style)				

(1) The USB port is intended for temporary local programming purposes only and not intended for permanent connection. Do not use the USB port in hazardous locations.
(2) Use this conductor category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Table 2 - Environmental Specifications - 1756-L7*x* ControlLogix Controllers

Attribute	1756-L71, 1756-L72, 1756-L73, 1756-L74, 1756-L75
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g (45 g with SD card installed)
Emissions CISPR 11 IEC 61000-6-4	Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz

Table 3 - Certifications - 1756-L7*x* ControlLogix Controllers

Certification(1)	1756-L71, 1756-L72, 1756-L73, 1756-L74, 1756-L75
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radio communications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection 'n' • EN 60079-0; General Requirements • II 3 G Ex nA IIC T4 X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Technical Data

Allen-Bradley

1756 ControlLogix Power Supplies Specifications

Standard Power Supplies Catalog Numbers 1756-PA72, 1756-PA75, 1756-PB72, 1756-PB75, 1756-PC75, 1756-PH75
ControlLogix-XT Power Supplies Catalog Numbers 1756-PAXT, 1756-PBXT
Redundant Power Supplies Catalog Numbers 1756-PA75R, 1756-PB75R
Chassis Adapter Module Catalog Number 1756-PSCA2

ControlLogix® power supplies are used with the 1756 chassis to provide 1.2V, 3.3V, 5V, and 24V DC power directly to the chassis backplane. Standard, ControlLogix-XT™, and redundant power supplies are available.

Standard DC Power Supplies

Table 4 - Technical Specifications - ControlLogix Standard DC Power Supplies

Attribute	1756-PB72/C	1756-PB75/B	1756-PC75/B	1756-PH75/B
Input voltage range	18…32V DC		30…60V DC	90…143V DC
Input voltage, nom	24V DC		48V DC	125V DC
Input power, max	95 W			
Output power, max	75 W @ 0…60 °C (32…140 °F)(2)			
Power consumption	20 W @ 0…60 °C (32…140 °F)			
Power dissipation	68.2 BTU/hr			
Hold up time(1)	35 ms @ 18V DC 40 ms @ 24V DC 40 ms @ 32V DC		50 ms @ 30…60V DC nom	50 ms @ 90…143V DC nom
Inrush current, max	30 A		20 A	
Current capacity at 1.2V	1.5 A			
Current capacity at 3.3V	4 A			
Current capacity at 5.1V	10 A	13 A		
Current capacity at 24V	2.8 A			
Overcurrent protection, max	User-supplied 15 A(3)			
Fusing	Non-replaceable fuse is soldered in place(4)			
Isolation voltage	250V (continuous), reinforced insulation type, power input-to-backplane Type tested @ 3500V DC for 60 s			
Weight, approx.	0.95 kg (2.10 lb)			
Dimensions	140 x 112 x 145 mm (5.51 x 4.41 x 5.71 in.)			
Module location	Left side of 1756 chassis			
Chassis	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17			
Chassis compatibility	Series A Series B	Series B		
Wire size	2.5 mm^2 (14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max			
Wire category	1 - on power ports(5)			
Conductor screw torque	0.8 N•m (7 lb•in)			
North American temperature code	T4			
IEC temperature code	T4		N/A	
Enclosure type rating	None (open-style)			

(1) The hold up time is the time between input voltage removal and DC power failure.
(2) The combination of all output power (5.1V backplane, 24V backplane, 3.3V backplane, and 1.2V backplane) cannot exceed 75 W.
(3) Use time-delay type overcurrent protection in all ungrounded conductors.
(4) This fuse is intended to guard against fire hazard due to short circuit conditions.
(5) Use this conductor category information for planning conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Table 5 - Environmental Specifications - ControlLogix Standard DC Power Supplies

Attribute	1756-PB72/C, 1756-PB75/B	1756-PC75/B, 1756-PH75/B
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)	
Temperature, surrounding air, max	60 °C (140 °F)	
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)	
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing	
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz	
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g	
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g	
Emissions	CISPR 11: Group 1, Class A	
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges	
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz	
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on power ports	
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports	
Conducted RF immunity IEC 61000-4-6	10 Vrms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz	
Oscillatory surge withstand IEEE C37.90.1	N/A	3 kV
Voltage variation IEC 61000-4-11 IEC 61000-4-29	 60% dips for 100 ms on DC supply ports 100% dips for 50 ms on DC supply ports ±20% fluctuations for 15 min on DC supply ports 5 s interruptions on DC supply ports 10 ms interruption on DC supply ports	

Table 6 - Certifications - ControlLogix Standard DC Power Supplies

Certification[1]	1756-PB72/C, 1756-PB75/B	1756-PC75/B, 1756-PH75/B
UL	N/A	UL Listed Industrial Control Equipment. See UL File E65584.
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for US and Canada. See UL File E194810.	N/A
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.	
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations	N/A
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)	
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions	
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X	N/A
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3	

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Power Load and Transformer Sizing

The following graphs show the input power requirements for the power supplies, given the power they are providing to the modules in the chassis.

Follow these steps to determine the power requirements for you chassis.

1. Calculate the Backplane Power Load by adding the power draw (in Watts) for all of the planned modules.

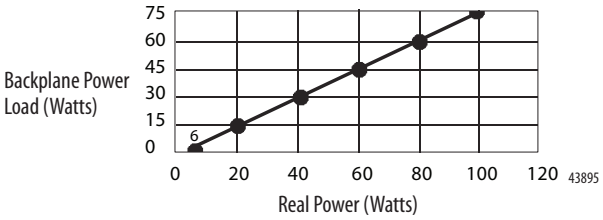
   For module power draws, refer to the module specification tables in the ControlLogix Selection Guide, publication 1756-SG001.

2. Locate the Backplane Power Load on the graph's vertical (y) axis and determine the corresponding Real Power (input-power) rating on the horizontal (x) axis.

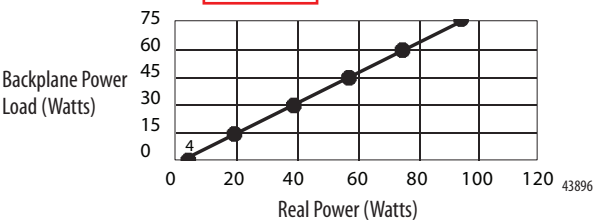
   The Real Power value is the amount of power consumed by the power supply.

Power Supply Power Requirements

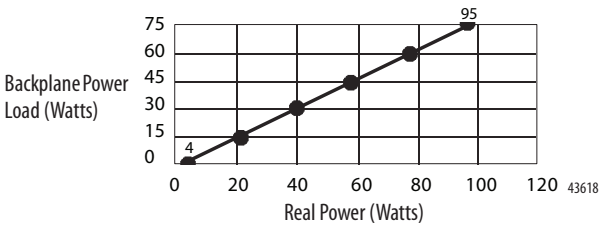
1756-PA72/C, 1756-PA75/B (AC)



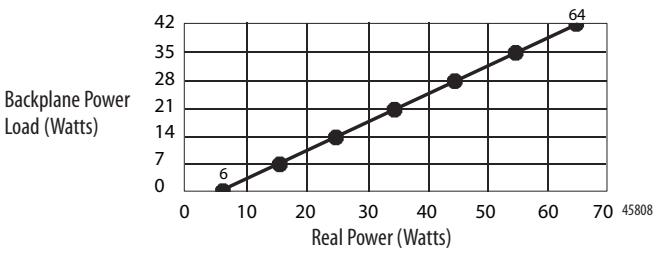
1756-PB72/C, 1756-PB75/B (DC)



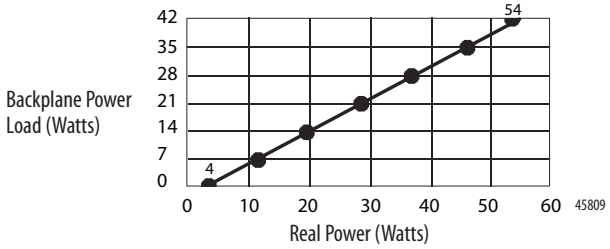
1756-PH75/B, 1756-PC75/B (DC)



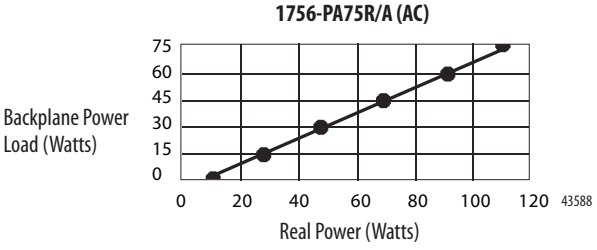
1756-PAXT (AC)



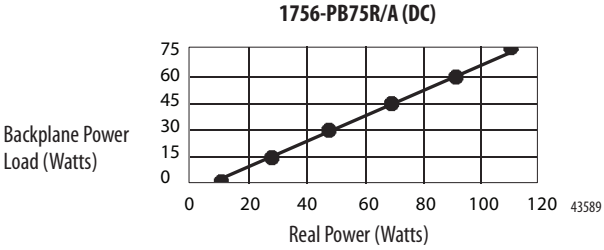
1756-PBXT (DC)



1756-PA75R/A (AC)



1756-PB75R/A (DC)



Apparent Power (Watts) = Transformer Load (VA) = Real Power (Watts)

Power Distribution Center (PDC)

REV	REVISION DESCRIPTION	LOG NO.	REV'D BY	CH'K'D BY	APPRV'D BY	DATE YYYY-MM-DD
1	RELEASE FOR SUBMITTAL	--	PSJ	JK	PSL	2023-08-02

TABLE OF CONTENTS

WIRE COLOUR CODING LEGEND

DESCRIPTION	DESIGNATION	WIRE
3 PHASE POWER	L1	BLACK
	L2	BLACK
	L3	BLACK
	N	WHITE
DC CONTROL	24VDC	BLUE
	OVDC	WHITE/BLUE
GROUND	G	GREEN/YELLOW
EXTERNAL POWER		YELLOW

NOTE: EXCEPTION TO MANUFACTURER PRE-ASSEMBLED CABLES.

NOTES:

1. ELECTRICAL ASSEMBLY TO BE ASSEMBLED UNDER UL508A AND THE MINIMUM REQUIREMENTS OUTLINED IN ES0127. WHERE THERE IS A CONFLICT BETWEEN THIS DOCUMENT AND THE REQUIREMENTS OF ES0127, THE INFORMATION PRESENTED IN THIS DOCUMENT WILL BE USED.

2. BLANK PAGES ARE RESERVED.

3. ENCLOSURE ENVIRONMENTAL RATING – UL TYPE 4X (IP66)

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: 2 PL DEC ± N/A
3 PL DEC ± N/A
ANGLE DEG ± N/A
REMOVE ALL BURRS, ALL CORNERS R 0.010 OR BREAK EDGE
(D) – CRITICAL CHARACTERISTIC

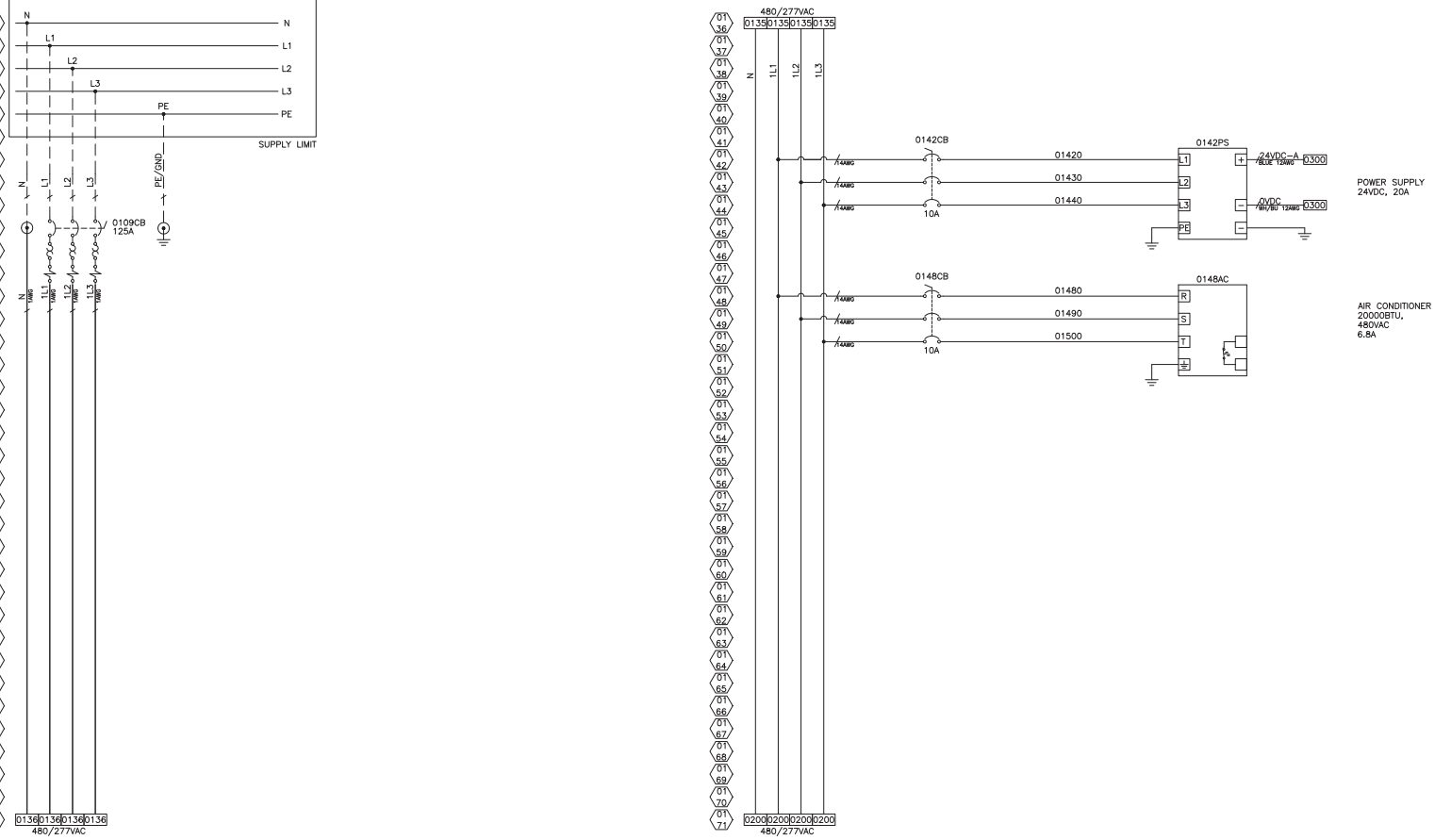
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 477

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
TABLE OF CONTENTS

THIRD ANGLE PROJECTION

SIZE	DWG NO.	REV
B	341383	1

SCALE: NTS | SHEET 00 OF 50 | SIZE B

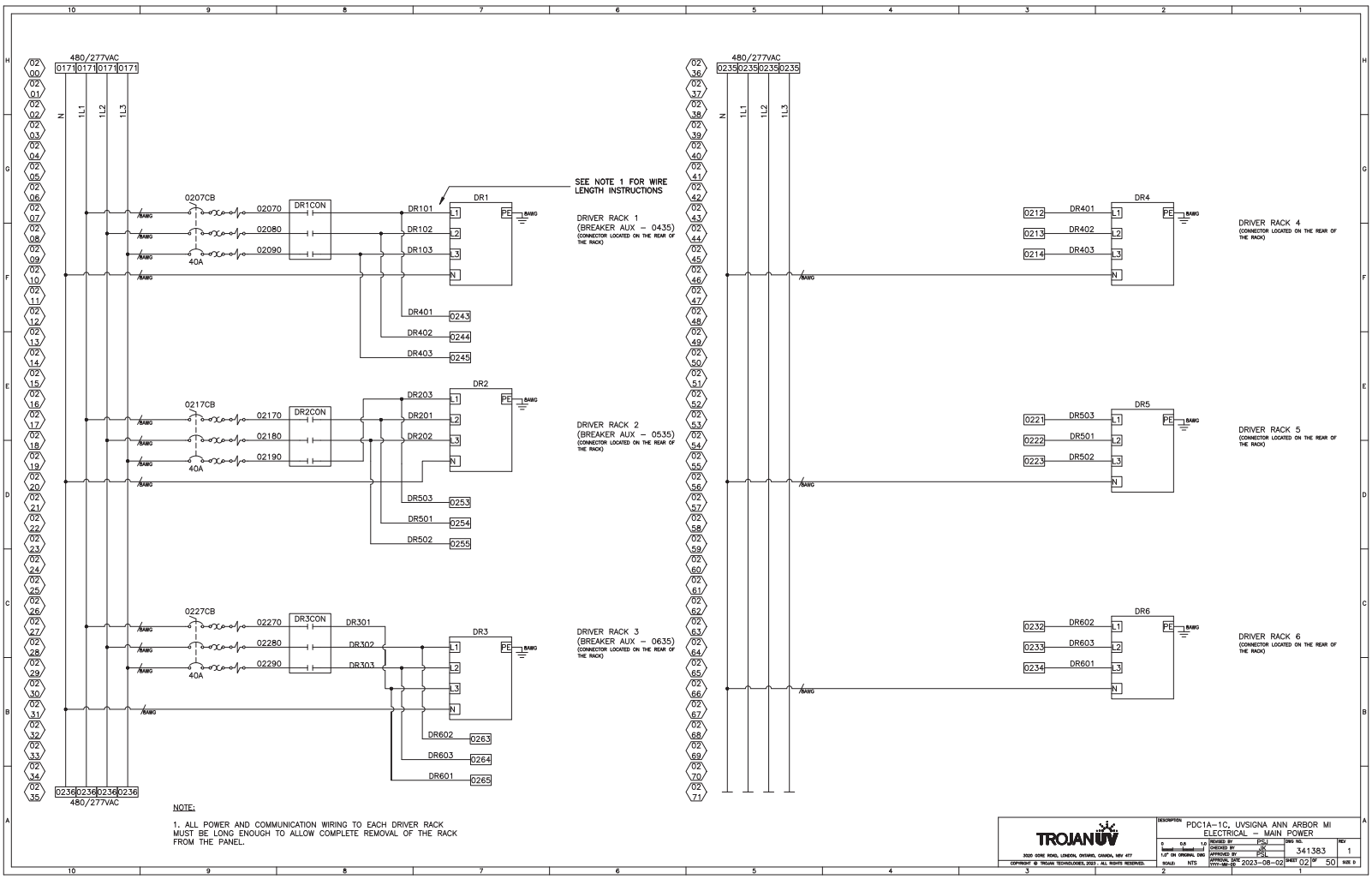


TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
ELECTRICAL – MAIN POWER

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
SCALE	NTS
DWG NO.	341383
REV	1
SHEET	01 OF 50
SIZE	D



NOTE:

1. ALL POWER AND COMMUNICATION WIRING TO EACH DRIVER RACK MUST BE LONG ENOUGH TO ALLOW COMPLETE REMOVAL OF THE RACK FROM THE PANEL.

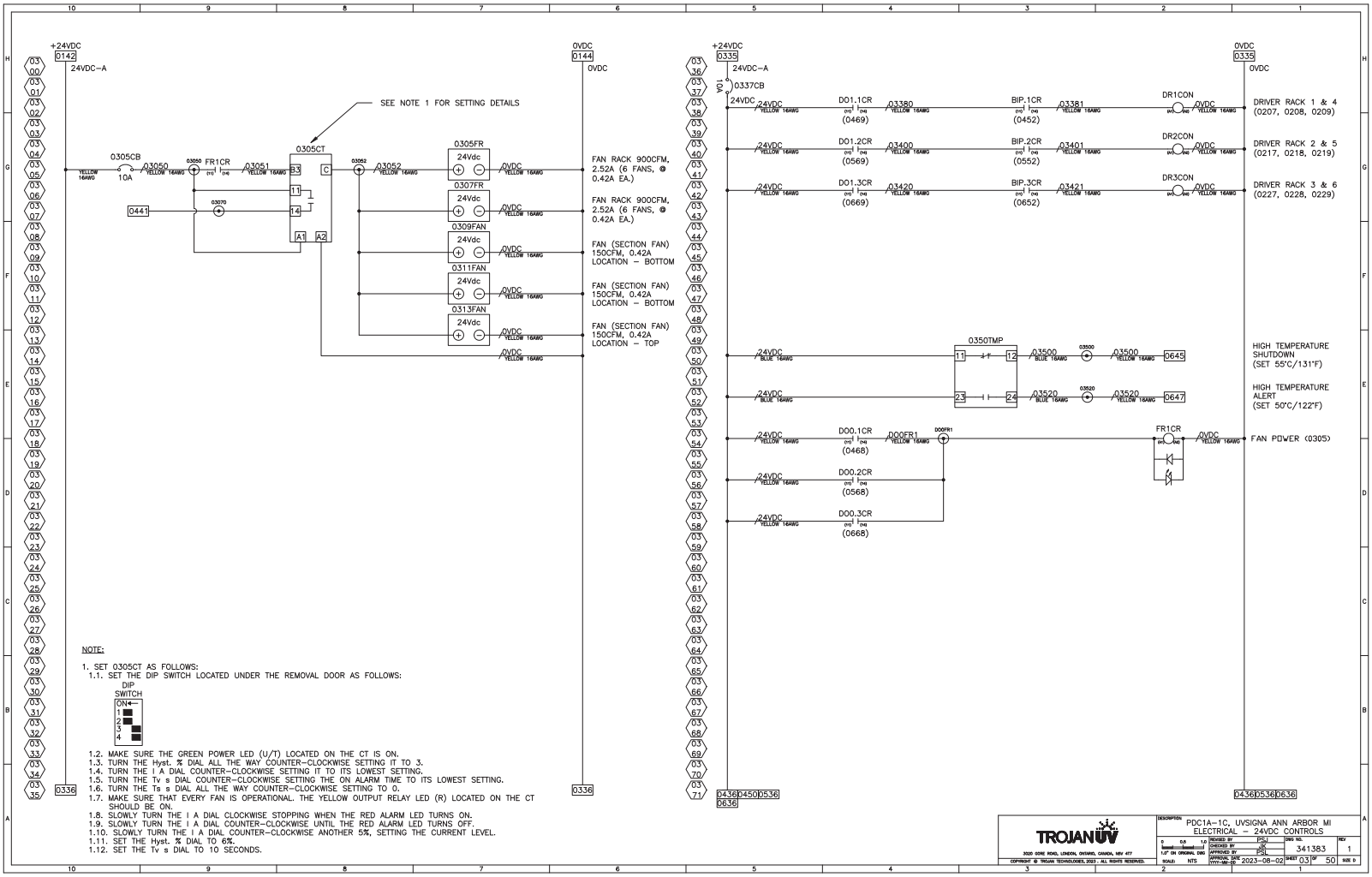
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
ELECTRICAL – MAIN POWER

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE	YYYY-MM-DD 2023-08-02
DRG NO.	341383
REV	1
SHEET	02 OF 50
SIZE	D

0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS

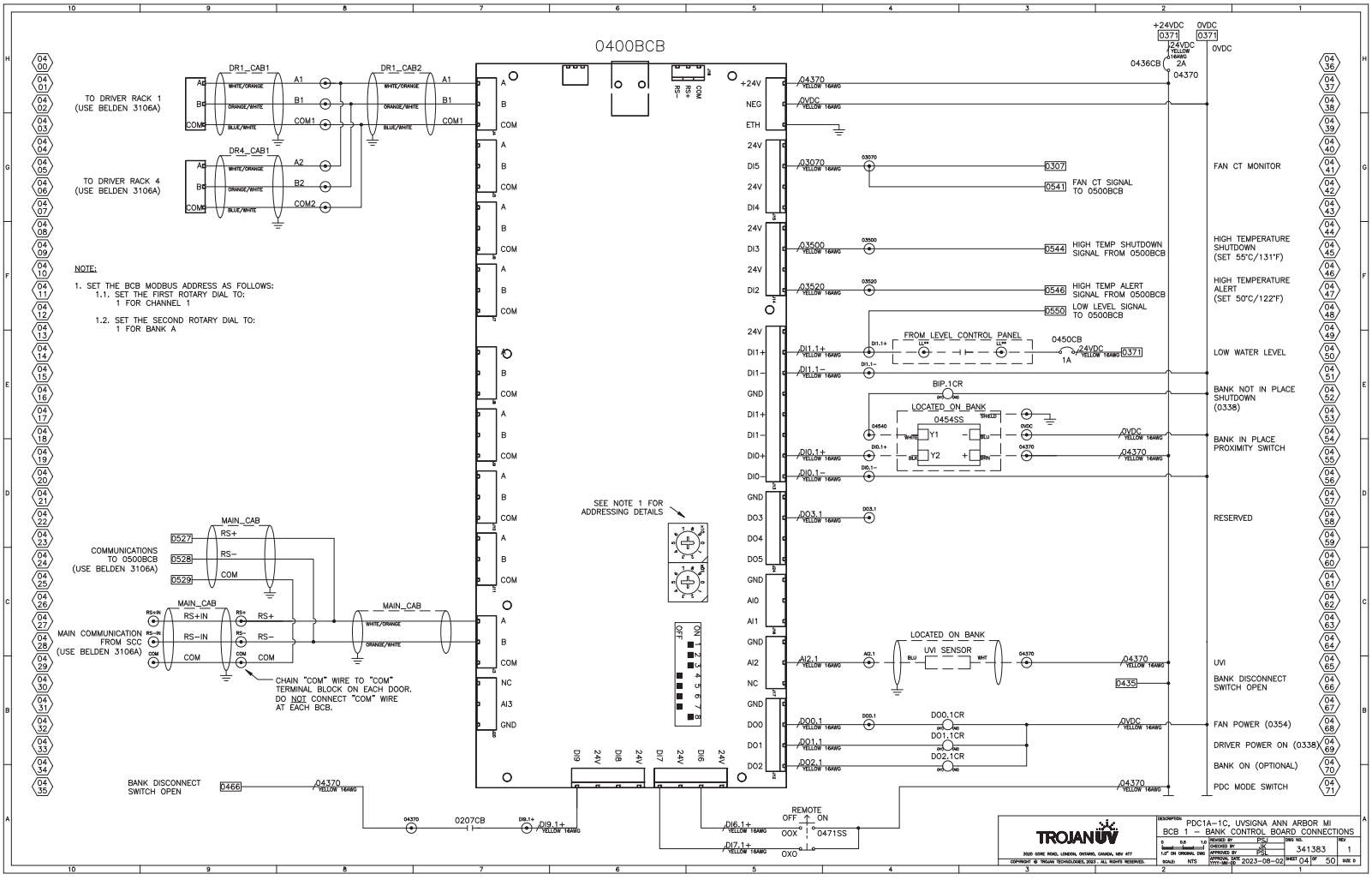


NOTE:

1. SET 0305CT AS FOLLOWS:
   1.1. SET THE DIP SWITCH LOCATED UNDER THE REMOVAL DOOR AS FOLLOWS:

   1.2. MAKE SURE THE GREEN POWER LED (U/T) LOCATED ON THE CT IS ON.
   1.3. TURN THE Hyst. % DIAL ALL THE WAY COUNTER–CLOCKWISE SETTING IT TO 3.
   1.4. TURN THE I A DIAL COUNTER–CLOCKWISE SETTING IT TO ITS LOWEST SETTING.
   1.5. TURN THE Tv s DIAL COUNTER–CLOCKWISE SETTING THE ON ALARM TIME TO ITS LOWEST SETTING.
   1.6. TURN THE Ts s DIAL ALL THE WAY COUNTER–CLOCKWISE SETTING TO 0.
   1.7. MAKE SURE THAT EVERY FAN IS OPERATIONAL. THE YELLOW OUTPUT RELAY LED (R) LOCATED ON THE CT SHOULD BE ON.
   1.8. SLOWLY TURN THE I A DIAL CLOCKWISE STOPPING WHEN THE RED ALARM LED TURNS ON.
   1.9. SLOWLY TURN THE I A DIAL COUNTER–CLOCKWISE UNTIL THE RED ALARM LED TURNS OFF.
   1.10. SLOWLY TURN THE I A DIAL COUNTER–CLOCKWISE ANOTHER 5%, SETTING THE CURRENT LEVEL.
   1.11. SET THE Hyst. % DIAL TO 6%.
   1.12. SET THE Tv s DIAL TO 10 SECONDS.

DESCRIPTION	PDC1A–1C, UVSIGNA ANN ARBOR MI ELECTRICAL – 24VDC CONTROLS
DRAWN BY	PSJ
CHECKED BY	
APPROVED BY	
APPROVAL DATE (YYYY–MM–DD)	2023–08–02
DRG NO.	341383
REV	1
SHEET	03 OF 50
SIZE	D


0400BCB
+24VDC
0371
0VDC
0371
24VDC
16AWG
2A
0436CB
04370
0VDC
DR1_CAB1
DR1_CAB2
DR4_CAB1
TO DRIVER RACK 1
(USE BELDEN 3106A)
TO DRIVER RACK 4
(USE BELDEN 3106A)
WHITE/ORANGE
ORANGE/WHITE
BLUE/WHITE
A1
B1
COM1
A2
B2
COM2
NOTE:
1. SET THE BCB MODBUS ADDRESS AS FOLLOWS:
1.1. SET THE FIRST ROTARY DIAL TO:
1 FOR CHANNEL 1
1.2. SET THE SECOND ROTARY DIAL TO:
1 FOR BANK A
+24V
NEG
ETH
DI5
DI4
DI3
DI2
DI1
DI0
GND
DO3
DO4
DO5
AI0
AI1
AI2
NC
AI3
DO0
DO1
DO2
0307
FAN CT SIGNAL
TO 0500BCB
FAN CT MONITOR
0544
HIGH TEMP SHUTDOWN
SIGNAL FROM 0500BCB
HIGH TEMPERATURE
SHUTDOWN
(SET 55°C/131°F)
0546
HIGH TEMP ALERT
SIGNAL FROM 0500BCB
0550
LOW LEVEL SIGNAL
TO 0500BCB
HIGH TEMPERATURE
ALERT
(SET 50°C/122°F)
FROM LEVEL CONTROL PANEL
0450CB
1A
LOW WATER LEVEL
BIP_1CR
LOCATED_ON_BANK
0454SS
BANK NOT IN PLACE
SHUTDOWN
(0338)
BANK IN PLACE
PROXIMITY SWITCH
RESERVED
LOCATED_ON_BANK
UVI SENSOR
UVI
BANK DISCONNECT
SWITCH OPEN
0435
DO0.1CR
DO1.1CR
DO2.1CR
FAN POWER (0354)
DRIVER POWER ON (0338)
BANK ON (OPTIONAL)
PDC MODE SWITCH
SEE NOTE 1 FOR
ADDRESSING DETAILS
MAIN_CAB
COMMUNICATIONS
TO 0500BCB
(USE BELDEN 3106A)
0527
0528
0529
RS+
RS−
COM
MAIN COMMUNICATION
FROM SCC
(USE BELDEN 3106A)
RS+IN
RS−IN
CHAIN "COM" WIRE TO "COM"
TERMINAL BLOCK ON EACH DOOR.
DO NOT CONNECT "COM" WIRE
AT EACH BCB.
BANK DISCONNECT
SWITCH OPEN
0466
0207CB
REMOTE
OFF
ON
0471SS
OOX
OXO
DI9
DI8
DI7
DI6
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 1Z7
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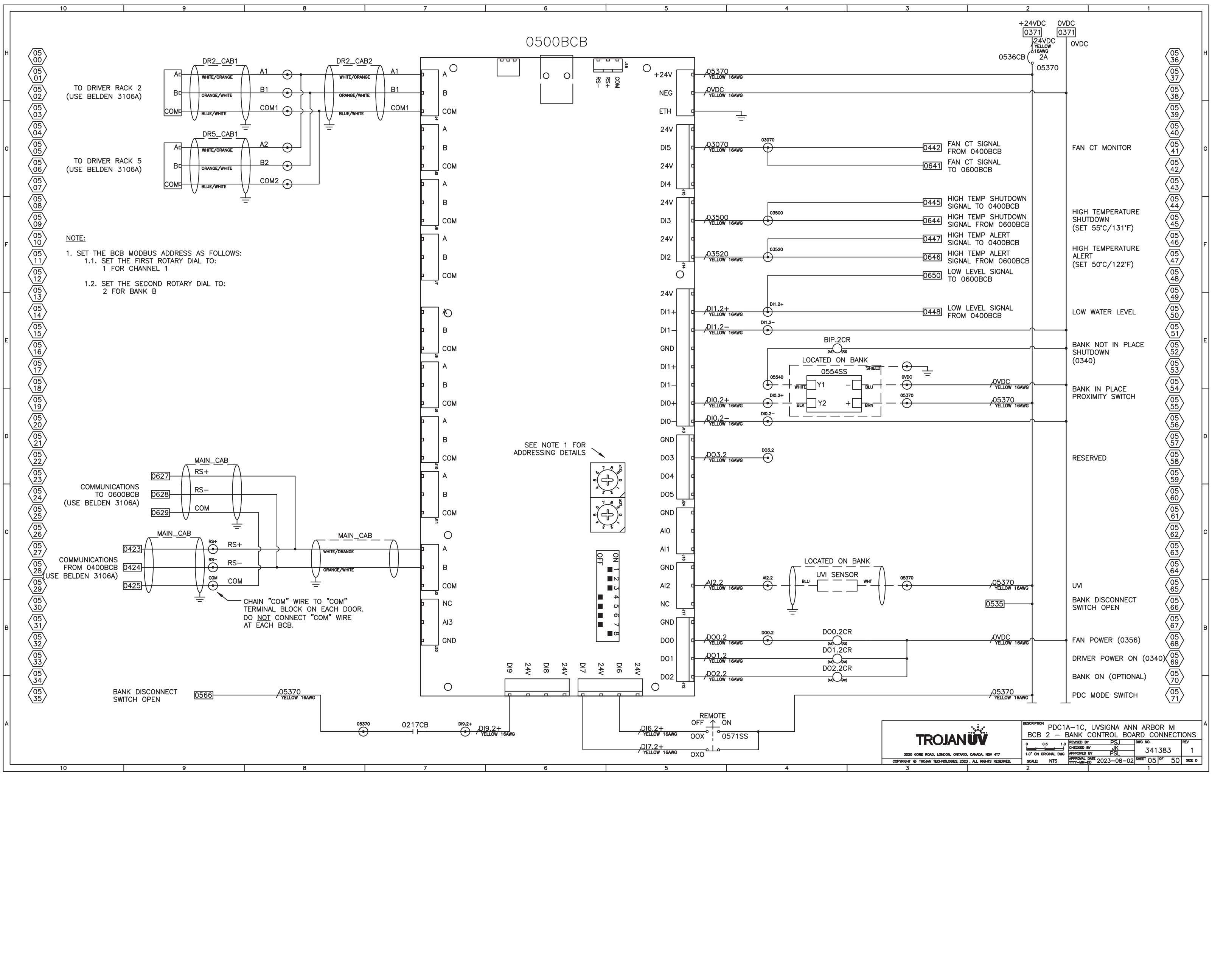
PDC1A-1C, UVSIGNA ANN ARBOR MI
BCB 1 - BANK CONTROL BOARD CONNECTIONS
PROJECT NO. 341383
REV 1
SCALE: NTS
APPROVAL DATE (YYYY-MM-DD) 2023-08-02
SHEET 04 OF 50
SIZE D



0500BCB
TO DRIVER RACK 2 (USE BELDEN 3106A)
TO DRIVER RACK 5 (USE BELDEN 3106A)
DR2_CAB1
DR2_CAB2
DR5_CAB1
NOTE:
1. SET THE BCB MODBUS ADDRESS AS FOLLOWS:
1.1. SET THE FIRST ROTARY DIAL TO: 1 FOR CHANNEL 1
1.2. SET THE SECOND ROTARY DIAL TO: 2 FOR BANK B
COMMUNICATIONS TO 0600BCB (USE BELDEN 3106A)
COMMUNICATIONS FROM 0400BCB (USE BELDEN 3106A)
CHAIN "COM" WIRE TO "COM" TERMINAL BLOCK ON EACH DOOR. DO NOT CONNECT "COM" WIRE AT EACH BCB.
BANK DISCONNECT SWITCH OPEN
SEE NOTE 1 FOR ADDRESSING DETAILS
+24VDC 0371
0VDC 0371
0536CB 2A
FAN CT MONITOR
FAN CT SIGNAL FROM 0400BCB
FAN CT SIGNAL TO 0600BCB
HIGH TEMP SHUTDOWN SIGNAL TO 0400BCB
HIGH TEMP SHUTDOWN SIGNAL FROM 0600BCB
HIGH TEMP ALERT SIGNAL TO 0400BCB
HIGH TEMP ALERT SIGNAL FROM 0600BCB
LOW LEVEL SIGNAL TO 0600BCB
LOW LEVEL SIGNAL FROM 0400BCB
HIGH TEMPERATURE SHUTDOWN (SET 55°C/131°F)
HIGH TEMPERATURE ALERT (SET 50°C/122°F)
LOW WATER LEVEL
BANK NOT IN PLACE SHUTDOWN (0340)
BANK IN PLACE PROXIMITY SWITCH
LOCATED ON BANK
0554SS
RESERVED
UVI SENSOR
UVI
BANK DISCONNECT SWITCH OPEN
FAN POWER (0356)
DRIVER POWER ON (0340)
BANK ON (OPTIONAL)
PDC MODE SWITCH
REMOTE OFF ON
0571SS
0217CB
TROJANUV
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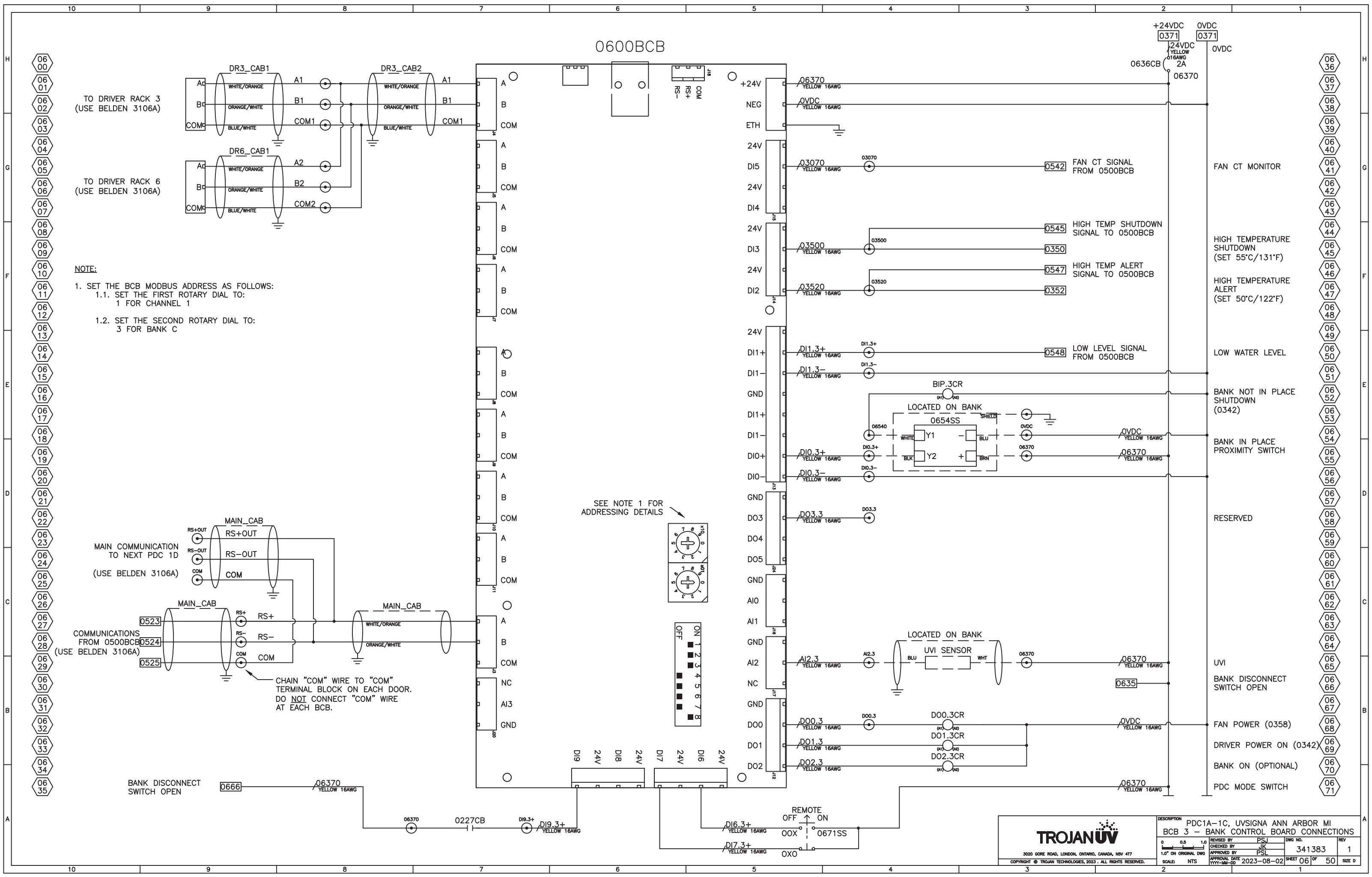
PDC1A-1C, UVSIGNA ANN ARBOR MI
BCB 2 - BANK CONTROL BOARD CONNECTIONS
341383
2023-08-02
SHEET 05 OF 50



0600BCB
TO DRIVER RACK 3
(USE BELDEN 3106A)
TO DRIVER RACK 6
(USE BELDEN 3106A)
DR3_CAB1
DR3_CAB2
DR6_CAB1
A1
B1
COM1
A2
B2
COM2
WHITE/ORANGE
ORANGE/WHITE
BLUE/WHITE
NOTE:
1. SET THE BCB MODBUS ADDRESS AS FOLLOWS:
1.1. SET THE FIRST ROTARY DIAL TO:
1 FOR CHANNEL 1
1.2. SET THE SECOND ROTARY DIAL TO:
3 FOR BANK C
MAIN COMMUNICATION
TO NEXT PDC 1D
(USE BELDEN 3106A)
MAIN_CAB
RS+OUT
RS-OUT
COM
COMMUNICATIONS
FROM 0500BCB
(USE BELDEN 3106A)
0523
0524
0525
RS+
RS-
CHAIN "COM" WIRE TO "COM"
TERMINAL BLOCK ON EACH DOOR.
DO NOT CONNECT "COM" WIRE
AT EACH BCB.
BANK DISCONNECT
SWITCH OPEN
0666
06370
YELLOW 16AWG
0227CB
DI9.3+
SEE NOTE 1 FOR
ADDRESSING DETAILS
ON
OFF
+24V
NEG
ETH
24V
DI5
DI4
DI3
DI2
DI1+
DI1-
GND
DI0+
DI0-
DO3
DO4
DO5
AI0
AI1
AI2
NC
AI3
DO0
DO1
DO2
DI9
DI8
DI7
DI6
+24VDC
0VDC
0371
0636CB
2A
24VDC
YELLOW 016AWG
03070
0542
FAN CT SIGNAL
FROM 0500BCB
FAN CT MONITOR
03500
0545
0350
HIGH TEMP SHUTDOWN
SIGNAL TO 0500BCB
HIGH TEMPERATURE
SHUTDOWN
(SET 55°C/131°F)
03520
0547
0352
HIGH TEMP ALERT
SIGNAL TO 0500BCB
HIGH TEMPERATURE
ALERT
(SET 50°C/122°F)
DI1.3+
DI1.3-
0548
LOW LEVEL SIGNAL
FROM 0500BCB
LOW WATER LEVEL
BIP.3CR
BANK NOT IN PLACE
SHUTDOWN
(0342)
LOCATED ON BANK
0654SS
06540
Y1
Y2
WHITE
BLK
BLU
BRN
SHIELD
DI0.3+
DI0.3-
BANK IN PLACE
PROXIMITY SWITCH
DO3.3
RESERVED
UVI SENSOR
AI2.3
WHT
UVI
0635
BANK DISCONNECT
SWITCH OPEN
DO0.3
DO0.3CR
DO1.3
DO1.3CR
DO2.3
DO2.3CR
FAN POWER (0358)
DRIVER POWER ON (0342)
BANK ON (OPTIONAL)
PDC MODE SWITCH
REMOTE
OFF ON
0671SS
DI6.3+
DI7.3+
OOX
OXO
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7
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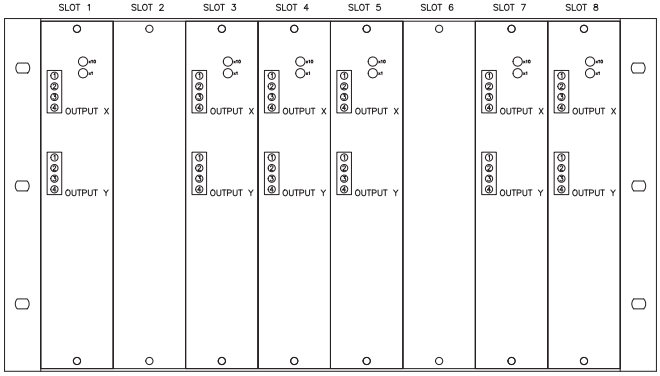
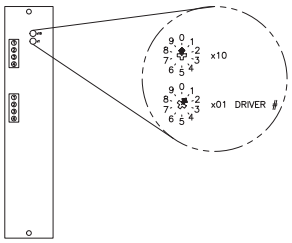
PDC1A-1C, UVSIGNA ANN ARBOR MI
BCB 3 - BANK CONTROL BOARD CONNECTIONS
REVISED BY PSJ
CHECKED BY JK
APPROVED BY PSL
DWG NO. 341383
REV 1
SCALE: NTS
APPROVAL DATE 2023-08-02
SHEET 06 OF 50
SIZE D

DRIVER POSITION IN RACK 1 (BANK 1A)

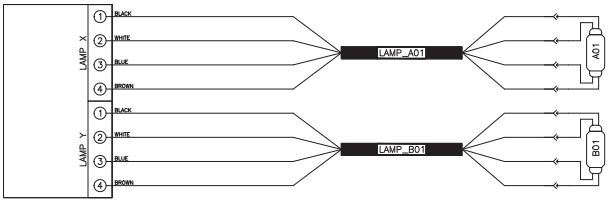


Rack 1								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 1		Driver 2	Driver 3	Driver 4		Driver 5	Driver 6
Phase	L1	L1	L3	L3	L2	L2	L2	L1
Modbus Address*	01		02	03	04		05	06

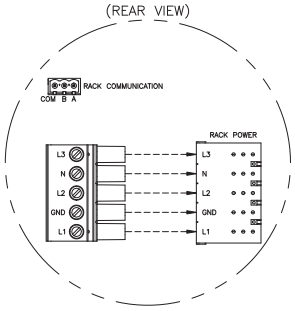
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 11 FOR RACK 1 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



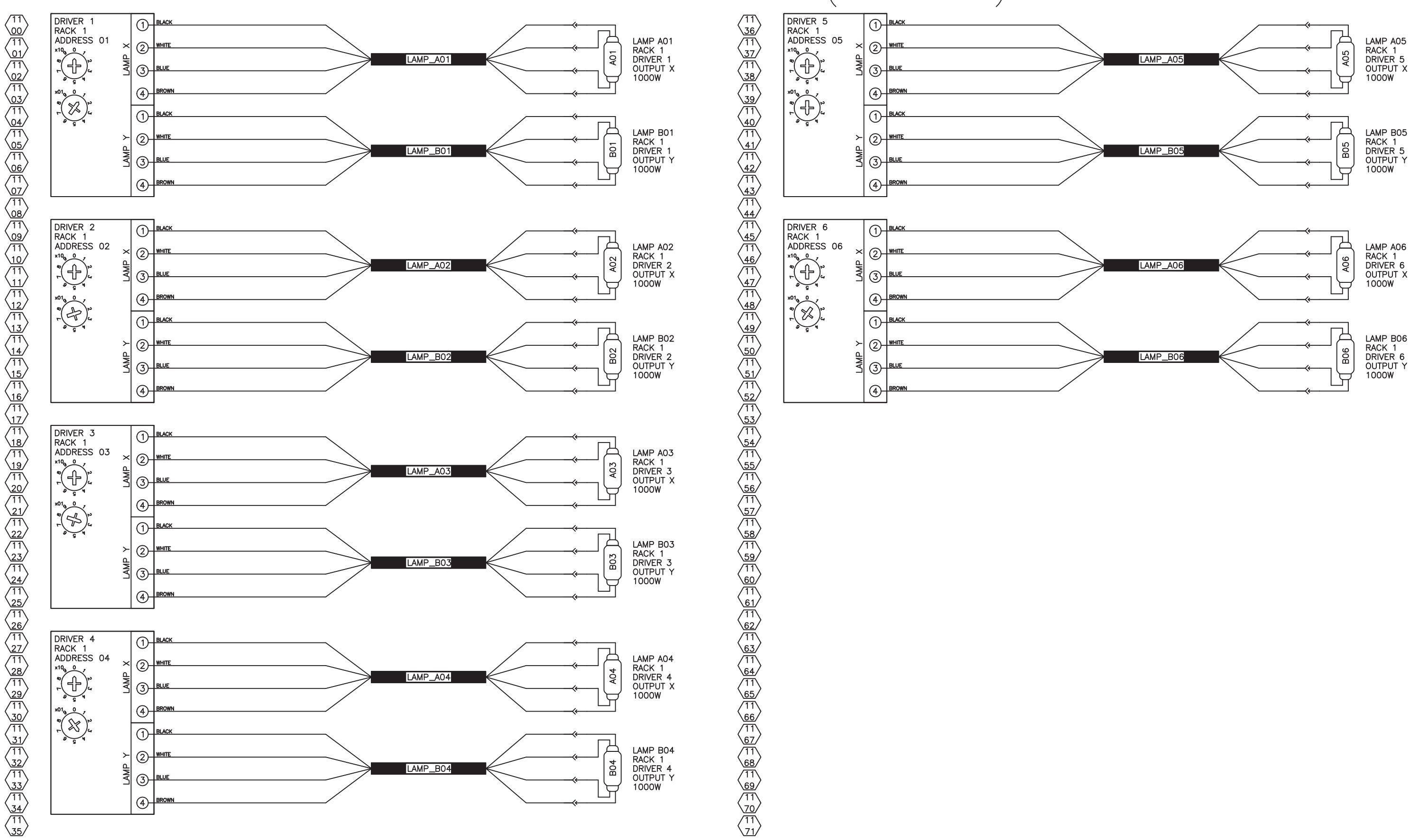
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 1 LAMP DRIVERS

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	MK	341383	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 10 OF 50	SIZE D

SCALE: NTS

RACK 1 CONNECTIONS (BANK 1A)



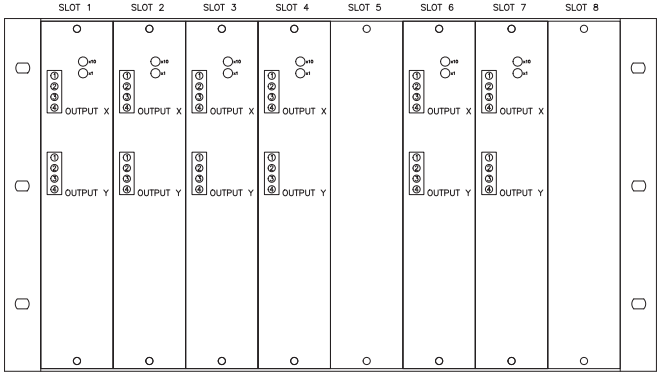
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: PDC1A–1C, UVSIGNA ANN ARBOR MI
RACK 1 LAMP–DRIVER CONNECTIONS

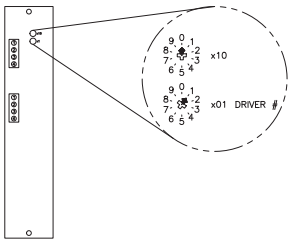
1.0" ON ORIGINAL DWG	REVISED BY: PSJ	DWG NO.: 341383	REV: 1
	CHECKED BY: JK		
	APPROVED BY: PSL		
SCALE: NTS	APPROVAL DATE YYYY–MM–DD: 2023–08–02	SHEET 11 OF 50	SIZE D

DRIVER POSITION IN RACK 2 (BANK 1B)

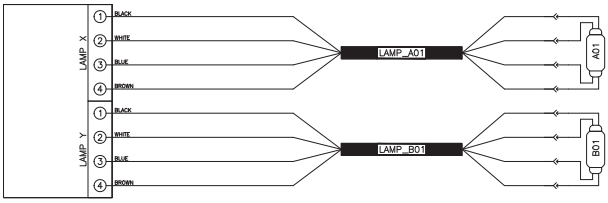


Rack 2								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 1	Driver 2	Driver 3	Driver 4		Driver 5	Driver 6	
Phase	L3	L3	L2	L2	L1	L1	L1	L3
Modbus Address*	01	02	03	04		05	06	

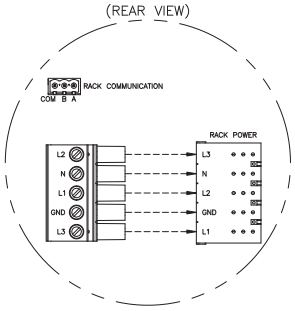
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 13 FOR RACK 2 SPECIFICS)



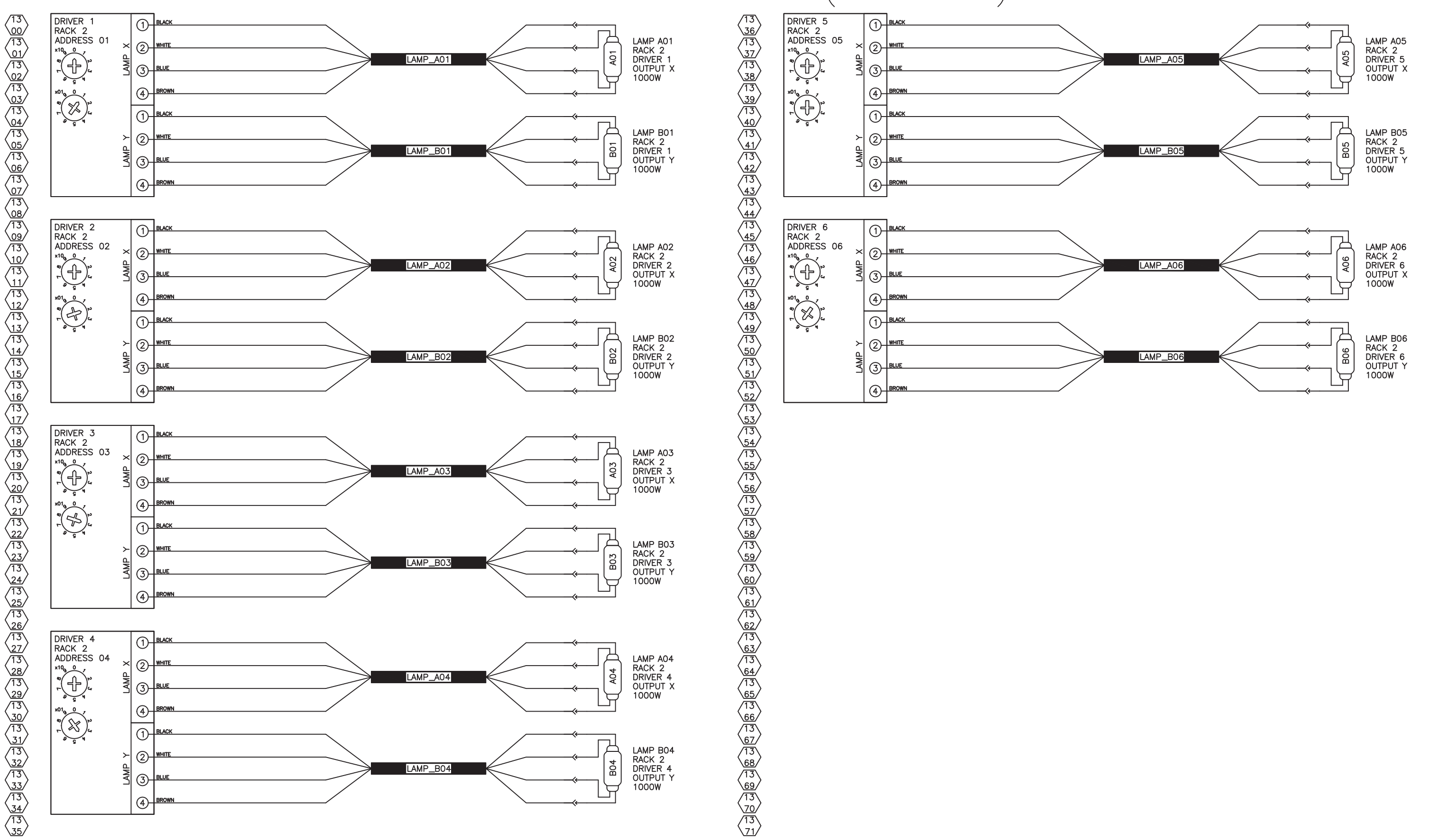
DRIVER RACK CONNECTORS
(REAR VIEW)



TROJANUV

DESCRIPTION	PDC1A–1C, UVSIGNA ANN ARBOR MI RACK 2 LAMP DRIVERS
DRAWN BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341383
REV	1
SHEET	12 OF 50
SIZE	D
SCALE	NTS

RACK 2 CONNECTIONS (BANK 1B)

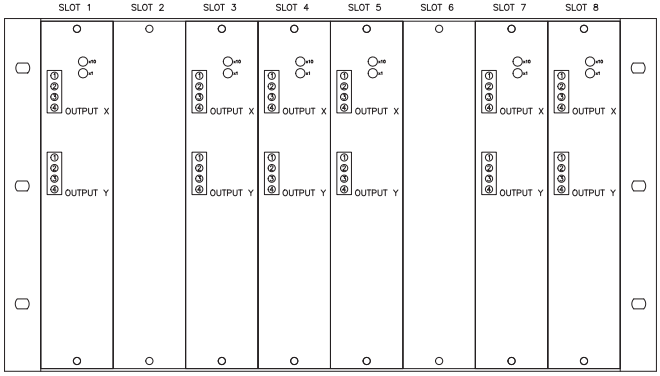


TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

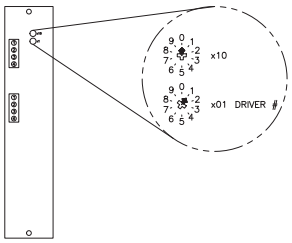
DESCRIPTION	PDC1A–1C, UVSIGNA ANN ARBOR MI RACK 2 LAMP–DRIVER CONNECTIONS		
1.0" ON ORIGINAL DWG	REVISED BY: PSJ	DWG NO.: 341383	REV: 1
	CHECKED BY: JK		
	APPROVED BY: PSL		
SCALE: NTS	APPROVAL DATE YYYY–MM–DD: 2023–08–02	SHEET 13 OF 50	SIZE D

DRIVER POSITION IN RACK 3 (BANK 1C)

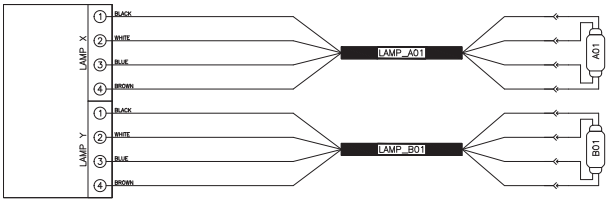


Rack 3								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 1		Driver 2	Driver 3	Driver 4		Driver 5	Driver 6
Phase	L2	L2	L1	L1	L3	L3	L3	L2
Modbus Address*	01		02	03	04		05	06

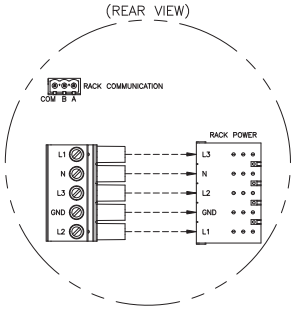
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 15 FOR RACK 3 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



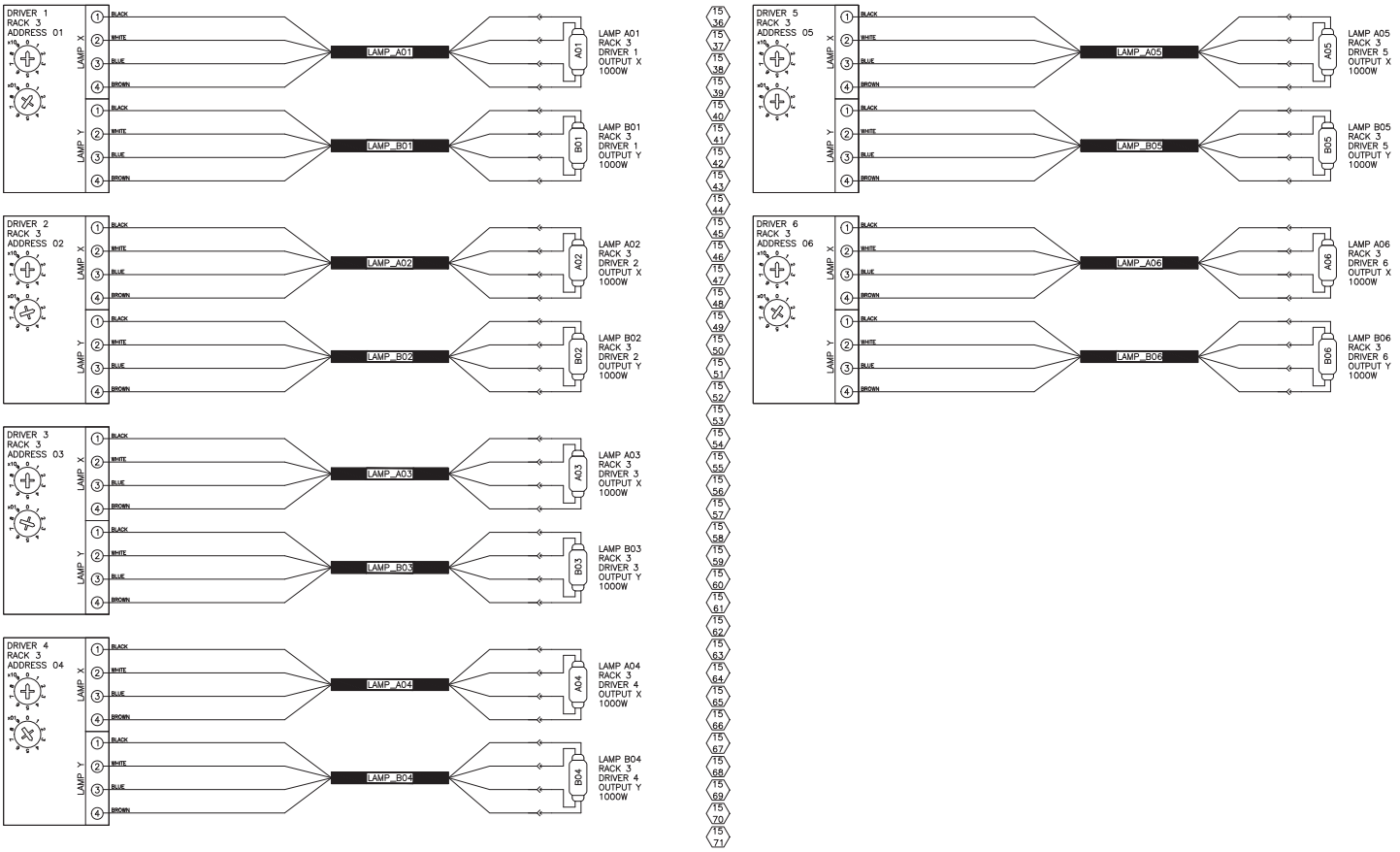
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 3 LAMP DRIVERS

DRAWN BY	PSJ	DWG NO.	REV
CHECKED BY	MK	341383	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 14 OF 50	SIZE D

SCALE: NTS
"1/2" ON ORIGINAL DWG

RACK 3 CONNECTIONS (BANK 1C)



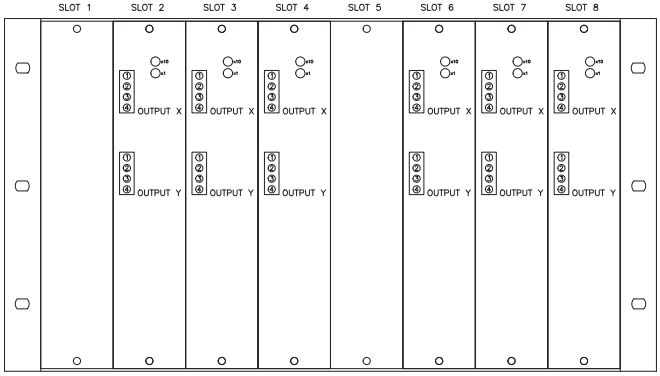
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 3 LAMP-DRIVER CONNECTIONS

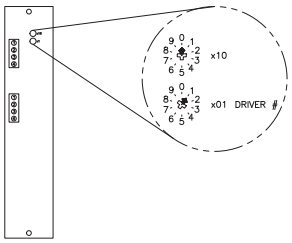
PROJECT NO.	341383
REV	1
SHEET	15 OF 50
SIZE	D
SCALE	NTS
DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02

DRIVER POSITION IN RACK 4 (BANK 1A)

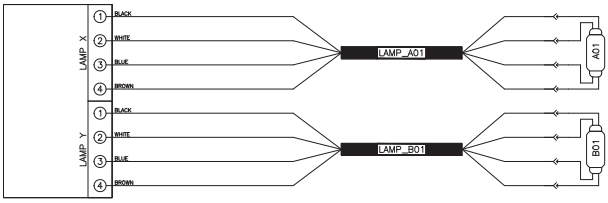


Rack 4								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number		Driver 7	Driver 8	Driver 9		Driver 10	Driver 11	Driver 12
Phase	L1	L1	L3	L3	L2	L2	L2	L1
Modbus Address*		07	08	09		10	11	12

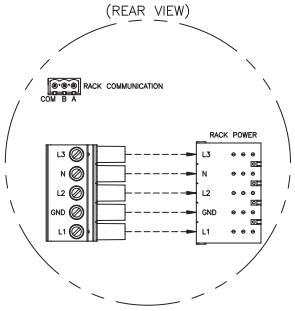
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 17 FOR RACK 4 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)

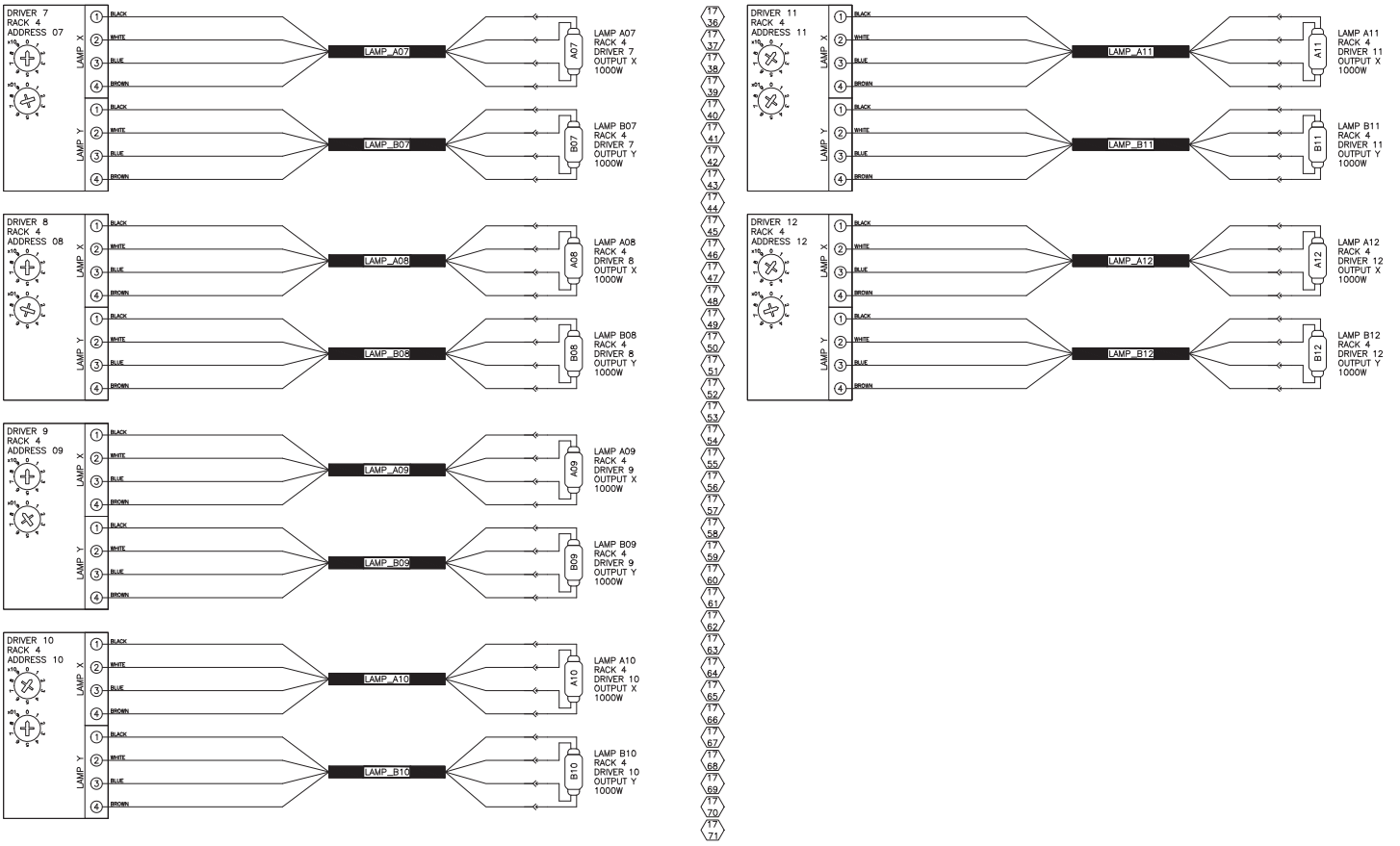


TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 477

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 4 LAMP DRIVERS

REVISED BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341383
REV	1
SHEET	16 OF 50
SIZE	D
SCALE	NTS

RACK 4 CONNECTIONS (BANK 1A)



TROJAN UV

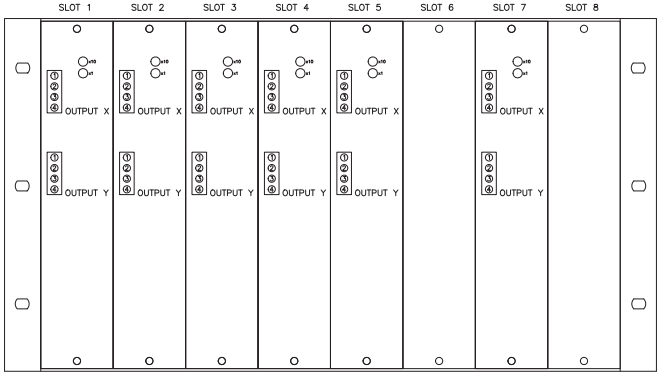
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 4 LAMP-DRIVER CONNECTIONS

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341383
REV	1
SHEET	17 OF 50
SIZE	D

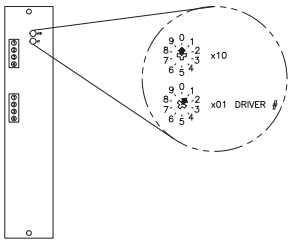
SCALE: NTS

DRIVER POSITION IN RACK 5 (BANK 1B)

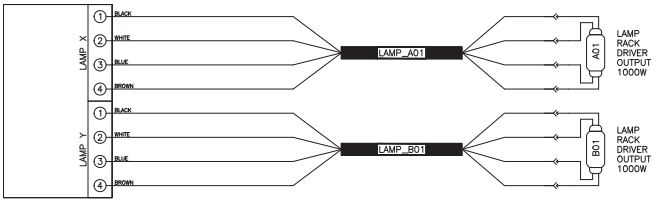


Rack 5								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 7	Driver 8	Driver 9	Driver 10	Driver 11		Driver 12	
Phase	L3	L3	L2	L2	L1	L1	L1	L3
Modbus Address*	07	08	09	10	11		12	

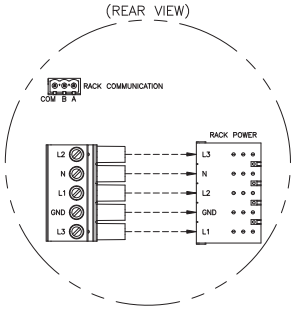
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 19 FOR RACK 5 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



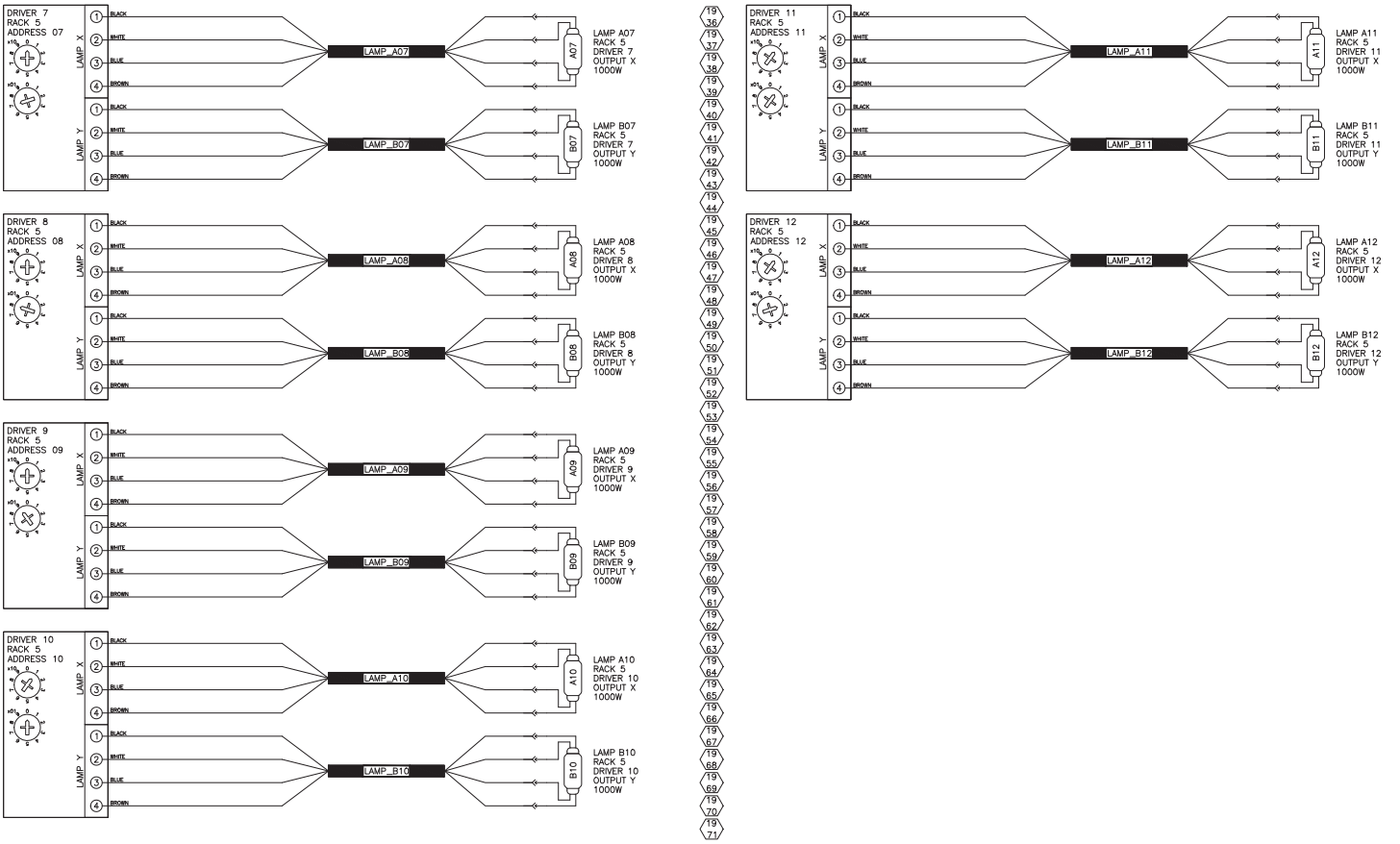
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 5 LAMP DRIVERS

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	JMC	341383	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 18 OF 50	SIZE D

SCALE: NTS

RACK 5 CONNECTIONS (BANK 1B)



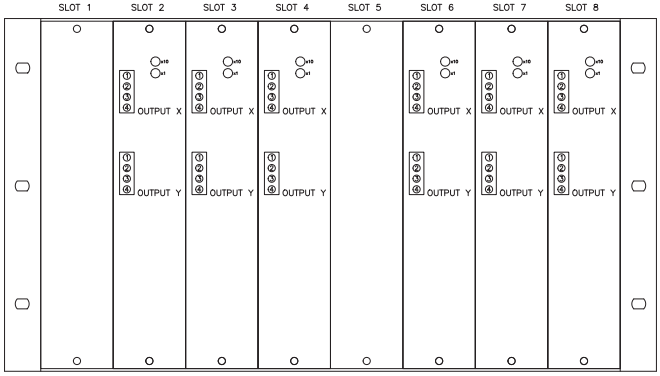
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 5 LAMP-DRIVER CONNECTIONS

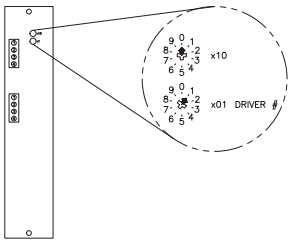
DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341383
REV	1
SHEET	19 OF 50
SIZE	D
SCALE	NTS

DRIVER POSITION IN RACK 6 (BANK 1C)

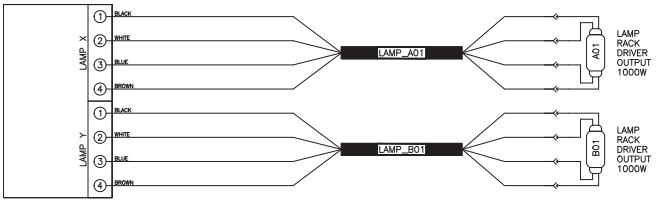


Rack 6								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number		Driver 7	Driver 8	Driver 9		Driver 10	Driver 11	Driver 12
Phase	L2	L2	L1	L1	L3	L3	L3	L2
Modbus Address*		07	08	09		10	11	12

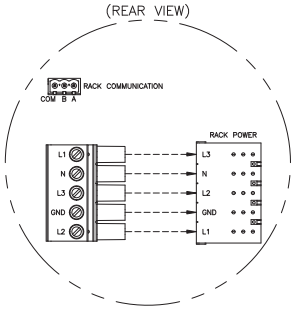
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 21 FOR RACK 6 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



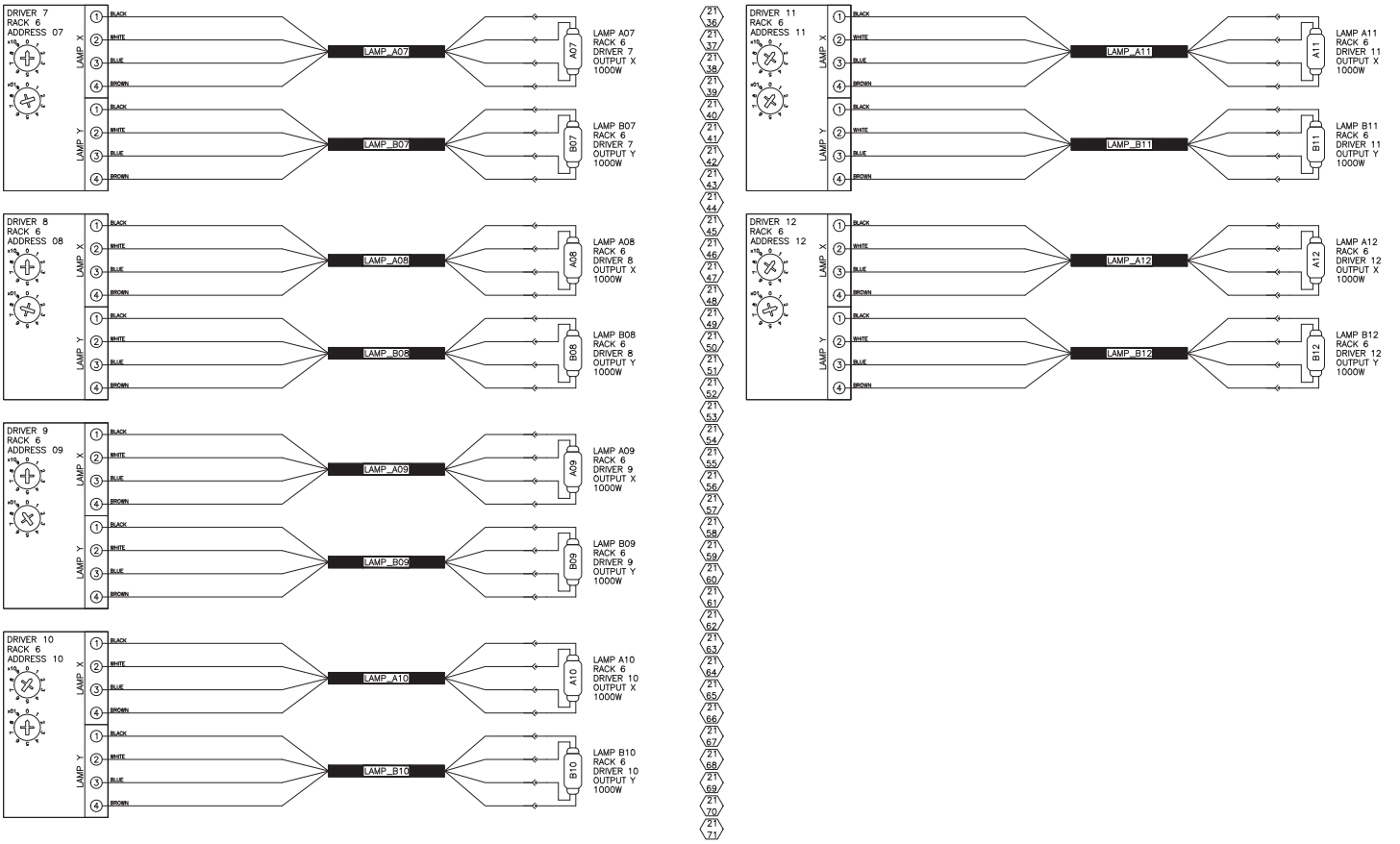
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 6 LAMP DRIVERS

REVISED BY	PSJ
CHECKED BY	JMK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341383
REV	1
SHEET	20 OF 50
SIZE	D

SCALE: NTS

RACK 6 CONNECTIONS (BANK 1C)



TROJAN UV

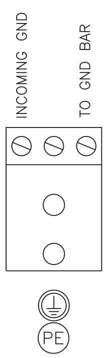
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 6 LAMP-DRIVER CONNECTIONS

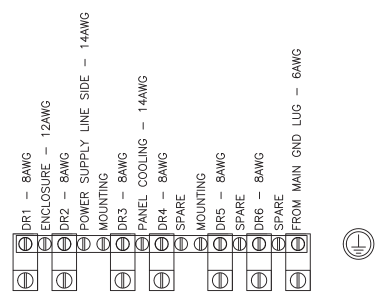
DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341383
REV	1
SHEET	21 OF 50
SIZE	D

SCALE: NTS

MAIN GROUND LUG CONNECTION LAYOUT

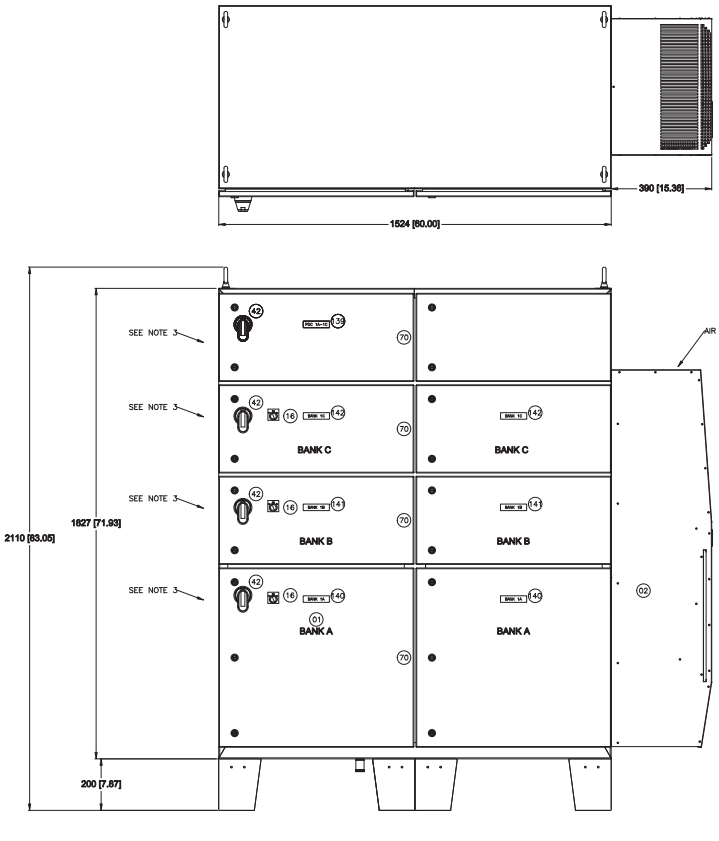


GROUND BAR CONNECTION LAYOUT



DESCRIPTION	PDC1A-1C, UVSIGNA ANN ARBOR MI GROUNDING DETAIL		
REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	JK	341383	1
APPROVED BY	PSL		
APPROVAL DATE YYYY-MM-DD	2023-08-02	SHEET 23 OF 50	SIZE D
SCALE:	NTS	1.0" ON ORIGINAL DWG	

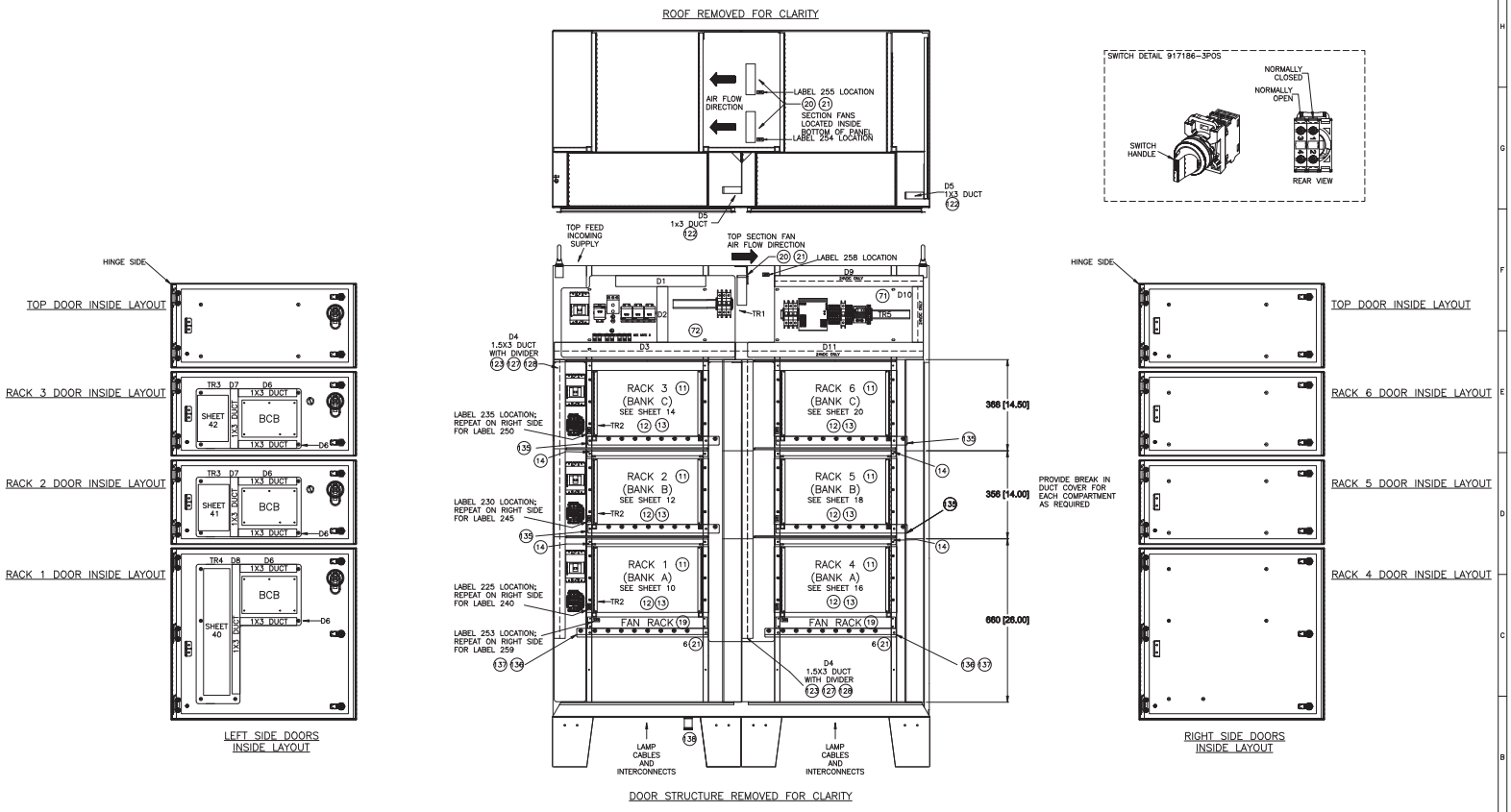
TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7



NOTES:
1. UNIT: (mm) [INCH]
2. DIMENSIONS ARE REFERENCE ONLY
3. RIGHT HAND DOOR MAY BE INTERLOCKED SO THAT IT CAN BE OPEN ONLY IF THE LEFT HAND DOOR IS OPENED FIRST

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI EXTERNAL LAYOUT
DRAWN BY: PSJ
CHECKED BY: JMC
APPROVED BY: PSJ
APPROVAL DATE (YYYY-MM-DD): 2023-08-02
DWG NO.: 341383
REV: 1
SCALE: NTS
SHEET 25 OF 50
SIZE: D

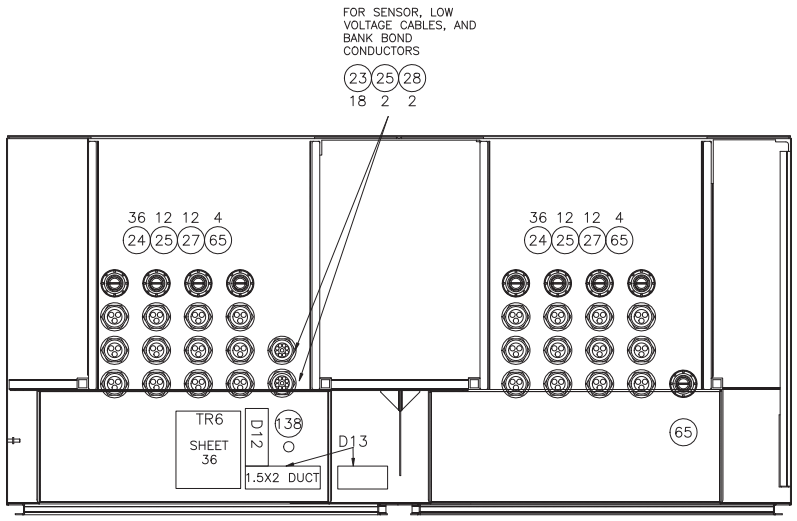


NOTES:

1. USE M6x1.0 TAP FOR ALL MESH DIVIDER MOUNTING HOLES (ITEM 14), SUPPORT TRAY/CABLE MOUNTING PLATE(ITEM 137, 136, 135), DRIVER RACKS (ITEM 11) AND FAN RACKS (ITEM 19), USE SST PHILLIPS HEAD SCREW AND SST LOCK WASHER.
2. BOND ENCLOSURE DOOR TO ENCLOSURE WITH 12AWG GREEN/YELLOW WIRE.
3. GROUND LUG IS OPTIONAL, CAN BE USED FOR WIRES WITH GAUGE 8AWG OR MORE. REFER SHEET#23 FOR POSITION AND SHEET#49 FOR QUANTITY.

TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 477

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI INTERNAL LAYOUT
DWG NO. 341383
REV 1
SHEET 26 OF 50
SIZE D
SCALE NTS
APPROVAL DATE YYYY-MM-DD 2023-08-02



BOTTOM INSIDE VIEW
(LOOKING THROUGH THE TOP)

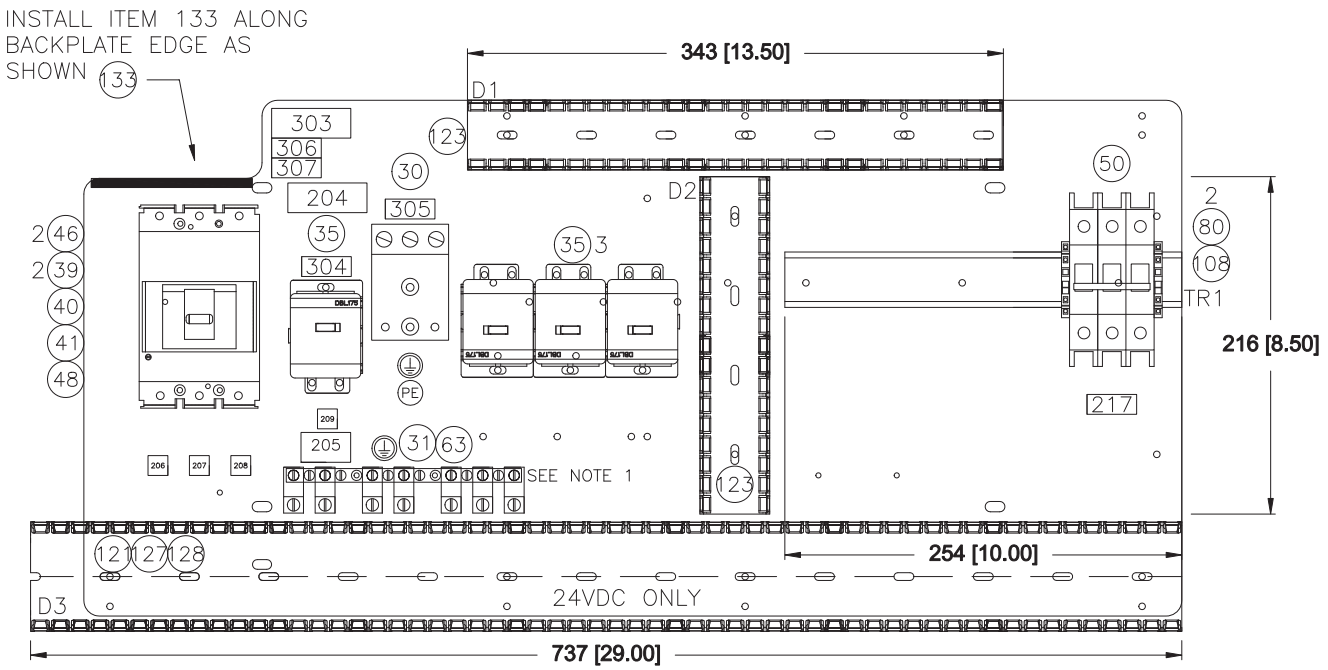
TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI INTERNAL BOTTOM LAYOUT

DRAWN BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341383
REV	1
SHEET	27 OF 50
SIZE	D

SCALE: NTS



NOTES

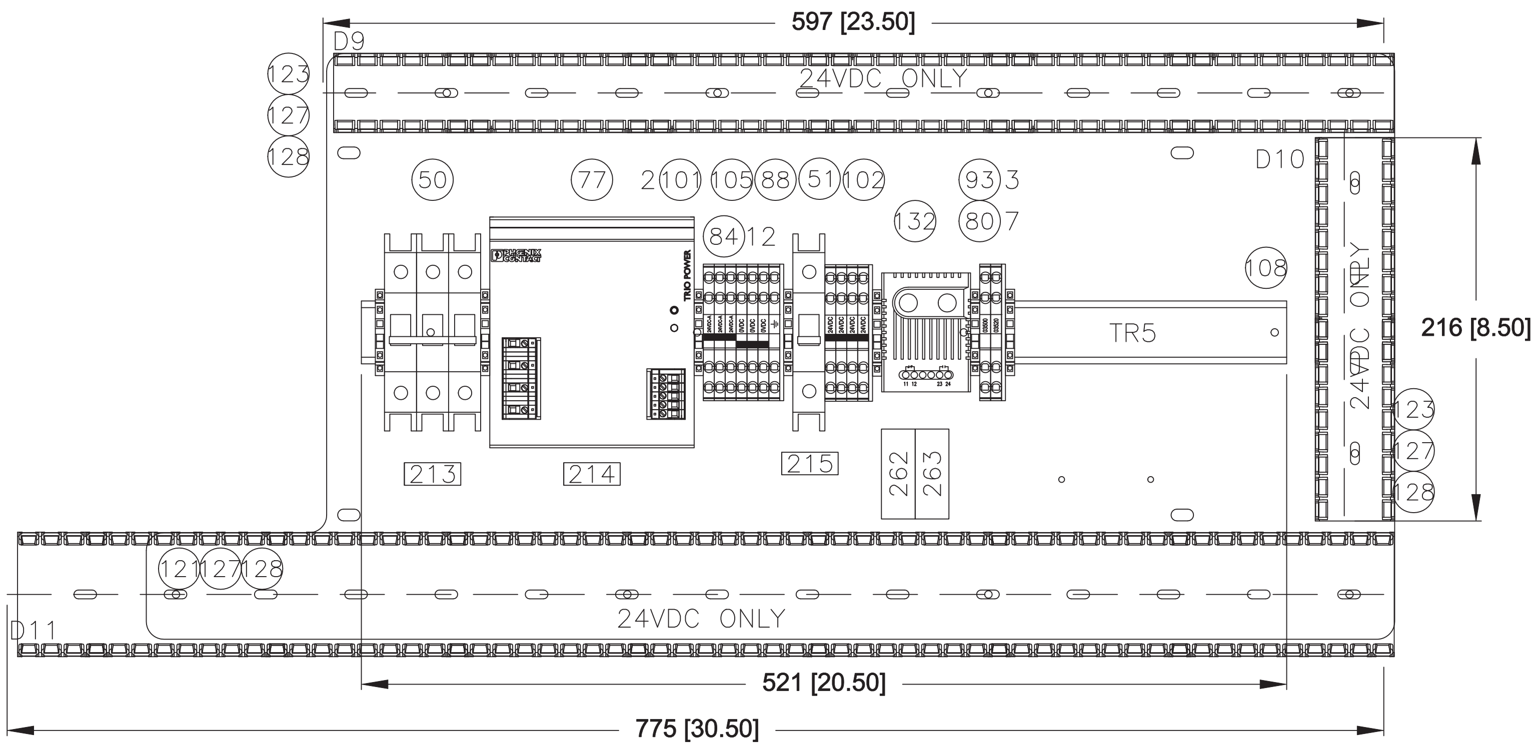
1. GROUND LUG IS OPTIONAL, CAN BE USED FOR WIRES WITH GAUGE 8AWG OR MORE. REFER SHEET#23 FOR POSITION AND SHEET#49 FOR QUANTITY.

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI BACKPLATE LAYOUT

REVIEWED BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DRG NO.	341383
REV	1
SHEET	30 OF 50
SIZE	D
SCALE	NTS

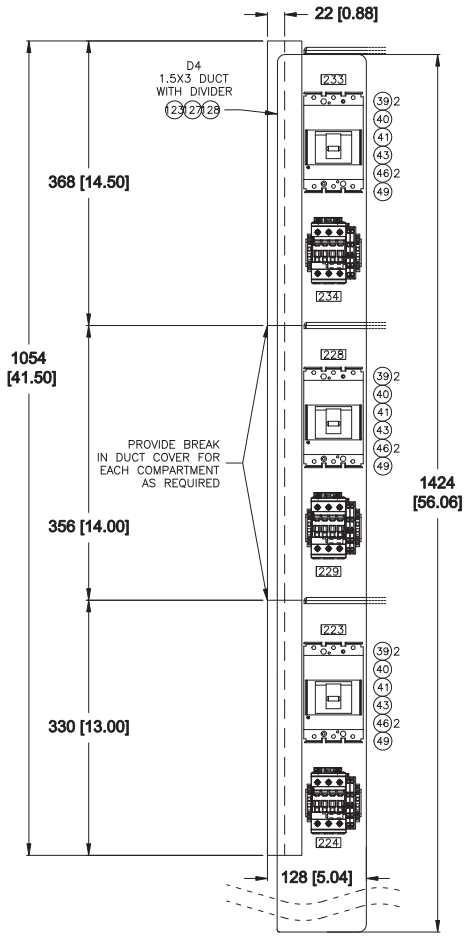


TROJANUV

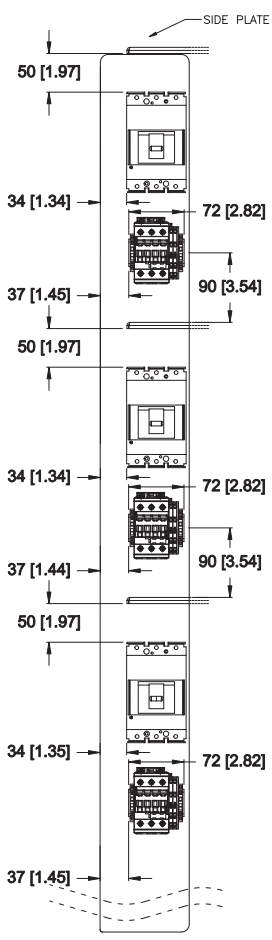
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION	PDC1A–1C, UVSIGNA ANN ARBOR MI BACKPLATE LAYOUT – RIGHT SECTION				
0 0.5 1.0 / 1.0" ON ORIGINAL DWG	REVISED BY	PSJ	DWG NO.	341383	REV 1
	CHECKED BY	JK			
	APPROVED BY	PSL			
SCALE: NTS	APPROVAL DATE YYYY–MM–DD	2023–08–02	SHEET 31	OF 50	SIZE D

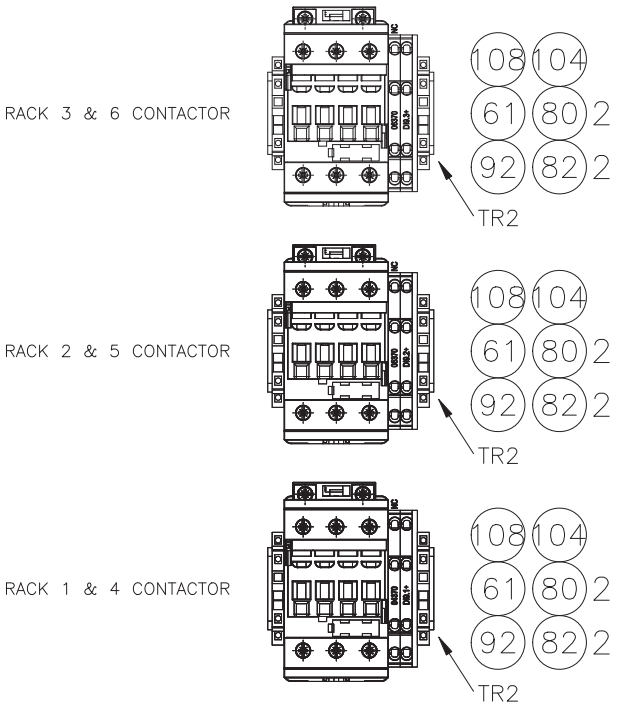
SIDE PLATE VIEW 1



SIDE PLATE VIEW 2



TERMINAL BLOCK DETAIL



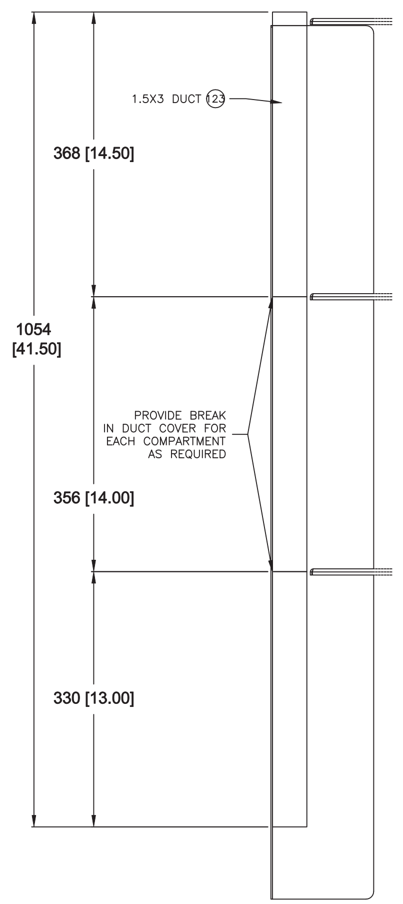
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
SIDE PLATE LAYOUT

DRAWN BY	PSJ
CHECKED BY	
APPROVED BY	
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341383
REV	1
SHEET	33 OF 50
SIZE	D
SCALE	NTS

RIGHT SECTION
SIDE PLATE VIEW

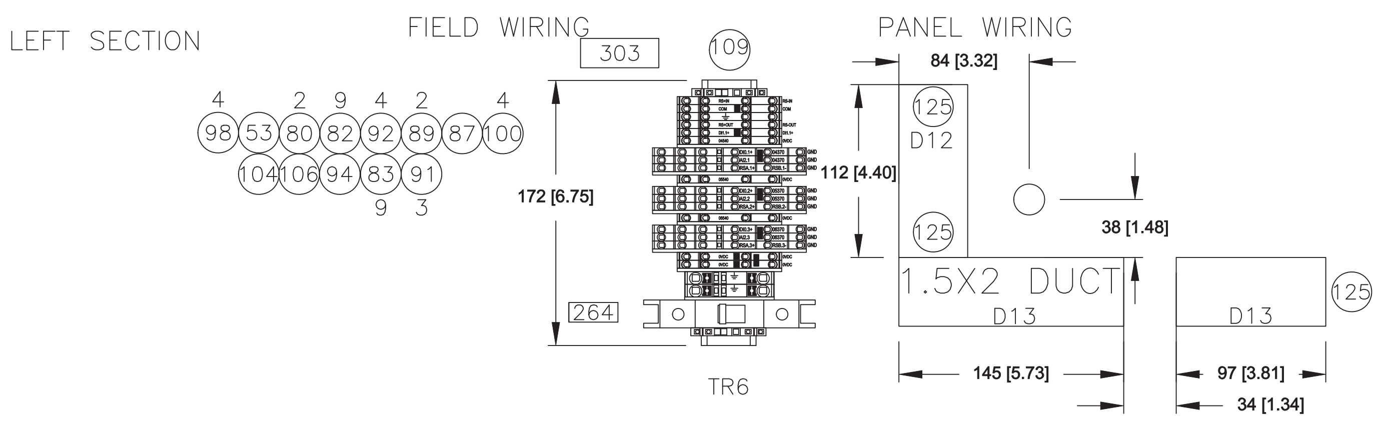


DESCRIPTION	PDC1A–1C, UVSIGNA ANN ARBOR MI SIDE PLATE LAYOUT – RIGHT SECTION
REVISED BY	PSJ
CHECKED BY	JK
APPROVED BY	PSL
APPROVAL DATE YYYY-MM-DD	2023–08–02
DWG NO.	341383
REV	1
SHEET	34 OF 50
SIZE	D
SCALE:	NTS

0 0.5 1.0
1.0" ON ORIGINAL DWG

TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

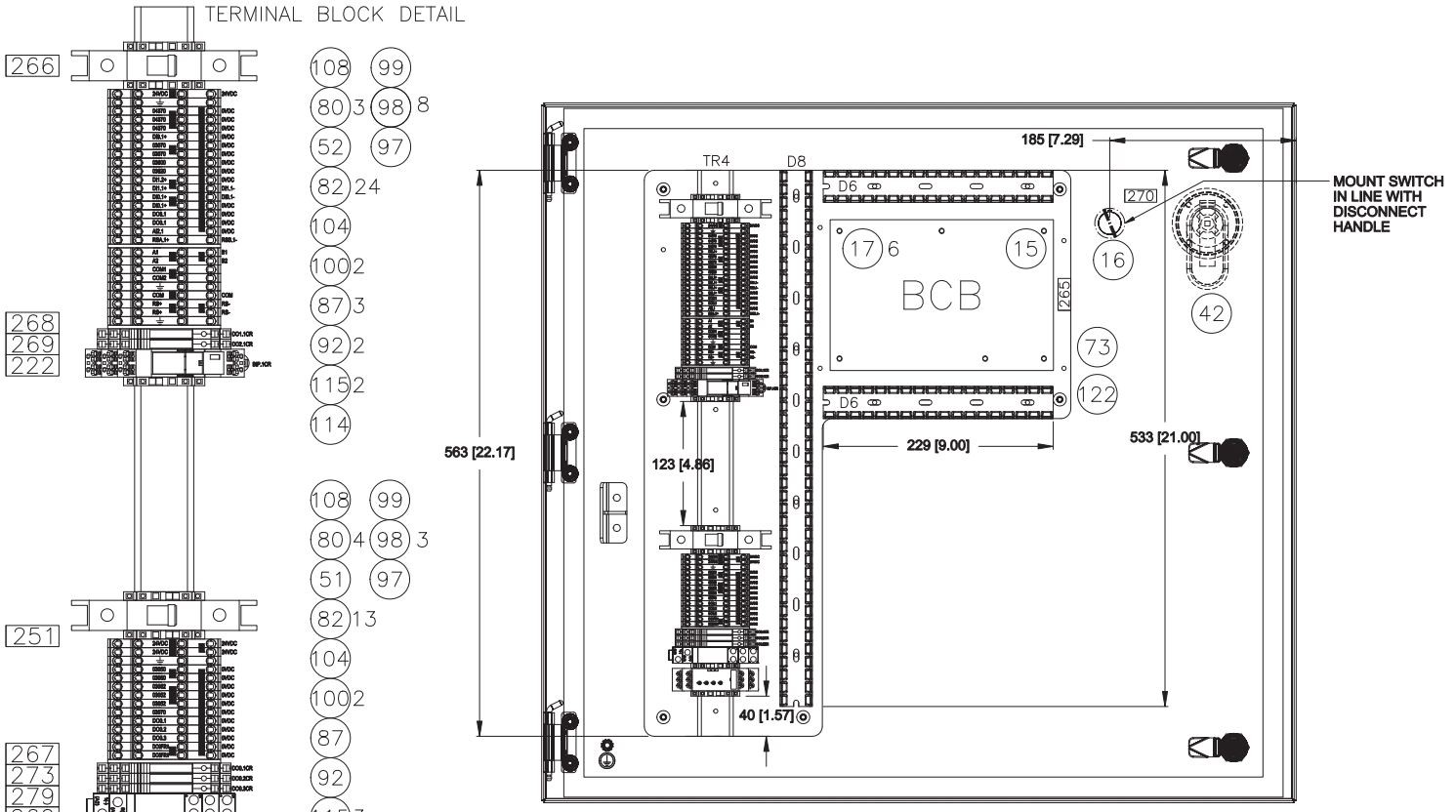
BOTTOM TERMINAL BLOCKS



TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI BOTTOM TERMINAL BLOCK LAYOUT

REVISED BY	PSJ	DWG NO. 341383	REV 1
CHECKED BY	JK		
APPROVED BY	PSL		
SCALE: NTS	APPROVAL DATE 2023-08-02	SHEET 36 OF 50	SIZE D



TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

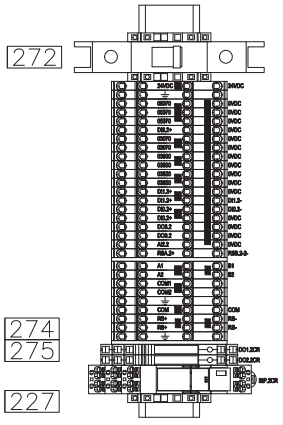
DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
RACK 1 DOOR LAYOUT

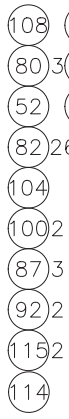
DRAWN BY	PSJ	DRG NO.	REV
CHECKED BY	MK	341383	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 40 OF 50	SIZE D

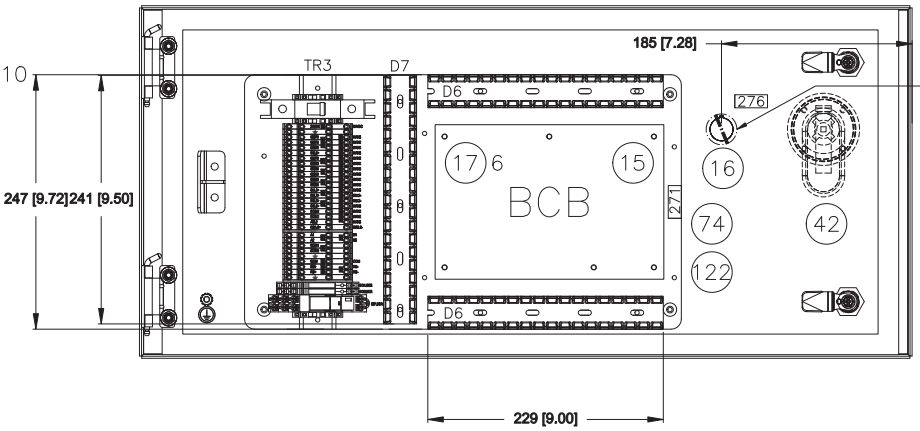
SCALE: NTS

1.0" ON ORIGINAL DWG

TERMINAL BLOCK DETAIL

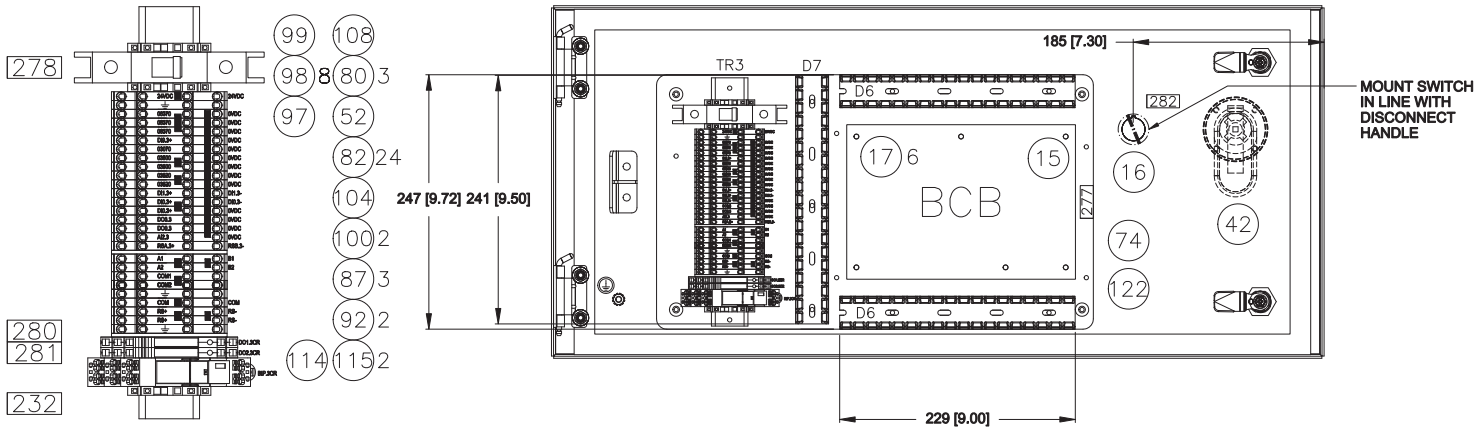






TROJANUV	DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI RACK 2 DOOR LAYOUT		
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7	REVISED BY: PSJ	DRG NO. 341383	REV 1
COPYRIGHT © TROJAN TECHNOLOGIES, 2023 - ALL RIGHTS RESERVED.	CHECKED BY: JMC		
	APPROVED BY: PSJ		
	SCALE: NTS	APPROVAL DATE (YYYY-MM-DD): 2023-08-02	SHEET 41 OF 50

TERMINAL BLOCK DETAIL



TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI RACK 3 DOOR LAYOUT

REVISED BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341383
REV	1
SCALE:	NTS
SHEET	42 OF 50
SIZE	D

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
142	2	NAMEPLATE, LAM SIG2R BANK1C	TROJAN	917856-B1C	917856-B1C
141	2	NAMEPLATE, LAM SIG2R BANK1B	TROJAN	917856-B1B	917856-B1B
140	2	NAMEPLATE, LAM SIG2R BANK1A	TROJAN	917856-B1A	917856-B1A
139	1	NAMEPLATE, LAM 2R PDC 1A-1C	TROJAN	917924-1A1C	917924-1A1C
138	1	VENT, DRAIN	HOFFMAN	AVDR4NM	901841
137	2	PLATE WLDT, PDC CABLE MTG LWR	TROJAN	337993-002	337993-002
136	2	SUPPORT TRAY, DRIVER CABLE	TROJAN	337948	337948
135	4	PLATE WLDT, PDC CABLE MTG UPR	TROJAN	337993-001	337993-001
134	18"	TAPE, ACRYLIC FOAM DBL SIDED	3M	VHB4930	005003
133	12"	WEATHERSTRIPPING, RW108	TRIM-LOCK	750-B-2-1/16	120005
132	1	THERMOSTAT, DUAL NC/NO DIN	STEGO	01172.0-00	916266
131	1	RELAY, 0.3A-15A 24-240VDC/AC	ABB	CM-SRS.M2S	917509-SRSM2S
130	97"	CABLE, 22AWG 1PAR 300V RS485	BELDEN	3106A	917515
129	3"	SPIRAL WRAP, PE 0.5" NA	HELLERMANNTYTON	3HFT9C	917528-001
128	132"	WIRE DUCT, SLOTTED DIVIDER 3X6	PANDUIT	SD3H6	913437-SD3H6
127	26	WIRE DUCT, DIVIDER MTG BASE	PANDUIT	DB-C	917138-0DBC
126					
125	13"	WIRE DUCT, TYPE F LT GRY1.5x2	PANDUIT	F1.5X2LG6 / C1.5LG6	913437-005
124					
123	142"	WIRE DUCT, TYPE F LT GRY 1.5x3	PANDUIT	F1.5X3LG6 / C1.5LG6	913437-006
122	149"	WIRE DUCT, TYPE F LT GRY 1x3	PANDUIT	F1X3LG6 / C1LG6	913437-004
121	58"	WIRE DUCT, TYPE F LT GRY 2.5x3	PANDUIT	F2.5X3LG6 / C2.5LG6	913437-033
120					
119	1	RELAY, SUPPRESSION DIODE + LED	FINDER	99.02.9.024.99	917559-2001
118	1	RELAY, BASE BLU SCR TERM SPDT	FINDER	97.01SPA	917559-1001
117	1	RELAY, 16A SPDT 24VDC	FINDER	46.61.9.024.0074	917559-0001
116					
115	9	RELAY, 6A 24VDC SPDT PIT PC	PHOENIX CONTACT	2900299	915403-112
114	3	RELAY, 6A DPDT 24VDC SAF RIF	PHOENIX CONTACT	2908215	917175-3006BS
113					
112					
111					
110					
109	7"	DIN RAIL, PERF 35x15 PHOENIX	PHOENIX CONTACT	1201730	913221
108	82"	**DIN RAIL PERF 35X7.5 PHOENIX**	**PHOENIX CONTACT**	**0801733**	**914147**
107					
106	A/R	TERM BLK, MARKER SHEET ZB8	PHOENIX CONTACT	1052002 OR EQUIVALENT	916050-1052002
105	A/R	TERM BLK, MARKER SHEET ZB6	PHOENIX CONTACT	1051003 OR EQUIVALENT	916050-1051003
104	A/R	TERM BLK, MARKER SHEET ZBF5	PHOENIX CONTACT	0808642 OR EQUIVALENT	916050-0808642
103					
102	1	TERM BLK, JUMPER 4P FBS 4 6	PHOENIX CONTACT	3030255	916050-3030255
101	2	TERM BLK, JUMPER 3P FBS 3 6	PHOENIX CONTACT	3030242	916050-3030242
100	12	TERM BLK, JUMPER 2P FBS PV	PHOENIX CONTACT	3032185	916050-3032185
99	2	TERM BLK, JUMPER 50P FBS 50 5	PHOENIX CONTACT	3038930	916050-3038930
98	33	TERM BLK, JUMPER 2P FBS 2 5	PHOENIX CONTACT	3030161	916050-3030161
97	4	TERM BLK, JUMPER 3P FBS 3 5	PHOENIX CONTACT	3030174	916050-3030174
96					
95					
94	1	TERM BLK, END PLT D PIT 6	PHOENIX CONTACT	3212044	916050-3212044
93	3	TERM BLK, END PLT D PIT 4 QU	PHOENIX CONTACT	3208979	916050-3208979
92	14	TERM BLK, END PLT D PITB 2.5	PHOENIX CONTACT	3211634	916050-3211634
91	3	TERM BLK, END PLT D PIT 2.5 3L	PHOENIX CONTACT	3211647	916050-3211647
90					
89	2	TERM BLK, PIT 6 PE GND	PHOENIX CONTACT	3211822	916078-3211822
88	1	TERM BLK, PIT 4 PE QUAT GND	PHOENIX CONTACT	3211809	916077-3211809
87	11	TERM BLK, PITB 2.5 PE GND	PHOENIX CONTACT	3210596	916049-3210596
86					
85					
84	12	TERM BLK, PIT 4 QUATTRO GRY	PHOENIX CONTACT	3211797	916077-3211797
83	9	TERM BLK, PIT 2.5 3FE/L/L	PHOENIX CONTACT	3210541	916049-3210541
82	102	TERM BLK, PITB 2.5 GRY	PHOENIX CONTACT	3210567	916049-3210567

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
81					
80	30	TERM BLK, END STOP CLIPFIX 35S	PHOENIX CONTACT	3022276	916050-3022276
79					
78					
77	1	PS, 24VDC 3P TRIO 20A	PHOENIX CONTACT	2866394	916051-394
76					
75					
74	2	BACKPLATE, DOOR UPPER PDC	TROJAN	338039-003	338039-003
73	1	BACKPLATE, DOOR LOWER PDC	TROJAN	338039-004	338039-004
72	1	BACKPLATE, TOP LS DRILLED PDC	TROJAN	338039-006	338039-006
71	1	BACKPLATE, TOP RS DRILLED PDC	TROJAN	338039-002	338039-002
70	4	KIT, DOOR INTERLOCK SOLO PDC	TROJAN	337849	337849
69					
68					
67					
66					
65	9	PLUG, HOLE SEAL 4X POLY 1.25 INCH	HOFFMAN	ASPB100125NM	913058-125P
64					
63	7	LUG, GND 2-14AWG 1 COND ILSCO	ILSCO	TA-2	917934
62					
61	3	CONTACTOR, AF26 45A NA 24V	ABB	AF26-30-00-11	917180-26C024
60					
59					
58					
57					
56					
55					
54					
53	1	BREAKER, 1A 1P AC/DC C ABB	ABB	SU201M-C1	917139-MC1010
52	3	BREAKER, 2A 1P AC/DC C ABB	ABB	SU201M-C2	917139-MC1020
51	2	BREAKER, 10A 1P AC/DC C ABB	ABB	SU201M-C10	917139-MC1100
50	2	BREAKER, 10A 3P AC/DC C ABB	ABB	SU203M-C10	917139-MC3100
49	3	BREAKER, 40A 3P 600VAC 25KA ABB	ABB	XT1NU3040AFF000XXX	917143-N3040
48	1	BREAKER, 125A 3P 600V 25KA ABB	ABB	XT1NU3125AFF000XXX	917143-N3125
47					
46	8	BREAKER, LUG CPRSN 3PC ABB	ABB	KXT1CU-3PC	917143-LUG3
45					
44					
43	3	BREAKER, AUX 24VDC 1Q/1SY	ABB	KXTAAXCDGSYFP	917143-AUX11024
42	4	DISC, HANDLE ON/OFF 10mmX4" ABB	ABB	OHB65L10B	912787-410
41	4	500mm PISTOL HANDLE SHAFT	ABB	OXP10X500	912786-10X500
40	4	RHE_B BASE FOR EXTENDED HANDLE	ABB	KXTBRHEBFP	916814-KXTBRHE
39	8	BREAKER, COVER LOW 3P XT1	ABB	KXT1LTC-3	917143-LTC3
38					
37					
36					
35	4	DIST BLOCK, 175A TE	TE CONNECTIVITY	DBL175	917305-175
34					
33					
32					
31	1	**GROUND BAR, 12DAP 6-14AWG**	**ILSCO**	**D187-12**	**916079-012**
30	1	LUG, GROUND 1/0-14AWG	ILSCO	TA2-0	917527-001
29					
28	2	STRAIN RELIEF, M-40 9-0.272	LAPP GROUP	53340969	915889-53340969
27	24	STRAIN RELIEF, M-40 3-0.542	LAPP GROUP	53340310	915889-53340310
26					
25	26	STRAIN RELIEF, M-40 1.102 B	LAPP GROUP	S2529	915889-52529
24	72	STRAIN RELIEF, INSERT 9mm	LAPP GROUP	53100009	915889-53100009
23	18	STRAIN RELIEF, INSERT 7mm	LAPP GROUP	53100007	915889-53100007
22					
21	18	FAN, METAL GUARD ORION	ORION	G109-15A	917530
20	3	FAN, 150CFM 24VDC	ORION	OD1238-24LB-XC	916974-150
19	2	FAN ASSY, UVSIGNAX150CFM 24VDC	ORION	OD600-24LBXC	916840
18					
17	18	STANDOFF, PCB 1/2" NYLON	RICHCO	LCBS-8-01	013237
16	3	SWITCH ASSY, SEL 22mm 3POS KIT	ABB	917186-3POS	917186-3POS
15	3	BOARD, BCB	TROJAN	931120	931120
14	4	MESH, SOLO PDC	CUSTOM	337766	337766
13	12	PLATE, SOLO RACK 1 SLOT	TROJAN	490297	490297
12	36	LAMP DRIVER, SOLO 2x1kW	TROJAN	915306	915306
11	6	RACK, SOLO DRIVER 8 SLOT	TROJAN	915307-001	915307-001
10					
09					
08					
07					
06					
05					
04					
03					
02	1	AC, 20000 400/460V 316SS 4X H	PENTAIR	G5720460205	917489-20164XH
01	1	ENCL WLDT, SOLO PDCDW BD 316	TROJAN	338040-2816	338040-2816

SEE NOTE 3 → 63

SEE NOTE 1 → 24

SEE NOTE 2 → 23

NOTES:

1. ITEM 24 SEAL INSERT TO BE INSTALLED IN ITEM 27 STRAIN RELIEF BY PANEL BUILDER.
2. ITEM 23 SEAL INSERT TO BE INSTALLED IN ITEM 28 STRAIN RELIEF BY PANEL BUILDER.
3. GROUND LUG IS OPTIONAL. USE GROUND LUGS FOR WIRES THAT DOES NOT FIT IN GROUND BAR.

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
BILL OF MATERIALS

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	JMC	341383	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 49 OF 50	SIZE D

SCALE: NTS

ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3
310					
309					
308					
307	1	EMLP(27x12.5)R	TORQUE	62 lb.in	
306	1	EMLP(27x12.5)R	MAIN FEED	75C WIRE	
305	1	EMLP(27x12.5)R	TORQUE	50 lb.in	
304	1	EMLP(27x12.5)R	TORQUE	53-88 lb.in	
303	2	EMLP(45x25)R	ALL FIELD WIRING	USE COPPER	CONDUCTORS ONLY
302					
301					
300					
299					
298					
297					
296					
295					
294					
293					
292					
291					
290					
289					
288					
287					
286					
285					
284					
283					
282	1	EMLP (27x12.5) R	0671SS		
281	1	EMLP (27x12.5) R	D02.3CR		
280	1	EMLP (27x12.5) R	D01.3CR		
279	1	EMLP (27x12.5) R	D00.3CR		
278	1	EMLP (27x12.5) R	0636CB	2A	
277	1	EMLP (27x12.5) R	0603BCB		
276	1	EMLP (27x12.5) R	0571SS		
275	1	EMLP (27x12.5) R	D02.2CR		
274	1	EMLP (27x12.5) R	D01.2CR		
273	1	EMLP (27x12.5) R	D00.2CR		
272	1	EMLP (27x12.5) R	0536CB	2A	
271	1	EMLP (27x12.5) R	0500BCB		
270	1	EMLP (27x12.5) R	0471SS		
269	1	EMLP (27x12.5) R	D02.1CR		
268	1	EMLP (27x12.5) R	D01.1CR		
267	1	EMLP (27x12.5) R	D00.1CR		
266	1	EMLP (27x12.5) R	0436CB	2A	
265	1	EMLP (27x12.5) R	0400BCB		
264	1	EMLP (27x12.5) R	0450CB	1A	
263	1	EMLP (45x25) R	0350TMP	ALERT	SET 50°C/122°F
262	1	EMLP (45x25) R	0350TMP	SHUTDOWN	SET 55°C/131°F
261					
260	1	EMLP (27x12.5) R	FR1CR		
259	1	EMLP (27x12.5) R	0307FR		
258	1	EMLP (27x12.5) R	0313FAN		
257					
256					

ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3
255	1	EMLP (27x12.5) R	0311FAN		
254	1	EMLP (27x12.5) R	0309FAN		
253	1	EMLP (27x12.5) R	0305FR		
252	1	EMLP (27x12.5) R	0305CT		
251	1	EMLP (27x12.5) R	0305CB	10A	
250	1	EMLP (27x12.5) R	DR6		
249					
248					
247					
246					
245	1	EMLP (27x12.5) R	DR5		
244					
243					
242					
241					
240	1	EMLP (27x12.5) R	DR4		
239					
238					
237					
236					
235	1	EMLP (27x12.5) R	DR3		
234	1	EMLP (27x12.5) R	DR3CON		
233	1	EMLP (27x12.5) R	0227CB	40A	
232	1	EMLP (27x12.5) R	BIP.3CR		
231					
230	1	EMLP (27x12.5) R	DR2		
229	1	EMLP (27x12.5) R	DR2CON		
228	1	EMLP (27x12.5) R	0217CB	40A	
227	1	EMLP (27x12.5) R	BIP.2CR		
226					
225	1	EMLP (27x12.5) R	DR1		
224	1	EMLP (27x12.5) R	DR1CON		
223	1	EMLP (27x12.5) R	0207CB	40A	
222	1	EMLP (27x12.5) R	BIP.1CR		
221					
220					
219					
218	1	EMLP (27x12.5) R	0148AC	20000BTU A/C	
217	1	EMLP (27x12.5) R	0148CB	10A	
216					
215	1	EMLP (27x12.5) R	0337CB	10A	
214	1	EMLP (27x12.5) R	0142PS	24VDC 20A	
213	1	EMLP (27x12.5) R	0142CB	10A	
212	1	US-EML (D12.5)		PE	
211					
210	A/R	US-EML (D12.5)	⏚		
209	1	EMLP (27x12.5) R	N		
208	1	EMLP (27x12.5) R	1L3		
207	1	EMLP (27x12.5) R	1L2		
206	1	EMLP (27x12.5) R	1L1		
205	1	EMLP (27x12.5) R	0109CB	125A	MAIN
204	1	EMLP (45x25) R	INCOMING SUPPLY	480/277V 3PH	60Hz
203					
202					
201					

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC1A-1C, UVSIGNA ANN ARBOR MI
LAMICOID BILL OF MATERIALS

0 0.5 1.0	DESIGNED BY	PSJ	DWG NO. 341383 REV 1
IF THIS MEASUREMENT DOES NOT MEASURE 1.0" ON ORIGINAL DWG	CHECKED BY	JMC	
	APPROVED BY	PSJ	
SCALE: NTS	APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 50 OF 50 SIZE D

REV	REVISION DESCRIPTION	LOG NO.	REV'D BY	CHK'D BY	APPRV'D BY	DATE YYYY-MM-DD
1	RELEASE FOR SUBMITTAL	--	PSJ	JK	PSL	2023-08-02

TABLE OF CONTENTS

WIRE COLOUR CODING LEGEND

DESCRIPTION	DESIGNATION	WIRE
3 PHASE POWER	L1	BLACK
	L2	BLACK
	L3	BLACK
	N	WHITE
DC CONTROL	24VDC	BLUE
	OVDC	WHITE/BLUE
GROUND	G	GREEN/YELLOW
EXTERNAL POWER		YELLOW

NOTE: EXCEPTION TO MANUFACTURER PRE-ASSEMBLED CABLES.

NOTES:

1. ELECTRICAL ASSEMBLY TO BE ASSEMBLED UNDER UL508A AND THE MINIMUM REQUIREMENTS OUTLINED IN ES0127. WHERE THERE IS A CONFLICT BETWEEN THIS DOCUMENT AND THE REQUIREMENTS OF ES0127, THE INFORMATION PRESENTED IN THIS DOCUMENT WILL BE USED.

2. BLANK PAGES ARE RESERVED.

3. ENCLOSURE ENVIRONMENTAL RATING – UL TYPE 4X (IP66)

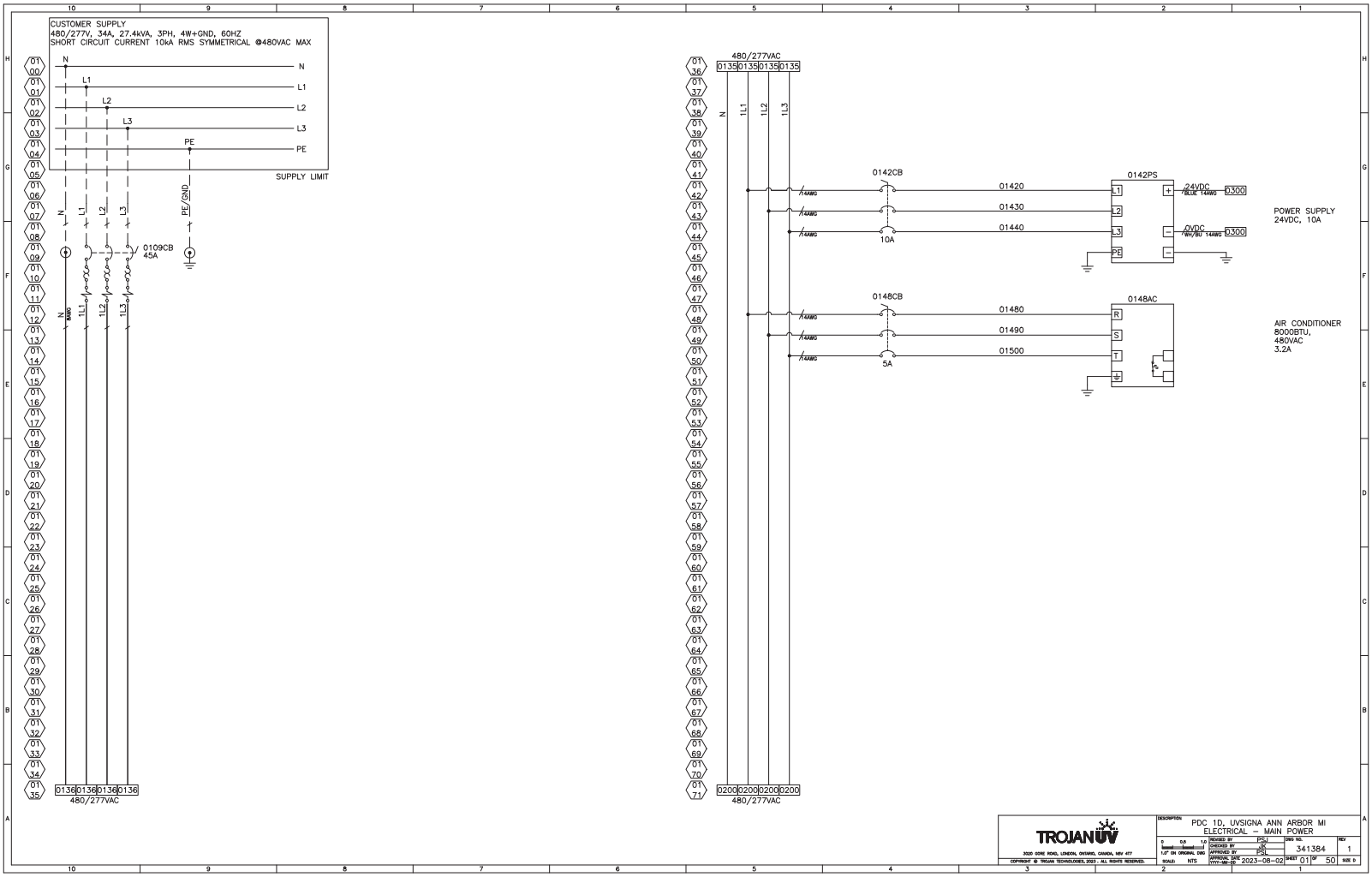
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: 2 PL DEC ± N/A
3 PL DEC ± N/A
ANGLE DEC ± N/A
REMOVE ALL BURRS, ALL CORNERS R 0.010 OR BREAK EDGE
CD – CRITICAL CHARACTERISTIC

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
TABLE OF CONTENTS

THIRD ANGLE PROJECTION

SIZE: B | DWG NO.: 341384 | REV: 1
SCALE: NTS | SHEET 00 OF 50 | SIZE: D



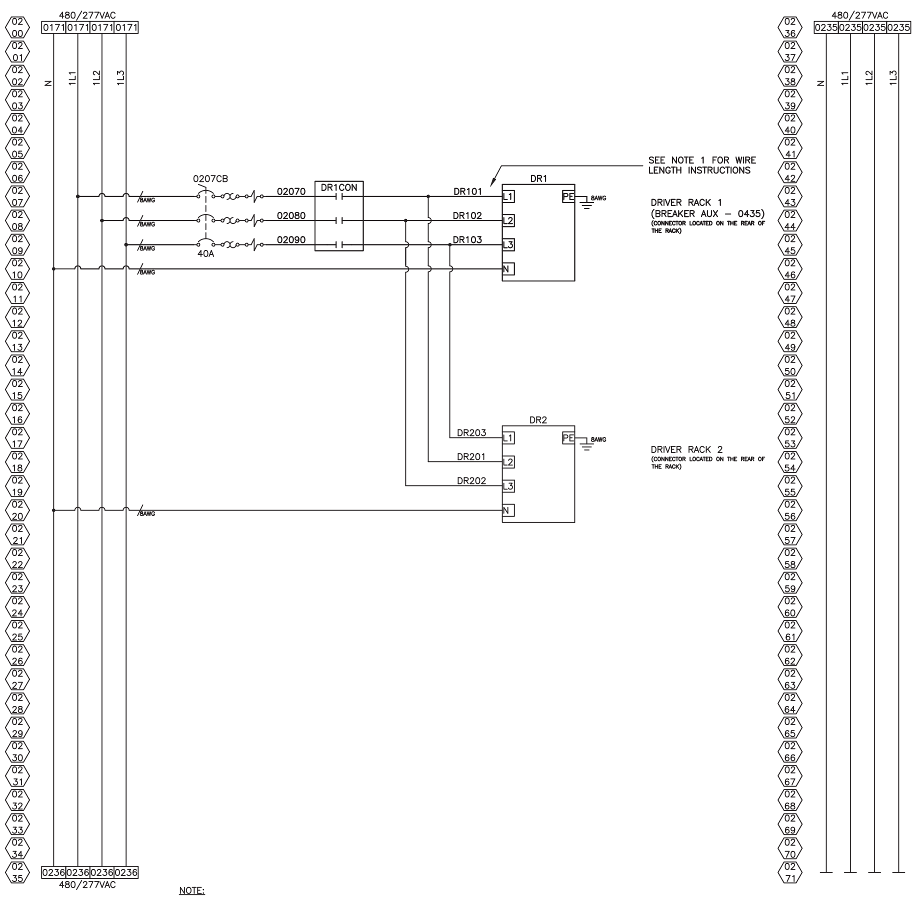
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
ELECTRICAL – MAIN POWER

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341384
REV	1
SHEET	01 OF 50
SIZE	D

0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS



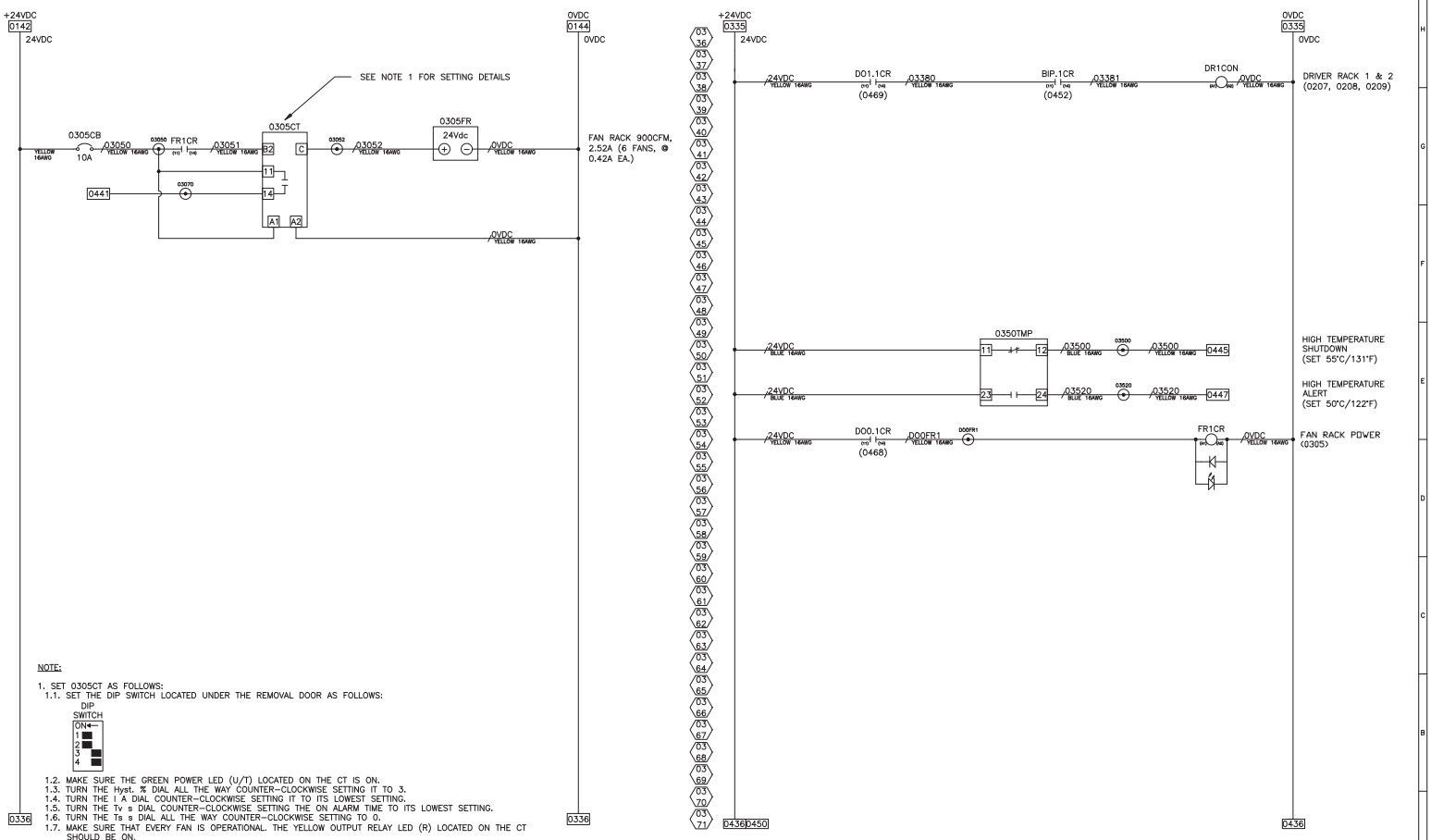
NOTE:

1. ALL POWER AND COMMUNICATION WIRING TO EACH DRIVER RACK MUST BE LONG ENOUGH TO ALLOW COMPLETE REMOVAL OF THE RACK FROM THE PANEL.

DESCRIPTION	PDC 1D, UVSIGNA ANN ARBOR MI ELECTRICAL – MAIN POWER		
REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	JK	341384	1
APPROVED BY	PSL		
APPROVAL DATE YYYY-MM-DD	2023-08-02	SHEET 02 OF 50	SIZE D

SCALE: NTS — 1.0" ON ORIGINAL DWG

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7



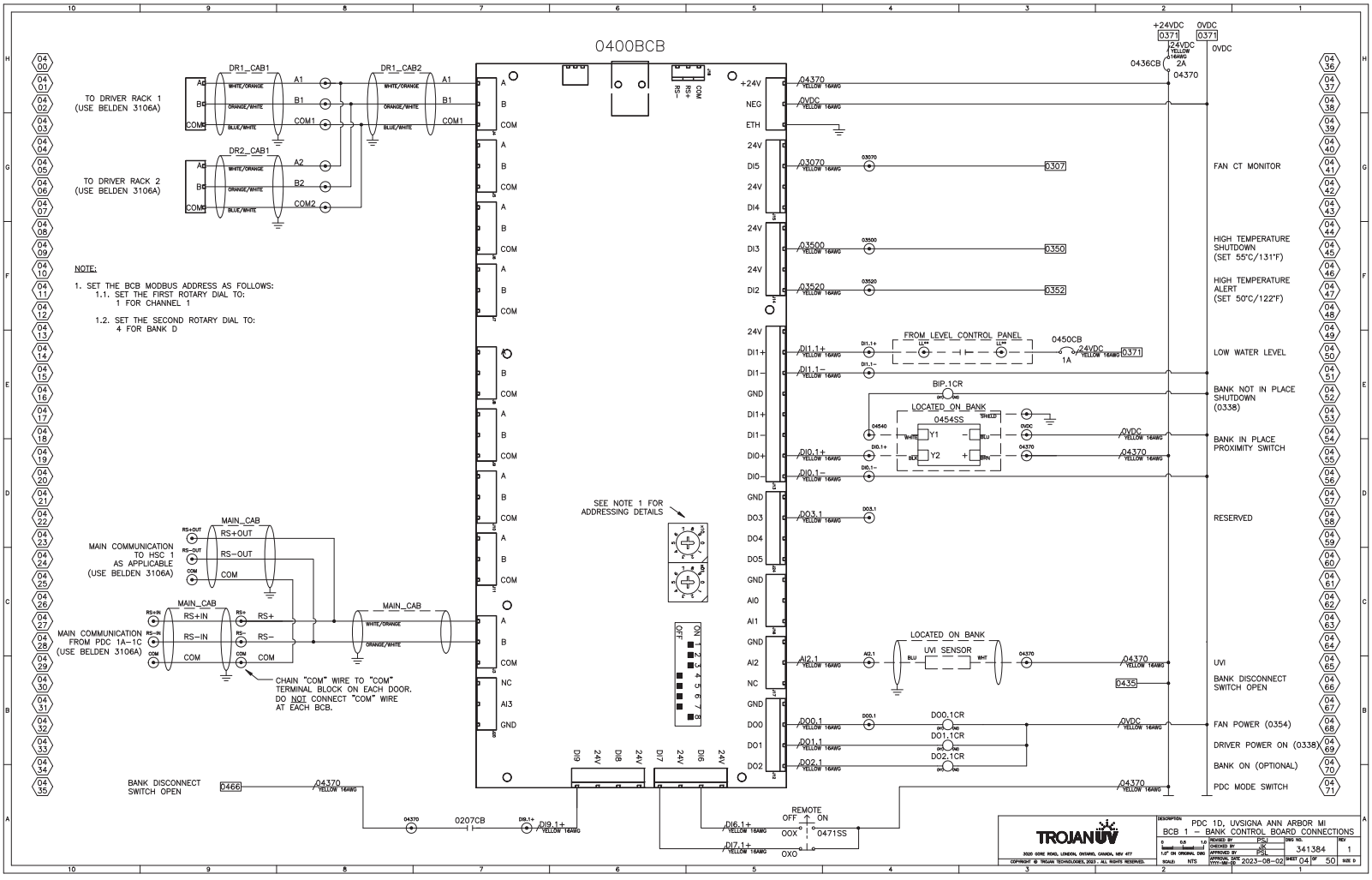
NOTE:

1. SET 0305CT AS FOLLOWS:
   1.1. SET THE DIP SWITCH LOCATED UNDER THE REMOVAL DOOR AS FOLLOWS:

   1.2. MAKE SURE THE GREEN POWER LED (U/T) LOCATED ON THE CT IS ON.
   1.3. TURN THE Hyst. % DIAL ALL THE WAY COUNTER-CLOCKWISE SETTING IT TO 3.
   1.4. TURN THE I A DIAL COUNTER-CLOCKWISE SETTING IT TO ITS LOWEST SETTING.
   1.5. TURN THE Tv s DIAL COUNTER-CLOCKWISE SETTING THE ON ALARM TIME TO ITS LOWEST SETTING.
   1.6. TURN THE Ts s DIAL ALL THE WAY COUNTER-CLOCKWISE SETTING TO 0.
   1.7. MAKE SURE THAT EVERY FAN IS OPERATIONAL. THE YELLOW OUTPUT RELAY LED (R) LOCATED ON THE CT SHOULD BE ON.
   1.8. SLOWLY TURN THE I A DIAL CLOCKWISE STOPPING WHEN THE RED ALARM LED TURNS ON.
   1.9. SLOWLY TURN THE I A DIAL COUNTER-CLOCKWISE UNTIL THE RED ALARM LED TURNS OFF.
   1.10. SLOWLY TURN THE I A DIAL COUNTER-CLOCKWISE ANOTHER 5%, SETTING THE CURRENT LEVEL.
   1.11. SET THE Hyst. % DIAL TO 6%.
   1.12. SET THE Tv s DIAL TO 10 SECONDS.

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
ELECTRICAL – 24VDC CONTROLS

DRAWN BY	PSJ
CHECKED BY	
APPROVED BY	
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DRG NO.	341384
REV	1
SHEET	03 OF 50
SIZE	D
SCALE	NTS


0400BCB
TO DRIVER RACK 1
(USE BELDEN 3106A)
TO DRIVER RACK 2
(USE BELDEN 3106A)
DR1_CAB1
DR1_CAB2
DR2_CAB1
NOTE:
1. SET THE BCB MODBUS ADDRESS AS FOLLOWS:
1.1. SET THE FIRST ROTARY DIAL TO:
1 FOR CHANNEL 1
1.2. SET THE SECOND ROTARY DIAL TO:
4 FOR BANK D
MAIN COMMUNICATION
TO HSC 1
AS APPLICABLE
(USE BELDEN 3106A)
MAIN COMMUNICATION
FROM PDC 1A–1C
(USE BELDEN 3106A)
MAIN_CAB
CHAIN "COM" WIRE TO "COM"
TERMINAL BLOCK ON EACH DOOR.
DO NOT CONNECT "COM" WIRE
AT EACH BCB.
SEE NOTE 1 FOR
ADDRESSING DETAILS
BANK DISCONNECT
SWITCH OPEN
+24VDC
0VDC
FROM LEVEL CONTROL PANEL
0450CB
BIP_1CR
LOCATED_ON_BANK
0454SS
UVI SENSOR
DO0.1CR
DO1.1CR
DO2.1CR
FAN CT MONITOR
HIGH TEMPERATURE
SHUTDOWN
(SET 55°C/131°F)
HIGH TEMPERATURE
ALERT
(SET 50°C/122°F)
LOW WATER LEVEL
BANK NOT IN PLACE
SHUTDOWN
(0338)
BANK IN PLACE
PROXIMITY SWITCH
RESERVED
UVI
BANK DISCONNECT
SWITCH OPEN
FAN POWER (0354)
DRIVER POWER ON (0338)
BANK ON (OPTIONAL)
PDC MODE SWITCH
REMOTE
OFF
ON
0471SS
0207CB
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 1Z7
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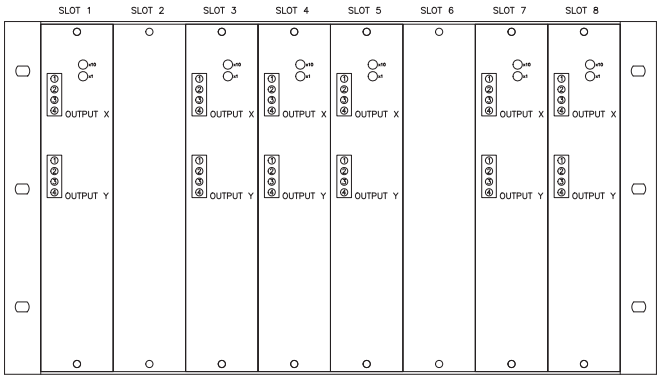
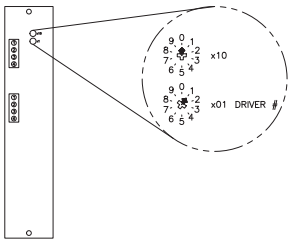
PDC 1D, UVSIGNA ANN ARBOR MI
BCB 1 – BANK CONTROL BOARD CONNECTIONS
DRAWN BY: PSJ
CHECKED BY: MK
APPROVED BY: PSJ
APPROVAL DATE (YYYY-MM-DD): 2023-08-02
DWG NO.: 341384
REV: 1
SCALE: NTS
SHEET 04 OF 50
SIZE D

DRIVER POSITION IN RACK 1 (BANK 1D)

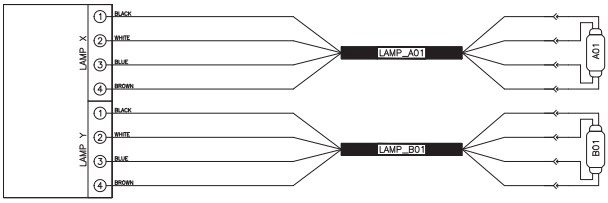


Rack 1								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 1		Driver 2	Driver 3	Driver 4		Driver 5	Driver 6
Phase	L1	L1	L3	L3	L2	L2	L2	L1
Modbus Address*	01		02	03	04		05	06

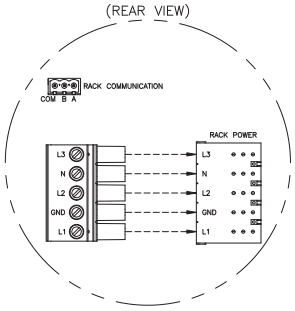
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 11 FOR RACK 1 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



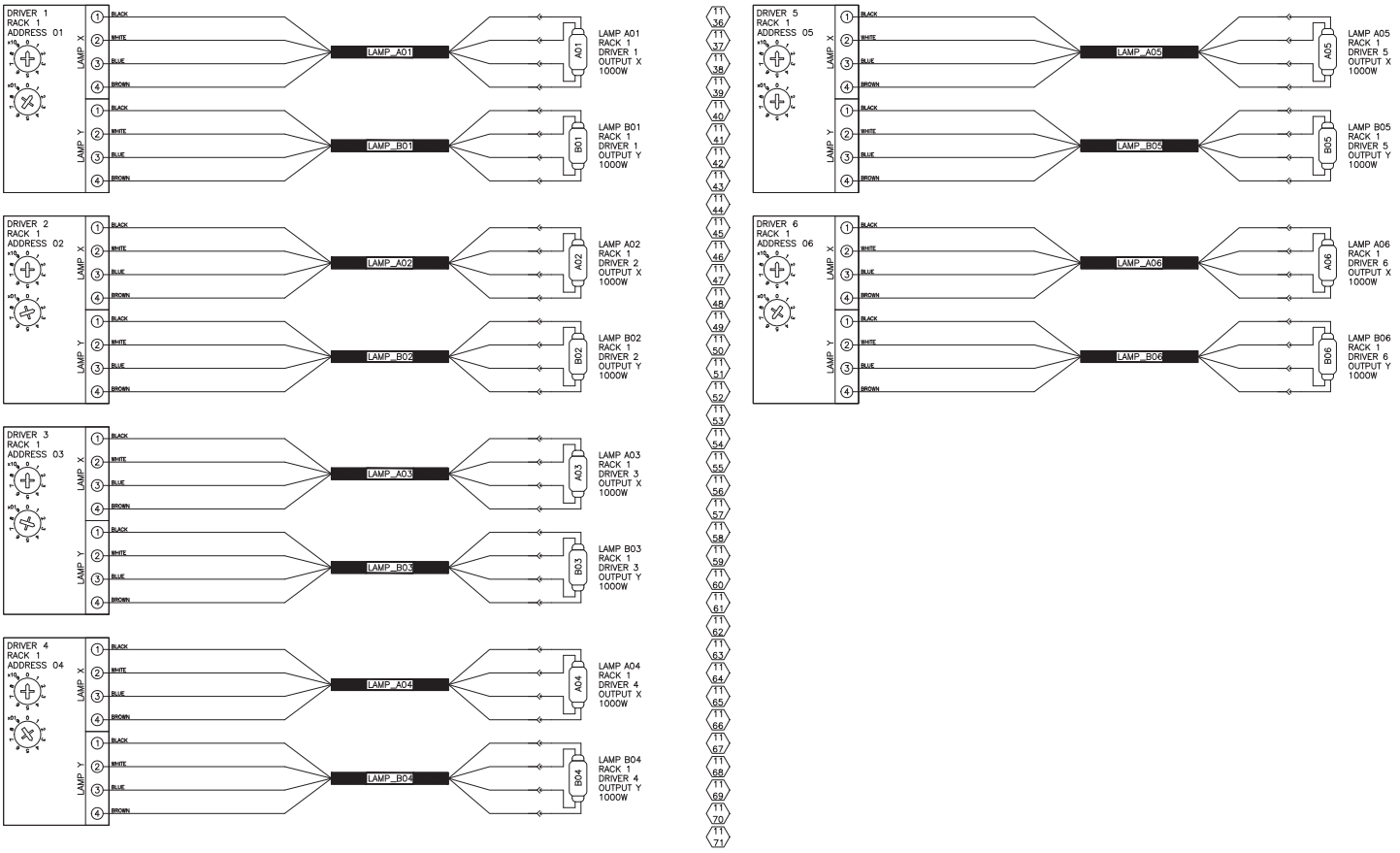
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
RACK 1 LAMP DRIVERS

REVISED BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341384
REV	1
SHEET	10 OF 50
SIZE	D

SCALE: NTS

RACK 1 CONNECTIONS (BANK 1D)



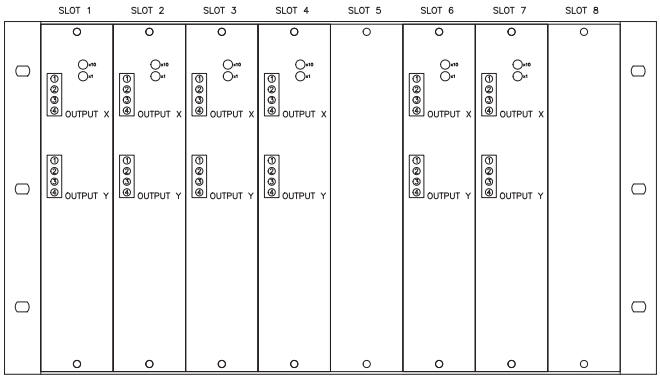
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
RACK 1 LAMP-DRIVER CONNECTIONS

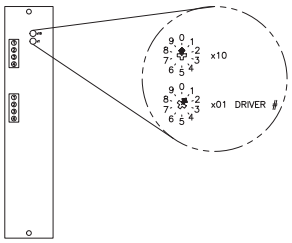
DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DRW NO.	341384
REV	1
SCALE	NTS
SHEET	11 OF 50
SIZE	D

DRIVER POSITION IN RACK 2 (BANK 1D)

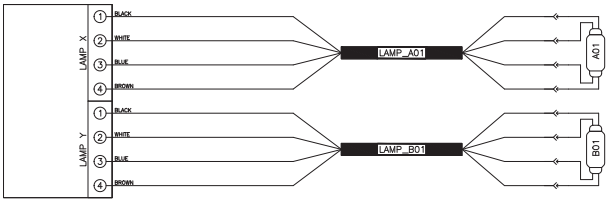


Rack 2								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 7	Driver 8	Driver 9	Driver 10		Driver 11	Driver 12	
Phase	L3	L3	L2	L2	L1	L1	L1	L3
Modbus Address*	07	08	09	10		11	12	

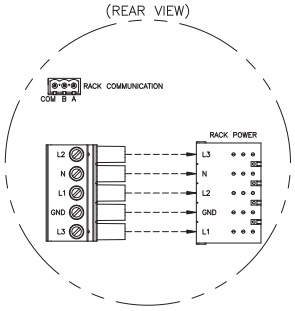
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 13 FOR RACK 2 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



TROJANUV

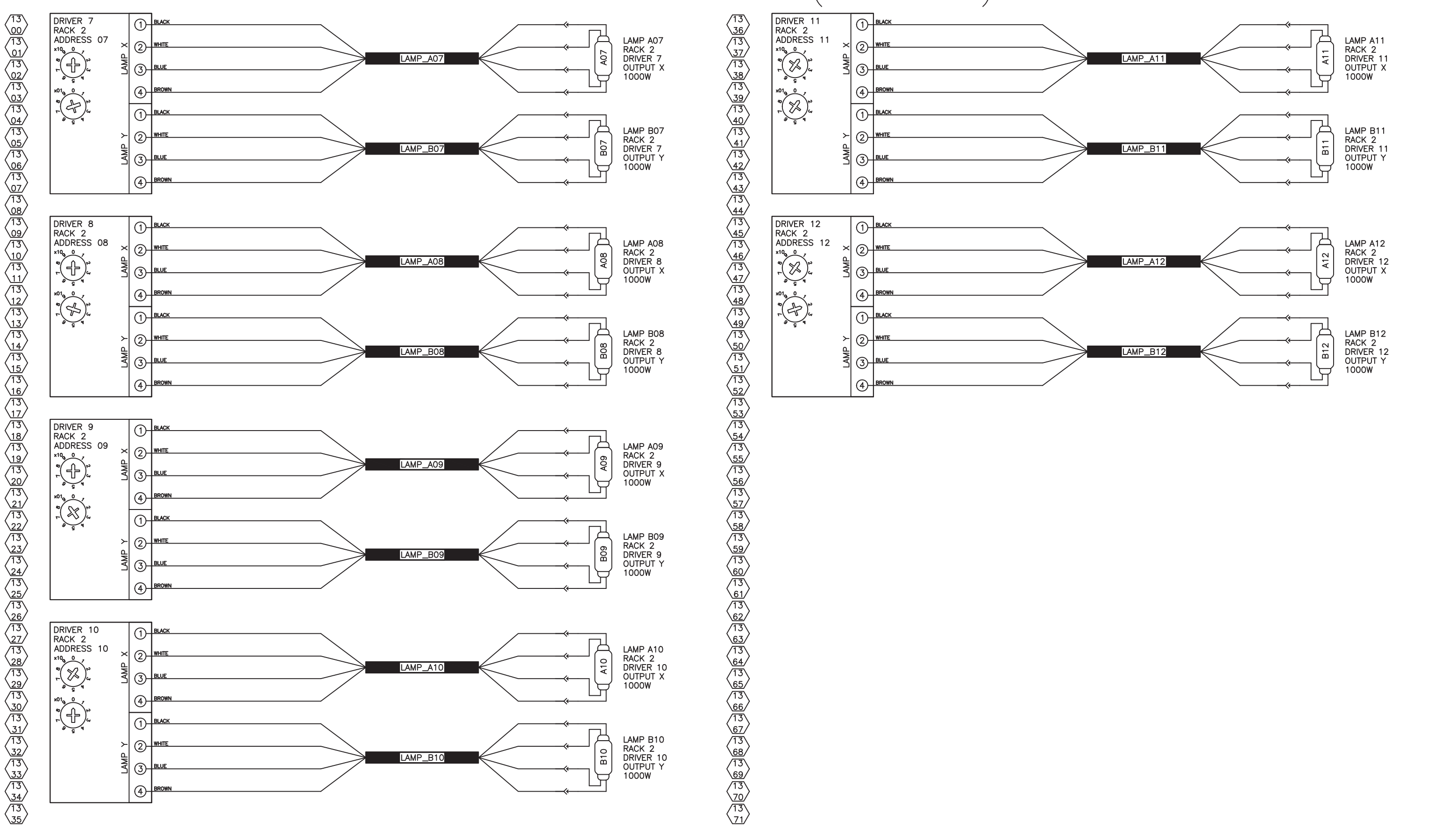
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
RACK 2 LAMP DRIVERS

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	MK	341384	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 12 OF 50	SIZE D

SCALE: NTS
"1.0" ON ORIGINAL DWG

RACK 2 CONNECTIONS (BANK 1D)

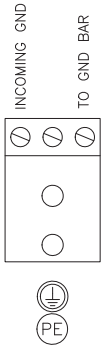


TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION	PDC 1D, UVSIGNA ANN ARBOR MI RACK 2 LAMP–DRIVER CONNECTIONS		
1.0" ON ORIGINAL DWG	REVISED BY PSJ	DWG NO. 341384	REV 1
	CHECKED BY JK		
	APPROVED BY PSL		
SCALE: NTS	APPROVAL DATE YYYY-MM-DD 2023-08-02	SHEET 13 OF 50	SIZE D

MAIN GROUND LUG CONNECTION LAYOUT



GROUND BAR CONNECTION LAYOUT

TROJANUV

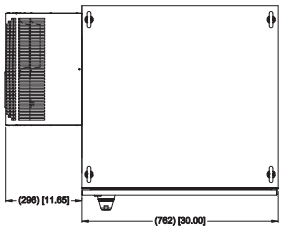
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

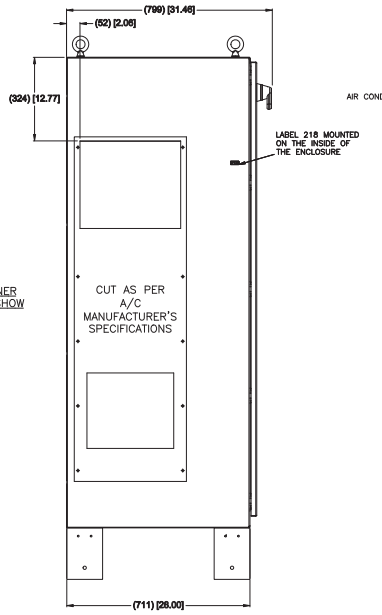
DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
GROUNDING DETAIL

0	0.0	0.0	REVISED BY	PSJ
1	0.0	0.0	CHECKED BY	JMC
1:2" ON ORIGINAL DWG			APPROVED BY	PSJ
SCALE:	NTS		APPROVAL DATE (YYYY-MM-DD)	2023-08-02

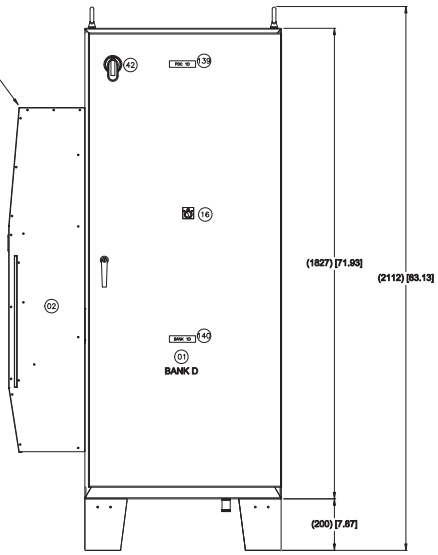
DWG NO. 341384 REV 1

SHEET 23 OF 50 SIZE D





AIR CONDITIONER REMOVED TO SHOW DETAIL

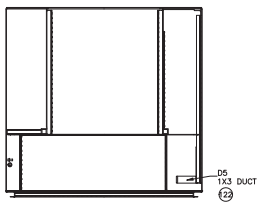


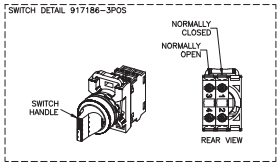
NOTES:
1. UNIT: (mm) [INCH]
2. DIMENSIONS ARE REFERENCE ONLY

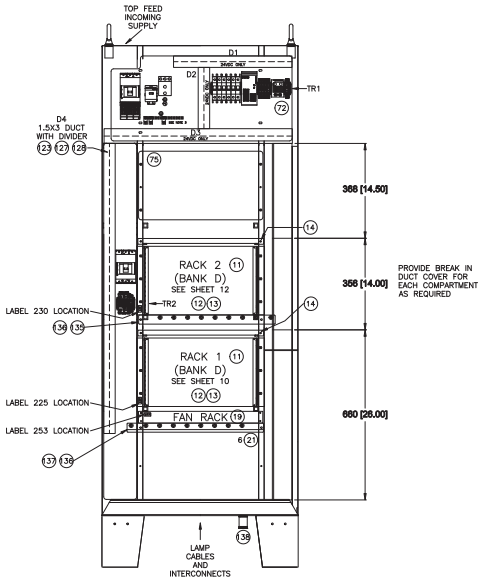
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 1Z7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI EXTERNAL LAYOUT
REVISED BY: PSJ
CHECKED BY: MK
APPROVED BY: PSJ
APPROVAL DATE (YYYY-MM-DD): 2023-08-02
DWG NO.: 341384
REV: 1
SCALE: NTS
SHEET 25 OF 50
SIZE: D

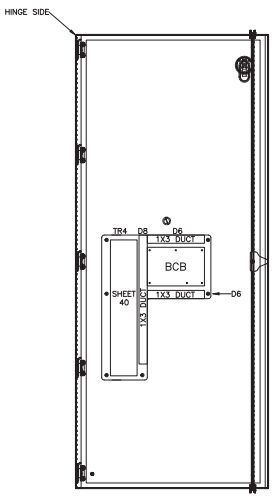
ROOF REMOVED FOR CLARITY







DOOR STRUCTURE REMOVED FOR CLARITY

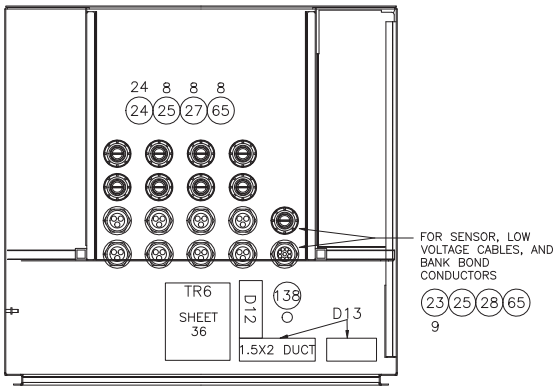


RACK 1 & 2 DOOR INSIDE LAYOUT

PANEL DOORS INSIDE LAYOUT

NOTES:
1. USE M6x1.0 TAP FOR ALL MESH DIVIDER MOUNTING HOLES (ITEM 14), SUPPORT TRAY/CABLE MOUNTING PLATE(ITEM 137, 136, 135), DRIVER RACKS (ITEM 11) AND FAN RACKS (ITEM 19), USE SST PHILLIPS HEAD SCREW AND SST LOCK WASHER.
2. BOND ENCLOSURE DOOR TO ENCLOSURE WITH 12AWG GREEN/YELLOW WIRE.
3. GROUND LUG IS OPTIONAL, CAN BE USED FOR WIRES WITH GAUGE 8AWG OR MORE. REFER SHEET#23 FOR QUANTITY AND POSITION.

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI INTERNAL LAYOUT
REVISED BY: PSJ
CHECKED BY: JMC
APPROVED BY: PSJ
APPROVAL DATE (YYYY-MM-DD): 2023-08-02
DWG NO.: 341384
REV: 1
SHEET: 26 OF 50
SIZE: D
SCALE: NTS



BOTTOM INSIDE VIEW
(LOOKING THROUGH THE DOOR)

TROJANUV

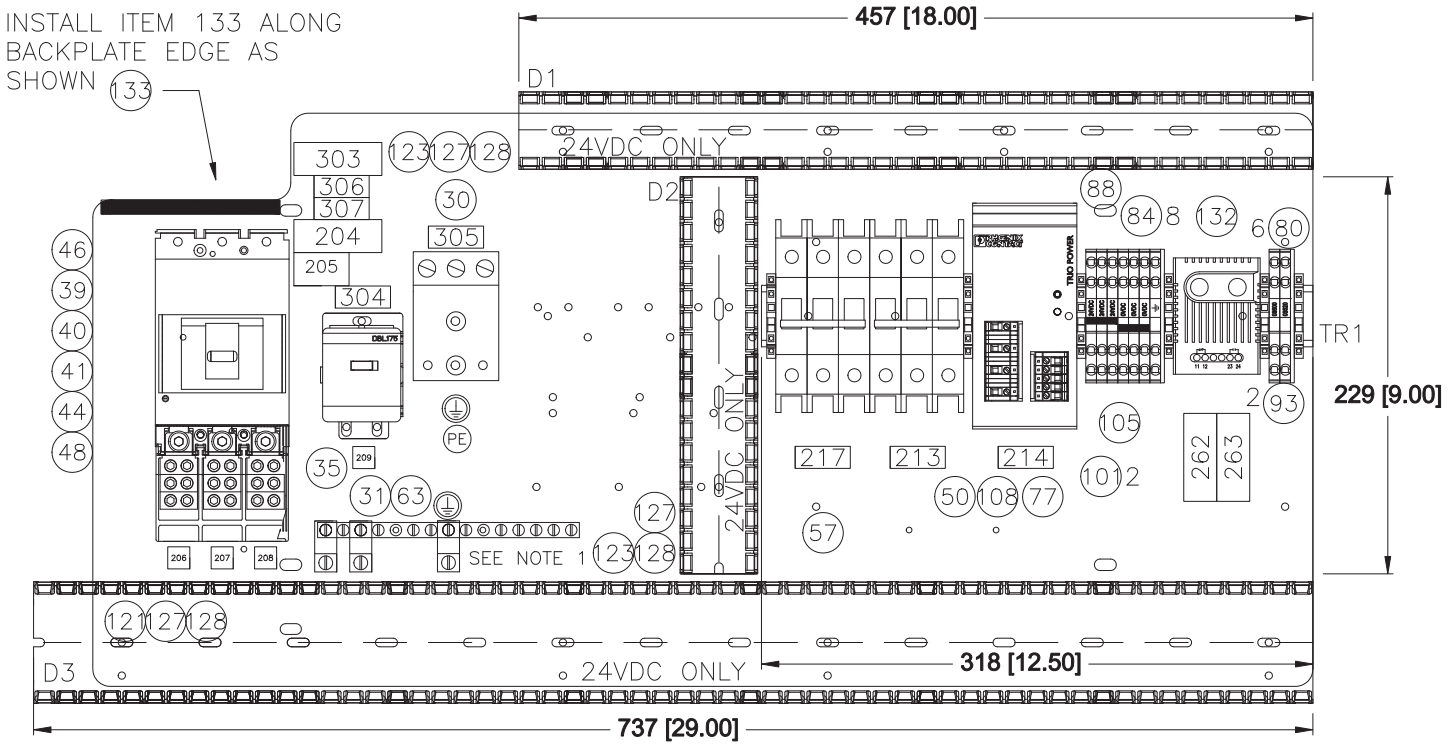
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 1Z7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI INTERNAL BOTTOM LAYOUT

DRAWN BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
SCALE	NTS

DRG NO. 341384 REV 1

SHEET 27 OF 50 SIZE D



NOTES

1. GROUND LUG IS OPTIONAL, CAN BE USED FOR WIRES WITH GAUGE 8AWG OR MORE. REFER SHEET#23 FOR POSITION AND SHEET#49 FOR QUANTITY.

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI BACKPLATE LAYOUT

DRAWN BY: PSJ

CHECKED BY:

APPROVED BY:

APPROVAL DATE: YYYY-MM-DD 2023-08-02

DWG NO. 341384

REV 1

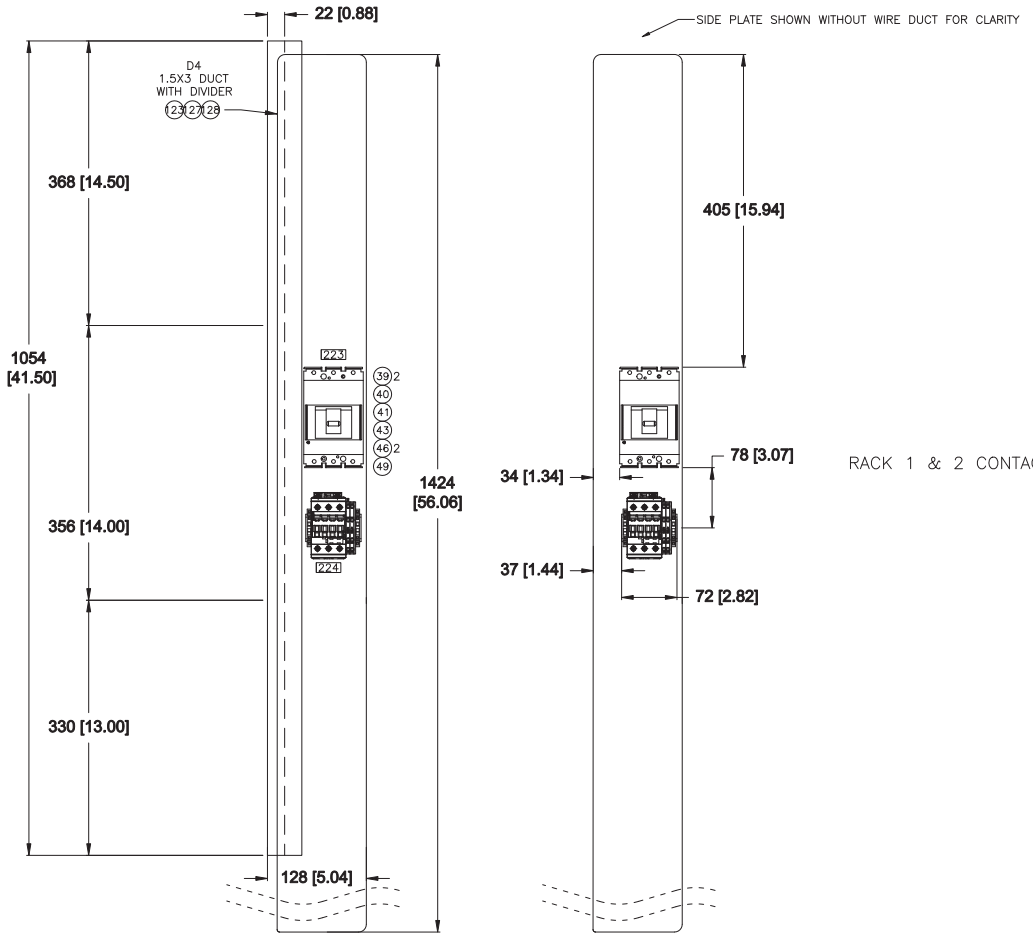
SCALE: NTS

SHEET 30 OF 50

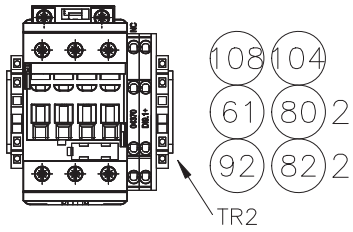
SIZE D

SIDE PLATE VIEW 1

SIDE PLATE VIEW 2



TERMINAL BLOCK DETAIL



RACK 1 & 2 CONTACTOR

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

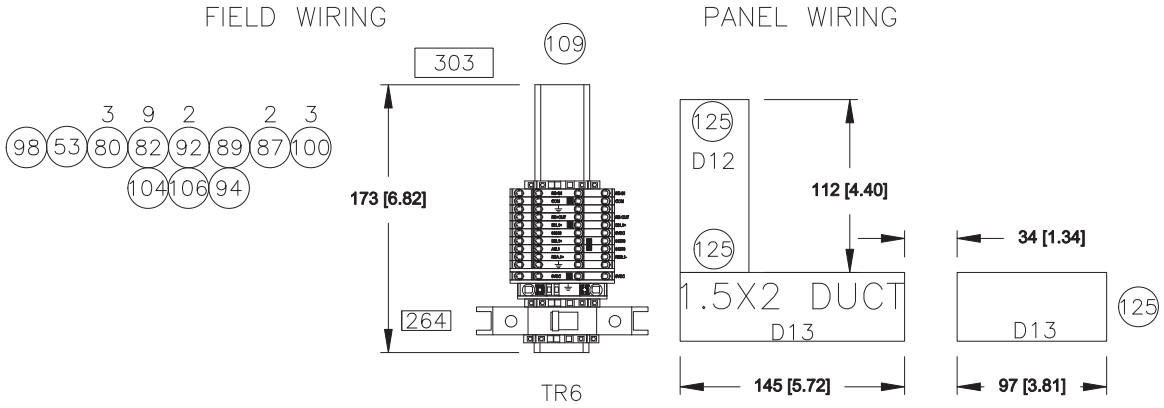
DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
SIDE PLATE LAYOUT

DRAWN BY	PSJ	DWG NO.	REV
CHECKED BY	JMC	341384	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 33 OF 50	SIZE D

SCALE: NTS

1 UNIT ON ORIGINAL DWG

BOTTOM TERMINAL BLOCKS



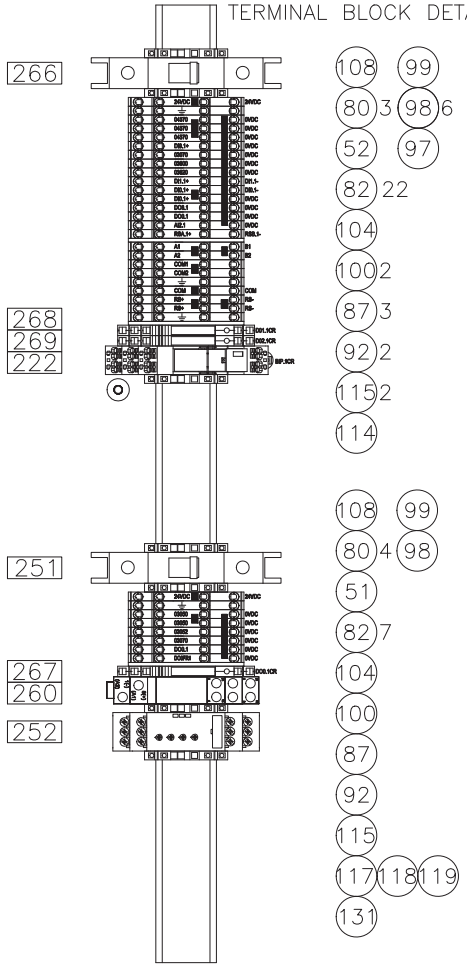
TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
BOTTOM TERMINAL BLOCK LAYOUT

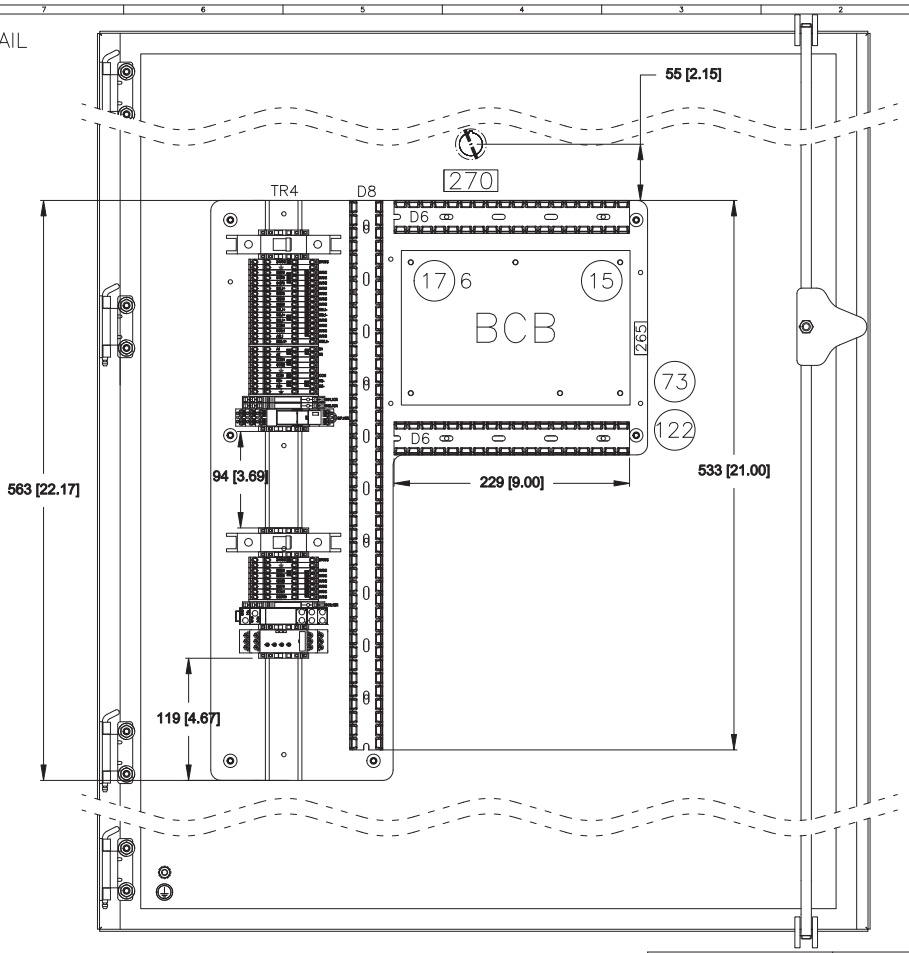
DRAWN BY	PCL
CHECKED BY	MK
APPROVED BY	PCL
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341384
REV	1
SCALE	NTS
SHEET	36 OF 50
SIZE	D

TERMINAL BLOCK DETAIL



108 99
80 3 98 6
52 97
82 22
104
100 2
87 3
92 2
115 2
114

108 99
80 4 98
51
82 7
104
100
87
92
115
117 118 119
131



TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
RACK 1 & 2 DOOR LAYOUT

DRAWN BY	PSJ
CHECKED BY	JDC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341384
REV	1
SCALE:	NTS
SHEET	40 OF 50
SIZE	D

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
140	1	NAMEPLATE, LAM SIG2R BANK1D	TROJAN	917856-B1D	917856-B1D
139	1	NAMEPLATE, LAM 2R PDC 1D	TROJAN	917924-1D00	917924-1D00
138	1	VENT, DRAIN	HOFFMAN	AVDR4NM	901841
137	1	PLATE WLDT, PDC CABLE MTG LWR	TROJAN	337993-002	337993-002
136	2	SUPPORT TRAY, DRIVER CABLE	TROJAN	337948	337948
135	1	PLATE WLDT, PDC CABLE MTG UPR	TROJAN	337993-001	337993-001
134	18"	TAPE, ACRYLIC FOAM DBL SIDED	3M	VHB4930	005003
133	4"	WEATHERSTRIPPING, RW108	TRIM-LOCK	750-B-2-1/16	120005
132	1	THERMOSTAT, DUAL NC/NO DIN	STEGO	01172.0-00	916266
131	1	RELAY, 0.3A-15A 24-240VDC/AC	ABB	CM-SRS.M2S	917509-SRSM2S
130	35'	CABLE, 22AWG 1PAR 300V RS485	BELDEN	3106A	917515
129	1'	SPIRAL WRAP, PE 0.5" NA	HELLERMANNTYTON	3HFTPVC	917528-001
128	99"	WIRE DUCT, SLOTTED DIVIDER 3X6	PANDUIT	SD3H6	913437-SD3H6
127	16	WIRE DUCT, DIVIDER MTG BASE	PANDUIT	DB-C	917138-0DBC
126					
125	13"	WIRE DUCT, TYPE F LT GRY1.5x2	PANDUIT	F1.5X2LG6 / C1.5LG6	913437-005
124					
123	71"	WIRE DUCT, TYPE F LT GRY 1.5x3	PANDUIT	F1.5X3LG6 / C1.5LG6	913437-006
122	94"	WIRE DUCT, TYPE F LT GRY 1x3	PANDUIT	F1X3LG6 / C1LG6	913437-004
121	29"	WIRE DUCT, TYPE F LT GRY 2.5x3	PANDUIT	F2.5X3LG6 / C2.5LG6	913437-033
120					
119	1	RELAY, SUPPRESSION DIODE + LED	FINDER	99.02.9.024.99	917559-2001
118	1	RELAY, BASE BLU SCR TERM SPDT	FINDER	97.01SPA	917559-1001
117	1	RELAY, 16A SPDT 24VDC	FINDER	46.61.9.024.0074	917559-0001
116					
115	3	RELAY, 6A 24VDC SPDT PIT PC	PHOENIX CONTACT	2900299	915403-112
114	1	RELAY, 6A DPDT 24VDC SAF RIF	PHOENIX CONTACT	2908215	917175-3006BS
113					
112					
111					
110					
109	7"	DIN RAIL, PERF 35x15 PHOENIX	PHOENIX CONTACT	1201730	913221
108	41"	**DIN RAIL PERF 35X7.5 PHOENIX**	**PHOENIX CONTACT**	**0801733**	**914147**
107					
106	A/R	TERM BLK, MARKER SHEET ZB8	PHOENIX CONTACT	1052002 OR EQUIVALENT	916050-1052002
105	A/R	TERM BLK, MARKER SHEET ZB6	PHOENIX CONTACT	1051003 OR EQUIVALENT	916050-1051003
104	A/R	TERM BLK, MARKER SHEET ZBF5	PHOENIX CONTACT	0808642 OR EQUIVALENT	916050-0808642
103					
102					
101	2	TERM BLK, JUMPER 3P FBS 3 6	PHOENIX CONTACT	3030242	916050-3030242
100	6	TERM BLK, JUMPER 2P FBS PV	PHOENIX CONTACT	3032185	916050-3032185
99	1	TERM BLK, JUMPER 50P FBS 50 5	PHOENIX CONTACT	3038930	916050-3038930
98	8	TERM BLK, JUMPER 2P FBS 2 5	PHOENIX CONTACT	3030161	916050-3030161
97	1	TERM BLK, JUMPER 3P FBS 3 5	PHOENIX CONTACT	3030174	916050-3030174
96					
95					
94	1	TERM BLK, END PLT D PIT 6	PHOENIX CONTACT	3212044	916050-3212044
93	2	TERM BLK, END PLT D PIT 4 QU	PHOENIX CONTACT	3208979	916050-3208979
92	6	TERM BLK, END PLT D PITTB 2.5	PHOENIX CONTACT	3211634	916050-3211634
91					
90					
89	1	TERM BLK, PIT 6 PE GND	PHOENIX CONTACT	3211822	916078-3211822
88	1	TERM BLK, PIT 4 PE QUAT GND	PHOENIX CONTACT	3211809	916077-3211809
87	6	TERM BLK, PITTB 2.5 PE GND	PHOENIX CONTACT	3210596	916049-3210596
86					
85					
84	8	TERM BLK, PIT 4 QUATTRO GRY	PHOENIX CONTACT	3211797	916077-3211797
83					
82	40	TERM BLK, PITTB 2.5 GRY	PHOENIX CONTACT	3210567	916049-3210567

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
81					
80	18	TERM BLK, END STOP CLIPFIX 35S	PHOENIX CONTACT	3022276	916050-3022276
79					
78					
77	1	PS, 24VDC 3P TRIO 10A	PHOENIX CONTACT	2866459	916051-459
76					
75	1	BACKPLATE, SOLO RACK PLATE	TROJAN	338039-005	338039-005
74					
73	1	BACKPLATE, DOOR LOWER PDC	TROJAN	338039-004	338039-004
72	1	BACKPLATE, TOP LS DRILLED PDC	TROJAN	338039-006	338039-006
71					
70					
69					
68					
67					
66					
65	9	PLUG, HOLE SEAL 4X POLY 1.25 INCH	HOFFMAN	ASPB100125NM	913058-125P
64					
SEE NOTE 3	3	LUG, GND 2-14AWG 1 COND ILSCO	ILSCO	TA-2	917934
62					
61	1	CONTACTOR, AF26 45A NA 24V	ABB	AF26-30-00-11	917180-26C024
60					
59					
58					
57	1	BREAKER, 5A 3P AC/DC C ABB	ABB	SU203M-C5	917139-MC3050
56					
55					
54					
53	1	BREAKER, 1A 1P AC/DC C ABB	ABB	SU201M-C1	917139-MC1010
52	1	BREAKER, 2A 1P AC/DC C ABB	ABB	SU201M-C2	917139-MC1020
51	1	BREAKER, 10A 1P AC/DC C ABB	ABB	SU201M-C10	917139-MC1100
50	1	BREAKER, 10A 3P AC/DC C ABB	ABB	SU203M-C10	917139-MC3100
49	1	BREAKER, 40A 3P 600VAC 25KA ABB	ABB	XT1NU3040AFF000XXX	917143-N3040
48	1	BREAKER, 45A 3P 600V 25KA ABB	ABB	XT1NU3045AFF000XXX	917143-N3045
47					
46	3	BREAKER, LUG CPRSN 3PC ABB	ABB	KXT1CU-3PC	917143-LUG3
45					
44	1	BREAKER, LUG MULTI 3PC XT1 ABB	ABB	KXT1MC-3PC	917143-LUG3MC
43	1	BREAKER, AUX 24VDC 1Q/1SY	ABB	KXTAAXCDQSYFP	917143-AUX11024
42	1	DISC, HANDLE ON/OFF 10mm4X ABB	ABB	OHB65L10B	912787-410
41	2	500mm PISTOL HANDLE SHAFT	ABB	OXP10X500	912786-10X500
40	2	RHE_B BASE FOR EXTENDED HANDLE	ABB	KXTBRHEBFP	916814-KXTBRHE
39	3	BREAKER, COVER LOW 3P XT1	ABB	KXT1LTC-3	917143-LTC3
38					
37					
36					
35	1	DIST BLOCK, 175A TE	TE CONNECTIVITY	DBL175	917305-175
34					
33					
32					
31	1	**GROUND BAR, 12DAP 6-14AWG**	**ILSCO**	**D187-12**	**916079-012**
30	1	LUG, GROUND 1/0-14AWG	ILSCO	TA2-0	917527-001
29					
28	1	STRAIN RELIEF, M-40 9-0.272	LAPP GROUP	53340969	915889-53340969
27	8	STRAIN RELIEF, M-40 3-0.542	LAPP GROUP	53340310	915889-53340310
26					
25	9	STRAIN RELIEF, M-40 1.102 B	LAPP GROUP	S2529	915889-52529
SEE NOTE 1	24	STRAIN RELIEF, INSERT 9mm	LAPP GROUP	53100009	915889-53100009
SEE NOTE 2	9	STRAIN RELIEF, INSERT 7mm	LAPP GROUP	53100007	915889-53100007
22					
21	6	FAN, METAL GUARD ORION	ORION	G109-15A	917530
20					
19	1	FAN ASSY, UVSIGNA6X150CFM 24VDC	ORION	OD600-24LBXC	916840
18					
17	6	STANDOFF, PCB 1/2" NYLON	RICHCO	LCBS-8-01	013237
16	1	SWITCH ASSY, SEL 22mm 3POS KIT	ABB	917186-3POS	917186-3POS
15	1	BOARD, BCB	TROJAN	931120	931120
14	2	MESH, SOLO PDC	CUSTOM	337766	337766
13	4	PLATE, SOLO RACK 1 SLOT	TROJAN	490297	490297
12	12	LAMP DRIVER, SOLO 2x1kW	TROJAN	915306	915306
11	2	RACK, SOLO DRIVER 8 SLOT	TROJAN	915307-001	915307-001
10					
09					
08					
07					
06					
05					
04					
03					
02	1	AC, 8000 400/460V 316SS 4X H	PENTAIR	CUSTOM	917489-08164XH
01	1	ENCL WLDT, SOLO PDCSW 1D 316	TROJAN	338040-1116	338040-1116

NOTES:

1. ITEM 24 SEAL INSERT TO BE INSTALLED IN ITEM 27 STRAIN RELIEF BY PANEL BUILDER.
2. ITEM 23 SEAL INSERT TO BE INSTALLED IN ITEM 28 STRAIN RELIEF BY PANEL BUILDER.
3. GROUND LUG IS OPTIONAL. USE GROUND LUGS FOR WIRES THAT DOES NOT FIT IN GROUND BAR.

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI BILL OF MATERIALS

REVISED BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341384
REV	1
SHEET	49 OF 50
SIZE	D

SCALE: NTS

10 9 8 7 6 5 4 3 2 1

H G F E D C B A

310					
309					
308					
307	1	EMLP(27x12.5)R	TORQUE	62 lb.in	
306	1	EMLP(27x12.5)R	MAIN FEED	75C WIRE	
305	1	EMLP(27x12.5)R	TORQUE	50 lb.in	
304	1	EMLP(27x12.5)R	TORQUE	53–88 lb.in	
303	2	EMLP(45x25)R	ALL FIELD WIRING	USE COPPER	CONDUCTORS ONLY
302					
301					
300					
299					
298					
297					
296					
295					
294					
293					
292					
291					
290					
289					
288					
287					
286					
285					
284					
283					
282					
281					
280					
279					
278					
277					
276					
275					
274					
273					
272					
271					
270	1	EMLP (27x12.5) R	0471SS		
269	1	EMLP (27x12.5) R	DO2.1CR		
268	1	EMLP (27x12.5) R	DO1.1CR		
267	1	EMLP (27x12.5) R	DO0.1CR		
266	1	EMLP (27x12.5) R	0436CB	2A	
265	1	EMLP (27x12.5) R	0400BCB		
264	1	EMLP (27x12.5) R	0450CB	1A	
263	1	EMLP (45x25) R	0350TMP	ALERT	SET 50°C/122°F
262	1	EMLP (45x25) R	0350TMP	SHUTDOWN	SET 55°C/131°F
261					
260	1	EMLP (27x12.5) R	FR1CR		
259					
258					
257					
256					
ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3

255					
254					
253	1	EMLP (27x12.5) R	0305FR		
252	1	EMLP (27x12.5) R	0305CT		
251	1	EMLP (27x12.5) R	0305CB	10A	
250					
249					
248					
247					
246					
245					
244					
243					
242					
241					
240					
239					
238					
237					
236					
235					
234					
233					
232					
231					
230	1	EMLP (27x12.5) R	DR2		
229					
228					
227					
226					
225	1	EMLP (27x12.5) R	DR1		
224	1	EMLP (27x12.5) R	DR1CON		
223	1	EMLP (27x12.5) R	0207CB	40A	
222	1	EMLP (27x12.5) R	BIP.1CR		
221					
220					
219					
218	1	EMLP (27x12.5) R	0148AC	8000BTU A/C	
217	1	EMLP (27x12.5) R	0148CB	5A	
216					
215					
214	1	EMLP (27x12.5) R	0142PS	24VDC 10A	
213	1	EMLP (27x12.5) R	0142CB	10A	
212	1	US–EML (D12.5)	PE		
211					
210	A/R	US–EML (D12.5)	⏚		
209	1	EMLP (27x12.5) R	N		
208	1	EMLP (27x12.5) R	1L3		
207	1	EMLP (27x12.5) R	1L2		
206	1	EMLP (27x12.5) R	1L1		
205	1	EMLP (27x12.5) R	0109CB	45A	MAIN
204	1	EMLP (45x25) R	INCOMING SUPPLY	480/277V 3PH	60Hz
203					
202					
201					
ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: PDC 1D, UVSIGNA ANN ARBOR MI
LAMICOID BILL OF MATERIALS

0 0.5 1.0 / 1.0" ON ORIGINAL DWG	REVISED BY: PSJ	DWG NO. 341384	REV 1
	CHECKED BY: JK		
	APPROVED BY: PSL		
SCALE: NTS	APPROVAL DATE YYYY-MM-DD: 2023-08-02	SHEET 50 OF 50	SIZE D

REV	REVISION DESCRIPTION	LOG NO.	RE'D BY	CH'D BY	APPR'D BY	DATE YYYY-MM-DD
1	RELEASE FOR SUBMITTAL	--	PSJ	JK	PSL	2023-08-02

TABLE OF CONTENTS

WIRE COLOUR CODING LEGEND

DESCRIPTION	DESIGNATION	WIRE
3 PHASE POWER	L1	BLACK
	L2	BLACK
	L3	BLACK
	N	WHITE
DC CONTROL	24VDC	BLUE
	OVDC	WHITE/BLUE
GROUND	G	GREEN/YELLOW
EXTERNAL POWER		YELLOW

NOTE: EXCEPTION TO MANUFACTURER PRE-ASSEMBLED CABLES.

NOTES:

1. ELECTRICAL ASSEMBLY TO BE ASSEMBLED UNDER UL508A AND THE MINIMUM REQUIREMENTS OUTLINED IN ES0127. WHERE THERE IS A CONFLICT BETWEEN THIS DOCUMENT AND THE REQUIREMENTS OF ES0127, THE INFORMATION PRESENTED IN THIS DOCUMENT WILL BE USED.

2. BLANK PAGES ARE RESERVED.

3. ENCLOSURE ENVIRONMENTAL RATING – UL TYPE 4X (IP66)

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: 2 PL DEC ± N/A
3 PL DEC ± N/A
ANGLE DEG ± N/A
REMOVE ALL BURRS, ALL CORNERS R 0.010 OR BREAK EDGE
[D] – CRITICAL CHARACTERISTIC

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
TABLE OF CONTENTS

THIRD ANGLE PROJECTION

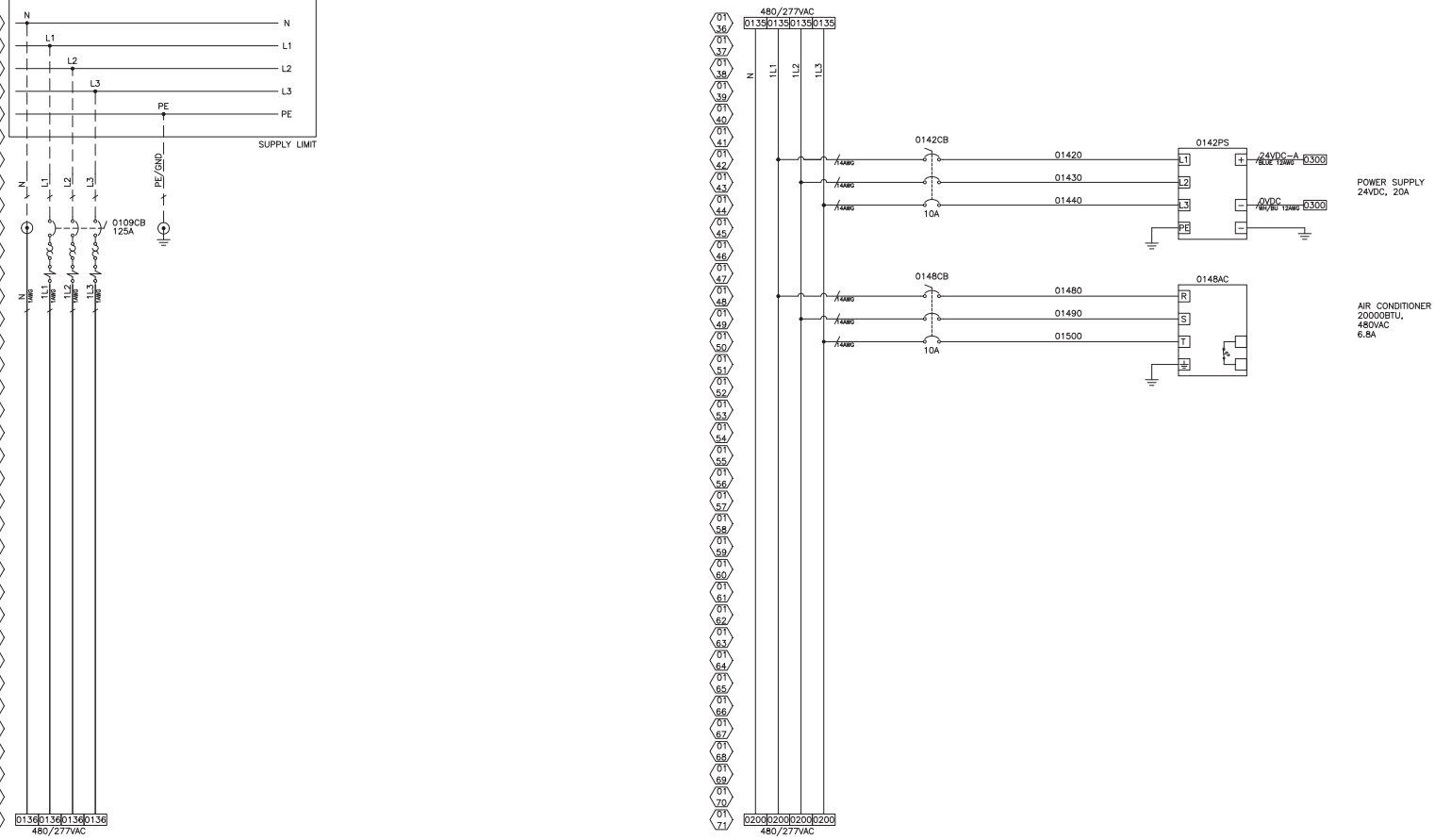
SCALE: NTS

DRG NO. 341385

REV 1

SHEET 00 OF 50

SIZE D

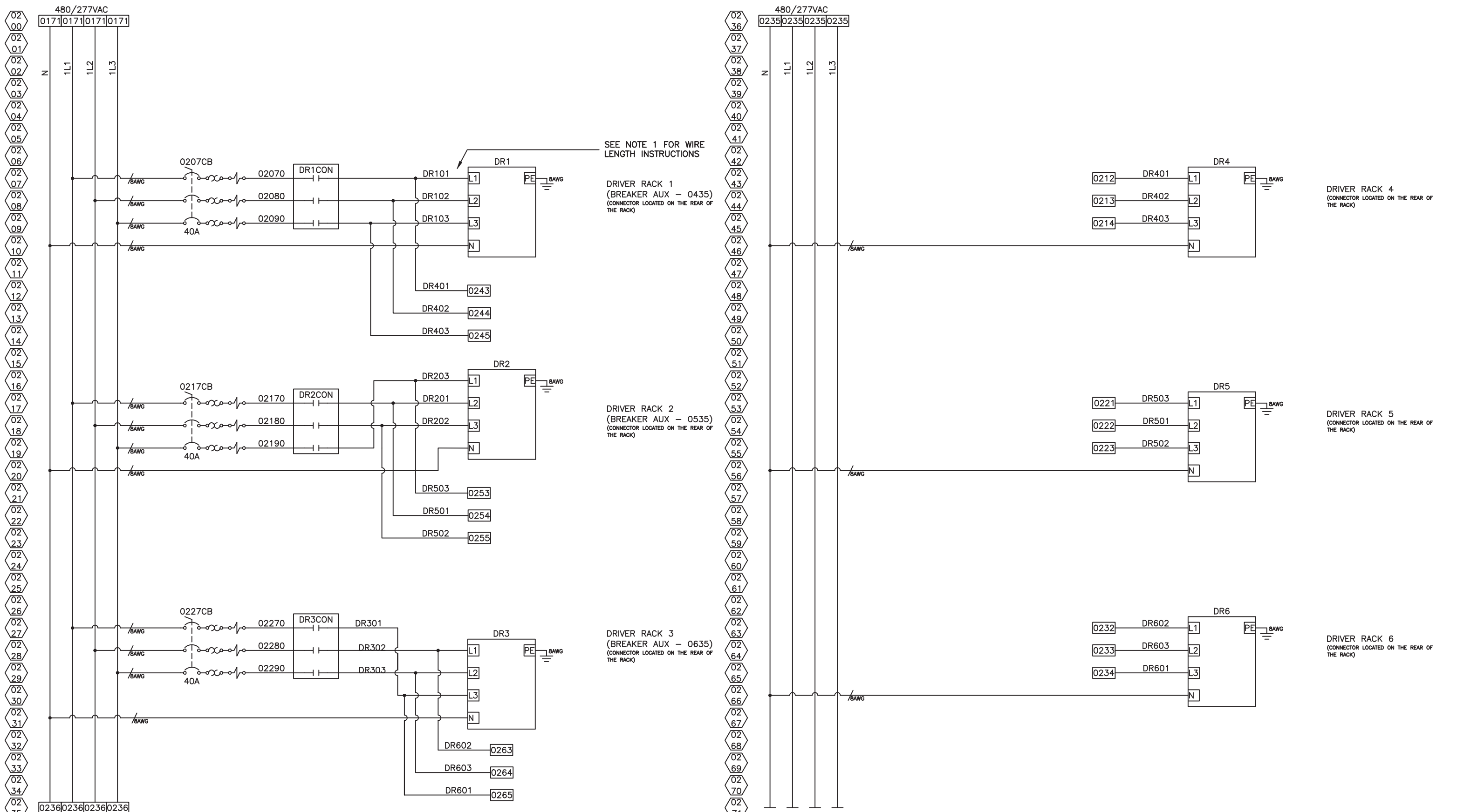


TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
ELECTRICAL – MAIN POWER

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
SCALE	NTS
DWG NO.	341385
REV	1
SHEET	01 OF 50
SIZE	D



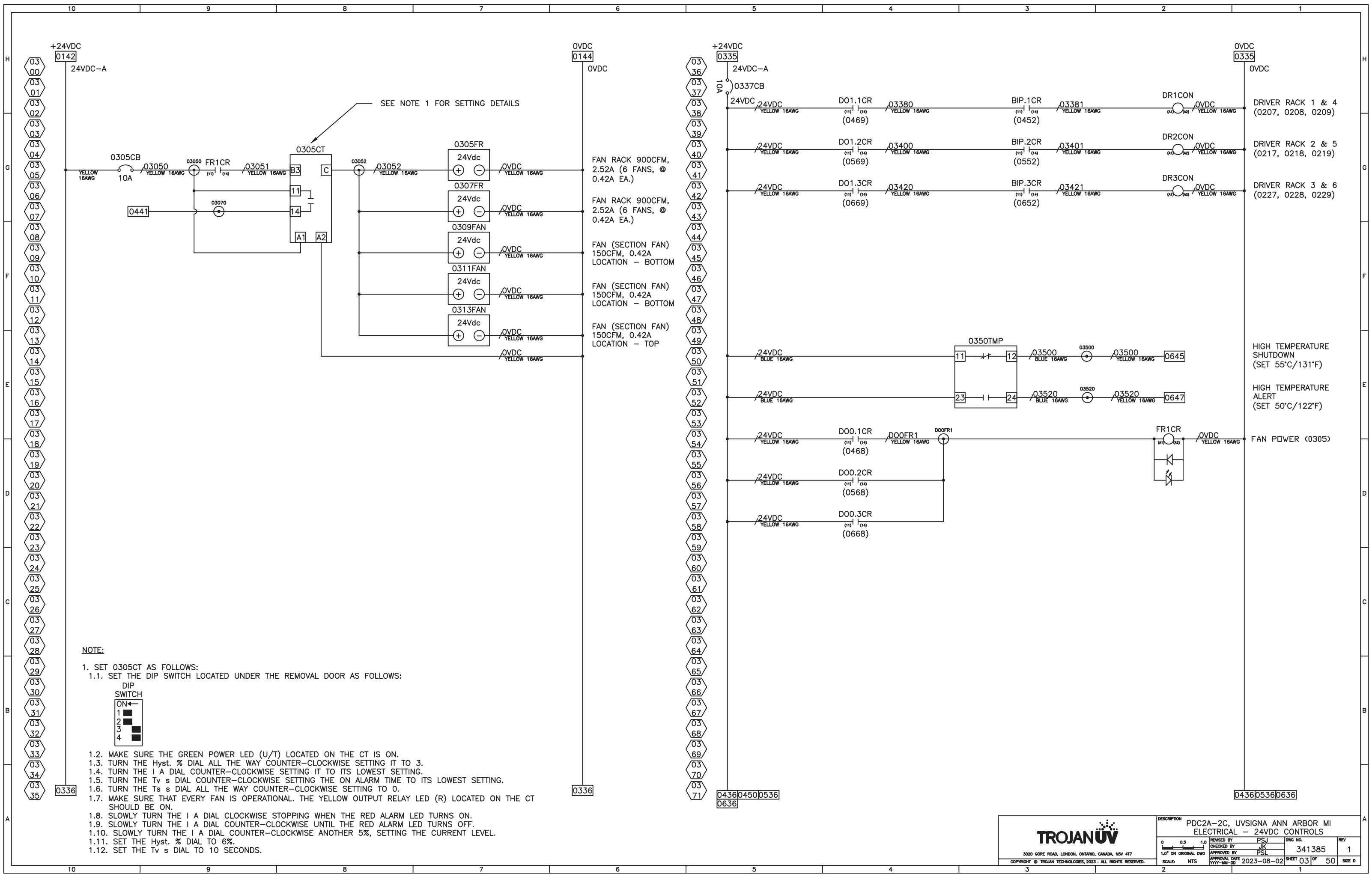
NOTE:

1. ALL POWER AND COMMUNICATION WIRING TO EACH DRIVER RACK MUST BE LONG ENOUGH TO ALLOW COMPLETE REMOVAL OF THE RACK FROM THE PANEL.

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION	PDC2A–2C, UVSIGNA ANN ARBOR MI ELECTRICAL – MAIN POWER
REVISED BY	PSJ
CHECKED BY	JK
APPROVED BY	PSL
APPROVAL DATE	2023-08-02
DWG NO.	341385
REV	1
SCALE	NTS
SHEET	02 OF 50
SIZE	D



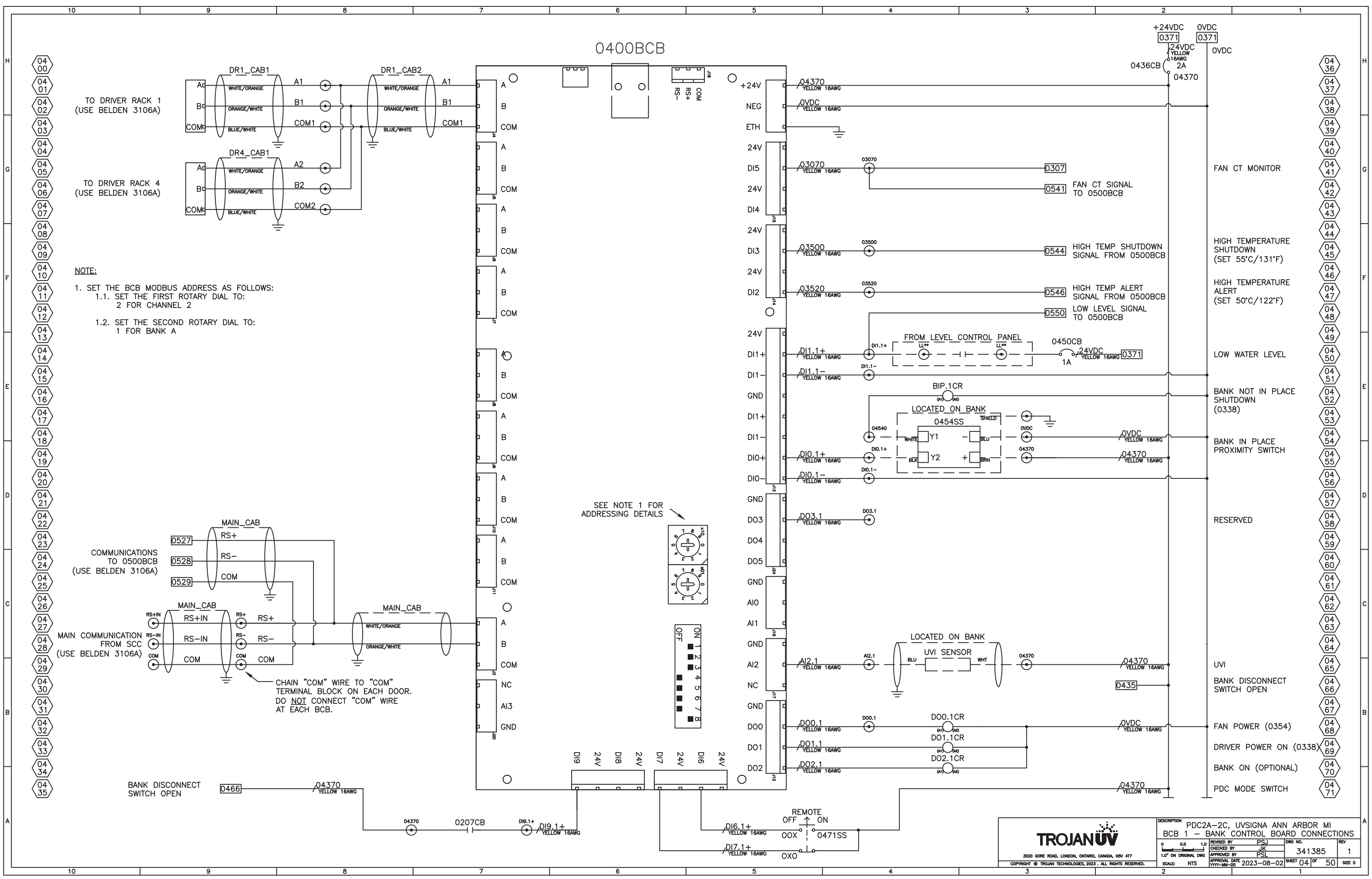
NOTE:

1. SET 0305CT AS FOLLOWS:
   1.1. SET THE DIP SWITCH LOCATED UNDER THE REMOVAL DOOR AS FOLLOWS:
   1.2. MAKE SURE THE GREEN POWER LED (U/T) LOCATED ON THE CT IS ON.
   1.3. TURN THE Hyst. % DIAL ALL THE WAY COUNTER-CLOCKWISE SETTING IT TO 3.
   1.4. TURN THE I A DIAL COUNTER-CLOCKWISE SETTING IT TO ITS LOWEST SETTING.
   1.5. TURN THE Tv s DIAL COUNTER-CLOCKWISE SETTING THE ON ALARM TIME TO ITS LOWEST SETTING.
   1.6. TURN THE Ts s DIAL ALL THE WAY COUNTER-CLOCKWISE SETTING TO 0.
   1.7. MAKE SURE THAT EVERY FAN IS OPERATIONAL. THE YELLOW OUTPUT RELAY LED (R) LOCATED ON THE CT SHOULD BE ON.
   1.8. SLOWLY TURN THE I A DIAL CLOCKWISE STOPPING WHEN THE RED ALARM LED TURNS ON.
   1.9. SLOWLY TURN THE I A DIAL COUNTER-CLOCKWISE UNTIL THE RED ALARM LED TURNS OFF.
   1.10. SLOWLY TURN THE I A DIAL COUNTER-CLOCKWISE ANOTHER 5%, SETTING THE CURRENT LEVEL.
   1.11. SET THE Hyst. % DIAL TO 6%.
   1.12. SET THE Tv s DIAL TO 10 SECONDS.

TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI ELECTRICAL - 24VDC CONTROLS

REVISED BY	PSJ
CHECKED BY	JK
APPROVED BY	PSL
APPROVAL DATE	2023-08-02
DWG NO.	341385
REV	1
SCALE	NTS
SHEET	03 OF 50
SIZE	D


0400BCB
TO DRIVER RACK 1 (USE BELDEN 3106A)
TO DRIVER RACK 4 (USE BELDEN 3106A)
DR1_CAB1
DR1_CAB2
DR4_CAB1
WHITE/ORANGE
ORANGE/WHITE
BLUE/WHITE
A1
B1
COM1
A2
B2
COM2
NOTE:
1. SET THE BCB MODBUS ADDRESS AS FOLLOWS:
1.1. SET THE FIRST ROTARY DIAL TO: 2 FOR CHANNEL 2
1.2. SET THE SECOND ROTARY DIAL TO: 1 FOR BANK A
COMMUNICATIONS TO 0500BCB (USE BELDEN 3106A)
MAIN_CAB
0527
0528
0529
RS+
RS−
COM
MAIN COMMUNICATION FROM SCC (USE BELDEN 3106A)
RS+IN
RS−IN
CHAIN "COM" WIRE TO "COM" TERMINAL BLOCK ON EACH DOOR. DO NOT CONNECT "COM" WIRE AT EACH BCB.
SEE NOTE 1 FOR ADDRESSING DETAILS
BANK DISCONNECT SWITCH OPEN
0466
04370
YELLOW 16AWG
0207CB
DI9.1+
REMOTE
OFF ON
0471SS
DI6.1+
DI7.1+
+24VDC
0VDC
0371
24VDC YELLOW 16AWG 2A
0436CB
+24V
NEG
ETH
24V
DI5
DI4
DI3
DI2
DI1+
DI1−
GND
DI0+
DI0−
DO3
DO4
DO5
AI0
AI1
AI2
NC
AI3
DO0
DO1
DO2
03070
0307
0541
FAN CT SIGNAL TO 0500BCB
03500
0544
HIGH TEMP SHUTDOWN SIGNAL FROM 0500BCB
03520
0546
HIGH TEMP ALERT SIGNAL FROM 0500BCB
0550
LOW LEVEL SIGNAL TO 0500BCB
FROM LEVEL CONTROL PANEL
0450CB
1A
DI1.1+
DI1.1−
BIP.1CR
LOCATED ON BANK
0454SS
04540
DI0.1+
DI0.1−
DO3.1
UVI SENSOR
AI2.1
DO0.1
DO1.1
DO2.1
DO0.1CR
DO1.1CR
DO2.1CR
0435
FAN CT MONITOR
HIGH TEMPERATURE SHUTDOWN (SET 55°C/131°F)
HIGH TEMPERATURE ALERT (SET 50°C/122°F)
LOW WATER LEVEL
BANK NOT IN PLACE SHUTDOWN (0338)
BANK IN PLACE PROXIMITY SWITCH
RESERVED
UVI
BANK DISCONNECT SWITCH OPEN
FAN POWER (0354)
DRIVER POWER ON (0338)
BANK ON (OPTIONAL)
PDC MODE SWITCH
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7
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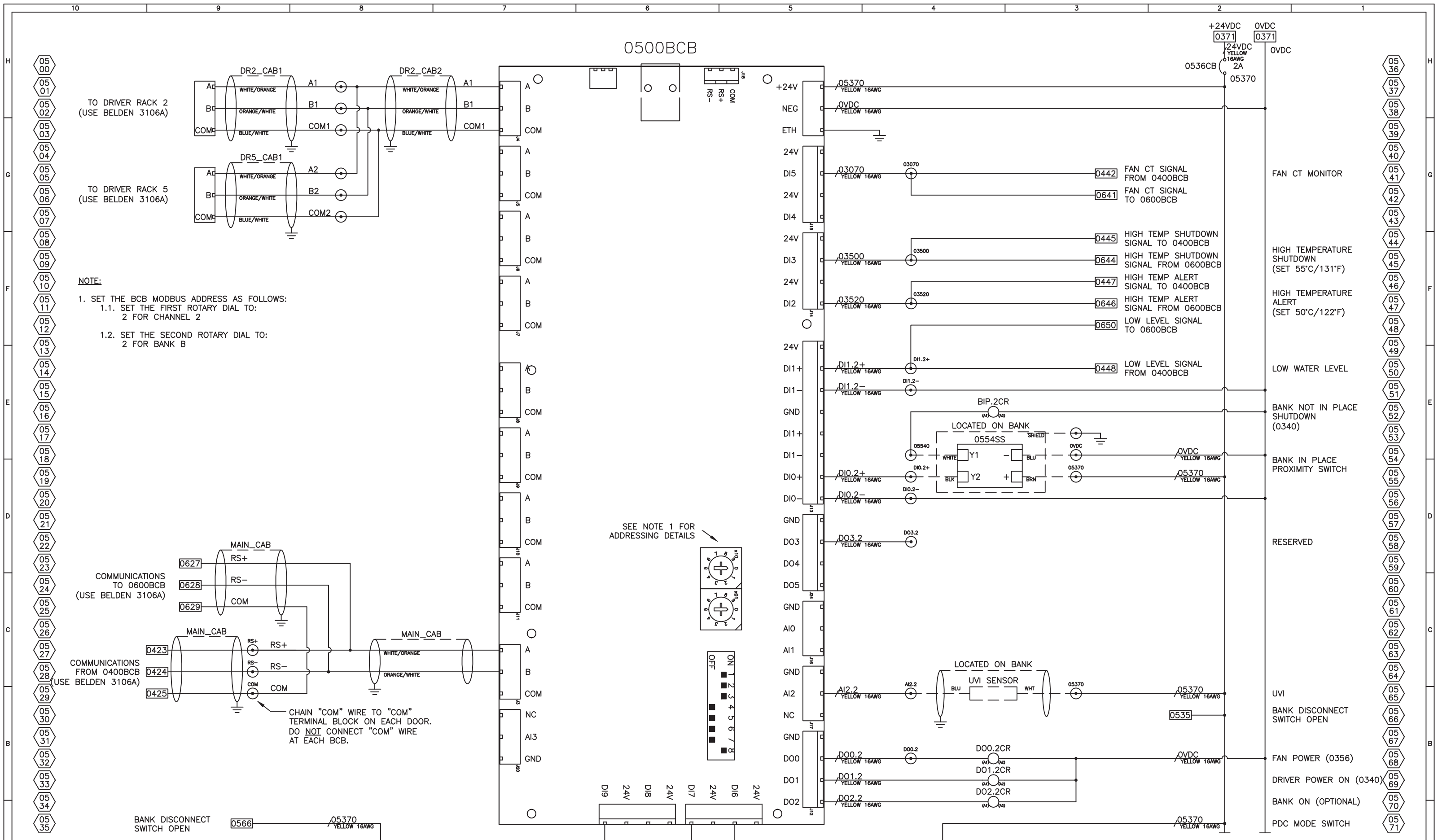
PDC2A−2C, UVSIGNA ANN ARBOR MI
BCB 1 − BANK CONTROL BOARD CONNECTIONS
REVISED BY PSJ
CHECKED BY JK
APPROVED BY PSL
APPROVAL DATE 2023−08−02
DWG NO. 341385
REV 1
SHEET 04 OF 50
SCALE: NTS



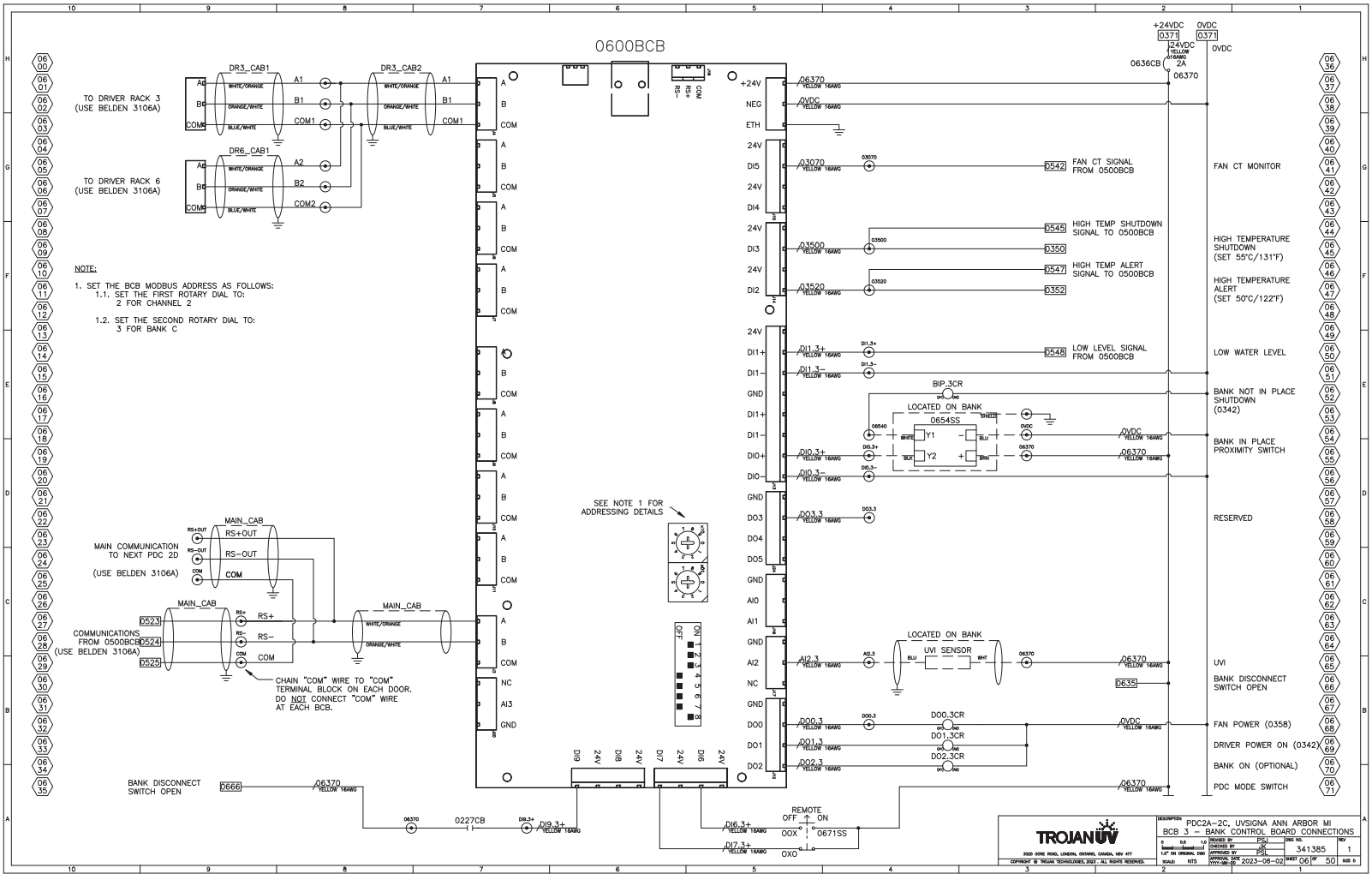
0500BCB
TO DRIVER RACK 2 (USE BELDEN 3106A)
TO DRIVER RACK 5 (USE BELDEN 3106A)
DR2_CAB1
DR2_CAB2
DR5_CAB1
NOTE:
1. SET THE BCB MODBUS ADDRESS AS FOLLOWS:
1.1. SET THE FIRST ROTARY DIAL TO: 2 FOR CHANNEL 2
1.2. SET THE SECOND ROTARY DIAL TO: 2 FOR BANK B
COMMUNICATIONS TO 0600BCB (USE BELDEN 3106A)
COMMUNICATIONS FROM 0400BCB (USE BELDEN 3106A)
CHAIN "COM" WIRE TO "COM" TERMINAL BLOCK ON EACH DOOR. DO NOT CONNECT "COM" WIRE AT EACH BCB.
BANK DISCONNECT SWITCH OPEN
SEE NOTE 1 FOR ADDRESSING DETAILS
+24VDC 0371
0VDC 0371
0536CB
FAN CT SIGNAL FROM 0400BCB
FAN CT SIGNAL TO 0600BCB
HIGH TEMP SHUTDOWN SIGNAL TO 0400BCB
HIGH TEMP SHUTDOWN SIGNAL FROM 0600BCB
HIGH TEMP ALERT SIGNAL TO 0400BCB
HIGH TEMP ALERT SIGNAL FROM 0600BCB
LOW LEVEL SIGNAL TO 0600BCB
LOW LEVEL SIGNAL FROM 0400BCB
LOCATED ON BANK
0554SS
UVI SENSOR
REMOTE OFF ON
0571SS
FAN CT MONITOR
HIGH TEMPERATURE SHUTDOWN (SET 55°C/131°F)
HIGH TEMPERATURE ALERT (SET 50°C/122°F)
LOW WATER LEVEL
BANK NOT IN PLACE SHUTDOWN (0340)
BANK IN PLACE PROXIMITY SWITCH
RESERVED
UVI
BANK DISCONNECT SWITCH OPEN
FAN POWER (0356)
DRIVER POWER ON (0340)
BANK ON (OPTIONAL)
PDC MODE SWITCH

TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

PDC2A-2C, UVSIGNA ANN ARBOR MI
BCB 2 – BANK CONTROL BOARD CONNECTIONS

REVISED BY	CHECKED BY	APPROVED BY	APPROVAL DATE	DWG NO.	REV	SHEET
PSJ	JK	PSL	2023-08-02	341385	1	05 OF 50

SCALE: NTS


0600BCB
TO DRIVER RACK 3
(USE BELDEN 3106A)
TO DRIVER RACK 6
(USE BELDEN 3106A)
DR3_CAB1
DR3_CAB2
DR6_CAB1
NOTE:
1. SET THE BCB MODBUS ADDRESS AS FOLLOWS:
1.1. SET THE FIRST ROTARY DIAL TO:
2 FOR CHANNEL 2
1.2. SET THE SECOND ROTARY DIAL TO:
3 FOR BANK C
MAIN_CAB
MAIN COMMUNICATION
TO NEXT PDC 2D
(USE BELDEN 3106A)
COMMUNICATIONS
FROM 0500BCB
(USE BELDEN 3106A)
CHAIN "COM" WIRE TO "COM"
TERMINAL BLOCK ON EACH DOOR.
DO NOT CONNECT "COM" WIRE
AT EACH BCB.
SEE NOTE 1 FOR
ADDRESSING DETAILS
+24VDC
0VDC
FAN CT SIGNAL
FROM 0500BCB
FAN CT MONITOR
HIGH TEMP SHUTDOWN
SIGNAL TO 0500BCB
HIGH TEMP ALERT
SIGNAL TO 0500BCB
HIGH TEMPERATURE
SHUTDOWN
(SET 55°C/131°F)
HIGH TEMPERATURE
ALERT
(SET 50°C/122°F)
LOW LEVEL SIGNAL
FROM 0500BCB
LOW WATER LEVEL
BIP_3CR
LOCATED ON BANK
0654SS
BANK NOT IN PLACE
SHUTDOWN
(0342)
BANK IN PLACE
PROXIMITY SWITCH
RESERVED
LOCATED ON BANK
UVI SENSOR
UVI
BANK DISCONNECT
SWITCH OPEN
DO0_3CR
DO1_3CR
DO2_3CR
FAN POWER (0358)
DRIVER POWER ON (0342)
BANK ON (OPTIONAL)
PDC MODE SWITCH
BANK DISCONNECT
SWITCH OPEN
0227CB
REMOTE
OFF
ON
0671SS
OXO
OOX
TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6H 4T7
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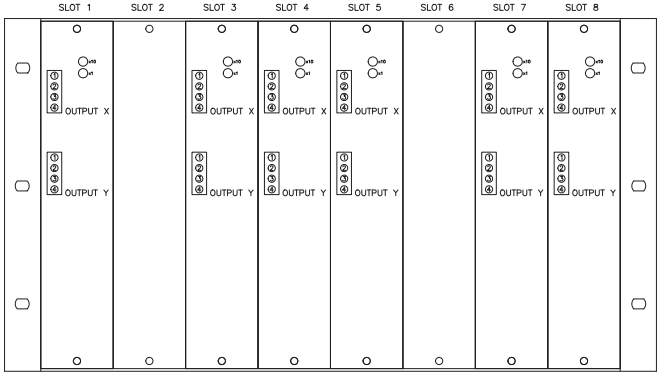
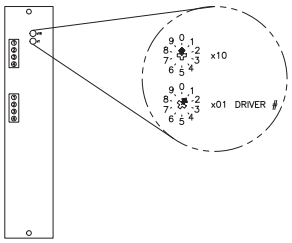
PDC2A-2C, UVSIGNA ANN ARBOR MI
BCB 3 - BANK CONTROL BOARD CONNECTIONS
DRAWING NO. 341385
REV 1
SCALE: NTS
APPROVAL DATE 2023-08-02
SHEET 06 OF 50

DRIVER POSITION IN RACK 1 (BANK 2A)

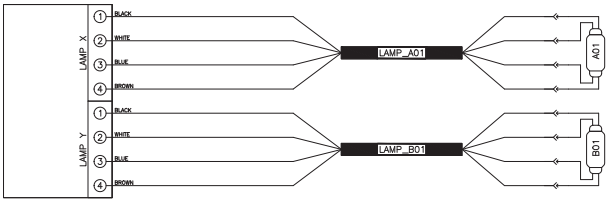


Rack 1								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 1		Driver 2	Driver 3	Driver 4		Driver 5	Driver 6
Phase	L1	L1	L3	L3	L2	L2	L2	L1
Modbus Address*	01		02	03	04		05	06

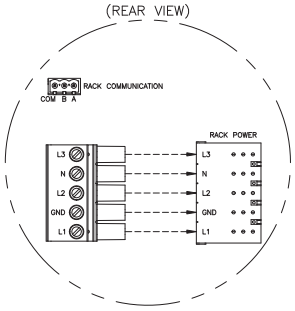
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 11 FOR RACK 1 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



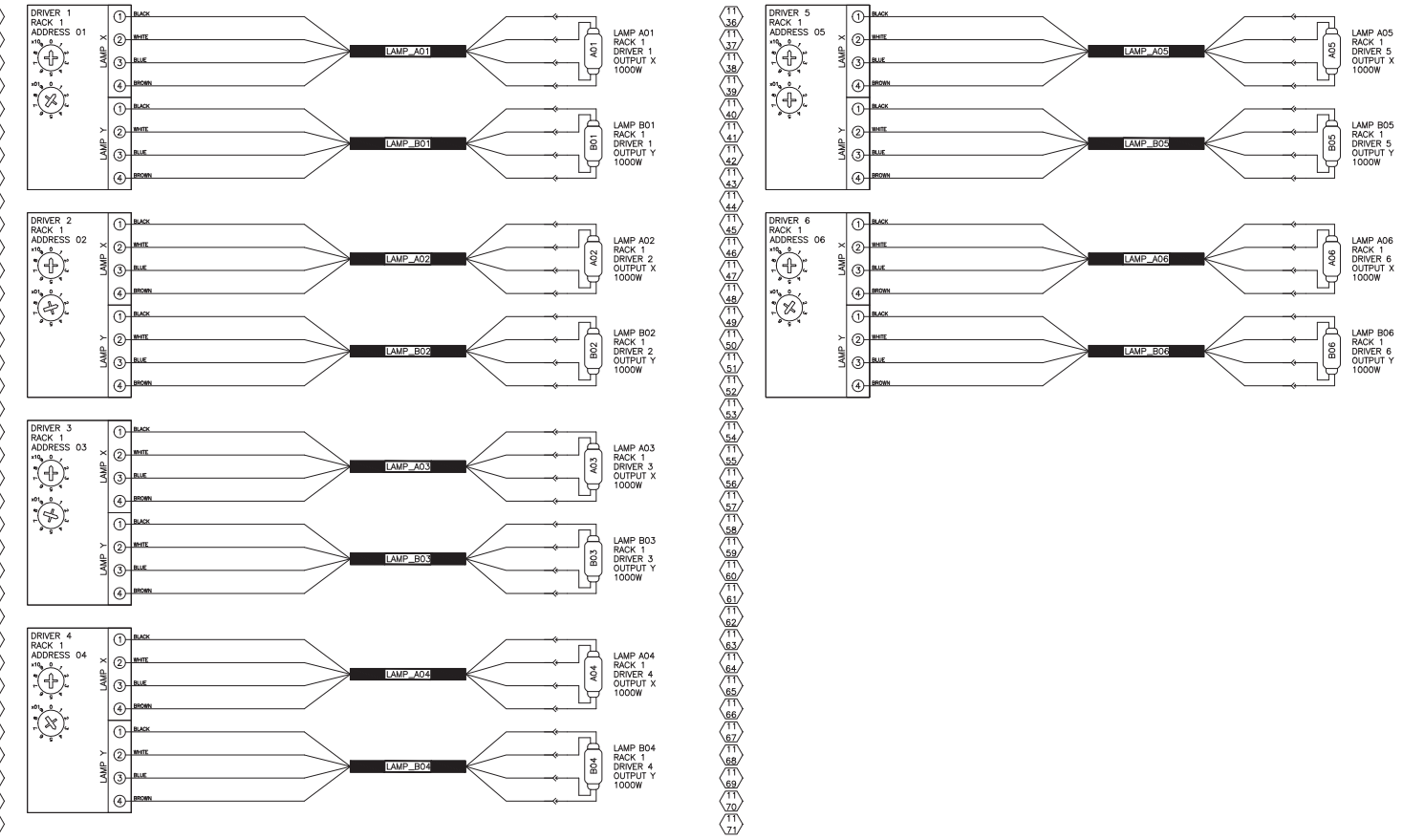
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 1 LAMP DRIVERS

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	MK	341385	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 10 OF 50	SIZE D

SCALE: NTS
1.0" ON ORIGINAL DWG

RACK 1 CONNECTIONS (BANK 2A)



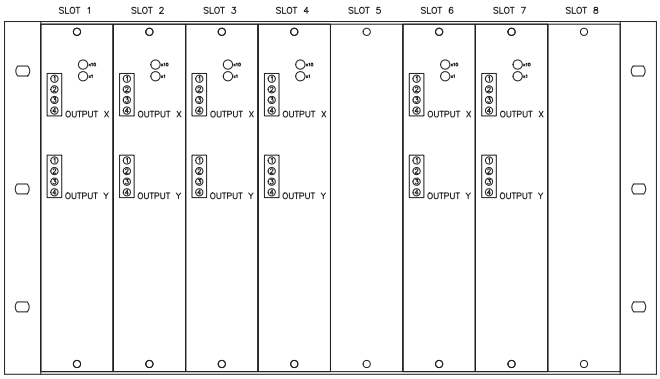
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 1 LAMP-DRIVER CONNECTIONS

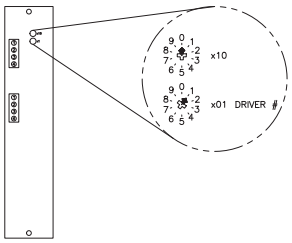
DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341385
REV	1
SCALE	NTS
SHEET	11 OF 50
SIZE	D

DRIVER POSITION IN RACK 2 (BANK 2B)

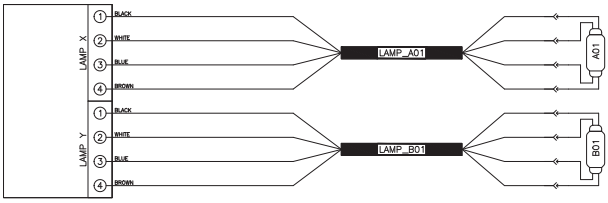


Rack 2								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 1	Driver 2	Driver 3	Driver 4		Driver 5	Driver 6	
Phase	L3	L3	L2	L2	L1	L1	L1	L3
Modbus Address*	01	02	03	04		05	06	

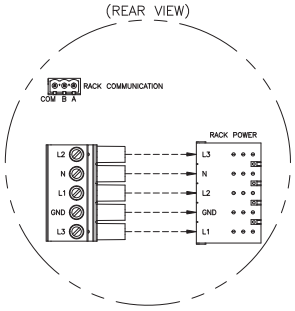
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 13 FOR RACK 2 SPECIFICS)



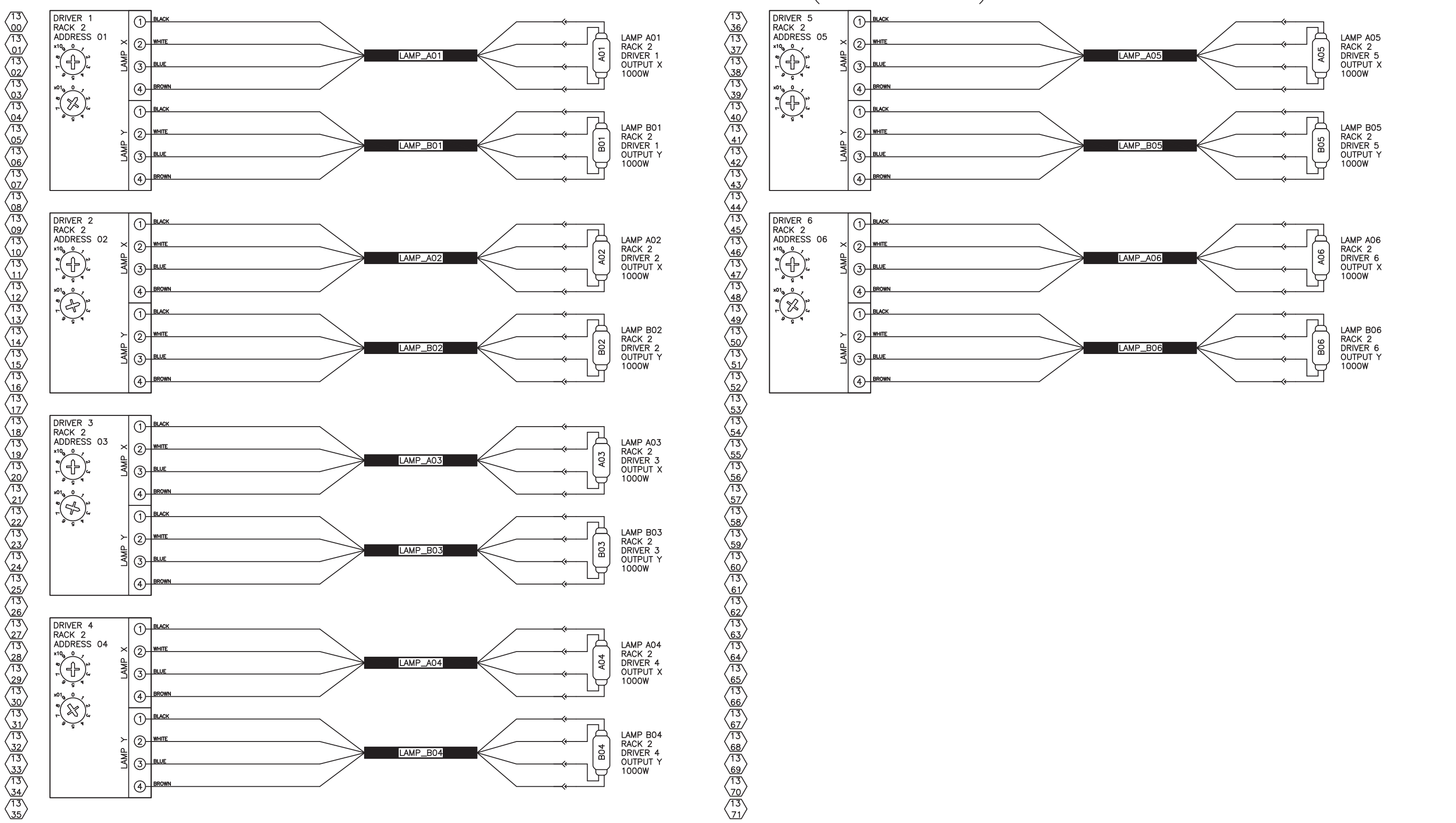
DRIVER RACK CONNECTORS
(REAR VIEW)



TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION	PDC2A-2C, UVSIGNA ANN ARBOR MI RACK 2 LAMP DRIVERS
REVISED BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341385
REV	1
SHEET	12 OF 50
SIZE	D
SCALE	NTS

RACK 2 CONNECTIONS (BANK 2B)

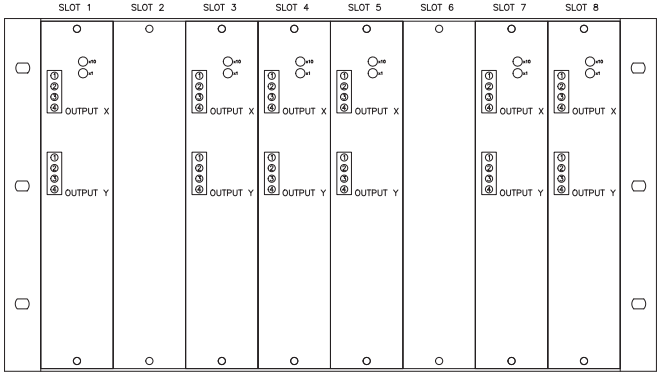


TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

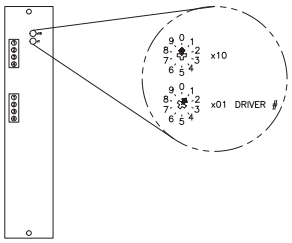
DESCRIPTION	PDC2A-2C, UVSIGNA ANN ARBOR MI RACK 2 LAMP-DRIVER CONNECTIONS		
REVISED BY	PSJ	DWG NO. 341385	REV 1
CHECKED BY	JK		
APPROVED BY	PSL		
SCALE: NTS	APPROVAL DATE 2023-08-02	SHEET 13 OF 50	SIZE D

DRIVER POSITION IN RACK 3 (BANK 2C)

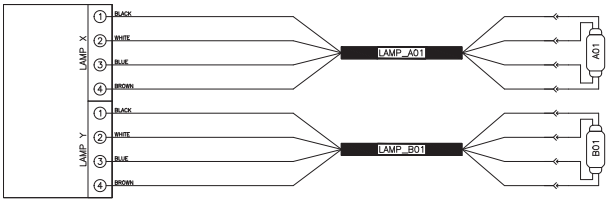


Rack 3								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 1		Driver 2	Driver 3	Driver 4		Driver 5	Driver 6
Phase	L2	L2	L1	L1	L3	L3	L3	L2
Modbus Address*	01		02	03	04		05	06

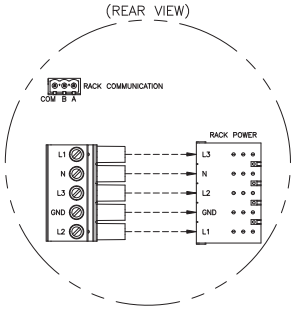
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 15 FOR RACK 3 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



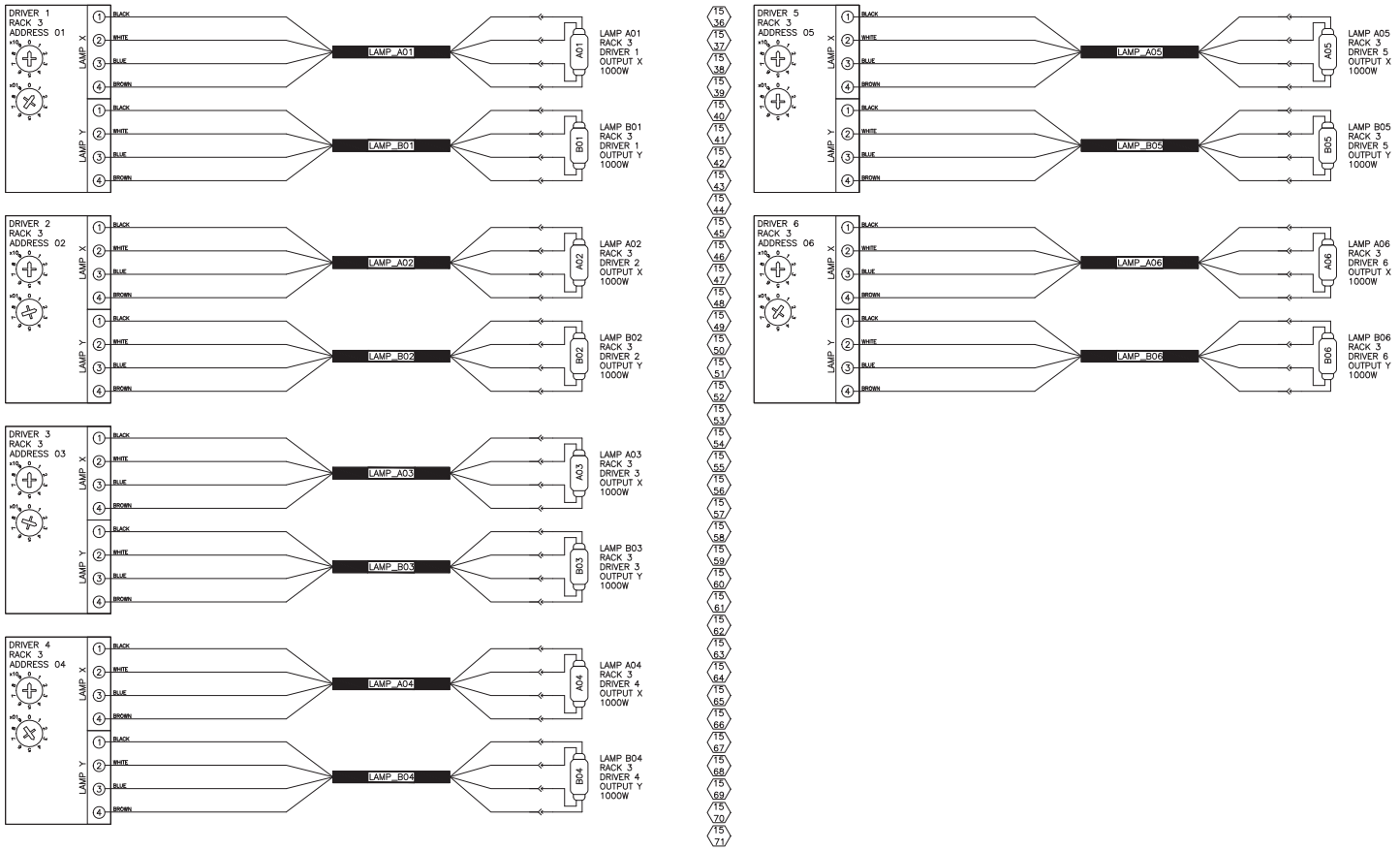
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 3 LAMP DRIVERS

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	MK	341385	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 14 OF 50	SIZE D

SCALE: NTS
"1.0" ON ORIGINAL DWG

RACK 3 CONNECTIONS (BANK 2C)



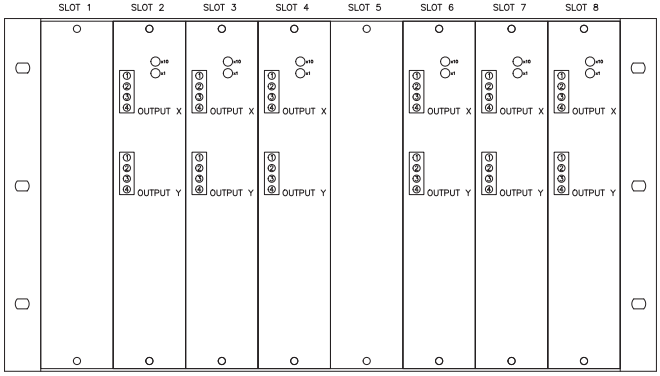
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 3 LAMP-DRIVER CONNECTIONS

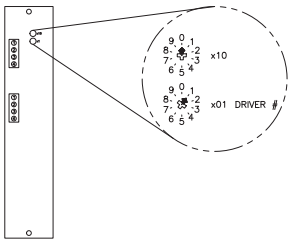
DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DRW NO.	341385
REV	1
SCALE	NTS
SHEET	15 OF 50
SIZE	D

DRIVER POSITION IN RACK 4 (BANK 2A)

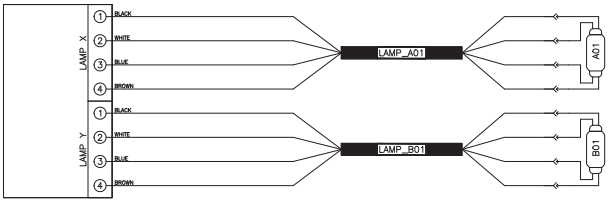


Rack 4								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number		Driver 7	Driver 8	Driver 9		Driver 10	Driver 11	Driver 12
Phase	L1	L1	L3	L3	L2	L2	L2	L1
Modbus Address*		07	08	09		10	11	12

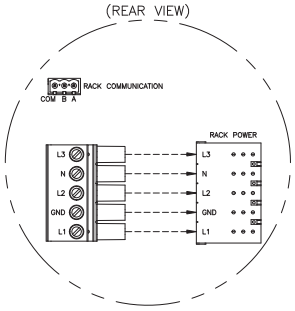
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 17 FOR RACK 4 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)

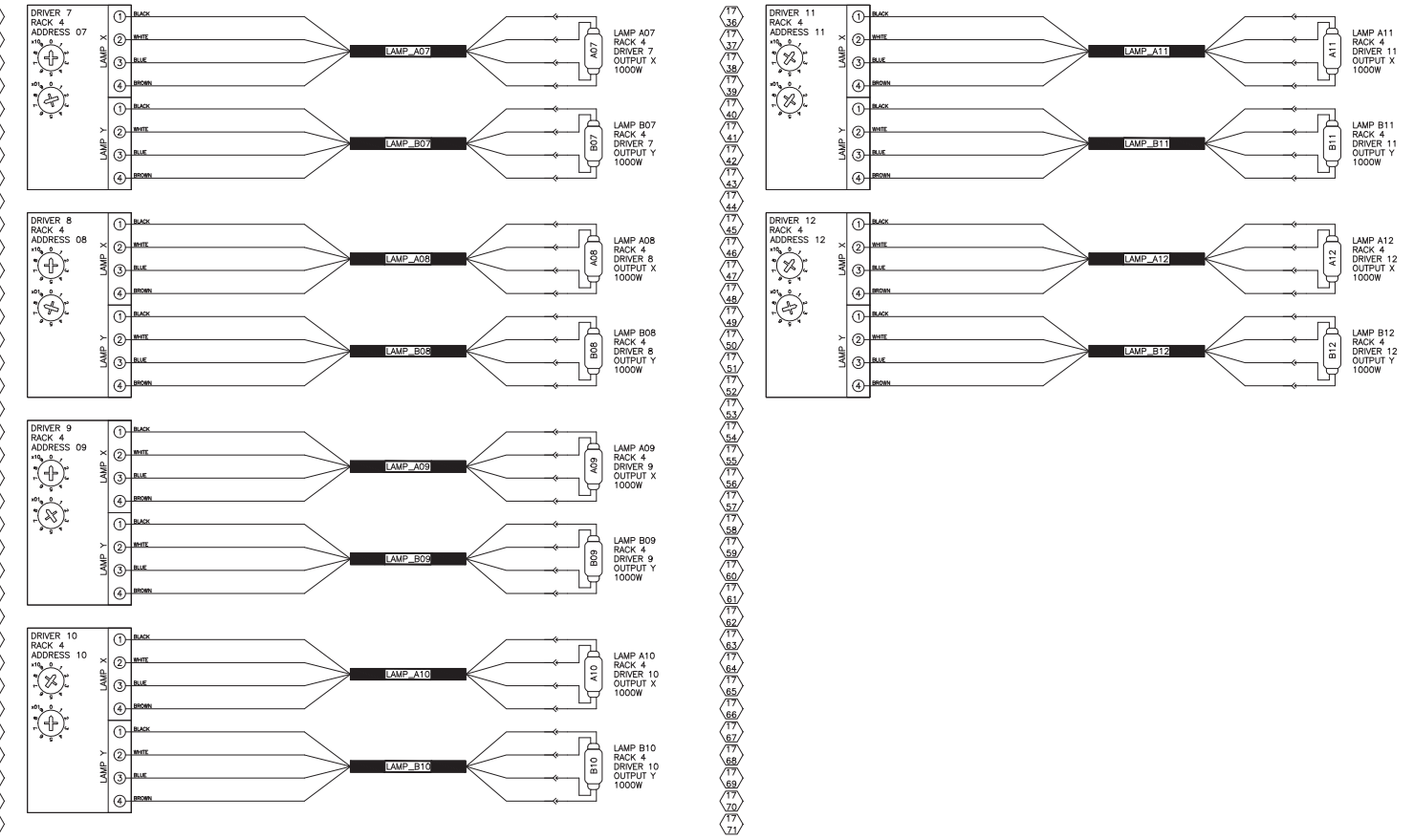


TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 1Z7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 4 LAMP DRIVERS

REVISED BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341385
REV	1
SCALE:	NTS
SHEET	16 OF 50
SIZE	D

RACK 4 CONNECTIONS (BANK 2A)



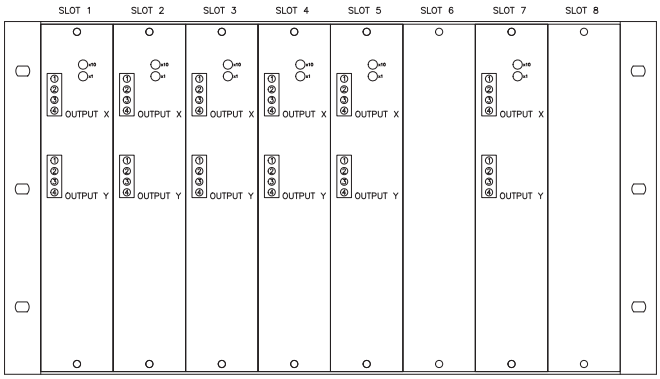
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 4 LAMP-DRIVER CONNECTIONS

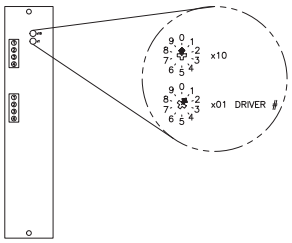
DRAWN BY	PSJ	
CHECKED BY	JMC	
APPROVED BY	PSJ	
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	
DWG NO.	341385	REV 1
SCALE: NTS	SHEET 17 OF 50	SIZE D

DRIVER POSITION IN RACK 5 (BANK 2B)

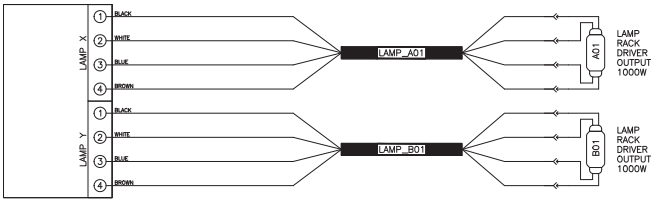


Rack 5								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 7	Driver 8	Driver 9	Driver 10	Driver 11		Driver 12	
Phase	L3	L3	L2	L2	L1	L1	L1	L3
Modbus Address*	07	08	09	10	11		12	

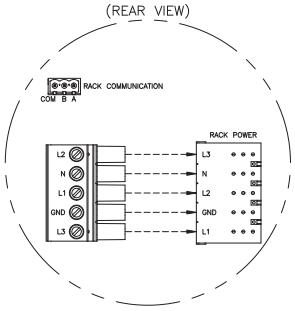
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 19 FOR RACK 5 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



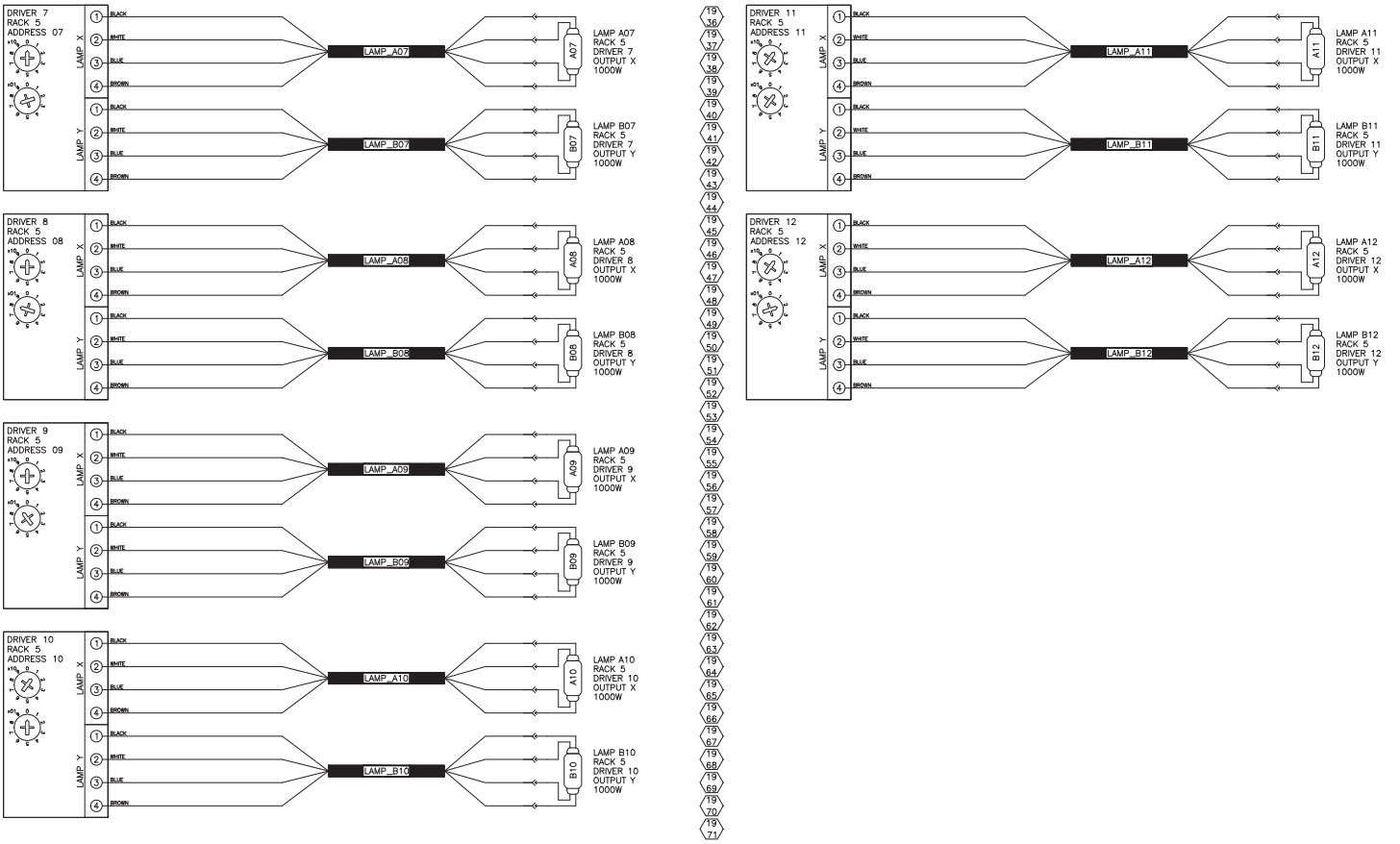
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 5 LAMP DRIVERS

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	JMC	341385	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 18 OF 50	SIZE D

SCALE: NTS
IF NOT 1" ON ORIGINAL, DWG

RACK 5 CONNECTIONS (BANK 2B)



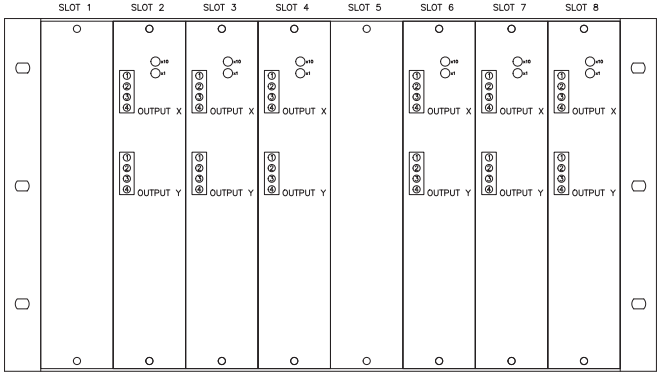
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 5 LAMP-DRIVER CONNECTIONS

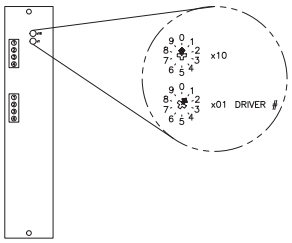
DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DRG NO.	341385
REV	1
SCALE	NTS
SHEET	19 OF 50
SIZE	D

DRIVER POSITION IN RACK 6 (BANK 2C)

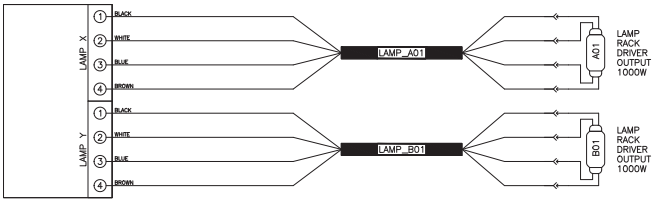


Rack 6								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number		Driver 7	Driver 8	Driver 9		Driver 10	Driver 11	Driver 12
Phase	L2	L2	L1	L1	L3	L3	L3	L2
Modbus Address*		07	08	09		10	11	12

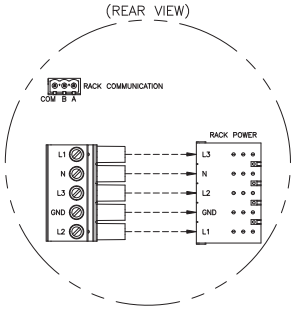
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 21 FOR RACK 6 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



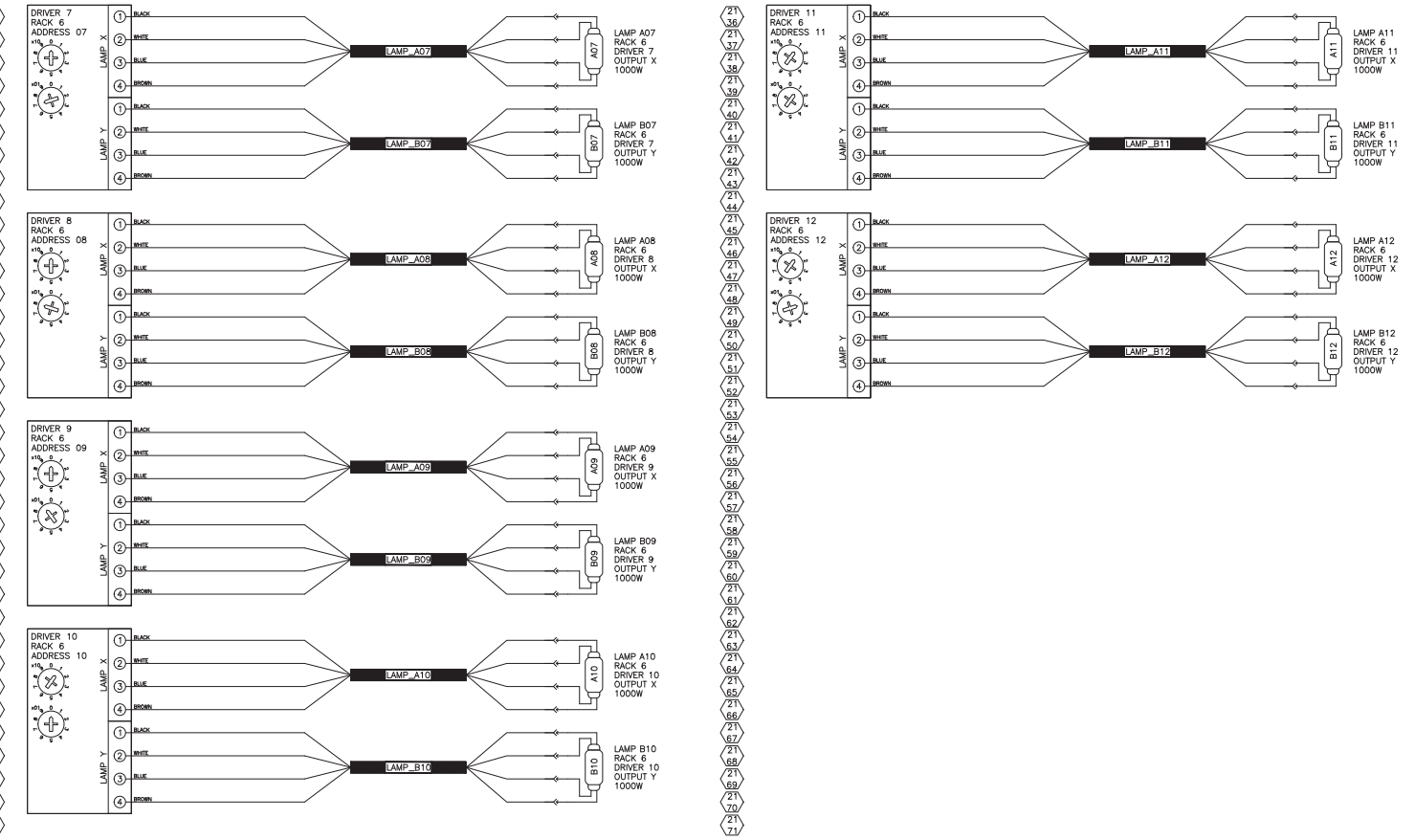
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 6 LAMP DRIVERS

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	MK	341385	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 20 OF 50	SIZE D

SCALE: NTS

RACK 6 CONNECTIONS (BANK 2C)



TROJAN UV

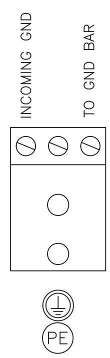
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
RACK 6 LAMP-DRIVER CONNECTIONS

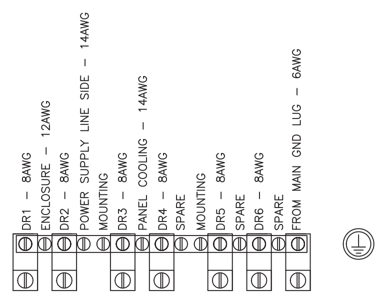
DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DRW NO.	341385
REV	1
SHEET	21 OF 50
SIZE	D

SCALE: NTS

MAIN GROUND LUG CONNECTION LAYOUT



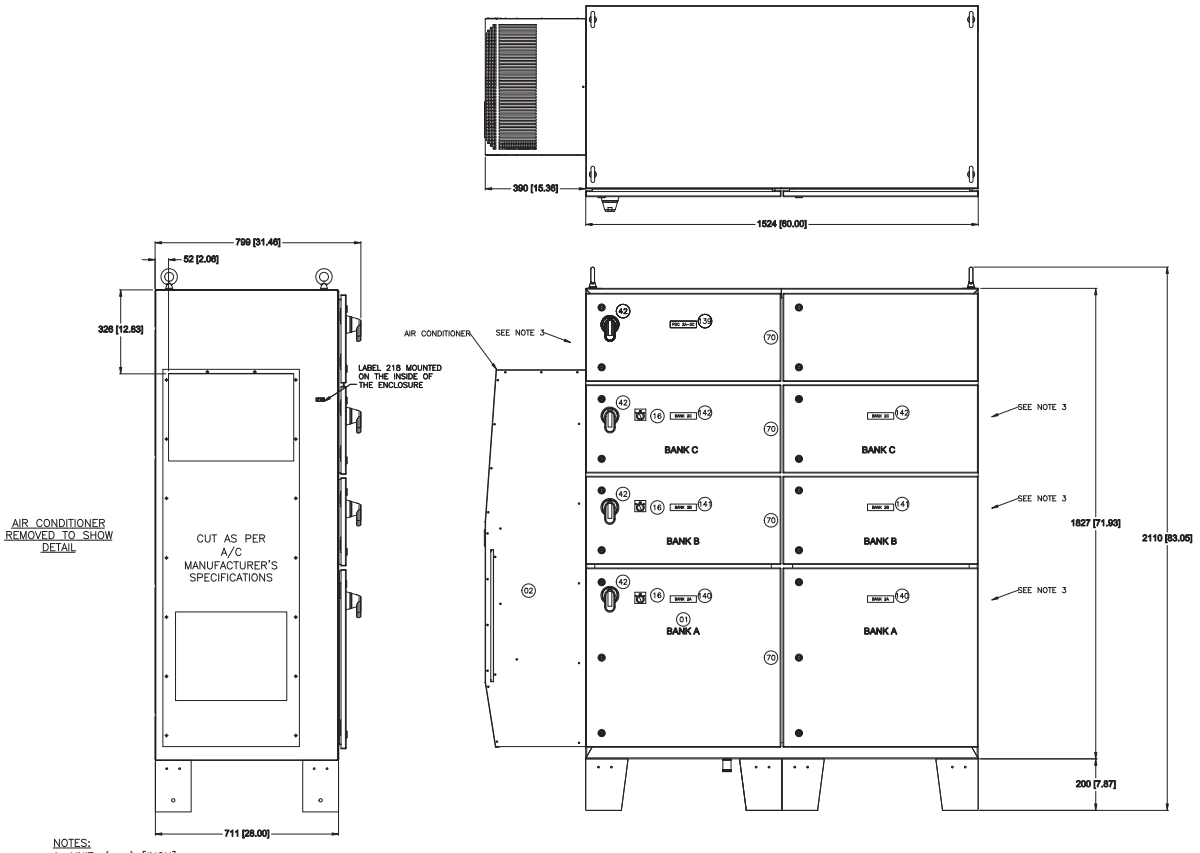
GROUND BAR CONNECTION LAYOUT



TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

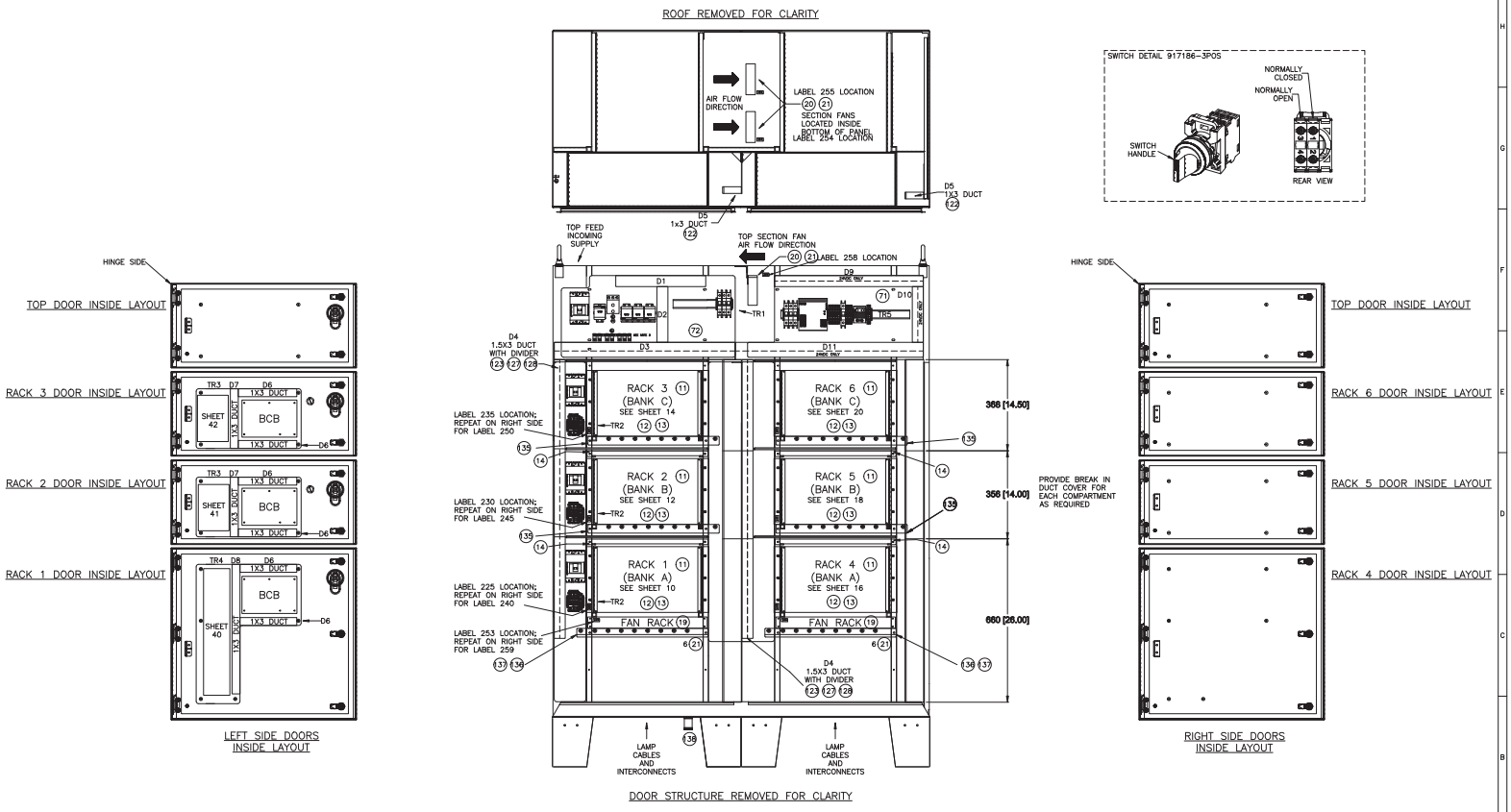
DESCRIPTION	PDC2A-2C, UVSIGNA ANN ARBOR MI GROUNDING DETAIL				
0 0.5 1.0 / 1.0" ON ORIGINAL DWG	REVISED BY	PSJ	DWG NO. 341385		REV 1
	CHECKED BY	JK			
	APPROVED BY	PSL			
SCALE: NTS	APPROVAL DATE YYYY-MM-DD	2023-08-02	SHEET 23	OF 50	SIZE D



NOTES:
1. UNIT: (mm) [INCH]
2. DIMENSIONS ARE REFERENCE ONLY
3. RIGHT HAND DOOR MAY BE INTERLOCKED SO THAT IT CAN BE OPEN ONLY IF THE LEFT HAND DOOR IS OPENED FIRST

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI EXTERNAL LAYOUT
DRAWN BY: PSJ
CHECKED BY: JMC
APPROVED BY: PSJ
APPROVAL DATE (YYYY-MM-DD): 2023-08-02
DWG NO.: 341385
REV: 1
SCALE: NTS
SHEET 25 OF 50
SIZE: D

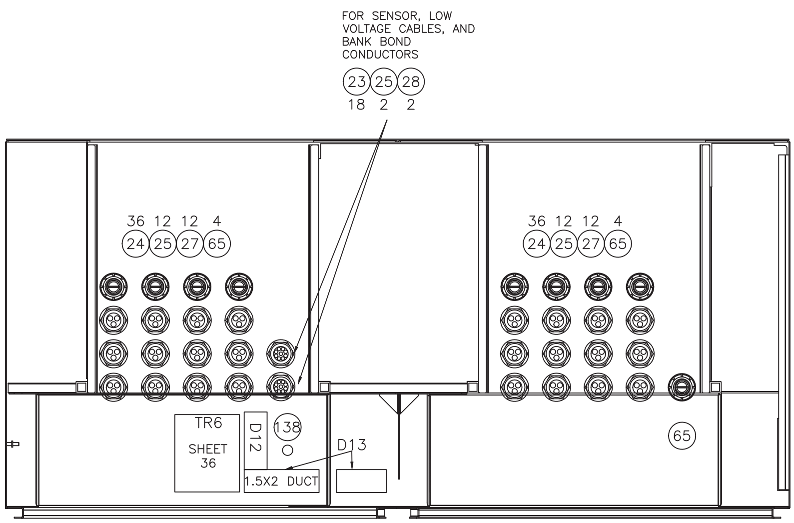


NOTES:

1. USE M6x1.0 TAP FOR ALL MESH DIVIDER MOUNTING HOLES (ITEM 14), SUPPORT TRAY/CABLE MOUNTING PLATE(ITEM 137, 136, 135), DRIVER RACKS (ITEM 11) AND FAN RACKS (ITEM 19), USE SST PHILLIPS HEAD SCREW AND SST LOCK WASHER.
2. BOND ENCLOSURE DOOR TO ENCLOSURE WITH 12AWG GREEN/YELLOW WIRE.
3. GROUND LUG IS OPTIONAL, CAN BE USED FOR WIRES WITH GAUGE 8AWG OR MORE. REFER SHEET#23 FOR POSITION AND SHEET#49 FOR QUANTITY.

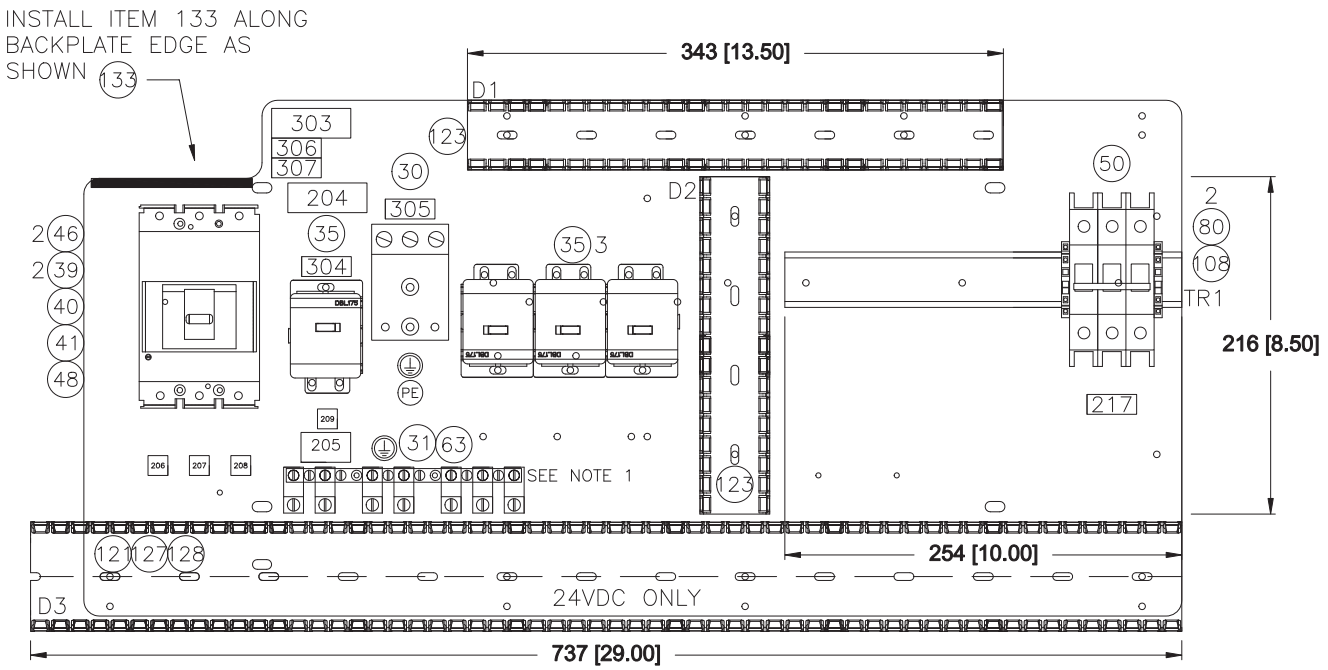
TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 477

DESCRIPTION	PDC2A-2C, UVSIGNA ANN ARBOR MI INTERNAL LAYOUT
REVISED BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE	YYYY-MM-DD 2023-08-02
DWG NO.	341385
REV	1
SHEET	26 OF 50
SIZE	D
SCALE	NTS



BOTTOM INSIDE VIEW
(LOOKING THROUGH THE TOP)

TROJAN UV	DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI INTERNAL BOTTOM LAYOUT
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7	0 0.5 1.0 / 1.0" ON ORIGINAL DWG
	REVISED BY: PSJ
	CHECKED BY: JK
	APPROVED BY: PSL
	APPROVAL DATE YYYY-MM-DD: 2023-08-02
	SCALE: NTS
	DWG NO.: 341385
	REV: 1
	SHEET 27 OF 50
	SIZE D



NOTES

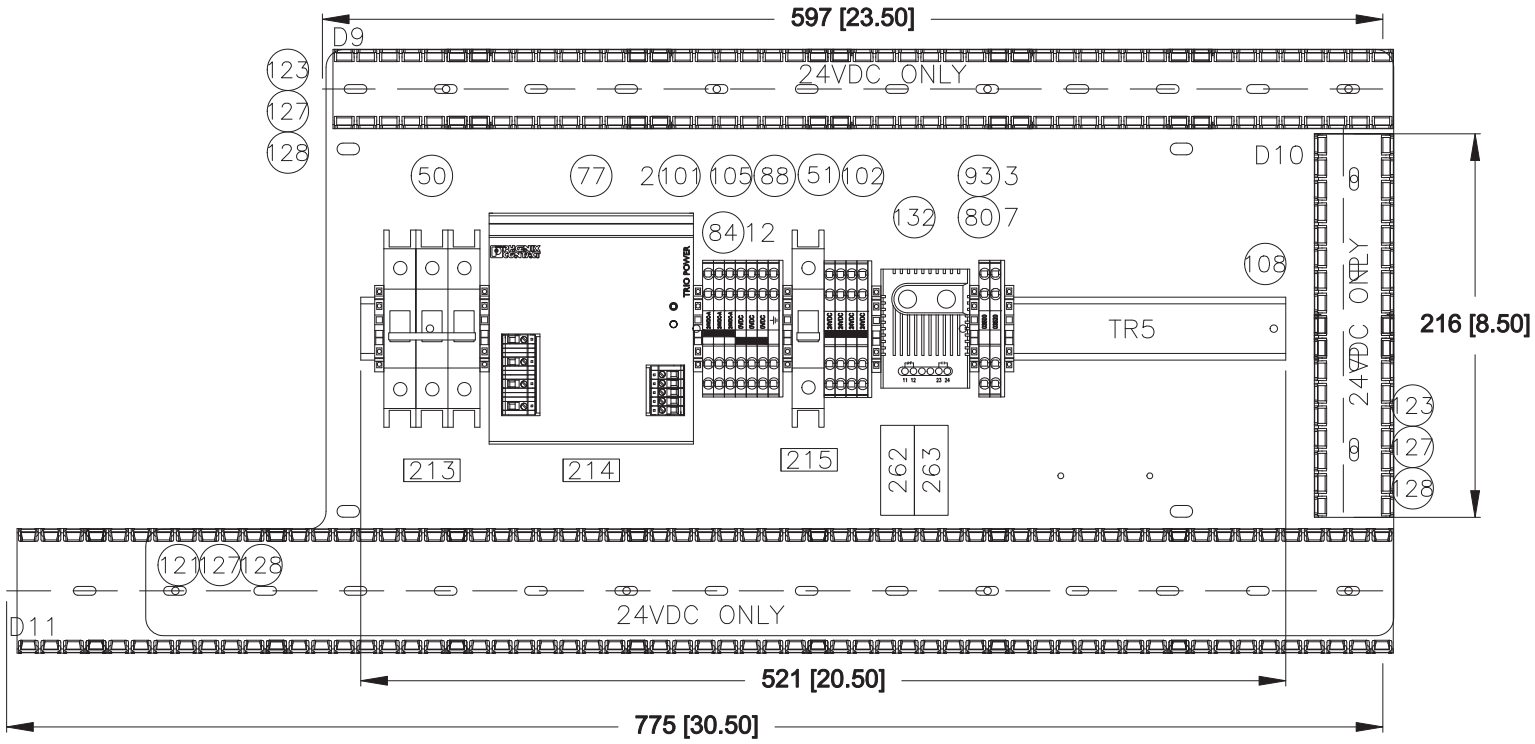
1. GROUND LUG IS OPTIONAL, CAN BE USED FOR WIRES WITH GAUGE 8AWG OR MORE. REFER SHEET#23 FOR POSITION AND SHEET#49 FOR QUANTITY.

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI BACKPLATE LAYOUT

REVIEWED BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341385
REV	1
SCALE	NTS
SHEET	30 OF 50
SIZE	D



TROJAN UV

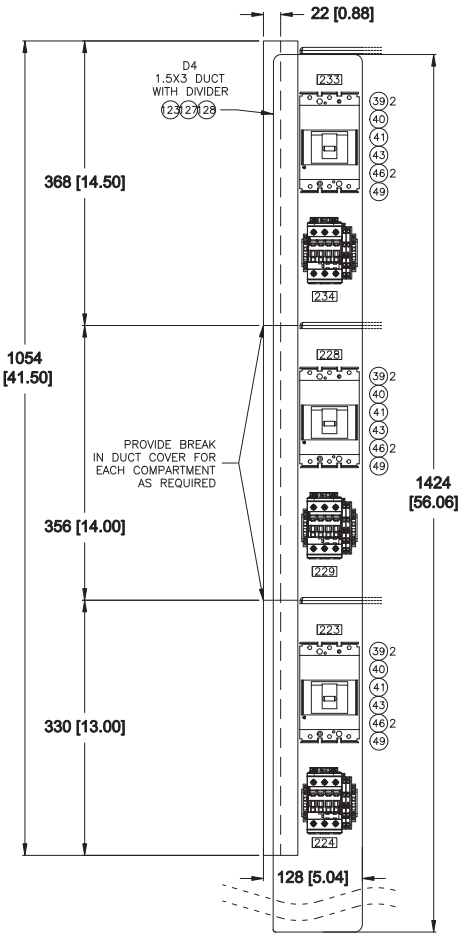
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
BACKPLATE LAYOUT - RIGHT SECTION

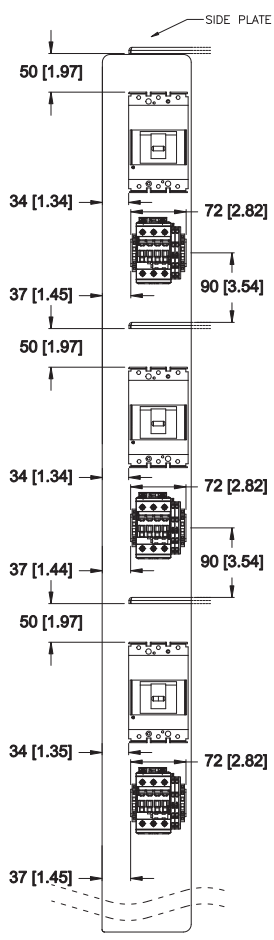
0	0.0	1.0	DRAWN BY: DSJ
1.0" ON ORIGINAL DWG			CHECKED BY: JMC
SCALE: NTS			APPROVED BY: DSJ
			APPROVAL DATE (YYYY-MM-DD): 2023-08-02

DWG NO: 341385 REV: 1
SHEET 31 OF 50 SIZE: D

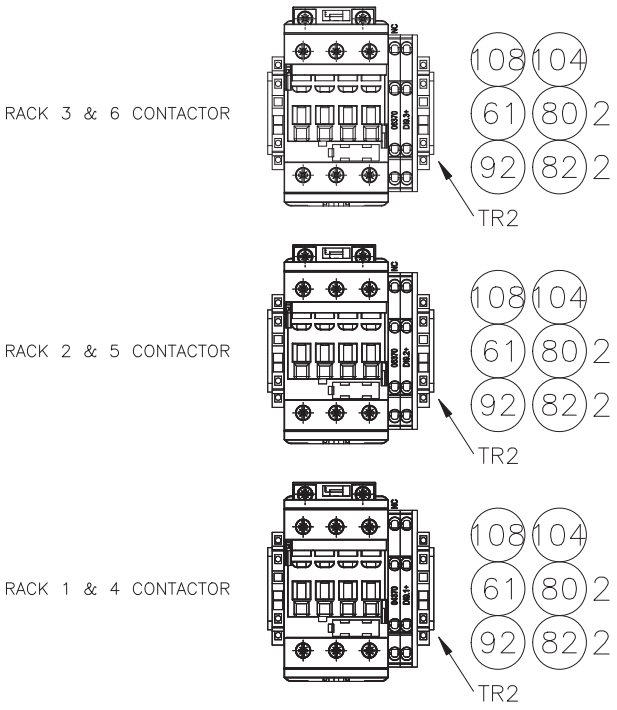
SIDE PLATE VIEW 1



SIDE PLATE VIEW 2



TERMINAL BLOCK DETAIL



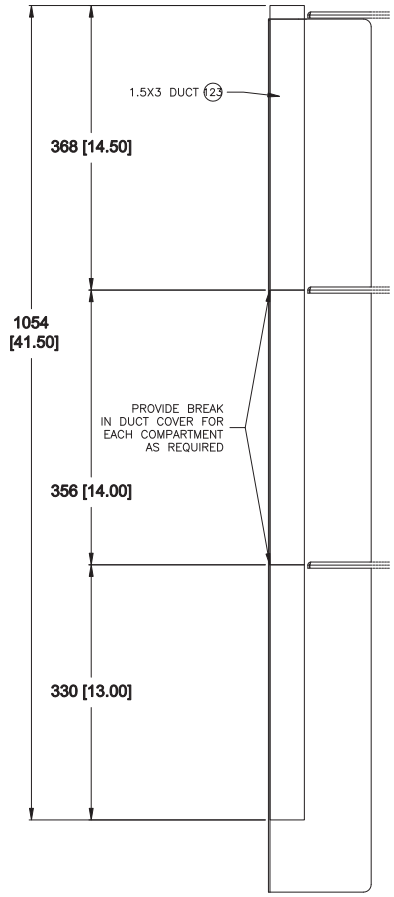
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
SIDE PLATE LAYOUT

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DRG NO.	341385
REV	1
SHEET	33 OF 50
SIZE	D
SCALE	NTS

RIGHT SECTION
SIDE PLATE VIEW

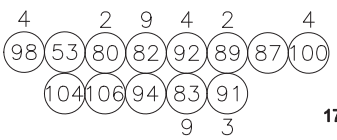


DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
SIDE PLATE LAYOUT – RIGHT SECTION

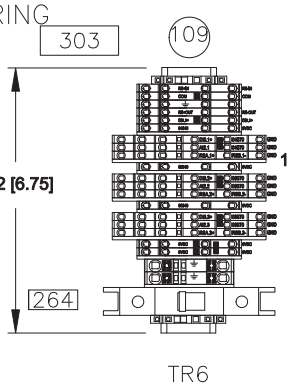
DRAWN BY	DSJ
CHECKED BY	MK
APPROVED BY	DSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341385
REV	1
SCALE	NTS
SHEET	34 OF 50
SIZE	D

BOTTOM TERMINAL BLOCKS

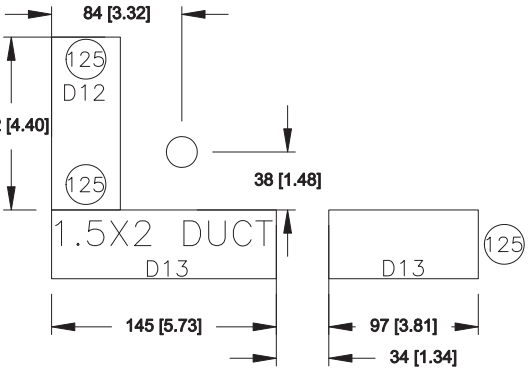
LEFT SECTION



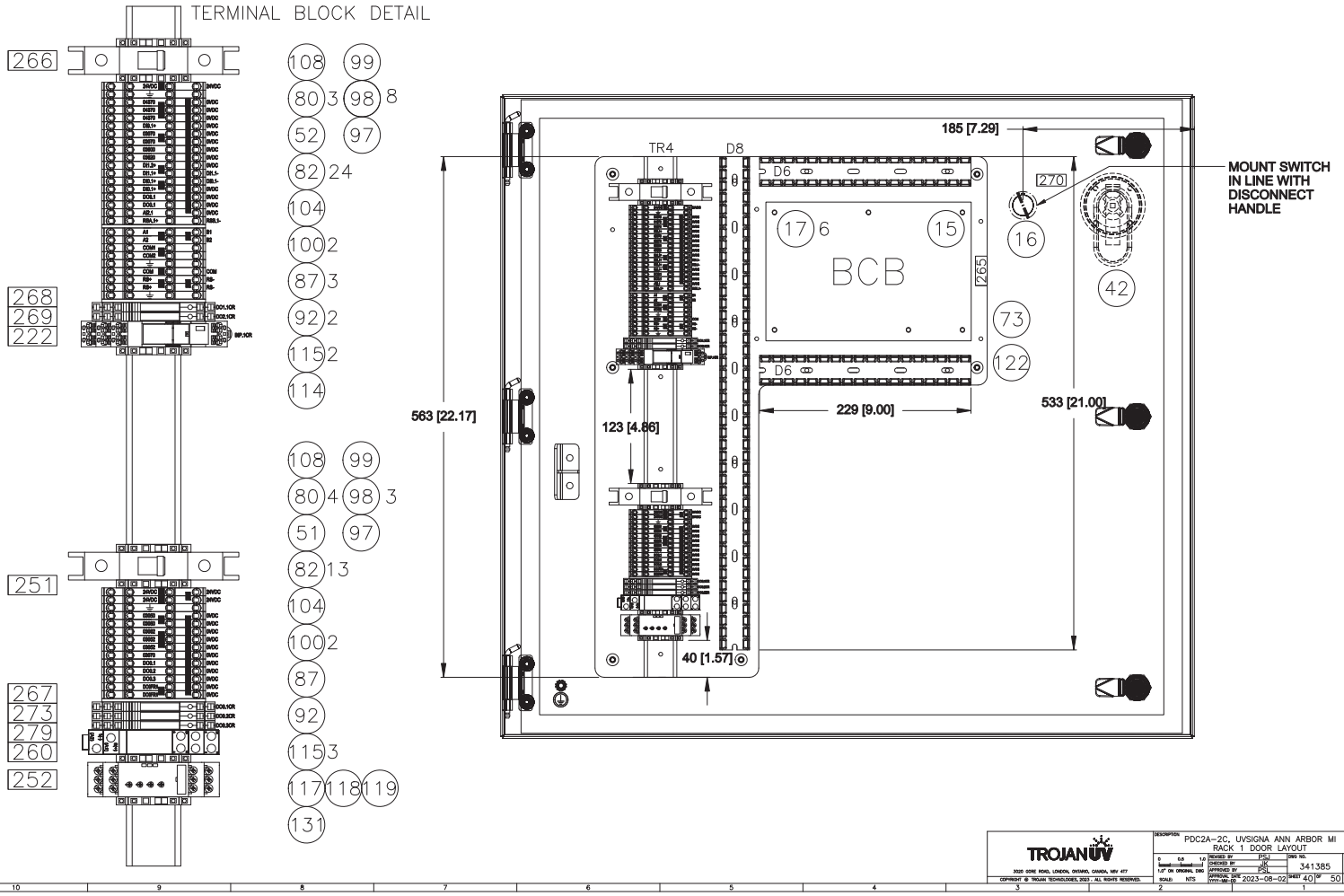
FIELD WIRING



PANEL WIRING



TROJANUV	DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI BOTTOM TERMINAL BLOCK LAYOUT
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7	DRAWN BY: PCJ
	CHECKED BY: MK
	APPROVED BY: PCJ
	APPROVAL DATE (YYYY-MM-DD): 2023-08-02
	DRG NO.: 341385
	REV: 1
	SHEET 36 OF 50
	SIZE D



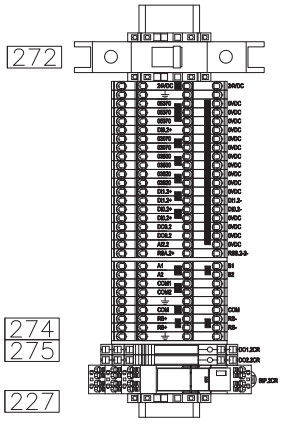
TROJAN UV

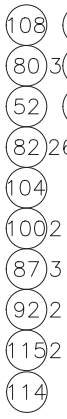
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

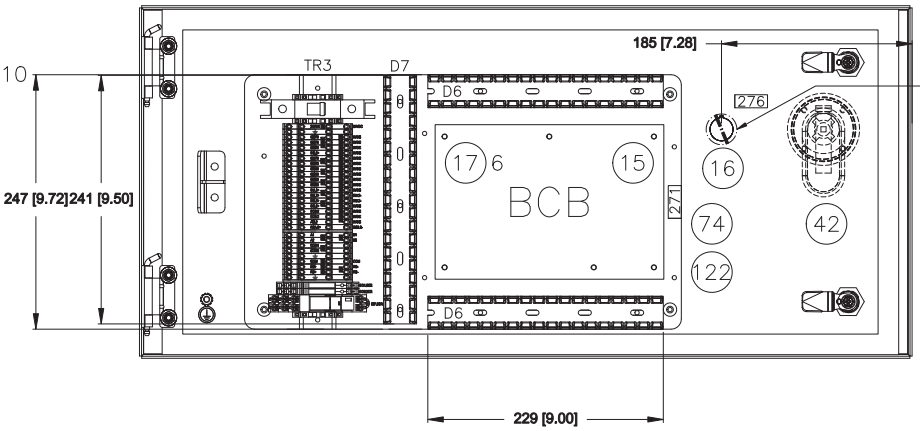
DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI RACK 1 DOOR LAYOUT

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341385
REV	1
SCALE:	NTS
SHEET	40 OF 50
SIZE	D

TERMINAL BLOCK DETAIL

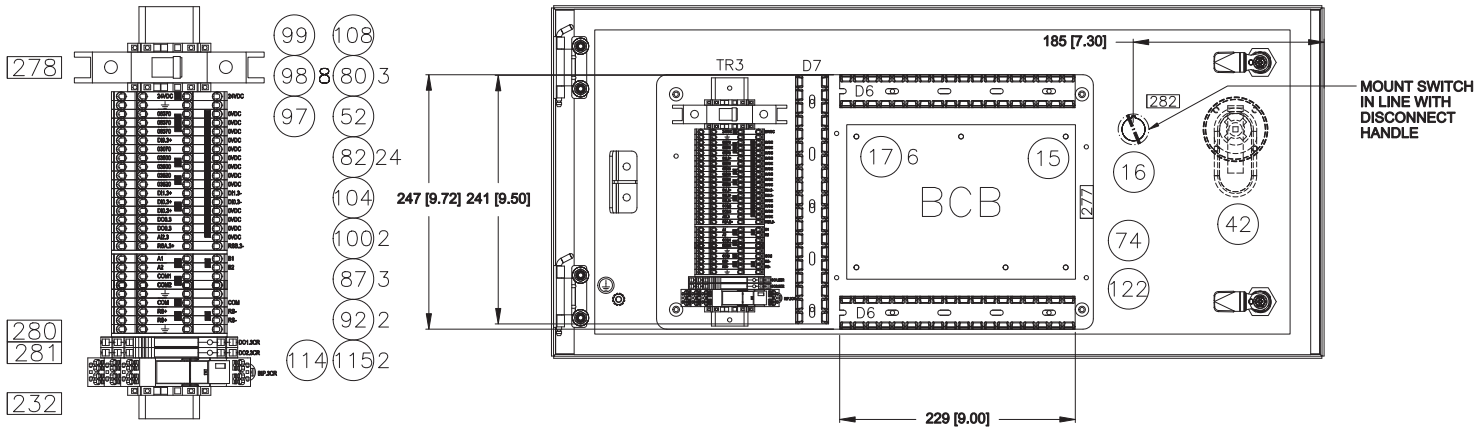






TROJANUV	DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI RACK 2 DOOR LAYOUT
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7	DRAWN BY: PSJ; CHECKED BY: JMC; APPROVED BY: PSJ; APPROVAL DATE: YYYY-MM-DD 2023-08-02
COPYRIGHT © TROJAN TECHNOLOGIES, 2023 - ALL RIGHTS RESERVED.	DRG NO. 341385; REV 1; SCALE: NTS; SHEET 41 OF 50; SIZE D

TERMINAL BLOCK DETAIL



TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI RACK 3 DOOR LAYOUT

REVISED BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
SCALE:	NTS
DRG NO.	341385
REV	1
SHEET	42 OF 50
SIZE	D

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
142	2	NAMEPLATE, LAM SIG2R BANK2C	TROJAN	917856-B2C	917856-B2C
141	2	NAMEPLATE, LAM SIG2R BANK2B	TROJAN	917856-B2B	917856-B2B
140	2	NAMEPLATE, LAM SIG2R BANK2A	TROJAN	917856-B2A	917856-B2A
139	1	NAMEPLATE, LAM 2R PDC 2A-2C	TROJAN	917924-2A2C	917924-2A2C
138	1	VENT, DRAIN	HOFFMAN	AVDR4NM	901841
137	2	PLATE WLDT, PDC CABLE MTG LWR	TROJAN	337993-002	337993-002
136	2	SUPPORT TRAY, DRIVER CABLE	TROJAN	337948	337948
135	4	PLATE WLDT, PDC CABLE MTG UPR	TROJAN	337993-001	337993-001
134	18"	TAPE, ACRYLIC FOAM DBL SIDED	3M	VHB4930	005003
133	12"	WEATHERSTRIPPING, RW108	TRIM-LOCK	750-B-2-1/16	120005
132	1	THERMOSTAT, DUAL NC/NO DIN	STEGO	01172.0-00	916266
131	1	RELAY, 0.3A-15A 24-240VDC/AC	ABB	CM-SRS.M2S	917509-SRSM2S
130	97'	CABLE, 22AWG 1PAR 300V RS485	BELDEN	3106A	917515
129	3'	SPIRAL WRAP, PE 0.5" NA	HELLERMANNTYTON	3HFT9C	917528-001
128	132"	WIRE DUCT, SLOTTED DIVIDER 3X6	PANDUIT	SD3H6	913437-SD3H6
127	26	WIRE DUCT, DIVIDER MTG BASE	PANDUIT	DB-C	917138-0DBC
126					
125	13"	WIRE DUCT, TYPE F LT GRY1.5x2	PANDUIT	F1.5X2LG6 / C1.5LG6	913437-005
124					
123	142"	WIRE DUCT, TYPE F LT GRY 1.5x3	PANDUIT	F1.5X3LG6 / C1.5LG6	913437-006
122	149"	WIRE DUCT, TYPE F LT GRY 1x3	PANDUIT	F1X3LG6 / C1LG6	913437-004
121	58"	WIRE DUCT, TYPE F LT GRY 2.5x3	PANDUIT	F2.5X3LG6 / C2.5LG6	913437-033
120					
119	1	RELAY, SUPPRESSION DIODE + LED	FINDER	99.02.9.024.99	917559-2001
118	1	RELAY, BASE BLU SCR TERM SPDT	FINDER	97.01SPA	917559-1001
117	1	RELAY, 16A SPDT 24VDC	FINDER	46.61.9.024.0074	917559-0001
116					
115	9	RELAY, 6A 24VDC SPDT PIT PC	PHOENIX CONTACT	2900299	915403-112
114	3	RELAY, 6A DPDT 24VDC SAF RIF	PHOENIX CONTACT	2908215	917175-3006BS
113					
112					
111					
110					
109	7"	DIN RAIL, PERF 35x15 PHOENIX	PHOENIX CONTACT	1201730	913221
108	82"	**DIN RAIL PERF 35X7.5 PHOENIX**	**PHOENIX CONTACT**	**0801733**	**914147**
107					
106	A/R	TERM BLK, MARKER SHEET ZB8	PHOENIX CONTACT	1052002 OR EQUIVALENT	916050-1052002
105	A/R	TERM BLK, MARKER SHEET ZB6	PHOENIX CONTACT	1051003 OR EQUIVALENT	916050-1051003
104	A/R	TERM BLK, MARKER SHEET ZBF5	PHOENIX CONTACT	0808642 OR EQUIVALENT	916050-0808642
103					
102	1	TERM BLK, JUMPER 4P FBS 4 6	PHOENIX CONTACT	3030255	916050-3030255
101	2	TERM BLK, JUMPER 3P FBS 3 6	PHOENIX CONTACT	3030242	916050-3030242
100	12	TERM BLK, JUMPER 2P FBS PV	PHOENIX CONTACT	3032185	916050-3032185
99	2	TERM BLK, JUMPER 50P FBS 50 5	PHOENIX CONTACT	3038930	916050-3038930
98	33	TERM BLK, JUMPER 2P FBS 2 5	PHOENIX CONTACT	3030161	916050-3030161
97	4	TERM BLK, JUMPER 3P FBS 3 5	PHOENIX CONTACT	3030174	916050-3030174
96					
95					
94	1	TERM BLK, END PLT D PIT 6	PHOENIX CONTACT	3212044	916050-3212044
93	3	TERM BLK, END PLT D PIT 4 QU	PHOENIX CONTACT	3208979	916050-3208979
92	14	TERM BLK, END PLT D PITB 2.5	PHOENIX CONTACT	3211634	916050-3211634
91	3	TERM BLK, END PLT D PIT 2.5 3L	PHOENIX CONTACT	3211647	916050-3211647
90					
89	2	TERM BLK, PIT 6 PE GND	PHOENIX CONTACT	3211822	916078-3211822
88	1	TERM BLK, PIT 4 PE QUAT GND	PHOENIX CONTACT	3211809	916077-3211809
87	11	TERM BLK, PITB 2.5 PE GND	PHOENIX CONTACT	3210596	916049-3210596
86					
85					
84	12	TERM BLK, PIT 4 QUATTRO GRY	PHOENIX CONTACT	3211797	916077-3211797
83	9	TERM BLK, PIT 2.5 3FE/L/L	PHOENIX CONTACT	3210541	916049-3210541
82	102	TERM BLK, PITB 2.5 GRY	PHOENIX CONTACT	3210567	916049-3210567

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
81					
80	30	TERM BLK, END STOP CLIPFIX 35S	PHOENIX CONTACT	3022276	916050-3022276
79					
78					
77	1	PS, 24VDC 3P TRIO 20A	PHOENIX CONTACT	2866394	916051-394
76					
75					
74	2	BACKPLATE, DOOR UPPER PDC	TROJAN	338039-003	338039-003
73	1	BACKPLATE, DOOR LOWER PDC	TROJAN	338039-004	338039-004
72	1	BACKPLATE, TOP LS DRILLED PDC	TROJAN	338039-006	338039-006
71	1	BACKPLATE, TOP RS DRILLED PDC	TROJAN	338039-002	338039-002
70	4	KIT, DOOR INTERLOCK SOLO PDC	TROJAN	337849	337849
69					
68					
67					
66					
65	9	PLUG, HOLE SEAL 4X POLY 1.25 INCH	HOFFMAN	ASPB100125NM	913058-125P
64					
63	7	LUG, GND 2-14AWG 1 COND ILSCO	ILSCO	TA-2	917934
62					
61	3	CONTACTOR, AF26 45A NA 24V	ABB	AF26-30-00-11	917180-26C024
60					
59					
58					
57					
56					
55					
54					
53	1	BREAKER, 1A 1P AC/DC C ABB	ABB	SU201M-C1	917139-MC1010
52	3	BREAKER, 2A 1P AC/DC C ABB	ABB	SU201M-C2	917139-MC1020
51	2	BREAKER, 10A 1P AC/DC C ABB	ABB	SU201M-C10	917139-MC1100
50	2	BREAKER, 10A 3P AC/DC C ABB	ABB	SU203M-C10	917139-MC3100
49	3	BREAKER, 40A 3P 600VAC 25KA ABB	ABB	XT1NU3040AFF000XXX	917143-N3040
48	1	BREAKER, 125A 3P 600V 25KA ABB	ABB	XT1NU3125AFF000XXX	917143-N3125
47					
46	8	BREAKER, LUG CPRSN 3PC ABB	ABB	KXT1CU-3PC	917143-LUG3
45					
44					
43	3	BREAKER, AUX 24VDC 1Q/1SY	ABB	KXTAAXCDGSYFP	917143-AUX11024
42	4	DISC, HANDLE ON/OFF 10mm4X ABB	ABB	OHB65L10B	912787-410
41	4	500mm PISTOL HANDLE SHAFT	ABB	OXP10X500	912786-10X500
40	4	RHE_B BASE FOR EXTENDED HANDLE	ABB	KXTBRHEBFP	916814-KXTBRHE
39	8	BREAKER, COVER LOW 3P XT1	ABB	KXT1LTC-3	917143-LTC3
38					
37					
36					
35	4	DIST BLOCK, 175A TE	TE CONNECTIVITY	DBL175	917305-175
34					
33					
32					
31	1	**GROUND BAR, 12DAP 6-14AWG**	**ILSCO**	**D187-12**	**916079-012**
30	1	LUG, GROUND 1/0-14AWG	ILSCO	TSA2-0	917527-001
29					
28	2	STRAIN RELIEF, M-40 9-0.272	LAPP GROUP	53340969	915889-53340969
27	24	STRAIN RELIEF, M-40 3-0.542	LAPP GROUP	53340310	915889-53340310
26					
25	26	STRAIN RELIEF, M-40 1.102 B	LAPP GROUP	S2529	915889-S2529
24	72	STRAIN RELIEF, INSERT 9mm	LAPP GROUP	53100009	915889-53100009
23	18	STRAIN RELIEF, INSERT 7mm	LAPP GROUP	53100007	915889-53100007
22					
21	18	FAN, METAL GUARD ORION	ORION	G109-15A	917530
20	3	FAN, 150CFM 24VDC	ORION	OD1238-24LB-XC	916974-150
19	2	FAN ASSY, UVSIGNAX150CFM 24VDC	ORION	OD600-24LBXC	916840
18					
17	18	STANDOFF, PCB 1/2" NYLON	RICHCO	LCBS-8-01	013237
16	3	SWITCH ASSY, SEL 22mm 3POS KIT	ABB	917186-3POS	917186-3POS
15	3	BOARD, BCB	TROJAN	931120	931120
14	4	MESH, SOLO PDC	CUSTOM	337766	337766
13	12	PLATE, SOLO RACK 1 SLOT	TROJAN	490297	490297
12	36	LAMP DRIVER, SOLO 2x1kW	TROJAN	915306	915306
11	6	RACK, SOLO DRIVER 8 SLOT	TROJAN	915307-001	915307-001
10					
09					
08					
07					
06					
05					
04					
03					
02	1	AC, 20000 400/460V 316SS 4X H	PENTAIR	G5720460205	917489-20164XH
01	1	ENCL WLDT, SOLO PDCDW BD 316	TROJAN	338040-2816	338040-2816

SEE NOTE 3 → 63

SEE NOTE 1 → 24

SEE NOTE 2 → 23

NOTES:

1. ITEM 24 SEAL INSERT TO BE INSTALLED IN ITEM 27 STRAIN RELIEF BY PANEL BUILDER.
2. ITEM 23 SEAL INSERT TO BE INSTALLED IN ITEM 28 STRAIN RELIEF BY PANEL BUILDER.
3. GROUND LUG IS OPTIONAL. USE GROUND LUGS FOR WIRES THAT DOES NOT FIT IN GROUND BAR.

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC2A-2C, UVSIGNA ANN ARBOR MI
BILL OF MATERIALS

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	JMC	341385	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 49 OF 50	SIZE D

SCALE: NTS

ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3
310					
309					
308					
307	1	EMLP(27x12.5)R	TORQUE	62 lb.in	
306	1	EMLP(27x12.5)R	MAIN FEED	75C WIRE	
305	1	EMLP(27x12.5)R	TORQUE	50 lb.in	
304	1	EMLP(27x12.5)R	TORQUE	53–88 lb.in	
303	2	EMLP(45x25)R	ALL FIELD WIRING	USE COPPER	CONDUCTORS ONLY
302					
301					
300					
299					
298					
297					
296					
295					
294					
293					
292					
291					
290					
289					
288					
287					
286					
285					
284					
283					
282	1	EMLP (27x12.5) R	0671SS		
281	1	EMLP (27x12.5) R	DO2.3CR		
280	1	EMLP (27x12.5) R	DO1.3CR		
279	1	EMLP (27x12.5) R	DO0.3CR		
278	1	EMLP (27x12.5) R	0636CB	2A	
277	1	EMLP (27x12.5) R	0600BCB		
276	1	EMLP (27x12.5) R	0571SS		
275	1	EMLP (27x12.5) R	DO2.2CR		
274	1	EMLP (27x12.5) R	DO1.2CR		
273	1	EMLP (27x12.5) R	DO0.2CR		
272	1	EMLP (27x12.5) R	0536CB	2A	
271	1	EMLP (27x12.5) R	0500BCB		
270	1	EMLP (27x12.5) R	0471SS		
269	1	EMLP (27x12.5) R	DO2.1CR		
268	1	EMLP (27x12.5) R	DO1.1CR		
267	1	EMLP (27x12.5) R	DO0.1CR		
266	1	EMLP (27x12.5) R	0436CB	2A	
265	1	EMLP (27x12.5) R	0400BCB		
264	1	EMLP (27x12.5) R	0450CB	1A	
263	1	EMLP (45x25) R	0350TMP	ALERT	SET 50°C/122°F
262	1	EMLP (45x25) R	0350TMP	SHUTDOWN	SET 55°C/131°F
261					
260	1	EMLP (27x12.5) R	FR1CR		
259	1	EMLP (27x12.5) R	0307FR		
258	1	EMLP (27x12.5) R	0313FAN		
257					
256					

ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3
255	1	EMLP (27x12.5) R	0311FAN		
254	1	EMLP (27x12.5) R	0309FAN		
253	1	EMLP (27x12.5) R	0305FR		
252	1	EMLP (27x12.5) R	0305CT		
251	1	EMLP (27x12.5) R	0305CB	10A	
250	1	EMLP (27x12.5) R	DR6		
249					
248					
247					
246					
245	1	EMLP (27x12.5) R	DR5		
244					
243					
242					
241					
240	1	EMLP (27x12.5) R	DR4		
239					
238					
237					
236					
235	1	EMLP (27x12.5) R	DR3		
234	1	EMLP (27x12.5) R	DR3CON		
233	1	EMLP (27x12.5) R	0227CB	40A	
232	1	EMLP (27x12.5) R	BIP.3CR		
231					
230	1	EMLP (27x12.5) R	DR2		
229	1	EMLP (27x12.5) R	DR2CON		
228	1	EMLP (27x12.5) R	0217CB	40A	
227	1	EMLP (27x12.5) R	BIP.2CR		
226					
225	1	EMLP (27x12.5) R	DR1		
224	1	EMLP (27x12.5) R	DR1CON		
223	1	EMLP (27x12.5) R	0207CB	40A	
222	1	EMLP (27x12.5) R	BIP.1CR		
221					
220					
219					
218	1	EMLP (27x12.5) R	0148AC	20000BTU A/C	
217	1	EMLP (27x12.5) R	0148CB	10A	
216					
215	1	EMLP (27x12.5) R	0337CB	10A	
214	1	EMLP (27x12.5) R	0142PS	24VDC 20A	
213	1	EMLP (27x12.5) R	0142CB	10A	
212	1	US–EML (D12.5)	PE		
211					
210	A/R	US–EML (D12.5)	⏚		
209	1	EMLP (27x12.5) R	N		
208	1	EMLP (27x12.5) R	1L3		
207	1	EMLP (27x12.5) R	1L2		
206	1	EMLP (27x12.5) R	1L1		
205	1	EMLP (27x12.5) R	0109CB	125A	MAIN
204	1	EMLP (45x25) R	INCOMING SUPPLY	480/277V 3PH	60Hz
203					
202					
201					

TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: PDC2A–2C, UVSIGNA ANN ARBOR MI
LAMICOID BILL OF MATERIALS

0 0.5 1.0 — 1.0" ON ORIGINAL DWG	REVISED BY: PSJ	DWG NO.: 341385	REV: 1
	CHECKED BY: JK		
	APPROVED BY: PSL		
SCALE: NTS	APPROVAL DATE YYYY–MM–DD: 2023–08–02	SHEET 50 OF 50	SIZE D

REV	REVISION DESCRIPTION	LOG NO.	RE'D BY	CH'D BY	APPR'D BY	DATE YYYY-MM-DD
1	RELEASE FOR SUBMITTAL	--	PSJ	JK	PSL	2023-08-02

TABLE OF CONTENTS

WIRE COLOUR CODING LEGEND

DESCRIPTION	DESIGNATION	WIRE
3 PHASE POWER	L1	BLACK
	L2	BLACK
	L3	BLACK
	N	WHITE
DC CONTROL	24VDC	BLUE
	OVDC	WHITE/BLUE
GROUND	G	GREEN/YELLOW
EXTERNAL POWER		YELLOW

NOTE: EXCEPTION TO MANUFACTURER PRE-ASSEMBLED CABLES.

NOTES:

1. ELECTRICAL ASSEMBLY TO BE ASSEMBLED UNDER UL508A AND THE MINIMUM REQUIREMENTS OUTLINED IN ES0127. WHERE THERE IS A CONFLICT BETWEEN THIS DOCUMENT AND THE REQUIREMENTS OF ES0127, THE INFORMATION PRESENTED IN THIS DOCUMENT WILL BE USED.

2. BLANK PAGES ARE RESERVED.

3. ENCLOSURE ENVIRONMENTAL RATING – UL TYPE 4X (IP66)

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: 2 PL DEC ± N/A
3 PL DEC ± N/A
ANGLE DEC ± N/A
REMOVE ALL BURRS, ALL CORNERS R 0.010 OR BREAK EDGE
CD – CRITICAL CHARACTERISTIC

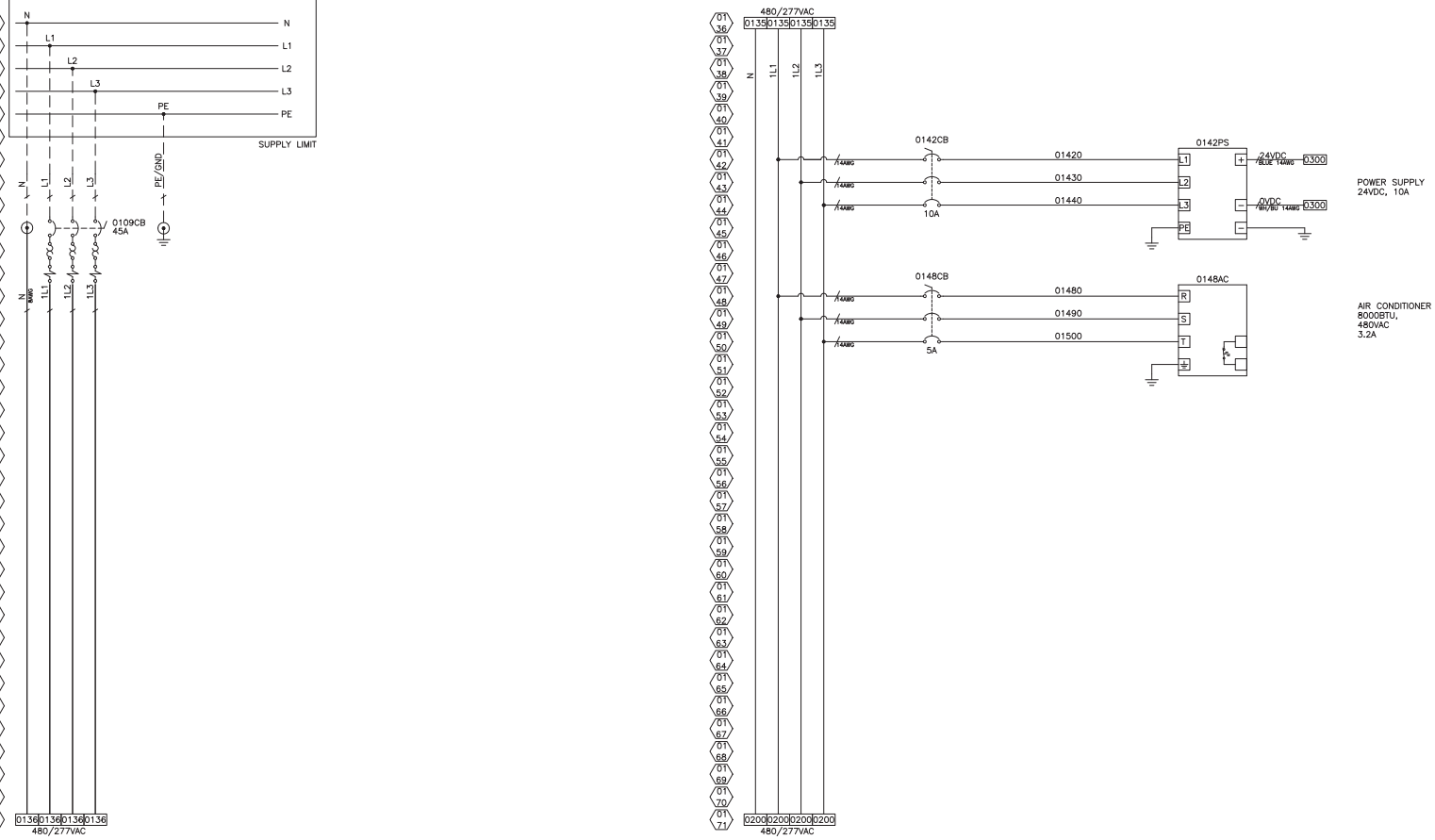
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI
TABLE OF CONTENTS

THIRD ANGLE PROJECTION

SIZE	DWG NO.	REV
B	341386	1

SCALE: NTS | SHEET 00 OF 50 | SIZE B



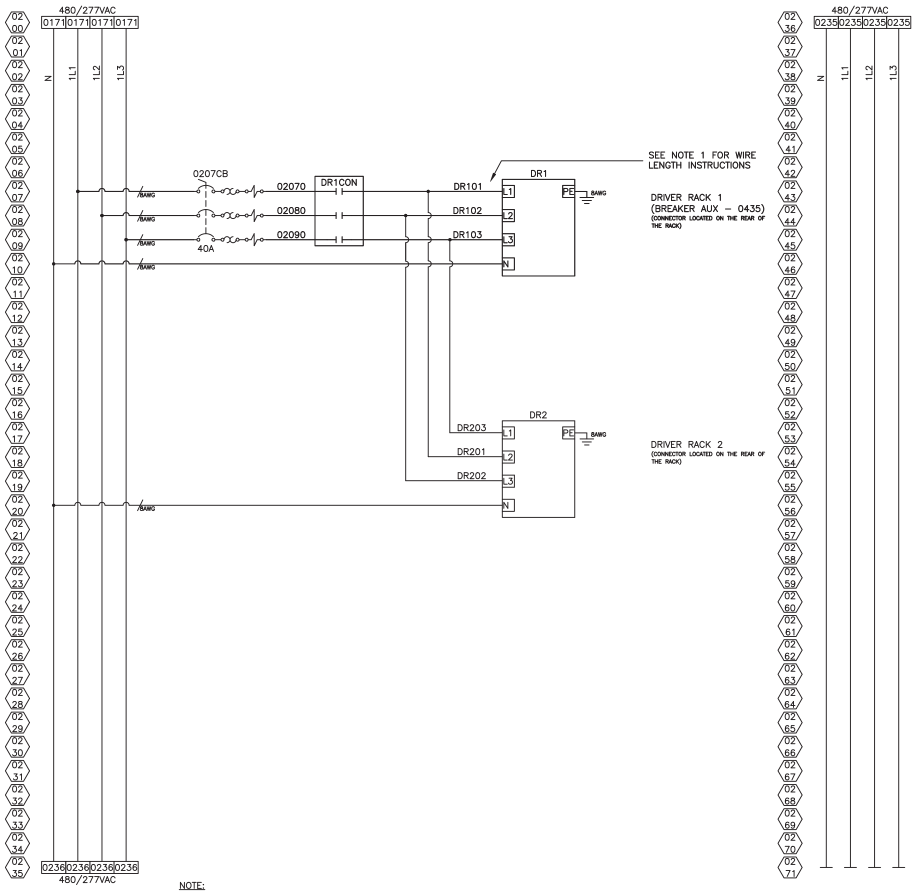
TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI
ELECTRICAL – MAIN POWER

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341386
REV	1
SHEET	01 OF 50
SIZE	D

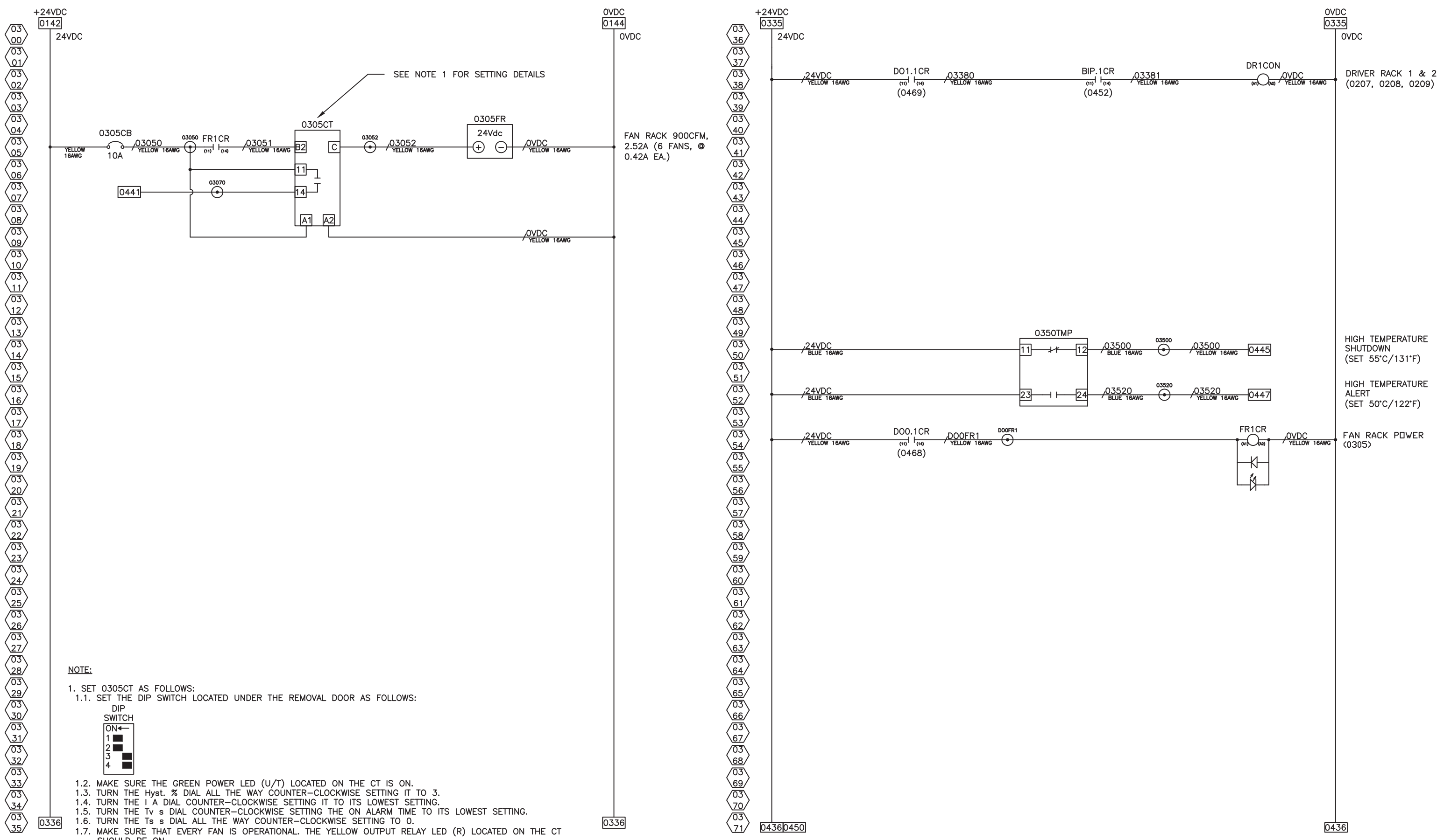
0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS



NOTE:

1. ALL POWER AND COMMUNICATION WIRING TO EACH DRIVER RACK MUST BE LONG ENOUGH TO ALLOW COMPLETE REMOVAL OF THE RACK FROM THE PANEL.

TROJANUV	DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI ELECTRICAL – MAIN POWER
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7	REVISED BY: PSJ
	CHECKED BY: JK
	APPROVED BY: PSL
0 0.5 1.0 — 1.0" ON ORIGINAL DWG	DWG NO. 341386 — REV 1
SCALE: NTS	APPROVAL DATE YYYY-MM-DD: 2023-08-02
	SHEET 02 OF 50 — SIZE D



NOTE:

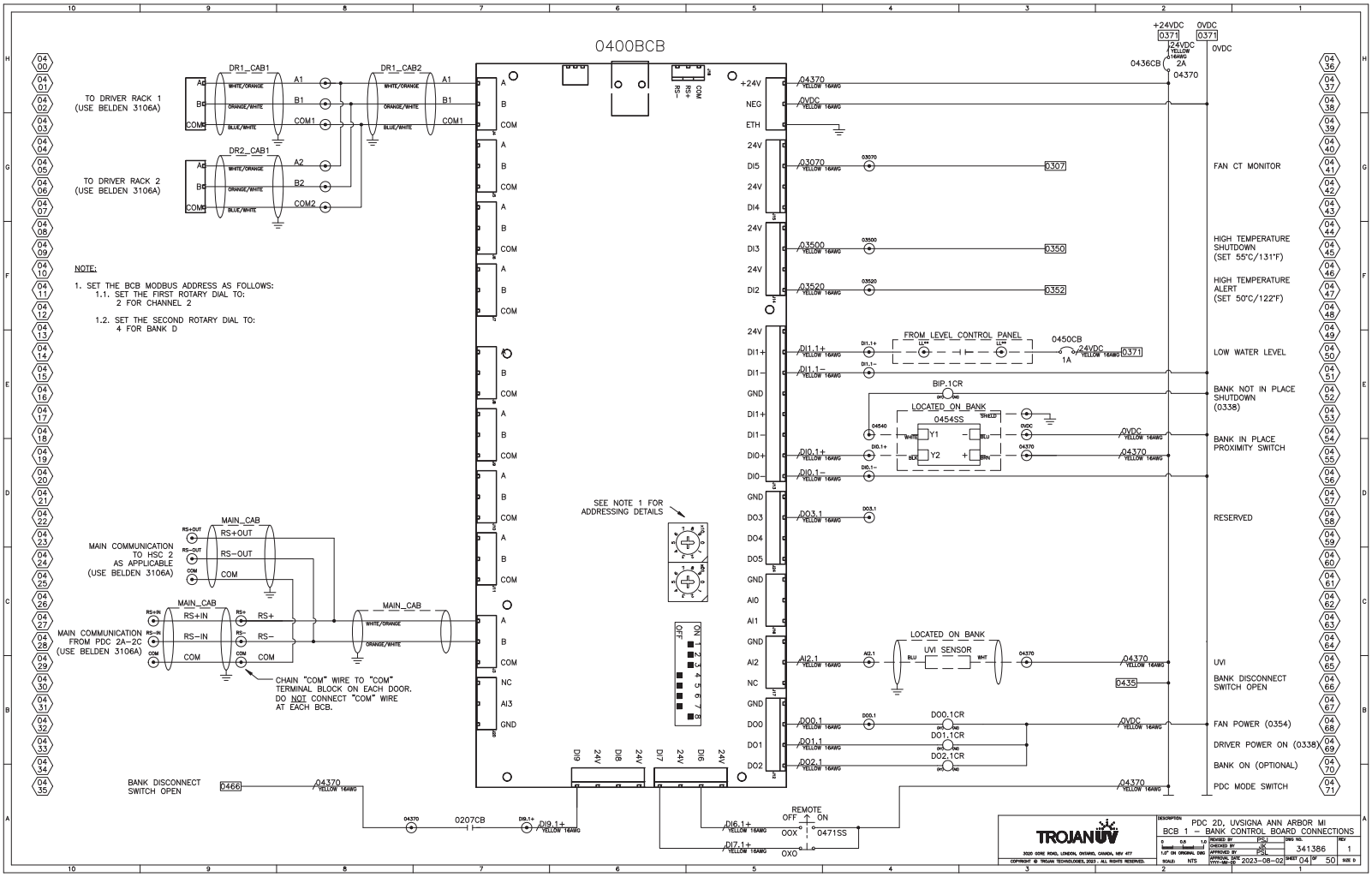
1. SET 0305CT AS FOLLOWS:
   1.1. SET THE DIP SWITCH LOCATED UNDER THE REMOVAL DOOR AS FOLLOWS:

DIP SWITCH
ON←
1
2
3
4

   1.2. MAKE SURE THE GREEN POWER LED (U/T) LOCATED ON THE CT IS ON.
   1.3. TURN THE Hyst. % DIAL ALL THE WAY COUNTER-CLOCKWISE SETTING IT TO 3.
   1.4. TURN THE I A DIAL COUNTER-CLOCKWISE SETTING IT TO ITS LOWEST SETTING.
   1.5. TURN THE Tv s DIAL COUNTER-CLOCKWISE SETTING THE ON ALARM TIME TO ITS LOWEST SETTING.
   1.6. TURN THE Ts s DIAL ALL THE WAY COUNTER-CLOCKWISE SETTING TO 0.
   1.7. MAKE SURE THAT EVERY FAN IS OPERATIONAL. THE YELLOW OUTPUT RELAY LED (R) LOCATED ON THE CT SHOULD BE ON.
   1.8. SLOWLY TURN THE I A DIAL CLOCKWISE STOPPING WHEN THE RED ALARM LED TURNS ON.
   1.9. SLOWLY TURN THE I A DIAL COUNTER-CLOCKWISE UNTIL THE RED ALARM LED TURNS OFF.
   1.10. SLOWLY TURN THE I A DIAL COUNTER-CLOCKWISE ANOTHER 5%, SETTING THE CURRENT LEVEL.
   1.11. SET THE Hyst. % DIAL TO 6%.
   1.12. SET THE Tv s DIAL TO 10 SECONDS.

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION	PDC 2D, UVSIGNA ANN ARBOR MI ELECTRICAL – 24VDC CONTROLS		
0 0.5 1.0 / 1.0" ON ORIGINAL DWG	REVISED BY PSJ / CHECKED BY JK / APPROVED BY PSL	DWG NO. 341386	REV 1
SCALE: NTS	APPROVAL DATE YYYY-MM-DD 2023-08-02	SHEET 03 OF 50	SIZE D


0400BCB
TO DRIVER RACK 1
(USE BELDEN 3106A)
DR1_CAB1
DR1_CAB2
TO DRIVER RACK 2
(USE BELDEN 3106A)
DR2_CAB1
NOTE:
1. SET THE BCB MODBUS ADDRESS AS FOLLOWS:
1.1. SET THE FIRST ROTARY DIAL TO:
2 FOR CHANNEL 2
1.2. SET THE SECOND ROTARY DIAL TO:
4 FOR BANK D
MAIN COMMUNICATION
TO HSC 2
AS APPLICABLE
(USE BELDEN 3106A)
MAIN_CAB
MAIN COMMUNICATION
FROM PDC 2A-2C
(USE BELDEN 3106A)
CHAIN "COM" WIRE TO "COM"
TERMINAL BLOCK ON EACH DOOR.
DO NOT CONNECT "COM" WIRE
AT EACH BCB.
SEE NOTE 1 FOR
ADDRESSING DETAILS
+24VDC
0VDC
0436CB
2A
FAN CT MONITOR
HIGH TEMPERATURE
SHUTDOWN
(SET 55°C/131°F)
HIGH TEMPERATURE
ALERT
(SET 50°C/122°F)
FROM LEVEL CONTROL PANEL
0450CB
1A
LOW WATER LEVEL
BIP_1CR
LOCATED_ON_BANK
0454SS
BANK NOT IN PLACE
SHUTDOWN
(0338)
BANK IN PLACE
PROXIMITY SWITCH
RESERVED
LOCATED_ON_BANK
UVI SENSOR
UVI
BANK DISCONNECT
SWITCH OPEN
FAN POWER (0354)
DRIVER POWER ON (0338)
BANK ON (OPTIONAL)
PDC MODE SWITCH
BANK DISCONNECT
SWITCH OPEN
0207CB
REMOTE
OFF
ON
0471SS
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7
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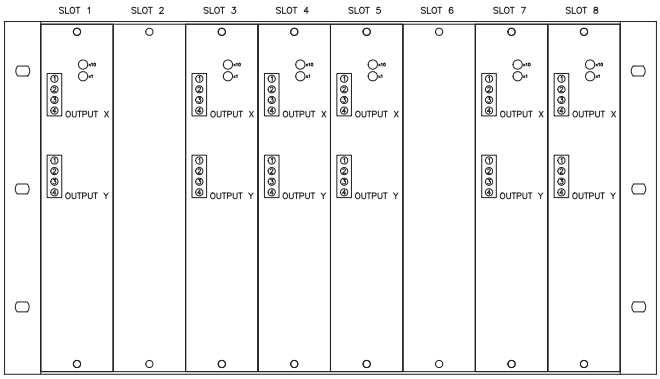
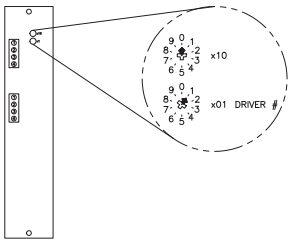
PDC 2D, UVSIGNA ANN ARBOR MI
BCB 1 – BANK CONTROL BOARD CONNECTIONS
DRAWING NO. 341386
REV 1
SCALE: NTS
APPROVAL DATE (YYYY-MM-DD) 2023-08-02
SHEET 04 OF 50
SIZE D

DRIVER POSITION IN RACK 1 (BANK 2D)

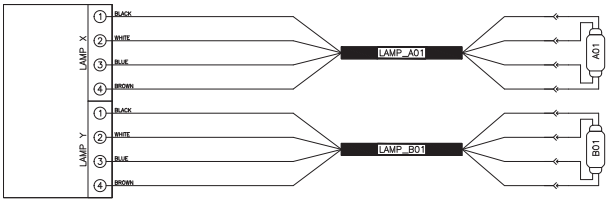


Rack 1								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 1		Driver 2	Driver 3	Driver 4		Driver 5	Driver 6
Phase	L1	L1	L3	L3	L2	L2	L2	L1
Modbus Address*	01		02	03	04		05	06

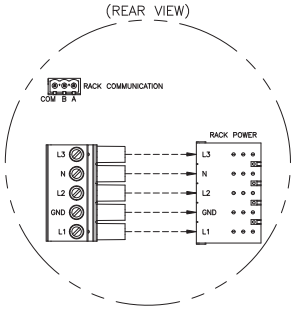
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 11 FOR RACK 1 SPECIFICS)



DRIVER RACK CONNECTORS
(REAR VIEW)



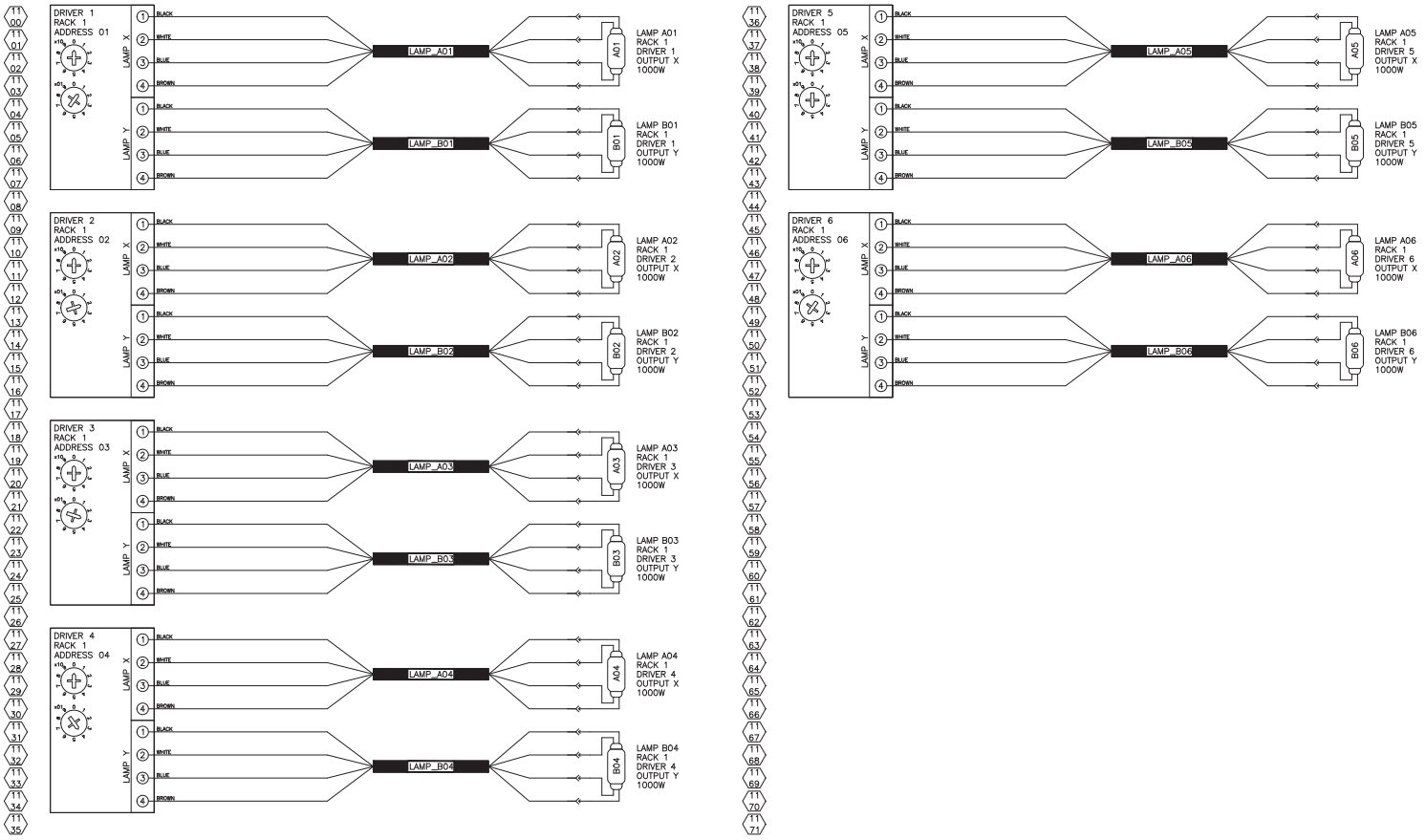
TROJANUV

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI
RACK 1 LAMP DRIVERS

REVISED BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341386
REV	1
SHEET	10 OF 50
SIZE	D

SCALE: NTS

RACK 1 CONNECTIONS (BANK 2D)



TROJAN UV

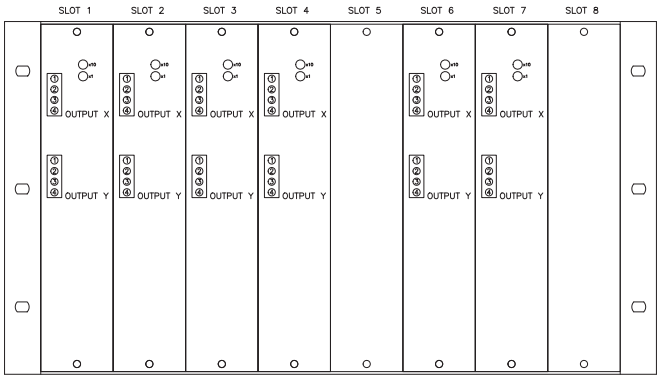
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI
RACK 1 LAMP-DRIVER CONNECTIONS

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341386
REV	1
SHEET	11 OF 50
SIZE	D

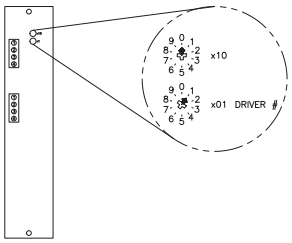
SCALE: NTS

DRIVER POSITION IN RACK 2 (BANK 2D)

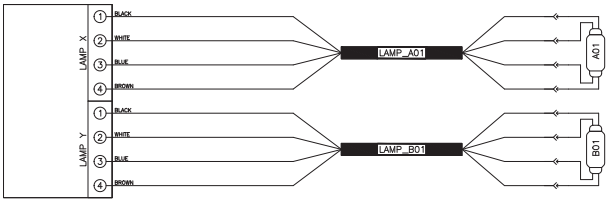


Rack 2								
Slot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Driver Number	Driver 7	Driver 8	Driver 9	Driver 10		Driver 11	Driver 12	
Phase	L3	L3	L2	L2	L1	L1	L1	L3
Modbus Address*	07	08	09	10		11	12	

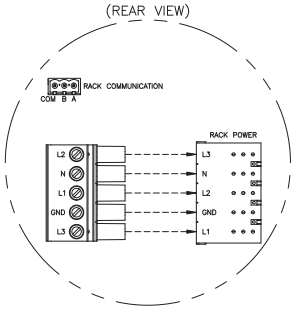
* MODBUS ADDRESS SETTING DETAIL – TYPICAL
(ADDRESS SHOWN IS 01)



LAMP TERMINATION DETAILS
(EXAMPLE, REFER TO SHEET 13 FOR RACK 2 SPECIFICS)



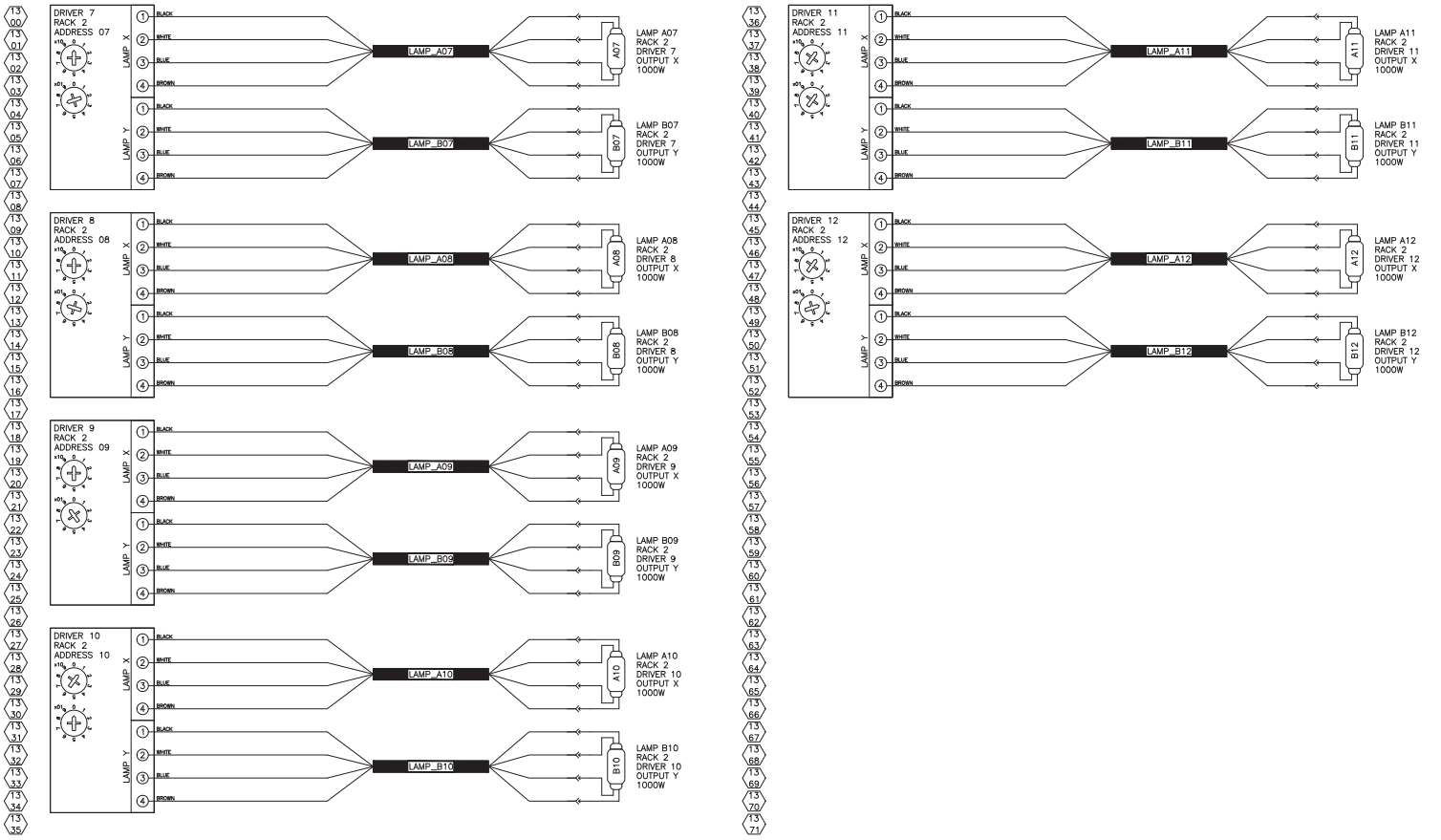
DRIVER RACK CONNECTORS
(REAR VIEW)



TROJAN UV

DESCRIPTION	PDC 2D, UVSIGNA ANN ARBOR MI RACK 2 LAMP DRIVERS
DRAWN BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341386
REV	1
SHEET	12 OF 50
SIZE	D
SCALE	NTS

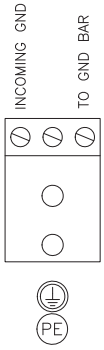
RACK 2 CONNECTIONS (BANK 2D)



DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI
RACK 2 LAMP-DRIVER CONNECTIONS

DRAWN BY	PSJ
CHECKED BY	JMC
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341386
REV	1
SHEET	13 OF 50
SIZE	D
SCALE	NTS

MAIN GROUND LUG CONNECTION LAYOUT



GROUND BAR CONNECTION LAYOUT

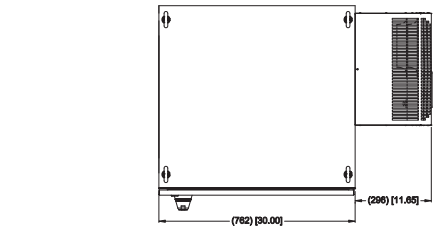
TROJANUV

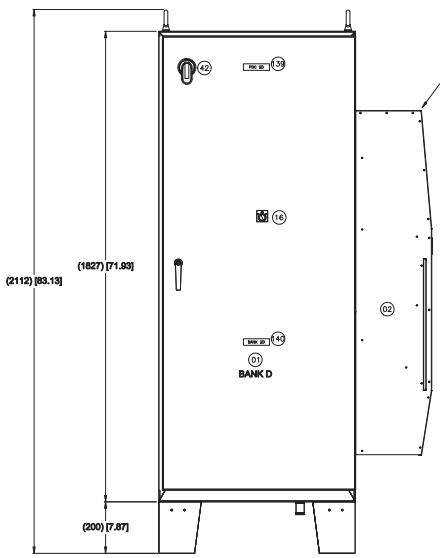
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

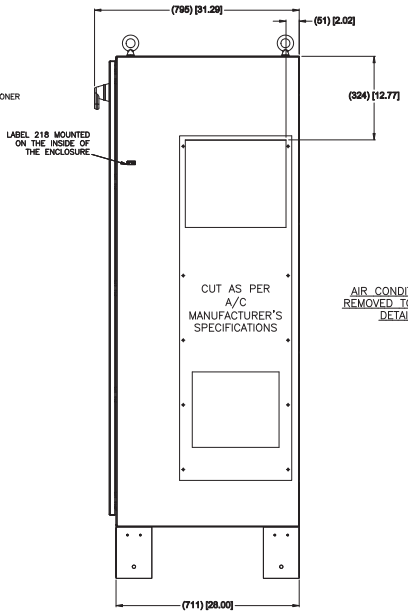
DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI
GROUNDING DETAIL

REVISED BY	PSJ	DWG NO.	REV
CHECKED BY	MK	341386	1
APPROVED BY	PSJ		
APPROVAL DATE (YYYY-MM-DD)	2023-08-02	SHEET 23 OF 50	SIZE D

SCALE: NTS







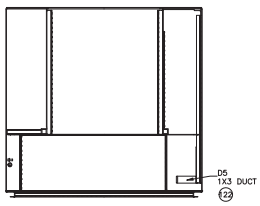
AIR CONDITIONER REMOVED TO SHOW DETAIL

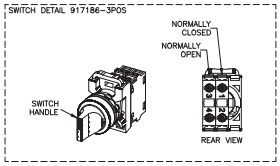
NOTES:
1. UNIT: (mm) [INCH]
2. DIMENSIONS ARE REFERENCE ONLY

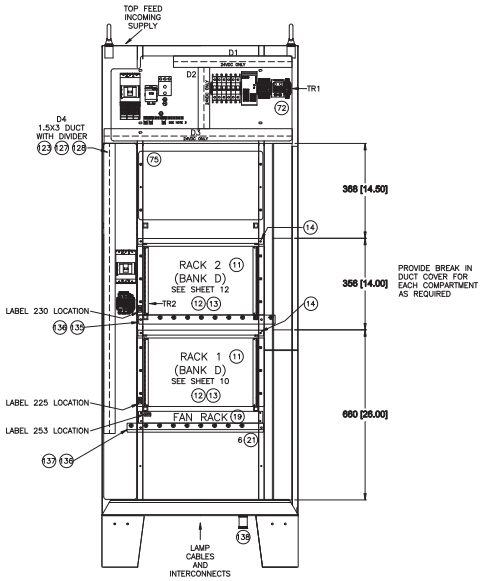
TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI EXTERNAL LAYOUT
DRAWN BY: PSJ
CHECKED BY: MK
APPROVED BY: PSJ
APPROVAL DATE (YYYY-MM-DD): 2023-08-02
SCALE: NTS
DRG NO.: 341386
REV: 1
SHEET 25 OF 50
SIZE: D

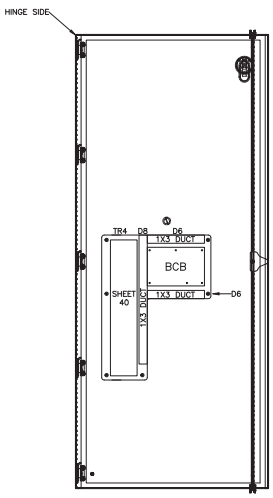
ROOF REMOVED FOR CLARITY







DOOR STRUCTURE REMOVED FOR CLARITY



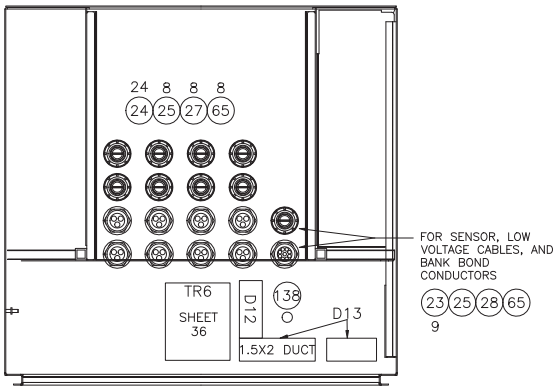
RACK 1 & 2 DOOR INSIDE LAYOUT

PANEL DOORS INSIDE LAYOUT

NOTES:
1. USE M6x1.0 TAP FOR ALL MESH DIVIDER MOUNTING HOLES (ITEM 14), SUPPORT TRAY/CABLE MOUNTING PLATE(ITEM 137, 136, 135), DRIVER RACKS (ITEM 11) AND FAN RACKS (ITEM 19), USE SST PHILLIPS HEAD SCREW AND SST LOCK WASHER.
2. BOND ENCLOSURE DOOR TO ENCLOSURE WITH 12AWG GREEN/YELLOW WIRE.
3. GROUND LUG IS OPTIONAL, CAN BE USED FOR WIRES WITH GAUGE 8AWG OR MORE. REFER SHEET#23 FOR QUANTITY AND POSITION.

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6N 477

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI INTERNAL LAYOUT
REVISED BY: PSJ
CHECKED BY: MK
APPROVED BY: PSJ
APPROVAL DATE (YYYY-MM-DD): 2023-08-02
DWG NO.: 341386
REV: 1
SHEET: 26 OF 50
SIZE: D
SCALE: NTS



BOTTOM INSIDE VIEW
(LOOKING THROUGH THE DOOR)

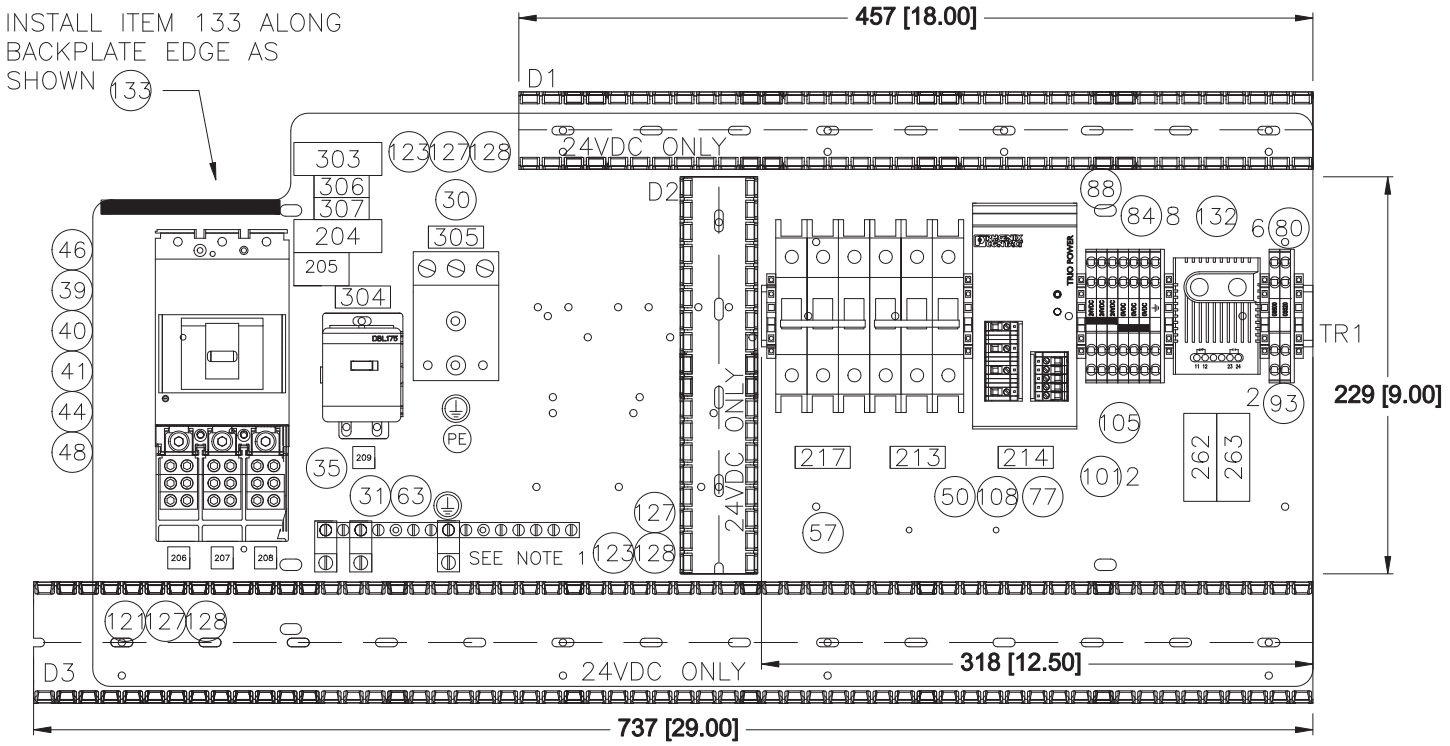
TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI INTERNAL BOTTOM LAYOUT

DRAWN BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
DWG NO.	341386
REV	1
SHEET	27 OF 50
SIZE	D

0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS



NOTES

1. GROUND LUG IS OPTIONAL, CAN BE USED FOR WIRES WITH GAUGE 8AWG OR MORE. REFER SHEET#23 FOR POSITION AND SHEET#49 FOR QUANTITY.

TROJANUV

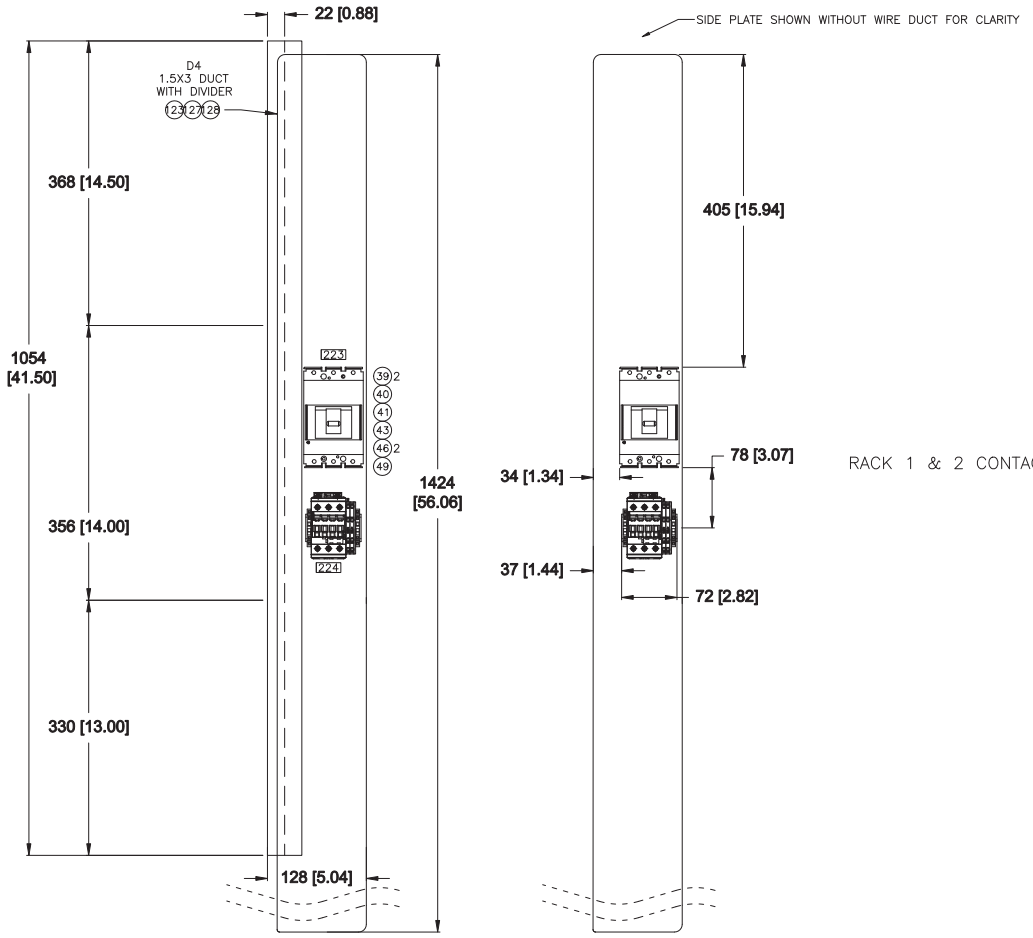
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI BACKPLATE LAYOUT

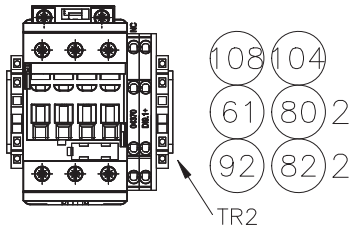
REVISED BY	PSJ
CHECKED BY	
APPROVED BY	
APPROVAL DATE	2023-08-02
DWG NO.	341386
REV	1
SCALE	NTS
SHEET	30 OF 50
SIZE	D

SIDE PLATE VIEW 1

SIDE PLATE VIEW 2



TERMINAL BLOCK DETAIL



RACK 1 & 2 CONTACTOR

TROJANUV

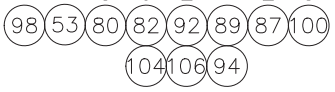
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

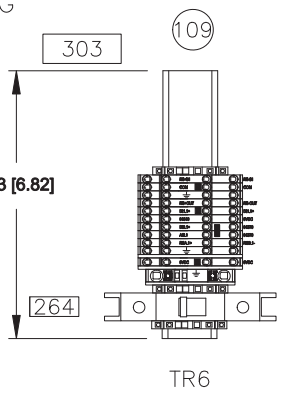
DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI
SIDE PLATE LAYOUT

DRAWN BY	PSJ
CHECKED BY	
APPROVED BY	
APPROVAL DATE (YYYY-MM-DD)	2023-08-02
SCALE	NTS
DRG NO.	341386
REV	1
SHEET	33 OF 50
SIZE	D

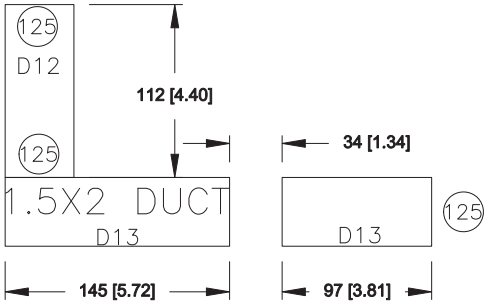
BOTTOM TERMINAL BLOCKS

FIELD WIRING

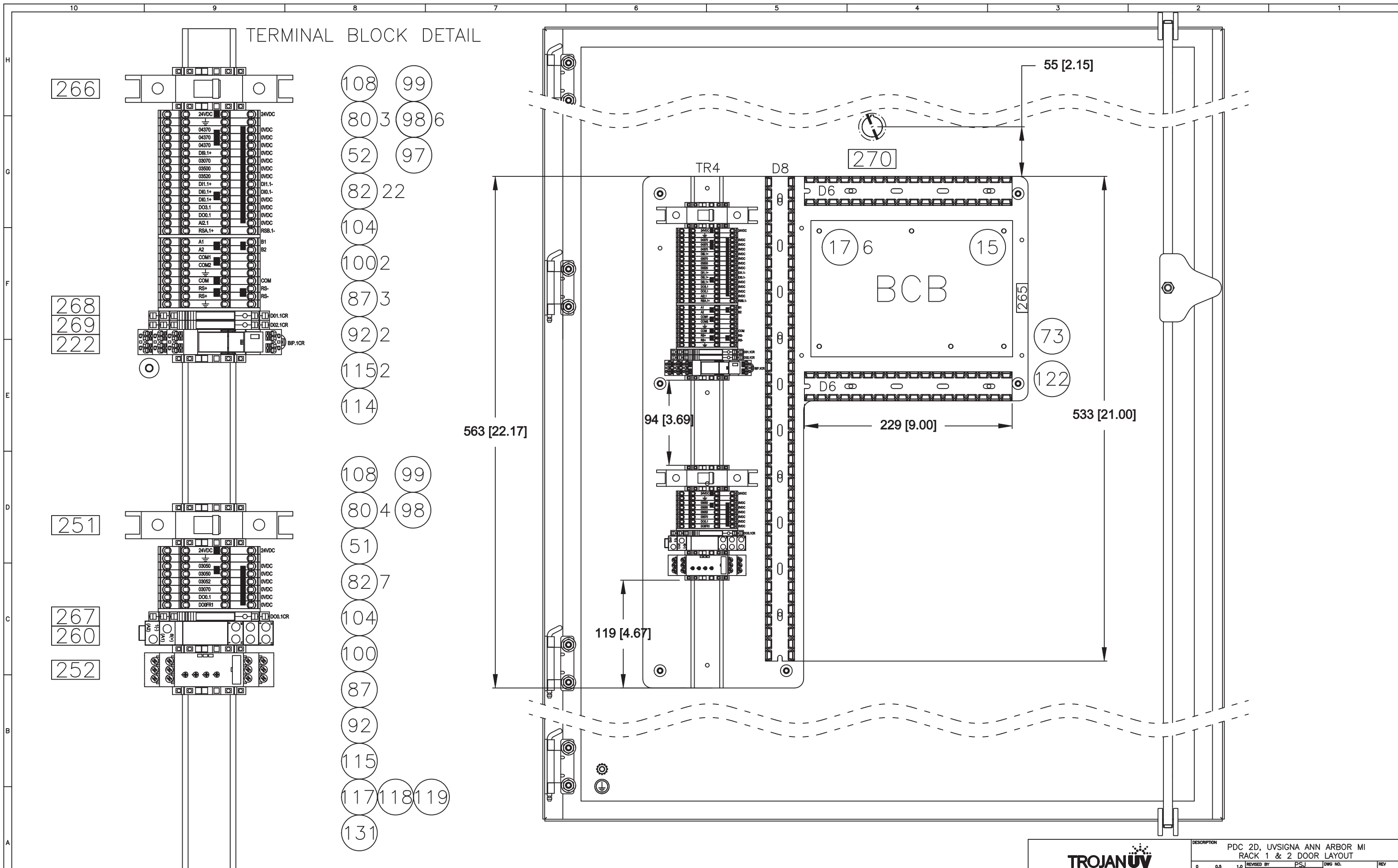




PANEL WIRING



TROJANUV	DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI BOTTOM TERMINAL BLOCK LAYOUT
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7	DRAWN BY: PCL
COPYRIGHT © TROJAN TECHNOLOGIES, 2023 - ALL RIGHTS RESERVED.	CHECKED BY: JMC
	APPROVED BY: PCL
	APPROVAL DATE (YYYY-MM-DD): 2023-08-02
	DWG NO.: 341386
	REV: 1
	SCALE: NTS
	SHEET 36 OF 50
	SIZE: D



TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION	PDC 2D, UVSIGNA ANN ARBOR MI RACK 1 & 2 DOOR LAYOUT		
0 0.5 1.0 1.0" ON ORIGINAL DWG	REVISED BY PSJ CHECKED BY JK APPROVED BY PSL	DWG NO. 341386	REV 1
SCALE: NTS	APPROVAL DATE YYYY-MM-DD 2023-08-02	SHEET 40 OF 50	SIZE D

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
140	1	NAMEPLATE, LAM SIG2R BANK2D	TROJAN	917856-B2D	917856-B2D
139	1	NAMEPLATE, LAM 2R PDC 2D	TROJAN	917924-2D00	917924-2D00
138	1	VENT, DRAIN	HOFFMAN	AVDR4NM	901841
137	1	PLATE WLDT, PDC CABLE MTG LWR	TROJAN	337993-002	337993-002
136	2	SUPPORT TRAY, DRIVER CABLE	TROJAN	337948	337948
135	1	PLATE WLDT, PDC CABLE MTG UPR	TROJAN	337993-001	337993-001
134	16"	TAPE, ACRYLIC FOAM DBL SIDED	3M	VHB4930	005003
133	4"	WEATHERSTRIPPING, RW108	TRIM-LOCK	750-B-2-1/16	120005
132	1	THERMOSTAT, DUAL NC/NO DIN	STEGO	01172.0-00	916266
131	1	RELAY, 0.3A-15A 24-240VDC/AC	ABB	CM-SRS.M2S	917509-SRSM2S
130	35'	CABLE, 22AWG 1PAR 300V RS485	BELDEN	3106A	917515
129	1'	SPIRAL WRAP, PE 0.5" NA	HELLERMANNTYTON	3HFTPVC	917528-001
128	99"	WIRE DUCT, SLOTTED DIVIDER 3X6	PANDUIT	SD3H6	913437-SD3H6
127	16	WIRE DUCT, DIVIDER MTG BASE	PANDUIT	DB-C	917138-0DBC
126					
125	13"	WIRE DUCT, TYPE F LT GRY1.5x2	PANDUIT	F1.5X2LG6 / C1.5LG6	913437-005
124					
123	71"	WIRE DUCT, TYPE F LT GRY 1.5x3	PANDUIT	F1.5X3LG6 / C1.5LG6	913437-006
122	94"	WIRE DUCT, TYPE F LT GRY 1x3	PANDUIT	F1X3LG6 / C1LG6	913437-004
121	29"	WIRE DUCT, TYPE F LT GRY 2.5x3	PANDUIT	F2.5X3LG6 / C2.5LG6	913437-033
120					
119	1	RELAY, SUPPRESSION DIODE + LED	FINDER	99.02.9.024.99	917559-2001
118	1	RELAY, BASE BLU SCR TERM SPDT	FINDER	97.01SPA	917559-1001
117	1	RELAY, 16A SPDT 24VDC	FINDER	46.61.9.024.0074	917559-0001
116					
115	3	RELAY, 6A 24VDC SPDT PIT PC	PHOENIX CONTACT	2900299	915403-112
114	1	RELAY, 6A DPDT 24VDC SAF RIF	PHOENIX CONTACT	2908215	917175-3006BS
113					
112					
111					
110					
109	7"	DIN RAIL, PERF 35x15 PHOENIX	PHOENIX CONTACT	1201730	913221
108	41"	**DIN RAIL PERF 35X7.5 PHOENIX**	**PHOENIX CONTACT**	**0801733**	**914147**
107					
106	A/R	TERM BLK, MARKER SHEET ZB8	PHOENIX CONTACT	1052002 OR EQUIVALENT	916050-1052002
105	A/R	TERM BLK, MARKER SHEET ZB6	PHOENIX CONTACT	1051003 OR EQUIVALENT	916050-1051003
104	A/R	TERM BLK, MARKER SHEET ZBF5	PHOENIX CONTACT	0808642 OR EQUIVALENT	916050-0808642
103					
102					
101	2	TERM BLK, JUMPER 3P FBS 3 6	PHOENIX CONTACT	3030242	916050-3030242
100	6	TERM BLK, JUMPER 2P FBS PV	PHOENIX CONTACT	3032185	916050-3032185
99	1	TERM BLK, JUMPER 50P FBS 50 5	PHOENIX CONTACT	3038930	916050-3038930
98	8	TERM BLK, JUMPER 2P FBS 2 5	PHOENIX CONTACT	3030161	916050-3030161
97	1	TERM BLK, JUMPER 3P FBS 3 5	PHOENIX CONTACT	3030174	916050-3030174
96					
95					
94	1	TERM BLK, END PLT D PIT 6	PHOENIX CONTACT	3212044	916050-3212044
93	2	TERM BLK, END PLT D PIT 4 QU	PHOENIX CONTACT	3208979	916050-3208979
92	6	TERM BLK, END PLT D PITTB 2.5	PHOENIX CONTACT	3211634	916050-3211634
91					
90					
89	1	TERM BLK, PIT 6 PE GND	PHOENIX CONTACT	3211822	916078-3211822
88	1	TERM BLK, PIT 4 PE QUAT GND	PHOENIX CONTACT	3211809	916077-3211809
87	6	TERM BLK, PITTB 2.5 PE GND	PHOENIX CONTACT	3210596	916049-3210596
86					
85					
84	8	TERM BLK, PIT 4 QUATTRO GRY	PHOENIX CONTACT	3211797	916077-3211797
83					
82	40	TERM BLK, PITTB 2.5 GRY	PHOENIX CONTACT	3210567	916049-3210567

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
81					
80	18	TERM BLK, END STOP CLIPFIX 35S	PHOENIX CONTACT	3022276	916050-3022276
79					
78					
77	1	PS, 24VDC 3P TRIO 10A	PHOENIX CONTACT	2866459	916051-459
76					
75	1	BACKPLATE, SOLO RACK PLATE	TROJAN	338039-005	338039-005
74					
73	1	BACKPLATE, DOOR LOWER PDC	TROJAN	338039-004	338039-004
72	1	BACKPLATE, TOP LS DRILLED PDC	TROJAN	338039-006	338039-006
71					
70					
69					
68					
67					
66					
65	9	PLUG, HOLE SEAL 4X POLY 1.25 INCH	HOFFMAN	ASPB100125NM	913058-125P
64					
SEE NOTE 3	3	LUG, GND 2-14AWG 1 COND ILSCO	ILSCO	TA-2	917934
62					
61	1	CONTACTOR, AF26 45A NA 24V	ABB	AF26-30-00-11	917180-26C024
60					
59					
58					
57	1	BREAKER, 5A 3P AC/DC C ABB	ABB	SU203M-C5	917139-MC3050
56					
55					
54					
53	1	BREAKER, 1A 1P AC/DC C ABB	ABB	SU201M-C1	917139-MC1010
52	1	BREAKER, 2A 1P AC/DC C ABB	ABB	SU201M-C2	917139-MC1020
51	1	BREAKER, 10A 1P AC/DC C ABB	ABB	SU201M-C10	917139-MC1100
50	1	BREAKER, 10A 3P AC/DC C ABB	ABB	SU203M-C10	917139-MC3100
49	1	BREAKER, 40A 3P 600VAC 25KA ABB	ABB	XT1NU3040AFF000XXX	917143-N3040
48	1	BREAKER, 45A 3P 600V 25KA ABB	ABB	XT1NU3045AFF000XXX	917143-N3045
47					
46	3	BREAKER, LUG CPRSN 3PC ABB	ABB	KXT1CU-3PC	917143-LUG3
45					
44	1	BREAKER, LUG MULTI 3PC XT1 ABB	ABB	KXT1MC-3PC	917143-LUG3MC
43	1	BREAKER, AUX 24VDC 1Q/1SY	ABB	KXTAAXCDQSYFP	917143-AUX11024
42	1	DISC, HANDLE ON/OFF 10mmX4 ABB	ABB	OHB65L10B	912787-410
41	2	500mm PISTOL HANDLE SHAFT	ABB	OXP10X500	912786-10X500
40	2	RHE_B BASE FOR EXTENDED HANDLE	ABB	KXTBRHEBFP	916814-KXTBRHE
39	3	BREAKER, COVER LOW 3P XT1	ABB	KXT1LTC-3	917143-LTC3
38					
37					
36					
35	1	DIST BLOCK, 175A TE	TE CONNECTIVITY	DBL175	917305-175
34					
33					
32					
31	1	**GROUND BAR, 12DAP 6-14AWG**	**ILSCO**	**D187-12**	**916079-012**
30	1	LUG, GROUND 1/0-14AWG	ILSCO	TA42-0	917527-001
29					
28	1	STRAIN RELIEF, M-40 9-0.272	LAPP GROUP	53340969	915889-53340969
27	8	STRAIN RELIEF, M-40 3-0.542	LAPP GROUP	53340310	915889-53340310
26					
25	9	STRAIN RELIEF, M-40 1.102 B	LAPP GROUP	S2529	915889-52529
SEE NOTE 1	24	STRAIN RELIEF, INSERT 9mm	LAPP GROUP	53100009	915889-53100009
SEE NOTE 2	9	STRAIN RELIEF, INSERT 7mm	LAPP GROUP	53100007	915889-53100007
22					
21	6	FAN, METAL GUARD ORION	ORION	G109-15A	917530
20					
19	1	FAN ASSY, UVSIGNA6X150CFM 24VDC	ORION	OD600-24LBXC	916840
18					
17	6	STANDOFF, PCB 1/2" NYLON	RICHCO	LCBS-8-01	013237
16	1	SWITCH ASSY, SEL 22mm 3POS KIT	ABB	917186-3POS	917186-3POS
15	1	BOARD, BCB	TROJAN	931120	931120
14	2	MESH, SOLO PDC	CUSTOM	337766	337766
13	4	PLATE, SOLO RACK 1 SLOT	TROJAN	490297	490297
12	12	LAMP DRIVER, SOLO 2x1kW	TROJAN	915306	915306
11	2	RACK, SOLO DRIVER 8 SLOT	TROJAN	915307-001	915307-001
10					
09					
08					
07					
06					
05					
04					
03					
02	1	AC, 8000 400/460V 316SS 4X H	PENTAIR	CUSTOM	917489-08164XH
01	1	ENCL WLDT, SOLO PDCSW 1D 316	TROJAN	338040-1116	338040-1116

NOTES:

1. ITEM 24 SEAL INSERT TO BE INSTALLED IN ITEM 27 STRAIN RELIEF BY PANEL BUILDER.
2. ITEM 23 SEAL INSERT TO BE INSTALLED IN ITEM 28 STRAIN RELIEF BY PANEL BUILDER.
3. GROUND LUG IS OPTIONAL. USE GROUND LUGS FOR WIRES THAT DOES NOT FIT IN GROUND BAR.

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI BILL OF MATERIALS

DRAWN BY: PSL | DWG NO.: 341386 | REV: 1

CHECKED BY: JMC

APPROVED BY: PSL

APPROVAL DATE (YYYY-MM-DD): 2023-08-02

SCALE: NTS | SHEET: 49 OF 50 | SIZE: D

ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3
310					
309					
308					
307	1	EMLP(27x12.5)R	TORQUE	62 lb.in	
306	1	EMLP(27x12.5)R	MAIN FEED	75C WIRE	
305	1	EMLP(27x12.5)R	TORQUE	50 lb.in	
304	1	EMLP(27x12.5)R	TORQUE	53-88 lb.in	
303	2	EMLP(45x25)R	ALL FIELD WIRING	USE COPPER	CONDUCTORS ONLY
302					
301					
300					
299					
298					
297					
296					
295					
294					
293					
292					
291					
290					
289					
288					
287					
286					
285					
284					
283					
282					
281					
280					
279					
278					
277					
276					
275					
274					
273					
272					
271					
270	1	EMLP (27x12.5) R	0471SS		
269	1	EMLP (27x12.5) R	DD2.1CR		
268	1	EMLP (27x12.5) R	DD1.1CR		
267	1	EMLP (27x12.5) R	DD0.1CR		
266	1	EMLP (27x12.5) R	0436CB	2A	
265	1	EMLP (27x12.5) R	0400BCB		
264	1	EMLP (27x12.5) R	0450CB	1A	
263	1	EMLP (45x25) R	0350TMP	ALERT	SET 50°C/122°F
262	1	EMLP (45x25) R	0350TMP	SHUTDOWN	SET 55°C/131°F
261					
260	1	EMLP (27x12.5) R	FR1CR		
259					
258					
257					
256					

ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3
255					
254					
253	1	EMLP (27x12.5) R	0305FR		
252	1	EMLP (27x12.5) R	0305CT		
251	1	EMLP (27x12.5) R	0305CB	10A	
250					
249					
248					
247					
246					
245					
244					
243					
242					
241					
240					
239					
238					
237					
236					
235					
234					
233					
232					
231					
230	1	EMLP (27x12.5) R	DR2		
229					
228					
227					
226					
225	1	EMLP (27x12.5) R	DR1		
224	1	EMLP (27x12.5) R	DR1CON		
223	1	EMLP (27x12.5) R	0207CB	40A	
222	1	EMLP (27x12.5) R	BIP.1CR		
221					
220					
219					
218	1	EMLP (27x12.5) R	0148AC	8000BTU A/C	
217	1	EMLP (27x12.5) R	0148CB	5A	
216					
215					
214	1	EMLP (27x12.5) R	0142PS	24VDC 10A	
213	1	EMLP (27x12.5) R	0142CB	10A	
212	1	US-EML (D12.5)	PE		
211					
210	A/R	US-EML (D12.5)	⏚		
209	1	EMLP (27x12.5) R	N		
208	1	EMLP (27x12.5) R	1L3		
207	1	EMLP (27x12.5) R	1L2		
206	1	EMLP (27x12.5) R	1L1		
205	1	EMLP (27x12.5) R	0109CB	45A	MAIN
204	1	EMLP (45x25) R	INCOMING SUPPLY	480/277V 3PH	60Hz
203					
202					
201					
ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3

TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N6V 4T7

DESCRIPTION: PDC 2D, UVSIGNA ANN ARBOR MI
LAMICOID BILL OF MATERIALS

DESIGNED BY	PSJ
CHECKED BY	MK
APPROVED BY	PSJ
APPROVAL DATE (YYYY-MM-DD)	2023-08-02

DWG NO. 341386 REV 1

SCALE: NTS SHEET 50 OF 50 SIZE D

Electronic Hygrotherm

Application

The Electronic Hygrotherm senses ambient temperature and relative air humidity and adjusts a connected device to maintain temperature and humidity set points.

Features

- Temperature (32-140 F) and humidity (50%-90% RH) adjustment
- High switching capacity
- Optical function displays (LED) in each control
- Long service life (100,000 cycles NO) (50,000 cycles, NC)
- Mounting clip for 35-mm DIN rail
- Change-over contact (relay)
- Connection: 5-pole terminal for AWG 14 max (2.5-mm square)
- Plastic housing UL94V-0
- Vertical mounting
- Maximum switching capacity:
  - 120 VAC 8A (Resistive Load)
  - 240 VAC 8A (Resistive Load)
  - 120 VAC 3A (Inductive Load)
  - 240 VAC 3A (Inductive Load)
  - 24 VDC 4A

Industry Standards

CE

cURus; File No. E164102

Finish

Light-gray plastic UL94V-0

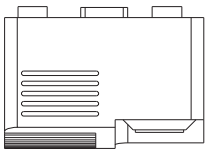
Bulletin: D85

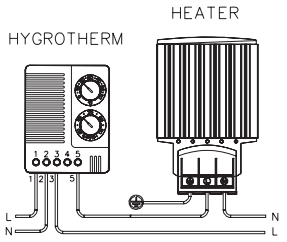
Standard Product

Catalog Number	AxBxC in.	AxBxC mm	Hysteresis	Humidity Set Point (adjustable)	Temperature Set Point (adjustable) (°F)	Operating Temperature Range (°C)	Storage Temperature (°F)	Storage Temperature (°C)
ATEMHUM	3.03 x 2.36 x 1.69	77 x 60 x 43	~ 3.6 F (2K) ± 1.8 F (1K) tolerance	50-90% RH	32 to 140	0 to 60	-4 to 176	-20 to 80

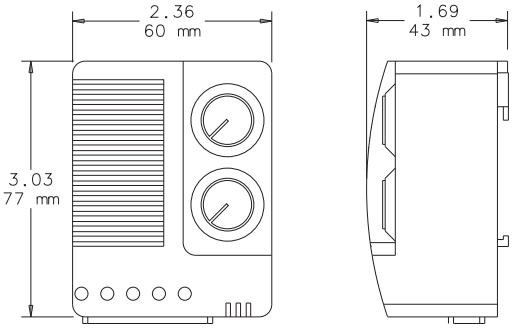
Relay Output

Contacts	Close at...	Open at...	Use for
3 and 5	humidity rise or temperature drop	humidity drop or temperature rise	heaters, dehumidifiers, low-temp alarms
4 and 5	humidity drop or temperature rise	humidity rise or temperature drop	cooling, humidifiers, high-temp alarms





EXAMPLE OF CONNECTION



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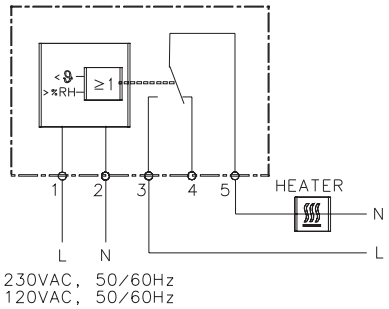


CONNECTION DIAGRAM

Mechanical Hygrostat

Application

The Mechanical Hygrostat controls relative air humidity inside an enclosure to prevent condensation and corrosion that can damage components. It can also be connected to an enclosure heater, cooling fans, warning lights or other devices.
The critical relative humidity (RH) level for most components is 65 percent. Above 65 percent RH, condensation can form and cause electronic equipment to malfunction.

Features

- Adjustable relative humidity range
- High switching capacity
- Long service life (>100,000 cycles)
- Maximum permissible air velocity of 50 ft./sec. (15 m/s)
- Maximum switching voltage = 250 VAC
  250 V should be switched only in a non-condensing environment
- Change-over contact
- Mounting clip for 35-mm DIN rail
- Connection: 3-pole terminal for AWG 14 max. (2.5-mm squared)
- Contact resistance less than 10 mΩ

Finish

Light-gray plastic, UL94V-0

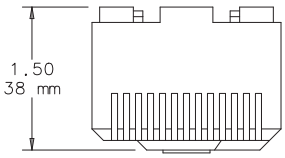
Bulletin: D85

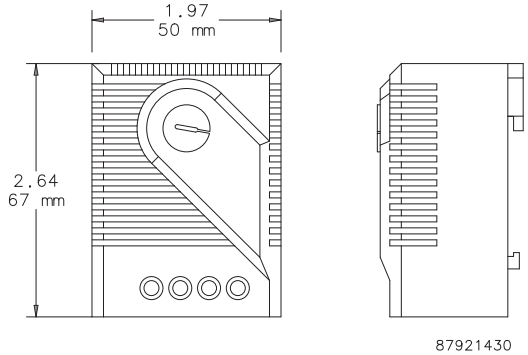
Industry Standards

CE

Standard Product

Catalog Number	AxBxC in.	AxBxC mm	Switching Capacity (Minimum)	Switching Capacity (Maximum)	Operating Temperature Adjustable) (°F)	Operating Temperature (Adjustable) (°C)	Storage Temperature (°F)	Storage Temperature (°C)	Setting Range
AMHUM	2.64 x 1.97 x 1.50	67 x 50 x 38	100mA @ AC/DC 20 V	5A @ AC 250 V (resistive load) 0.2A @ AC 250 V (inductive load at cos 0 = 0.8) DC 20W	32 to 140	0 to 60	-4 to 176	-20 to 80	35 to 95% RH





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Dual Thermostat

Industry Standards

CE
CSA File No. 215952

cURus; File No. E164102

Application

Two thermostats in one, the Dual Thermostat independently controls equipment heating and cooling systems.

Features

- Two thermostats; one normally closed (NC), red, and one normally open (NO), blue, in one casing
- Wide adjustable temperature range (32 -140 F)
- Thermostatic bimetallic sensor element
- Connection: 4-pole terminal for AWG 14 max (2.5 mm ^{2})
- Mounting clip for 35-mm DIN rail

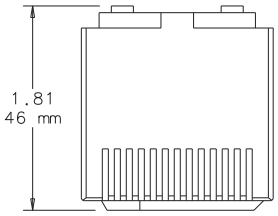
Finish

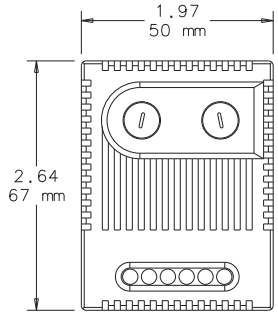
Light-gray plastic, UL94V-0

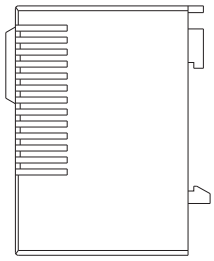
Bulletin: D85

Standard Product

Catalog Number	AxBxC in.	AxBxC mm	Switching Capacity (Normally Closed)	Switching Capacity (Normally Open)	Setting Range (Normally Closed)	Setting Range (Normally Open)
ADLTEMP	2.64 x 1.97 x 1.81	67 x 50 x 46	10 A resistive/2 A inductive @250 VAC, DC 30 W	5 A resistive/2 A inductive @250 VAC, DC 30 W	32-140 F	32-140 F







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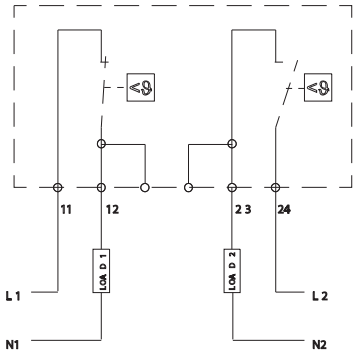


CONNECTION DIAGRAM

Temperature Control Switches

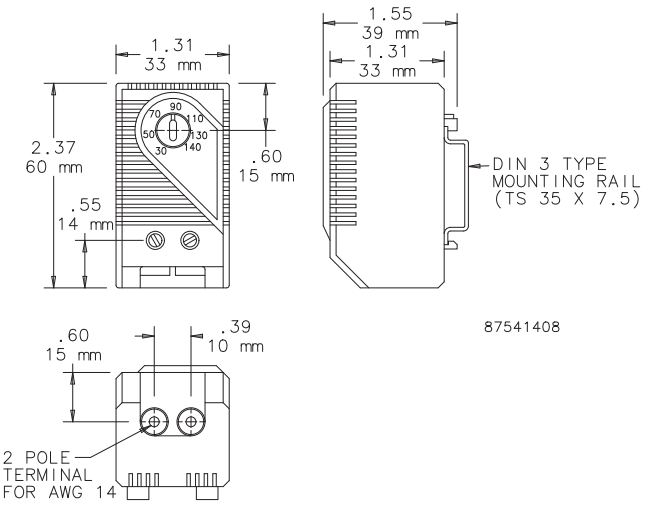
Features

- Additional label for conversion to Celsius scale and blank label to cover set point range label when adjustment after initial setting is not desired are included
- Bimetal temperature sensor
- Plastic housing
- Connections consist of tubular screw terminals for AWG 14 (.04 sq. in.)
- Provision for both panel mounting and DIN rail mounting

Finish

Molded plastic housing is black

Bulletin: D85



Industry Standards

cURus; File No. E164102
UL94-VO

Protection rating IEC IP30
CSA Certified, File Number 215952
CE

Application

These easy-to-install thermostats regulate and monitor air temperature in enclosures that contain heat-emitting equipment. Thermostats prolong heater and fan life expectancy by controlling operation time and increase electrical component working efficiency by exposing them to fewer environmental contaminants.

Standard Product

Catalog Number	Contact Type	Control Application
ATEMNC	NC (normally closed), quick acting	Heater
ATEMNO	NO (normally open), quick acting	Fan

Switching Capacity

Load	Amps
Maximum load	15 A resistive / 2 A inductive @ 120 VAC
	10 A resistive / 2 A inductive @ 250 VAC
	DC 30 W
Minimum load	20 mA (all voltages)

Power supply unit - TRIO-PS/3AC/24DC/20 - 2866394

Please be informed that the data shown in this PDF Document is generated from our Online Catalog. Please find the complete data in the user's documentation. Our General Terms of Use for Downloads are valid (http://phoenixcontact.com/download)

Primary-switched TRIO POWER power supply for DIN rail mounting, input: 3-phase, output: 24 V DC/20 A

Product Description

TRIO POWER power supplies with standard functionality
TRIO POWER is particularly suited to standard machine production, thanks to 1- and 3-phase versions up to 960 W. The wide-range input and the international approval package enable worldwide use.
The robust metal housing, the high electric strength, and the wide temperature range ensure a high level of power supply reliability.

Why buy this product

- Use the third negative terminal block as a grounding terminal block and minimize installation costs
- Maximum operational reliability thanks to high MTBF (mean time between failures) of more than 500,000 hours and high dielectric strength of up to 300 V AC
- Rugged design with metal housing and wide temperature range from -25 to +70°C
- Compensation of voltage drops by means of output voltage that can be adjusted on the front

RoHS

Key Commercial Data

Packing unit	1 STK
GTIN	4 046356 046671
GTIN	4046356046671
Weight per Piece (excluding packing)	2,180.000 g
Custom tariff number	85044030
Country of origin	China

Technical data

Dimensions

Width	115 mm

Power supply unit - TRIO-PS/3AC/24DC/20 - 2866394

Technical data

Dimensions

Height	130 mm
Depth	152.5 mm

Ambient conditions

Degree of protection	IP20
Ambient temperature (operation)	-25 °C ... 70 °C (> 55° C derating : 2.5%/K)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	≤ 95 % (at 25 °C, non-condensing)
Noise immunity	EN 61000-6-2:2005

Input data

Nominal input voltage range	3x 400 V AC ... 500 V AC
Input voltage range	3x 320 V AC ... 575 V AC (Derating < 360 V AC: 1,5 %/V)
	2x 360 V AC ... 575 V AC (for 2-phase operation)
AC frequency range	45 Hz ... 65 Hz
Discharge current to PE	< 3.5 mA
Current consumption	3x 1.1 A (400 V AC)
	3x 0.8 A (480 V AC)
Inrush surge current	< 15 A
Power failure bypass	> 17 ms (3x 400 V AC)
Choice of suitable circuit breakers	6 A ... 16 A (Characteristics B, C, D, K)
Power factor (cos phi)	0.67
Type of protection	Transient surge protection
Protective circuit/component	Varistor

Output data

Nominal output voltage	24 V DC ±1 %
Setting range of the output voltage (U_{Set})	22.5 V DC ... 29.5 V DC (> 24 V DC, constant capacity restricted)
Nominal output current (I_N)	20 A (U_{OUT} = 24 V DC)
Derating	55 °C ... 70 °C (2.5%/K)
Connection in parallel	Yes, for redundancy and increased capacity
Connection in series	yes
Max. capacitive load	Unlimited
Active current limitation	Approx. 25 A
Control deviation	< 1 % (change in load, static 10 % ... 90 %)
	< 2 % (change in load, dynamic 10 % ... 90 %)
	< 0.1 % (change in input voltage ±10 %)
Residual ripple	< 10 mV_{PP}
Output power	480 W

Power supply unit - TRIO-PS/3AC/24DC/20 - 2866394

Technical data

Output data

Typical response time	< 1 s
Peak switching voltages nominal load	< 30 mV_{PP}
Maximum power dissipation in no-load condition	< 6 W
Power loss nominal load max.	< 48 W

General

Net weight	2 kg
Operating voltage display	Green LED
Efficiency	91 % (at 400 V AC and nominal values)
Insulation voltage input/output	4 kV AC (type test)
	2 kV AC (routine test)
Insulation voltage input / PE	2 kV AC (type test)
	2 kV AC (routine test)
Insulation voltage output / PE	500 V DC (routine test)
Protection class	I (with PE connection)
MTBF (IEC 61709, SN 29500)	> 1190000 h
Mounting position	horizontal DIN rail NS 35, EN 60715
Assembly instructions	Can be aligned: Horizontally 0 mm, vertically 50 mm

Connection data, input

Connection method	Screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	2.5 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	2.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	14
Stripping length	9 mm
Screw thread	M2,5

Connection data, output

Connection method	Screw connection
Conductor cross section solid min.	0.5 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section flexible min.	0.5 mm²
Conductor cross section flexible max.	4 mm²
Conductor cross section AWG min.	12
Conductor cross section AWG max.	10
Stripping length	14 mm

Power supply unit - TRIO-PS/3AC/24DC/20 - 2866394

Technical data

Connection data, output

Screw thread	M3

Signaling

Status display	"DC OK" LED green
Note on status display	U_{OUT} > 21.5 V: LED lights up

Standards and Regulations

Electromagnetic compatibility	Conformance with EMC Directive 2014/30/EU
Shock	18 ms, 30g, in each space direction (according to IEC 60068-2-27)
Noise immunity	EN 61000-6-2:2005
Connection in acc. with standard	CUL
Standards/regulations	EN 61000-4-2
Contact discharge	4 kV (Test Level 2)
Standards/regulations	EN 61000-4-3
Frequency range	80 MHz ... 1 GHz
Test field strength	10 V/m
Frequency range	1.4 GHz ... 2 GHz
Test field strength	3 V/m
Standards/regulations	EN 61000-4-4
Comments	Criterion B
Standards/regulations	EN 61000-4-5
	EN 61000-6-3
	EN 61000-4-6
Frequency range	0.15 MHz ... 80 MHz
Voltage	10 V (Test Level 3)
Standards/regulations	EN 61000-4-11
Standard - Electrical safety	EN 60950-1/VDE 0805 (SELV)
Standard – Electronic equipment for use in electrical power installations and their assembly into electrical power installations	EN 50178/VDE 0160 (PELV)
Standard – Safety extra-low voltage	EN 60950-1 (SELV)
	EN 60204 (PELV)
Standard - Safe isolation	DIN VDE 0100-410
Standard – Protection against shock currents, basic requirements for protective separation in electrical equipment	EN 50178
Standard – Limitation of mains harmonic currents	EN 61000-3-2
UL approvals	UL/C-UL listed UL 508
	UL/C-UL Recognized UL 60950
Vibration (operation)	< 15 Hz, amplitude ±2.5 mm (according to IEC 60068-2-6)
	15 Hz ... 150 Hz, 2.3g, 90 min.

Power supply unit - TRIO-PS/3AC/24DC/20 - 2866394

Technical data

Standards and Regulations

Low Voltage Directive	Conformance with LV directive 2006/95/EC

SU201M-C10

PDC Item 51
Breaker, 10A 1P AC/DC C ABB - ABB SU201M-C10- Trojan P/N 917139-MC1100 - Page 1/3

5 GeGrr alelf mo r rtfi e

Extended Product Type:	l	SU201M-C10
Product ID:	l	2Ci S2D177D3010R
EAN:	l	R014DD66709R0
Catalog Description:	l	Mtetr r8nGlCtru8trhc nGr BGr1-lSU200Ml-l1kl-lC
Long Description:	l	SU201M-C10lMtetr r8nGlCtru8trhc nGr BGr1C-CPr rhl10B, .l10, .l1klUAR96

, LLtrtfi er alelf mo r rtfi e

Actuator Material:	l	ed8ar rtfi el5 rf 8sl .lc ar uB.lSGr ar paG
Ambient Air Temperature:	l	b sGrr rtfi el-2Clhhh+CCl°Cl Srfirr gG-R0lhhh+D0l°C
Built-In Depth (t_2):	l	46lo o
Connecting Capacity:	l	c8dpr rl10l/l10lo o ²l FaGxtpaGlwtrPlFGrr8aG0hDClhhh2Clo o ²l FaGxtpaG0hDClhhh2Clo o ²l 3tgtLl0hDClhhh7Clo o ²l Srrr eLGLl0hDClhhh7Clo o ²
Connecting Capacity UL/CSA:	l	c8dpr rl19-9l, W5 l Cf eL8urfirl19-Rl, W5
Contact Position Indication:	l	3GLlb Nl/l5 nGGelb FF
Country of Origin:	l	c8agr rtr l(c5)
Customs Tariff Number:	l	9C742010
Data Sheet, Technical Information:	l	2Ci C0021DDi 0202
Declaration of Conformity - CE:	l	2Ci KR00C6Cl 2D02
Degree of Protection:	l	k20
EAN:	l	R014DD66709R0
EPLAN Catalog Tree:	l	EaGurntur alGegteGGrtegl/lk rf rGurtfi elLGvtuGdl/l5 GeGrr a
EPLAN Function Definition:	l	Ctru8trhpnGr BGr1/lStegaGlutru8trhpnGr BGr1/lCtru8trhpnGr BGr11_2
ETIM 5:	l	EC0000R2l-lMtetr r8nGlutru8trhpnGr BGr1(MCc)
ETIM 6:	l	EC0000R2l-lMtetr r8nGlutru8trhpnGr BGr1(MCc)
Environmental Conditions:	l	29luyuaGdl wtrPlCCl°Cl/l60-64l%l r eLl2Cl°Cl/l6O-100l%
Housing Material:	l	ed8ar rtfi el5 rf 8sl .l3 , AlD07O
Installation Size:	l	r uuhrfili NlR7990l7
Instructions and Manuals:	l	2Ci C0021DDi 0202
Interrupting Rating acc. to UL1077:	l	(2DDlVl, C)l10lB,
Invoice Description:	l	SU201M-C10lMtetr r8nGlCtru8trhc nGr BGr1C-CPr rhl10B, .l10, .l1k
Maximum Operating Voltage UL/CSA:	l	2DDlVl, Cl R9lVli C
Mechanical Endurance:	l	20000luyuaG
Minimum Order Quantity:	l	1lstGuG
Mounting Position:	l	, ey
Mounting on DIN Rail:	l	TH7O-DhCl(7ClxlDhClo o lMf 8ertegl3r ta)lr uuhrfil ECl40D1Cl TH7O-1Cl(7Clxl1Clo o lMf 8ertegl3r ta)lr uuhrfil ECl40D1O
Number of Poles:	l	1
Number of Protected Poles:	l	1
Overvoltage Category:	l	

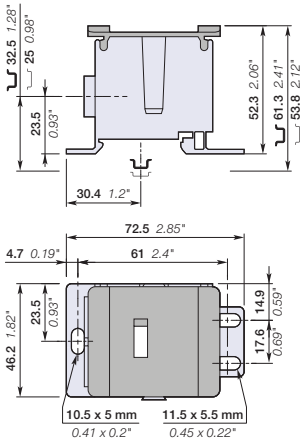
Package Level 1 Gross Weight:	l	1h7lBg
Package Level 1 Height:	l	92lo o
Package Level 1 Length:	l	161lo o
Package Level 1 Units:	l	10lstGuG
Package Level 1 Width:	l	121lo o
Package Level 2 EAN:	l	R014DD667D44O
Package Level 2 Gross Weight:	l	14lBg
Package Level 2 Height:	l	210lo o
Package Level 2 Length:	l	76Clo o
Package Level 2 Units:	l	D2lstGuG
Package Level 2 Width:	l	7Clo o
Pole Net Weight:	l	0h12ClBg
Pollution Degree:	l	7
Power Loss:	l	2.1lWl r rh8 r mGLlb sGrr rteglCf eLtrtfi edlsGrlk f aGl2.1lW
Power Supply Connection:	l	, rptrrr ry
Product Main Type:	l	SU200M
Product Name:	l	Mtetr r8nGlCtru8trhc nGr BGn
Product Net Depth:	l	46lo o
Product Net Height:	l	111lo o
Product Net Weight:	l	0h12ClBg
Product Net Width:	l	1DhClo o
Rated Current (I_n):	l	10l,
Rated Frequency (f):	l	C0lHzl 40lHzl i ClHz
Rated Insulation Voltage (U_i):	l	r uuhlrhll EC/ENl4044R-1lRR0lV
Rated Operational Voltage:	l	r uuhlrhl ECl406RD-2l270lVl, C
Rated Service Short-Circuit Breaking Capacity (I_{cs}):	l	(270lVl, C)l11h7lB,
Rated Ultimate Short-Circuit Breaking Capacity (I_{cu}):	l	(270lVl, C)l1ClB,
Recommended Screw Driver:	l	kf ztLrtvl2
Remarks:	l	kR0ltelGeuai d8nGlwtrPluf vGn
Resistance to Shock acc. to IEC 60068-2-27:	l	2Cgl/l2ldPf uBdl/l17lo d
Resistance to Vibrations acc. to IEC 60068-2-6:	l	Cg.l20luyuaGdlr rhClhlh1C0lhlhlClHzlwtrPlai r Ll0h9l e
RoHS Information:	l	2Ci KR00C64i 0201
RoHS Status:	l	Ff ai wteglEUli trGurtvGl2002/6C/ECl, 8g8drlh19.l200ClreLlr o GeLo Gem
Screw Terminal Type:	l	Fr tadr lGlct-LtrGurtfi er alCyateLGn-alrhTGro ter a
Selling Unit of Measure:	l	stGuG
Standards:	l	CS, l22h2lNf hCl EC/ENl406RD-2l UAlR96
Terminal Type:	l	SurGwlTGro ter al
Tightening Torque:	l	2h9lN·o
Tripping Characteristic:	l	C
UNSPSC:	l	7612141R
Width in Number of Modular Spacings:	l	1

eClass:	DMI2DTKT60T
Accessories Available:	YGd
Interrupting Rating acc. to UL489:	(2DDIVI, C)I10IB, I (R9IVIi C)I10IB,

DBL175 distribution terminal blocks

Single pole - 46.2 mm *1.81 in* spacing

DBL175



46.2 mm *1.81 in* spacing

Description

- Save installation time with our modular solutions,
- Ease the installation with plate or rail mounting options on our modular blocks,
- Easily increase the number of outputs using jumpers.

Ordering details

Description		Color	Type	Order code		Pkg qty	Weight (1 pce) g
Feed-through	Single pole distribution, 12 connections	Grey	DBL175	1SNL317510R0000		1	200

Main technical data

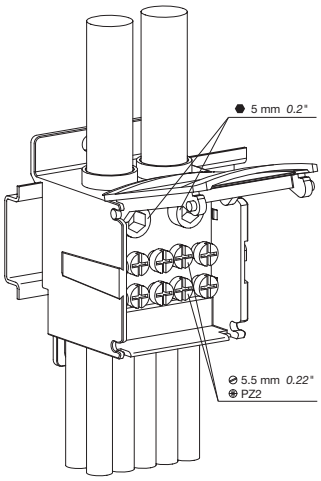
Connecting capacity		IEC	UL
Max current / Max cross section	Copper	175 A / 70 mm²	*175 A / 2/0 AWG*
	Aluminium	135 A / 70 mm²	
Rated voltage		1000 V AC / 1500 V DC	*1000 V*
Rated impulse voltage			
Short-time withstand current (Icw 1s)		11000 A	
Short Circuit Current Rating (SCCR)			*100 kA*
Rated peak withstand current (Ipk)		30 kA	
Protection		IP10	*NEMA 1*

Connection type	Cross section	
2 x Ø 11.8 mm	10 ... 50 mm²	10 ... 70 mm²
	8 ... 1/0 AWG	*6 ... 2/0 AWG*
10 x Ø 6.5 mm	2.5 ... 16 mm²	2.5 ... 16 mm²
	14 ... 6 AWG	*14 ... 6 AWG*

The connecting capacity data for one Rigid - Solid / Stranded - Flexible conductor (when applicable) is a mandatory information required by IEC, UL and CSA standards (Copper conductors). All other data are provided as supplementary information only. For more details, please consult our CB, UL or CSA certificates and technical datasheet available on http://www.ABB.com

CE RoHS USR EAC

Mounting instructions



Rail			TH 35-7.5, TH 35-15			
Tool	**Diameter of cable Ø**		**Wire stripping length**		**Recommended torque**	
Allen key						
5 mm	11.8 mm	*0.46 in*	15 mm	*0.708 in*	6... 10 Nm	*53 ... 88 lb.in*
Posidriv - flat screwdriver						
5.5 mm *0.22 in*	6.5 mm	*0.26 in*	11 mm	*0.43 in*	2 ... 3 Nm	*18 ... 26.5 lb.in*

Accessories

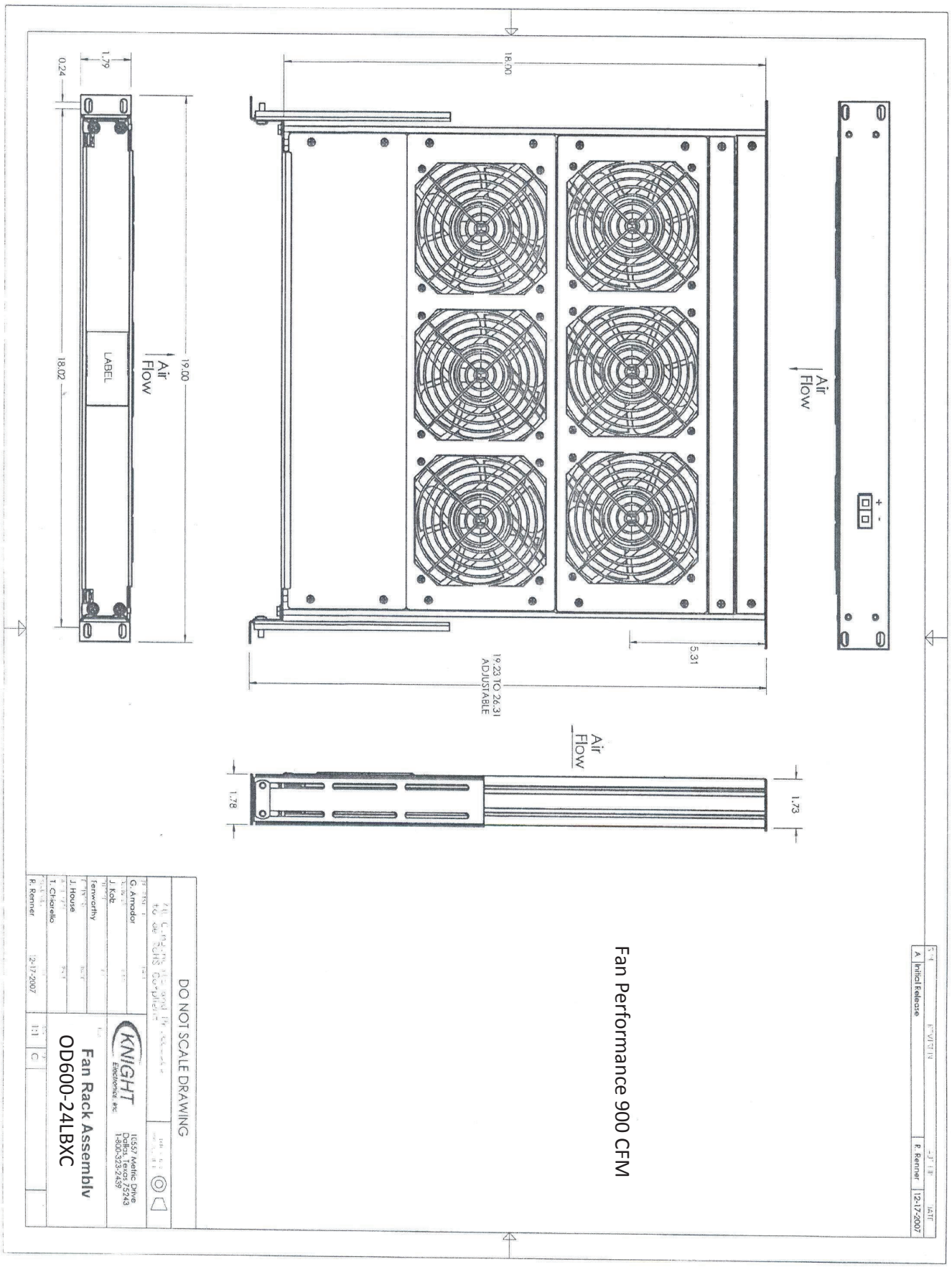
	Description			Color	Type	Order code		Pkg qty	Weight (1 pce) g
1	**End stops**	10 mm	*0.394 in*	Grey	BAM2	1SNA206351R1600		50	12.00
		9 mm	*0.354 in*		BADL	1SNA399903R0200		50	4.70
		12 mm	*0.472 in*		BADH	1SNA116900R2700		50	20.00
2	**Terminal block markers**	Pre-printed marker card		White	MC512PA	1SNK149002R0000		1	10.00
		Blank card			MC512	1SNK140000R0000		22	9.00

Complete list of accessories is indicated in the terminal block datasheet including end stops.
Some accessories such as jumper bars may modify the terminal block's ratings: Complete information available in the accessories section of the catalog.

Stranded conductor – Flexible with insulated ferrule – Rigid conductor

All the technical data for UL/CSA standard and dimensions in inches are in italic.

PDC LH Bank Item 19
Fan Assy, UVSigna6X150CFM 24VDC - Orion OD600-24LBXC / Trojan P/N 916840pg. 1/1

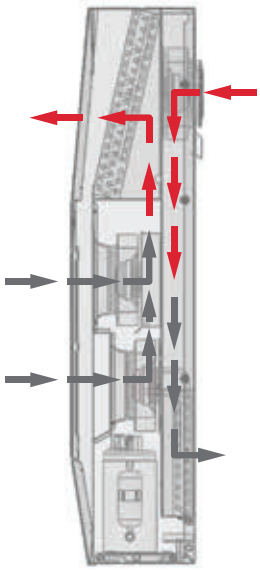


SPECTRACOOL INDOOR/OUTDOOR

G57
20000 BTU/Hr.
5861 Watt

G52
8000/12000 BTU/Hr.
2300/3500 Watt

G28
4000/6000 BTU/Hr.
1172/1758 Watt



Clean AirFlow
Ambient AirFlow

INDUSTRY STANDARDS

UL/cUL Listed; Type 12, 3R, 4; 4X optional; File No. SA6453

CE
EAC
IP 56 Internal Loop
IP 34 on External Loop
Telcordia GR-487 capable (Outdoor)

APPLICATION

- Industrial automation
- Telecommunications equipment
- Waste water treatment systems
- Package handling equipment
- Security and defense systems
- And more

FEATURES

- Energy-efficient rotary compressor on most models
- R407c and R134a earth-friendly refrigerants
- 115, 230 and 400/460 VAC 3-phase power input on most models
- UL Listed to save customers time and money with agency approvals
- Outdoor model operating temperature range from -40 F/-40 C to 131 F/55 C
- Exterior and partially recessed mounting options
- Attractive industrial design with minimal use of visible fasteners
- Reliable mechanical thermostat on enclosure side of the unit; indoor air conditioner models include digital display on ambient side
- Dual condenser-side air movers for performance redundancy on G52 and G57 models
- Galvanized sheet-metal cover for rugged factory and outdoor environments
- Easy-mount flanges for simple installation
- Cut-out adapter options for enclosures with GENESIS and T-Series air conditioners, enable users to easily transition to the new unit
- Dust-resistant condenser coil allows the unit to be run filterless in most applications
- Cleanable, reusable aluminum mesh filter protects coils for maximum cooling performance
- Mounting hardware, gaskets and user manual furnished with the unit
- Every unit functionally tested before shipping
- Standard Indoor Air Conditioner models also include:
  - Active condensate management with heater strip
  - Power-off relay for door switch and other system requirements
  - Malfunction switch
- Standard Outdoor Air Conditioner models also include:
  - Telcordia GR-487 capable
  - Corrosion-resistant components
  - Malfunction switch
  - Compressor heater
  - Head pressure control
  - Up to 2000 Watt (G28, G52) and 3000 Watt (G57) enclosure heater

SPECIFICATIONS

- Nominal cooling capacity:
  G28 4000 & 6000 BTU/Hr. (1172 and 1758 W)
  G52 8000 & 12000 BTU/Hr. (2344 and 3516 W)
  G57 20000 BTU/Hr. (5861 W)
- Outdoor model operating temperature range from -40 F/-40 C to 131 F/55 C

FINISH

- RAL 7035 light-gray, semi-textured powder-coat paint
- Other colors and textures available

NOTES

Visit www.PentairProtect.com to download 2D and 3D CAD drawings into the overall design of your electrical system.

EtherNet/IP ODVA PI PROFIBUS • PROFINET

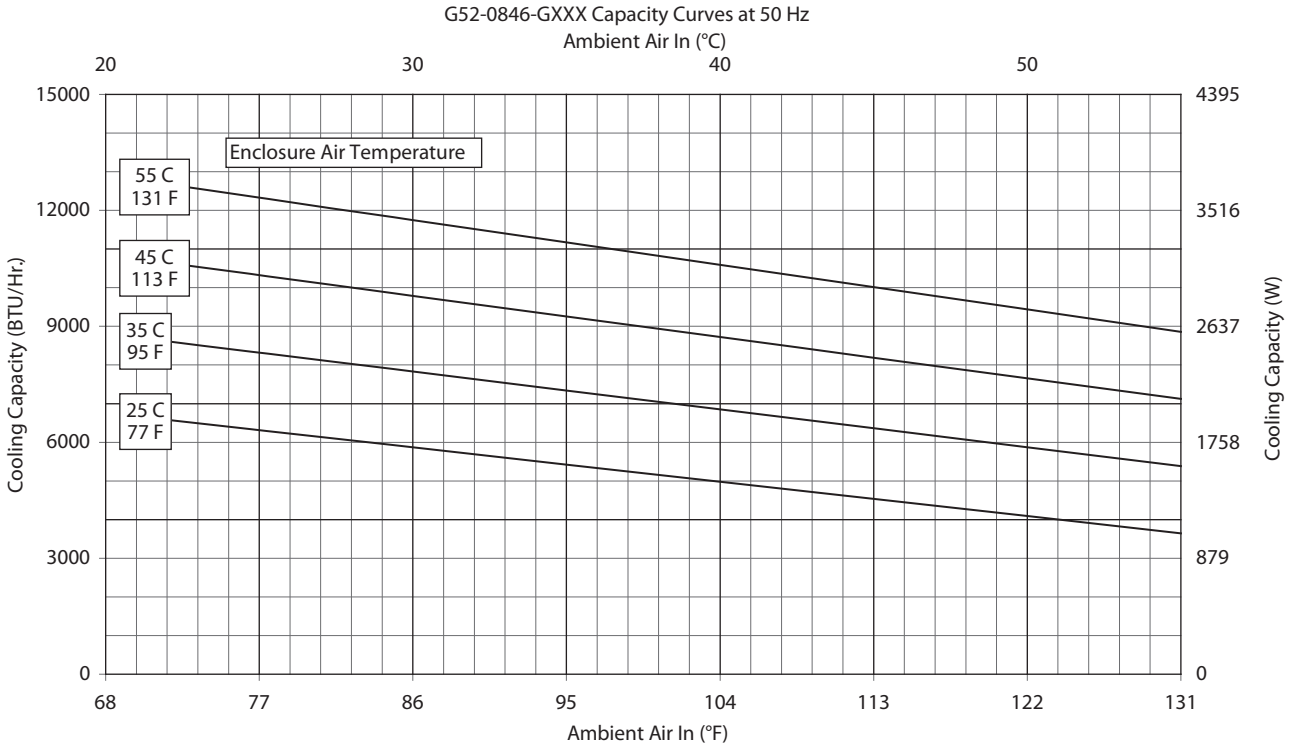
Performance Data G52 Models 8000/12000 BTU/Hr. (2300/3500 Watt)

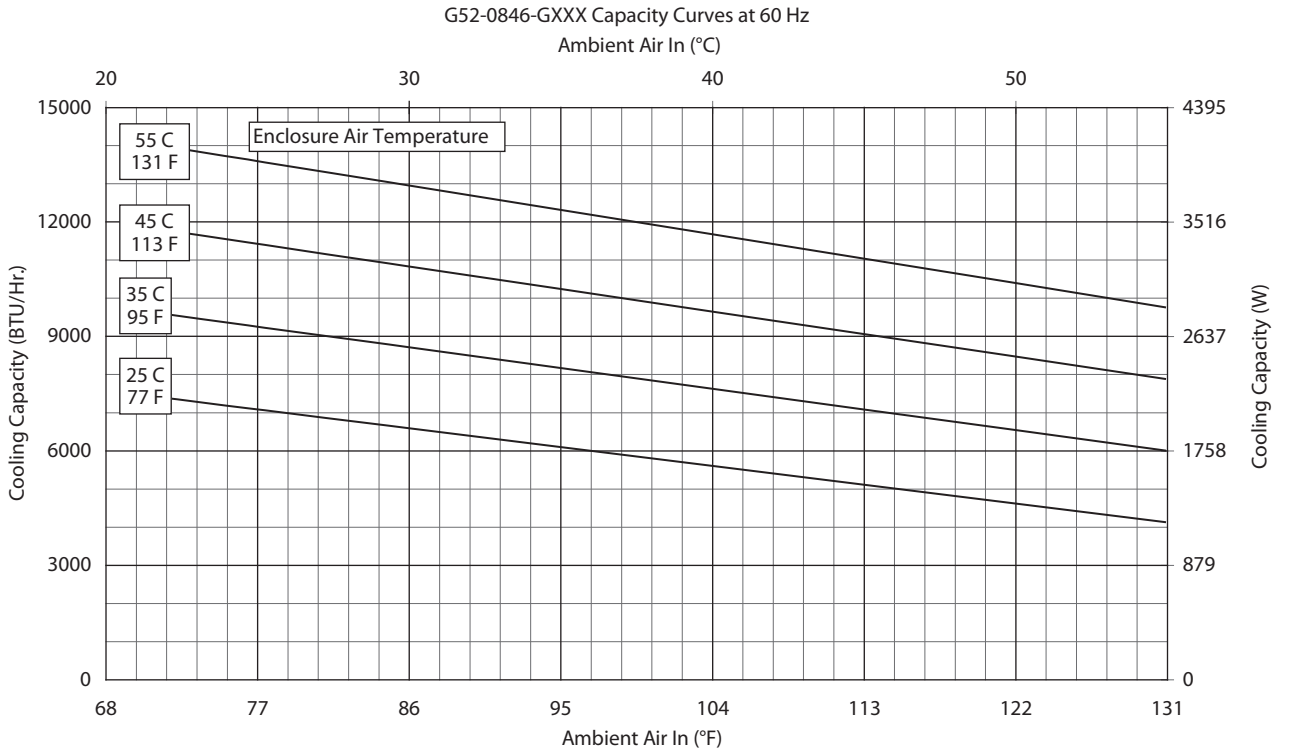
CATALOG NUMBER						
Indoor Model	G520816G050	G520826G050	G520846G050	G521216G050	G521226G050	G521246G050
Indoor Model Stainless Steel Type 4X	G520816G051	G520826G051	G520846G051	G521216G051	G521226G051	G521246G051
Indoor Model with Remote Access Control*	G520816G060	G520826G060	G520846G060	G521216G060	G521226G060	G521246G060
Outdoor Model without Heat Pkg.	G520816G100	G520826G100	G520846G100	G521216G100	G521226G100	G521246G100
Outdoor Model Partial Recessed Mount	G520816G101	G520826G101	G520846G101	G521216G101	G521226G101	G521246G101
Outdoor Model without Heat Pkg. Stainless Steel Type 4X	G520816G102	G520826G102	G520846G102	G521216G102	G521226G102	G521246G102
Outdoor Model with Heat Pkg.	G520816G150	G520826G150	G520846G150	G521216G150	G521226G150	G521246G150
Outdoor Model with Heat Pkg. Stainless Steel Type 4X	G520816G151	G520826G151	G520846G151	G521216G151	G521226G151	G521246G151
COOLING PERFORMANCE						
Nominal:						
BTU/Hr.	**8000**	**8000**	**8000**	**12000**	**12000**	**12000**
Watts	**2300**	**2300**	**2300**	**3500**	**3500**	**3500**
At 131 F/131 F (55 C/55 C):						
BTU/Hr.	7300/8200	7300/8200	8800/9800	12000/12500	12000/12500	11100/12000
Watts	2139/2403	2139/2403	2578/2871	3516/3662	3516/3662	3252/3516
At 95 F/95 F (35 C/35 C):						
BTU/Hr.	6000/6800	6000/6800	7400/8200	9900/10700	9900/10700	9900/10700
Watts	1758/1992	1758/1992	2168/2402	2900/3135	2900/3135	2900/3135
Refrigerant	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant Charge (ounces/grams)	24/680	24/680	24/680	38/1077	38/1077	38/1077
Operating Temperature Range:						
Maximum (°F/°C)	131/55	131/55	131/55	131/55	131/55	131/55
Indoor Minimum (°F/°C)	50/10	50/10	50/10	50/10	50/10	50/10
Outdoor Minimum (°F/°C)	-40/-40	-40/-40	-40/-40	-40/-40	-40/-40	-40/-40
Airflow at 0 Static Pressure:						
Internal loop 50 Hz (CFM / m^3/hr.)	285/484	285/484	285/484	287/487	287/487	287/487
External loop 50 Hz (CFM / m^3/hr.)	650/1104	650/1104	650/1104	635/1078	635/1078	635/1078
Internal loop 60 Hz (CFM / m^3/hr.)	310/527	310/527	310/527	305/518	305/518	305/518
External loop 60 Hz (CFM / m^3/hr.)	700/1189	700/1189	700/1189	650/1104	650/1104	650/1104
Max. Heater W (Outdoor Models):	2000	2000	NA	2000	2000	NA
ELECTRICAL DATA						
Rated Voltage	**115**	**230/208-230**	**400/460 3~**	**115**	**230/208-230**	**400/460 3~**
Frequency (Hz)	50/60	50/60	50/60	50/60	50/60	50/60
Operating Range	+/- 10%	+/- 10%	+/- 10%	+/- 10%	+/- 10%	+/- 10%
Max. Power Consumption (W)	1250/1415	1250/1415	806/957**	2100/2427	1830/2130	910/1106**
Max. Nominal Current (A at 50/60 Hz)	11.2/12.3	5.6/7.0-6.2	3.1/3.2	16.1/21.0	9.1/10.6-9.5	3.6/3.5
Starting Current (A)	48	27	16	57	38	16
Agency Approvals	UL/cUL Listed CE EAC Others available upon request					
Power Input Description	Terminal Block					
ENCLOSURE PROTECTION						
UL Type	Type 12, 3R, 4 standard Type 4X Stainless steel optional					
International Rating	IP56 internal loop IP34 external loop					
CONTROLLER						
Description	Basic mechanical thermostat with digital display					
Thermostat Location	Enclosure side on all base models					
Digital Display Location:						
Indoor Models	Ambient side					
Outdoor Models	Enclosure side					
Factory Thermostat Setting (F/C)	80/27					
SOUND LEVEL						
At 1.5 Meters	68 dB(A)					
UNIT CONSTRUCTION						
Material	Galvanized sheet metal standard Stainless steel optional					
Finish	RAL 7035 light-gray, semi-textured powder-coat paint standard Other colors available					
ACCESSORIES						
EASYSWAP Adaptor Plenum (GENESIS M52)	Enables SPECTRACOOL to be mounted to a GENESIS M52 air conditioner cutout Catalog Number PLM52G52					
UNIT DIMENSIONS						
Height (in./mm)	52.69/1338					
Width (in./mm)	17.12/435					
Depth (in./mm)	11.66/296					
Weight (lb./kg)	128/58.1	128/58.1	138/62.6	131/59.4	131/59.4	141/64.0

*Units with Remote Access Control utilize a digital controller and communicate via EtherNet/IP, Profinet, Modbus TCP/IP and SNMP over ethernet or modbus RTU over USB.

**Watts based on .65 power factor.

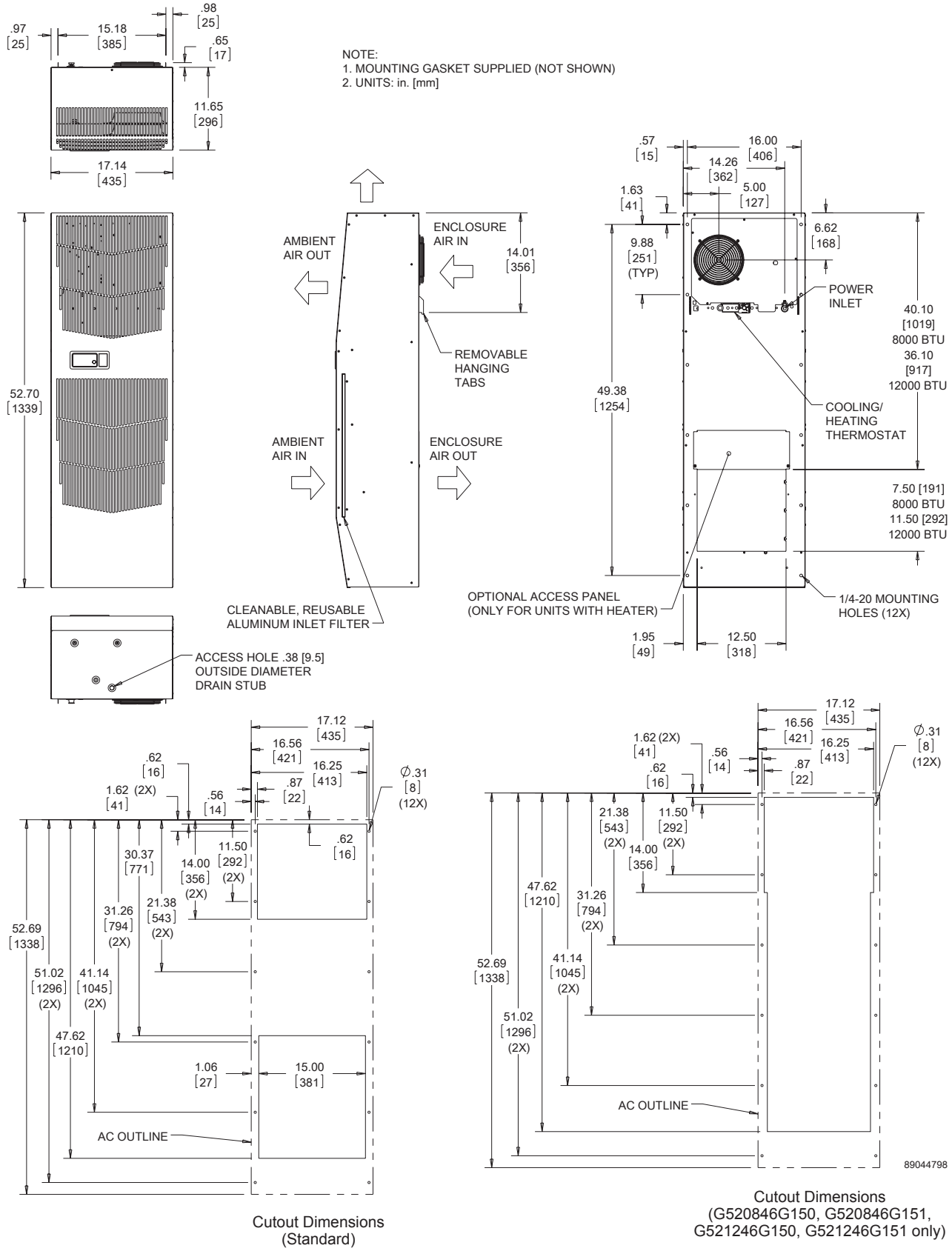
Performance Curves for G52 Models 8000 BTU/Hr. (2300 Watt)





PDC Item 02
AC, 8000 400/460V 304SS 4x H - Pentair G520846G151 / Trojan P/N 917489-08144XH pg. 4/4

G52 Models 8000/12000 BTU/Hr. (2300/3500 Watt)



Visit nVent.com/HOFFMAN to download 2D and 3D CAD drawings into the overall design of your electrical system.

Hydraulic System Center (HSC)

REV	REVISION DESCRIPTION	LOG NO.	REV'D BY	CHK'D BY	APPRV'D BY	DATE YYYY-MM-DD
1	SUBMITTAL	–	JRN	SPM	MB	2023-08-01

TABLE OF CONTENTS

NOTES:

1. ELECTRICAL ASSEMBLY TO BE ASSEMBLED UNDER UL508A AND THE MINIMUM REQUIREMENTS OUTLINED IN ES0127.WHERE THERE IS A CONFLICT BETWEEN THIS DOCUMENT AND REQUIREMENTS OF ES0127, THE INFORMATION PRESENTED IN THIS DOCUMENT WILL BE USED.
2. ENCLOSURE ENVIRONMENTAL RATING – UL TYPE 4X (IP66).
3. MINIMUM WIRE SIZE FOR CONTROL WIRE IS 16AWG STRANDED COPPER UNLESS WIRE CABLE OR HARNESS IS PROVIDED FOR COMPONENTS BY MANUFACTURER OR PER TROJAN DESIGN.

WIRE COLOUR CODING LEGEND

DESCRIPTION	DESIGNATION	WIRE
3 PHASE POWER	L1	BLACK
	L2	BLACK
	L3	BLACK
DC CONTROL	24VDC	BLUE
	OVDC	WHITE/BLUE
GROUND	G	GREEN/YELLOW
EXTERNAL POWER		YELLOW

NOTE: EXCEPTION TO MANUFACTURER PRE-ASSEMBLED CABLES.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: 2 PL DEC ± N/A
3 PL DEC ± N/A
ANGLE DEG ± N/A
REMOVE ALL BURRS, ALL CORNERS
R 0.010 OR BREAK EDGE
– CRITICAL CHARACTERISTIC

TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: WD, UVSIGNA HSC 1
ANN ARBOR REPLACEMENT, MI

THIRD ANGLE PROJECTION

0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS

DWG NO. E171100051H1 | REV 1
SHEET 00 OF 06 | SIZE D

INCOMING SUPPLY–DISCONNECTING MEANS AND OVERCURRENT PROTECTION DEVICE (BY OTHERS)
480VAC, 2.5kVA, 3A, 3PH, 3W+GND, 60HZ WYE SOURCE
SHORT CIRCUIT CURRENT 10kA RMS SYMMETRICAL @480VAC MAX.

L1
L2
L3
PE
SUPPLY LIMIT

1L1 1L2 1L3
4AWG

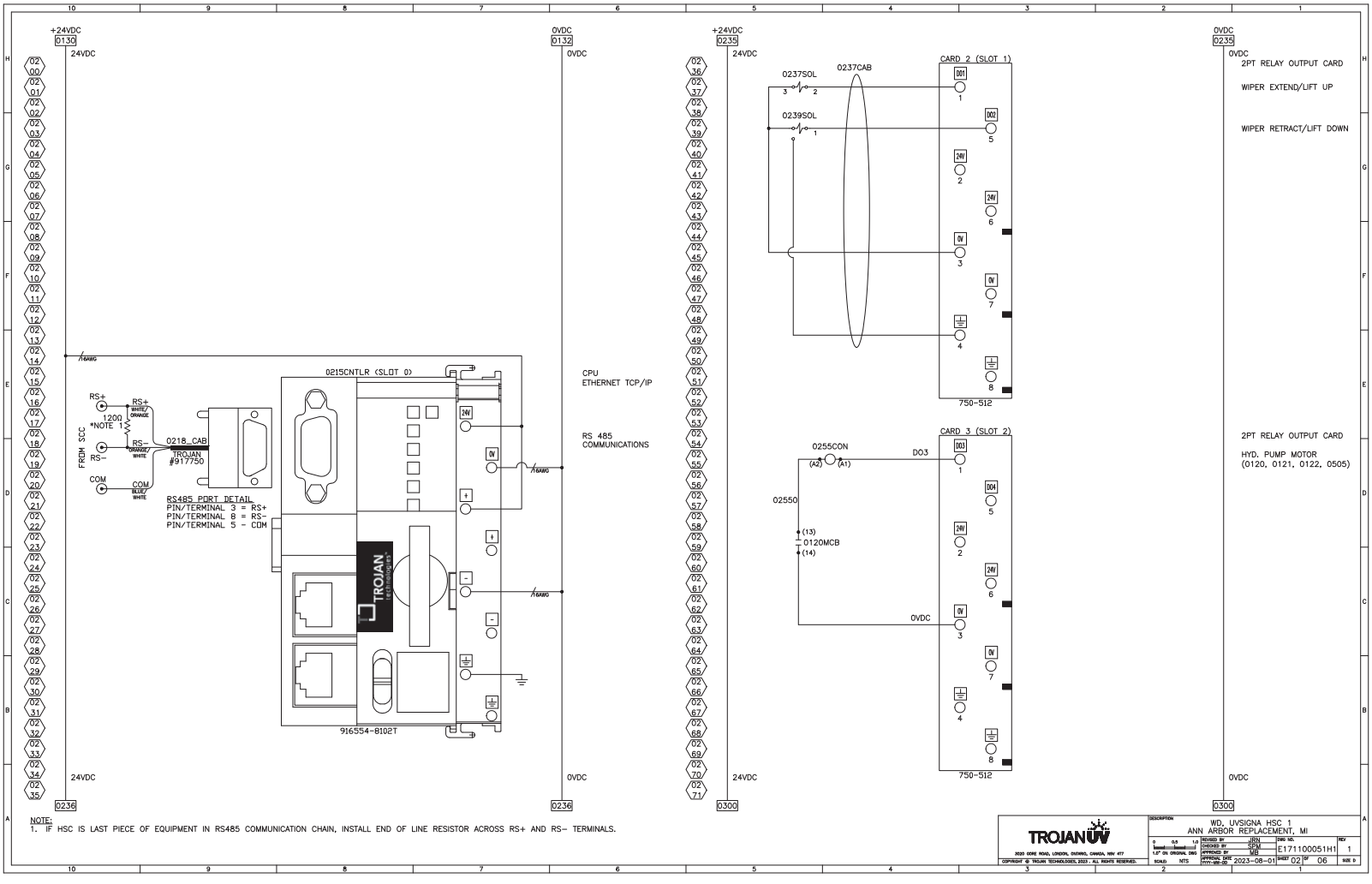
0120MCB
1.6–2.5A
(0505)
1.7A
0255CON
01200
01210
01220
0120MTR
HYDRAULIC PUMP
1.0 HP
1.5FLA

0130CB
6A
0130PS
01300
01310
01320
01301
16AWG
0130CB1
10A
24VDC
0VDC
0200
24VDC 10A
POWER SUPPLY

TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: WD, UVSIGNA HSC 1
ANN ARBOR REPLACEMENT, MI

DRAWN BY	JRN
CHECKED BY	SPM
APPROVED BY	MB
APPROVAL DATE YYYY-MM-DD	2023-08-01
DWG NO.	E171100051H1
REV	1
SCALE	NTS
SHEET	01
OF	06
SIZE	D



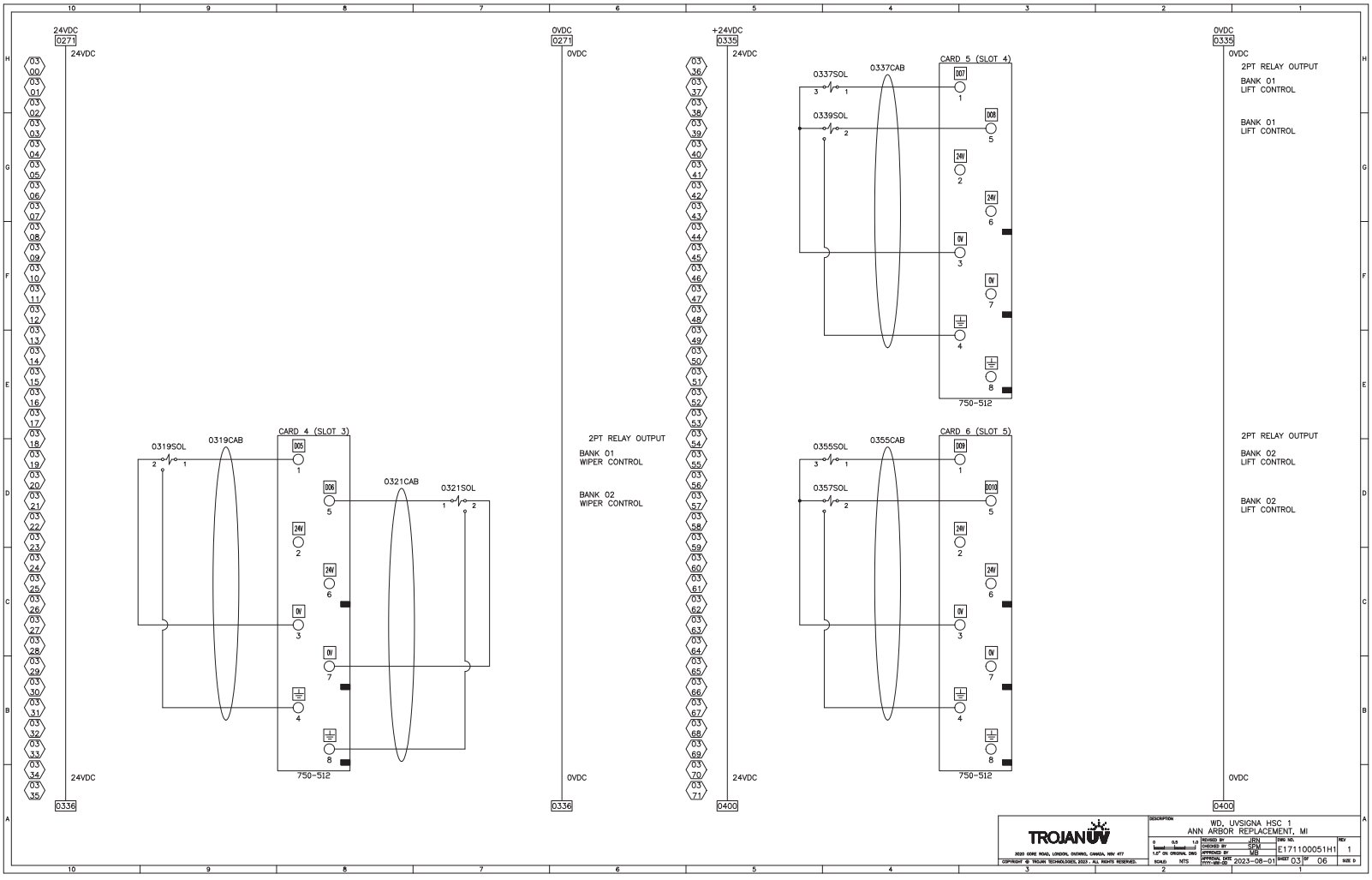
NOTE:
1. IF HSC IS LAST PIECE OF EQUIPMENT IN RS485 COMMUNICATION CHAIN, INSTALL END OF LINE RESISTOR ACROSS RS+ AND RS- TERMINALS.

TROJAN UV
3020 KING ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION
WD, UVSIGNA HSC 1
ANN ARBOR REPLACEMENT, MI

DRAWN BY	JRN	DWG NO.	REV
CHECKED BY	SPM	E171100051H1	1
APPROVED BY	MB		
APPROVAL DATE YYYY-MM-DD	2023-08-01	SHEET 02 OF 06	SIZE D

SCALE NTS



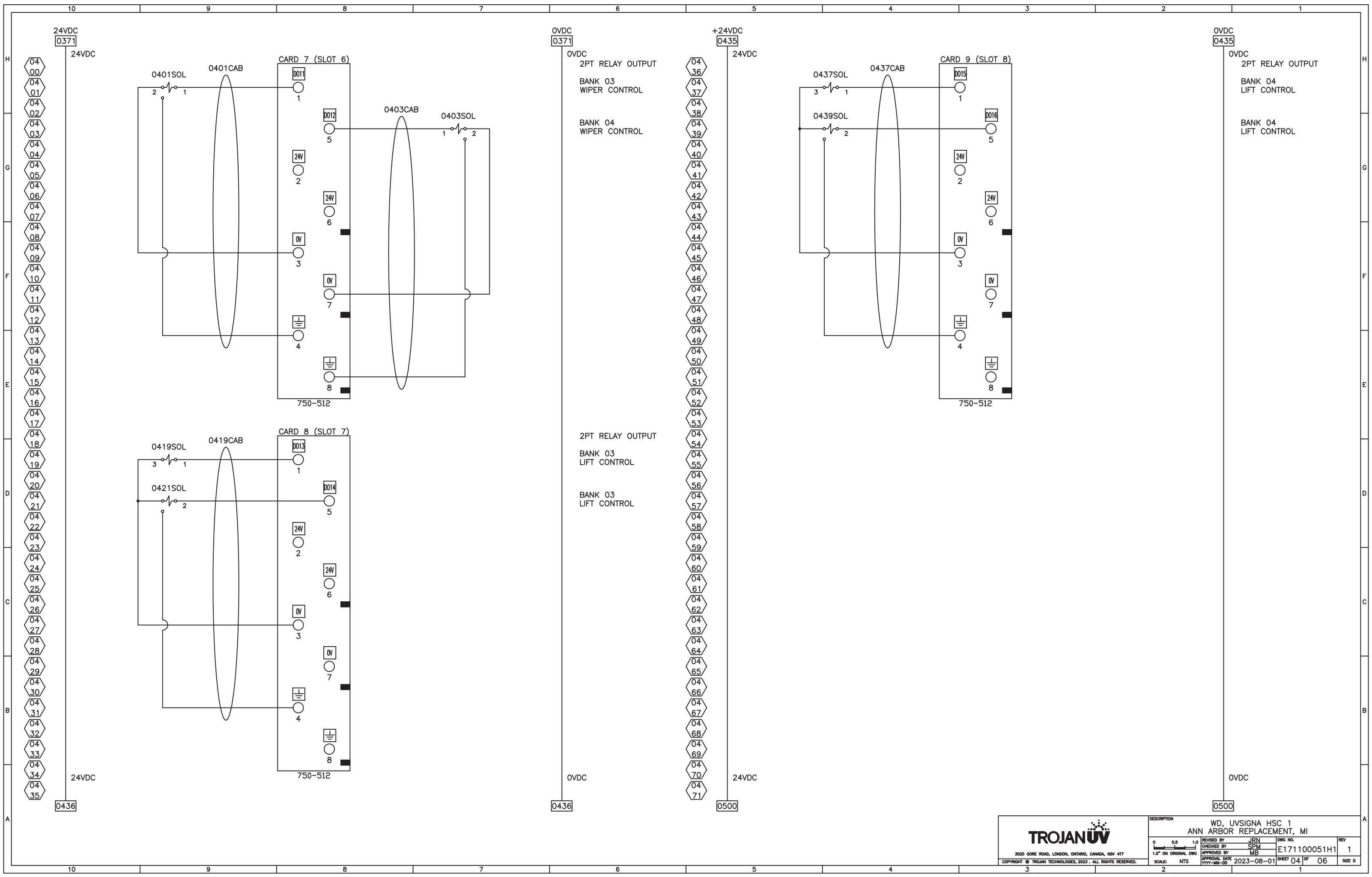
TROJAN UV

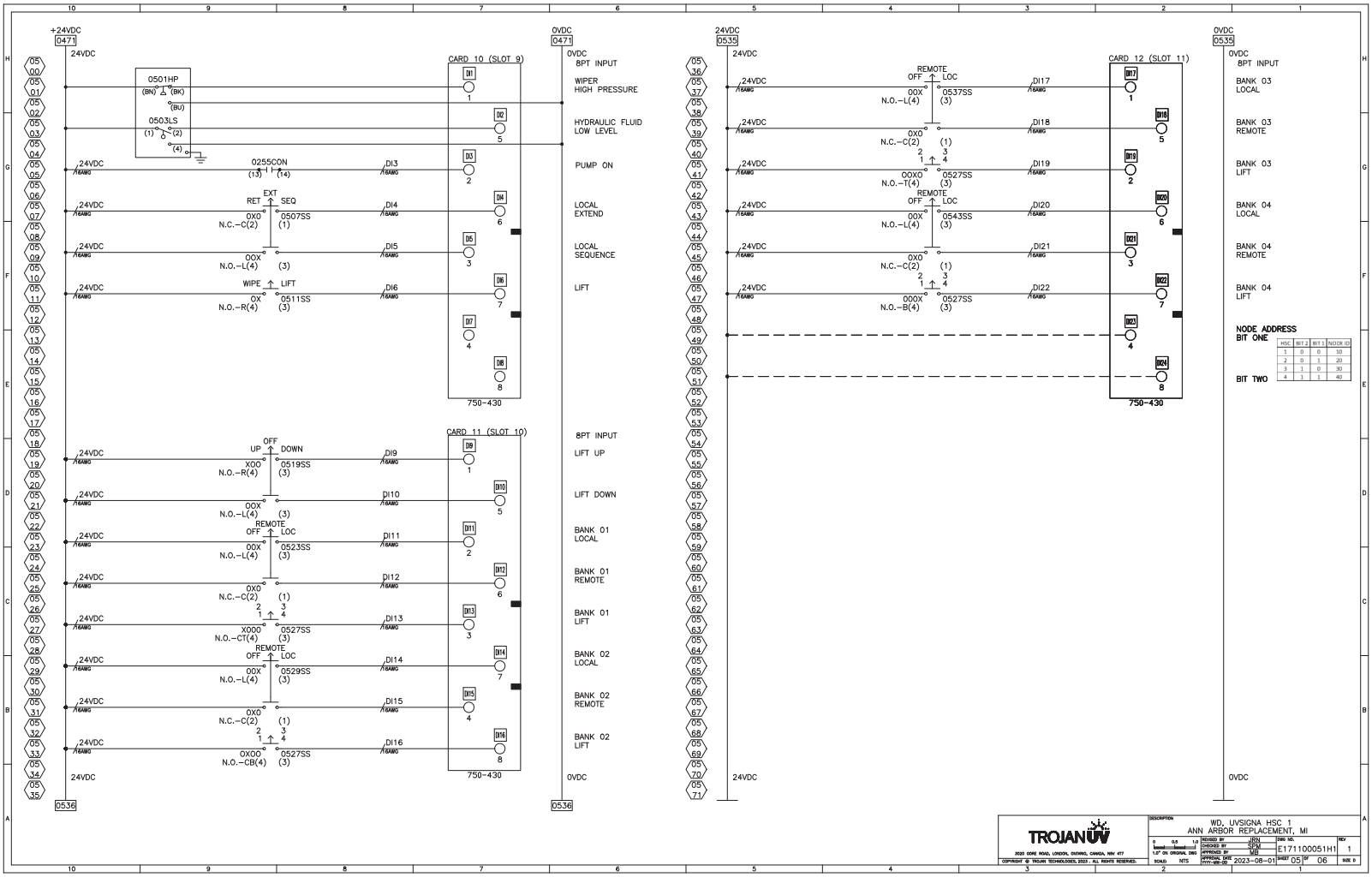
3020 KING ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION

WD, UVSIGNA HSC 1
ANN ARBOR REPLACEMENT, MI

0 0.5 1.0	DRAWN BY	JRN	DWG NO.	REV
mm	CHECKED BY	SPM	E171100051H1	1
1.0" ON ORIGINAL DWG	APPROVED BY	MB		
SCALE NTS	APPROVAL DATE YYYY-MM-DD	2023-08-01	SHEET 03 OF 06	SIZE D

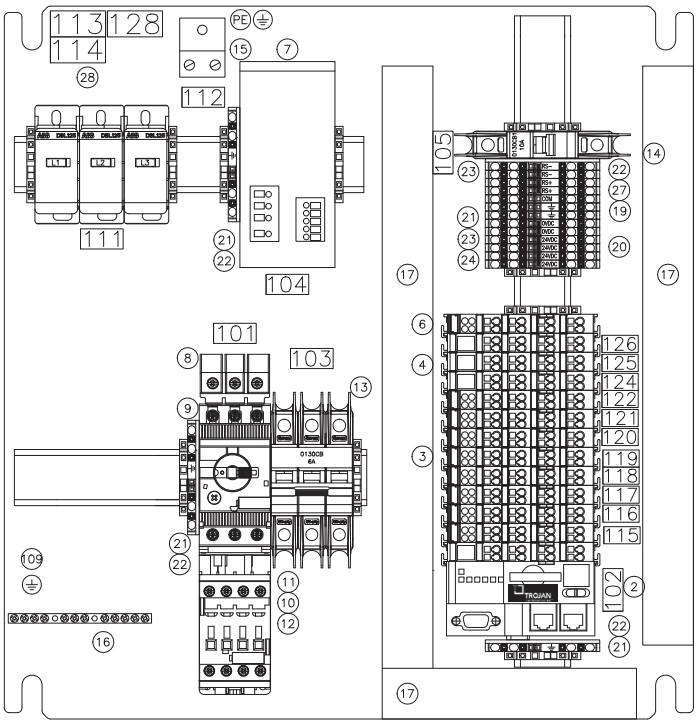

24VDC
0371
24VDC
0401SOL
0401CAB
CARD 7 (SLOT 6)
DO11
DO12
0403CAB
0403SOL
24V
0V
750-512
0419SOL
0419CAB
0421SOL
CARD 8 (SLOT 7)
DO13
DO14
0436
0VDC
0371
2PT RELAY OUTPUT
BANK 03
WIPER CONTROL
BANK 04
WIPER CONTROL
2PT RELAY OUTPUT
BANK 03
LIFT CONTROL
BANK 03
LIFT CONTROL
+24VDC
0435
0437SOL
0437CAB
0439SOL
CARD 9 (SLOT 8)
DO15
DO16
0500
0VDC
0435
2PT RELAY OUTPUT
BANK 04
LIFT CONTROL
BANK 04
LIFT CONTROL
TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7
COPYRIGHT © TROJAN TECHNOLOGIES, 2023 . ALL RIGHTS RESERVED.
DESCRIPTION: WD, UVSIGNA HSC 1
ANN ARBOR REPLACEMENT, MI
REVISED BY JRN
CHECKED BY SPM
APPROVED BY MB
APPROVAL DATE 2023-08-01
SCALE: NTS
DWG NO. E171100051H1
REV 1
SHEET 04 OF 06
SIZE D



DESCRIPTION
WD, UVSIGNA HSC 1
ANN ARBOR REPLACEMENT, MI

DRAWN BY	JRN
CHECKED BY	SPM
APPROVED BY	MB
APPROVAL DATE YYYY-MM-DD	2023-08-01
DWG NO.	E171100051H1
REV	1
SHEET	05
OF	06
SIZE	D

0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS



HYDRAULIC PUMP–14AWG
GROUND LUG–10AWG
SPARE
SPARE
SPARE
ENCLOSURE–14AWG
SPARE

128	1	EMLP (27x12.5)	MAIN FEED	75C WIRE	
127					
126	1	EMLP (27x12.5)	DI3		
125	1	EMLP (27x12.5)	DI2		
124	1	EMLP (27x12.5)	DI1		
123					
122	1	EMLP (27x12.5)	DO8		
121	1	EMLP (27x12.5)	DO7		
120	1	EMLP (27x12.5)	DO6		
119	1	EMLP (27x12.5)	DO5		
118	1	EMLP (27x12.5)	DO4		
117	1	EMLP (27x12.5)	DO3		
116	1	EMLP (27x12.5)	DO2		
115	1	EMLP (27x12.5)	DO1		
114	1	EMLP (45x25)	INCOMING SUPPLY	480V 60 HZ	
113	1	EMLP (45x25)	ALL FIELD WIRING	USE COPPER	CONDUCTORS ONLY
112	1	EMLP (27x12.5)	TORQUE	50 lb.In	
111	1	EMLP (27x12.5)	TORQUE	31–44 lb.In	
110	1	US-EML (D12.5)	PE		
109	2	US-EML (D12.5)	⏚		
108					
107					
106					
105	1	EMLP (27x12.5)	0130CB1	10A PS	
104	1	EMLP (27x12.5)	0130PS	24VDC	
103	1	EMLP (27x12.5)	0130CB	POWER SUPPLY	
102	1	EMLP (27x12.5)	0215CNTLR	CONTROLLER	
101	1	EMLP (27x12.5)	0120MCB	MOTOR STARTER	
100					
ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3

	36	1	CABLE ASSY, HSC G4 RS485	CUSTOM	917750	917750
	35					
	34					
	33					
	32					
	31					
	30					
	29					
NOTE 1 →	28	3	DIST BLOCK, 125A ABB	ABB	DBL125	917305–125
	27					
	26	1	RESISTOR, 120ohm DNET	---	---	913840
	25	A/R	TERM BLK, END STOP CLIPFIX 35	PHOENIX CONTACT	3022276	916050–3022276
	24	1	TERM BLK, JUMPER 4P FBS 4 5	PHOENIX CONTACT	3030187	916050–3030187
	23	3	TERM BLK, JUMPER 2P FBS 2 5	PHOENIX CONTACT	3030161	916050–3030161
	22	4	TERM BLK, END PLT D ST 2.5 GU	PHOENIX CONTACT	3030514	916050–3030514
	21	5	TERM BLK, PIT 2.5 PE QUAT GND	PHOENIX CONTACT	3209594	916049–3209594
	20	6	TERM BLK, PIT 2.5 QUATTRO BLU	PHOENIX CONTACT	3209581	916049–3209581
	19	5	TERM BLK, PIT 2.5 QUATTRO GRY	PHOENIX CONTACT	3209578	916049–3209578
	18	A/R	TERM BLK, DIN RAIL PERF 35X7.5	PHOENIX CONTACT	0801733	914147
	17	A/R	WIRE DUCT, TYPE F LT GRY 1x3	PANDUIT	F1X3LG6 / C1LG6	913437–004
	16	1	GROUND BAR, 12 TAP	Tab	35610203	917380–012BLU
	15	1	LUG, GND ZCON 600V 1/0–14AWG	BLACKBURN	ADR11–21	917397–1121
NOTE 1 →	14	1	BREAKER, 10A 1P AC/DC C ABB	ABB	SU201M–C10	917139–MC1100
	13	1	BREAKER, 6A 3P AC/DC C ABB	ABB	SU203M–C6	917139–MC3060
	12	1	STARTER, AUXILIARY CONTACT	ABB	MS132–HKF1–11	917182–HKF111
	11	1	STARTER, COUPLING LINK	ABB	BEA16–4	917182–BEA164
	10	1	CONTACTOR, AF09 25A 1NO 24V	ABB	AF09–30–10–11	917180–09A024
	9	1	STARTER, MS132 2.50A	ABB	MS132–2.5	917182–MS132G
	8	1	STARTER, POWER IN FEED 3 PHASE	ABB	MS132–S1–M3–25	917182–S1M325
	7	1	PS, 24VDC 3P TRIO 10A	PHOENIX CONTACT	2866459	916051–459
	6	1	END MODULE	WAGO	750–600	916554–600
	5					
	4	3	DI 8CH 24VDC	WAGO	750–430	916554–430
	3	8	DO 2CH RELAY	WAGO	750–512	916554–512
	2	1	CONTROLLER, 8102T ENET RS485	CUSTOM	916554–8102T	916554–8102T
	1	1	BACKPLATE, HSC G4 ELEC	CUSTOM	902041	902041
	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER

NOTE:

1. ACCORDING TO UL 508A, SECTION 54, ALL FIELD WIRING CONDUCTORS, EXTERNAL TO THE PANEL SHALL BE "COPPER CONDUCTORS ONLY" AND TEMPERATURE RATINGS FOR THE FIELD WIRING CONDUCTORS RATED LESS THAN 100 AMPS SHALL BE 75°C (167°F). REFER THE FOLLOWING BELOW MENTIONED DETAILS FOR FIELD WIRING TERMINATION TIGHTENING TORQUE.

   A. GROUND LUG 5.65 N–m (50 lb–in).
   B. DISTRIBUTION BLOCK 3.5– 5 N–m (30.97 – 44.25 lb–in).

TROJANUV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: WD, UVSIGNA HSC 1
ANN ARBOR REPLACEMENT, MI

DRAWN BY	JRN
CHECKED BY	SPM
APPROVED BY	MB
APPROVAL DATE YYYY–MM–DD	2023–08–01
DWG NO.	E171100051H1
REV	1
SHEET	06
OF	06
SIZE	D
SCALE	NTS

REV	REVISION DESCRIPTION	LOG NO.	REV'D BY	CHK'D BY	APPRV'D BY	DATE YYYY-MM-DD
1	SUBMITTAL	–	JRN	SPM	MB	2023-08-01

TABLE OF CONTENTS

NOTES:

1. ELECTRICAL ASSEMBLY TO BE ASSEMBLED UNDER UL508A AND THE MINIMUM REQUIREMENTS OUTLINED IN ES0127.WHERE THERE IS A CONFLICT BETWEEN THIS DOCUMENT AND REQUIREMENTS OF ES0127, THE INFORMATION PRESENTED IN THIS DOCUMENT WILL BE USED.
2. ENCLOSURE ENVIRONMENTAL RATING – UL TYPE 4X (IP66).
3. MINIMUM WIRE SIZE FOR CONTROL WIRE IS 16AWG STRANDED COPPER UNLESS WIRE CABLE OR HARNESS IS PROVIDED FOR COMPONENTS BY MANUFACTURER OR PER TROJAN DESIGN.

WIRE COLOUR CODING LEGEND

DESCRIPTION	DESIGNATION	WIRE
3 PHASE POWER	L1	BLACK
	L2	BLACK
	L3	BLACK
DC CONTROL	24VDC	BLUE
	0VDC	WHITE/BLUE
GROUND	G	GREEN/YELLOW
EXTERNAL POWER		YELLOW

NOTE: EXCEPTION TO MANUFACTURER PRE–ASSEMBLED CABLES.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: 2 PL DEC ± N/A
3 PL DEC ± N/A
ANGLE DEG ± N/A
REMOVE ALL BURRS, ALL CORNERS
R 0.010 OR BREAK EDGE
– CRITICAL CHARACTERISTIC

TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: WD, UVSIGNA HSC 2
ANN ARBOR REPLACEMENT, MI

THIRD ANGLE PROJECTION

0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS

DWG NO. E171100051H2 | REV 1
SHEET 00 OF 06 | SIZE D

INCOMING SUPPLY–DISCONNECTING MEANS AND OVERCURRENT PROTECTION DEVICE (BY OTHERS)
480VAC, 2.5kVA, 3A, 3PH, 3W+GND, 60HZ WYE SOURCE
SHORT CIRCUIT CURRENT 10kA RMS SYMMETRICAL @480VAC MAX.

L1
L2
L3
PE
SUPPLY LIMIT

1L1 1L2 1L3
4AWG

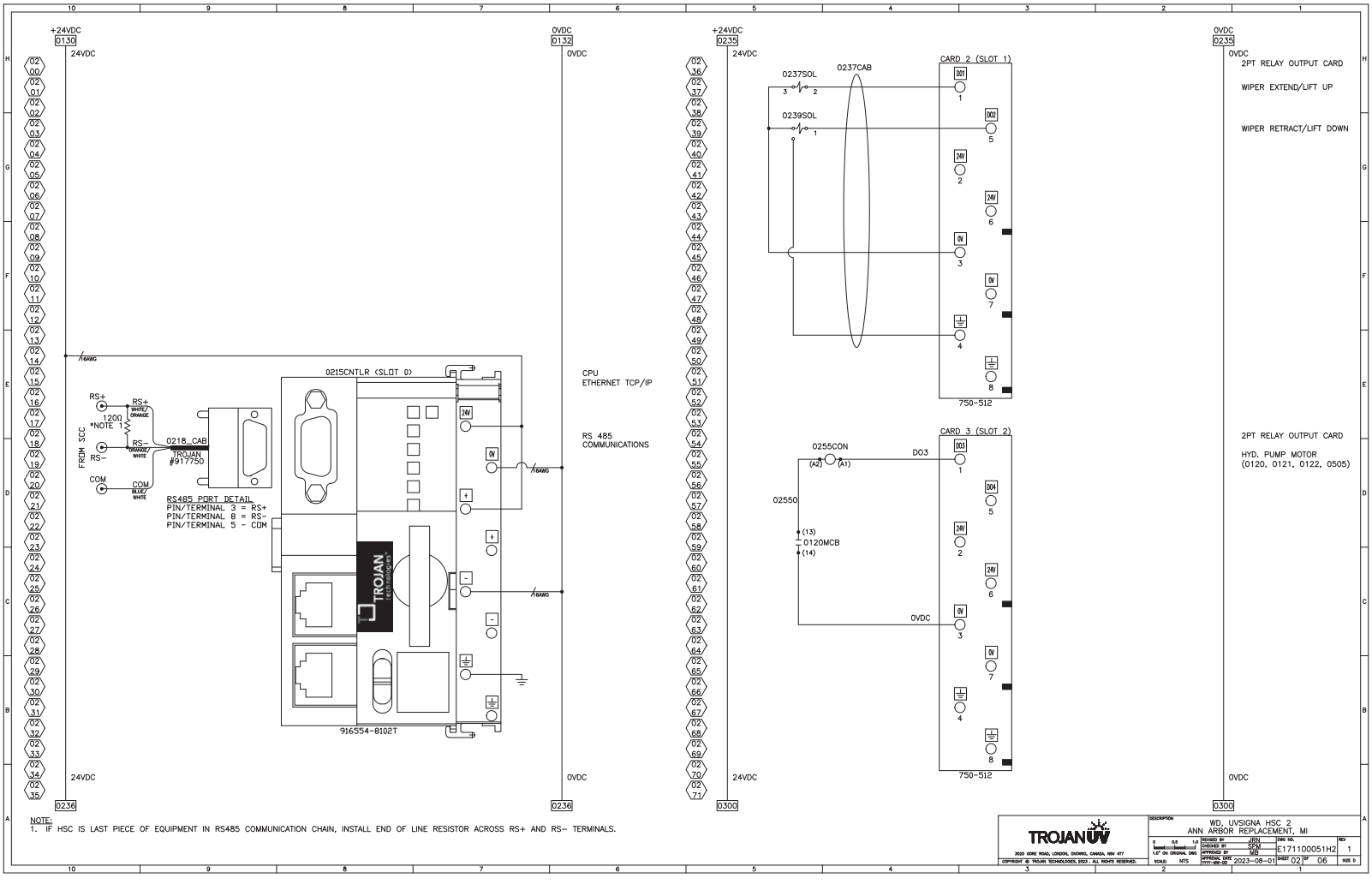
0120MCB
1.6–2.5A
0255CON
(0505)
1.7A
01200
01210
01220
0120MTR
HYDRAULIC PUMP
1.0 HP
1.5FLA

0130CB
6A
0130PS
01300
01310
01320
01301
16AWG
0130CB1
10A
24VDC
0VDC
0200
24VDC 10A
POWER SUPPLY

DESCRIPTION
WD, UVSIGNA HSC 2
ANN ARBOR REPLACEMENT, MI

DRAWN BY	JBN	DWG NO.	REV
CHECKED BY	SPM	E171100051H2	1
APPROVED BY	MB		
APPROVAL DATE (YYYY-MM-DD)	2023-08-01	SHEET 01 OF 06	SIZE D

0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS

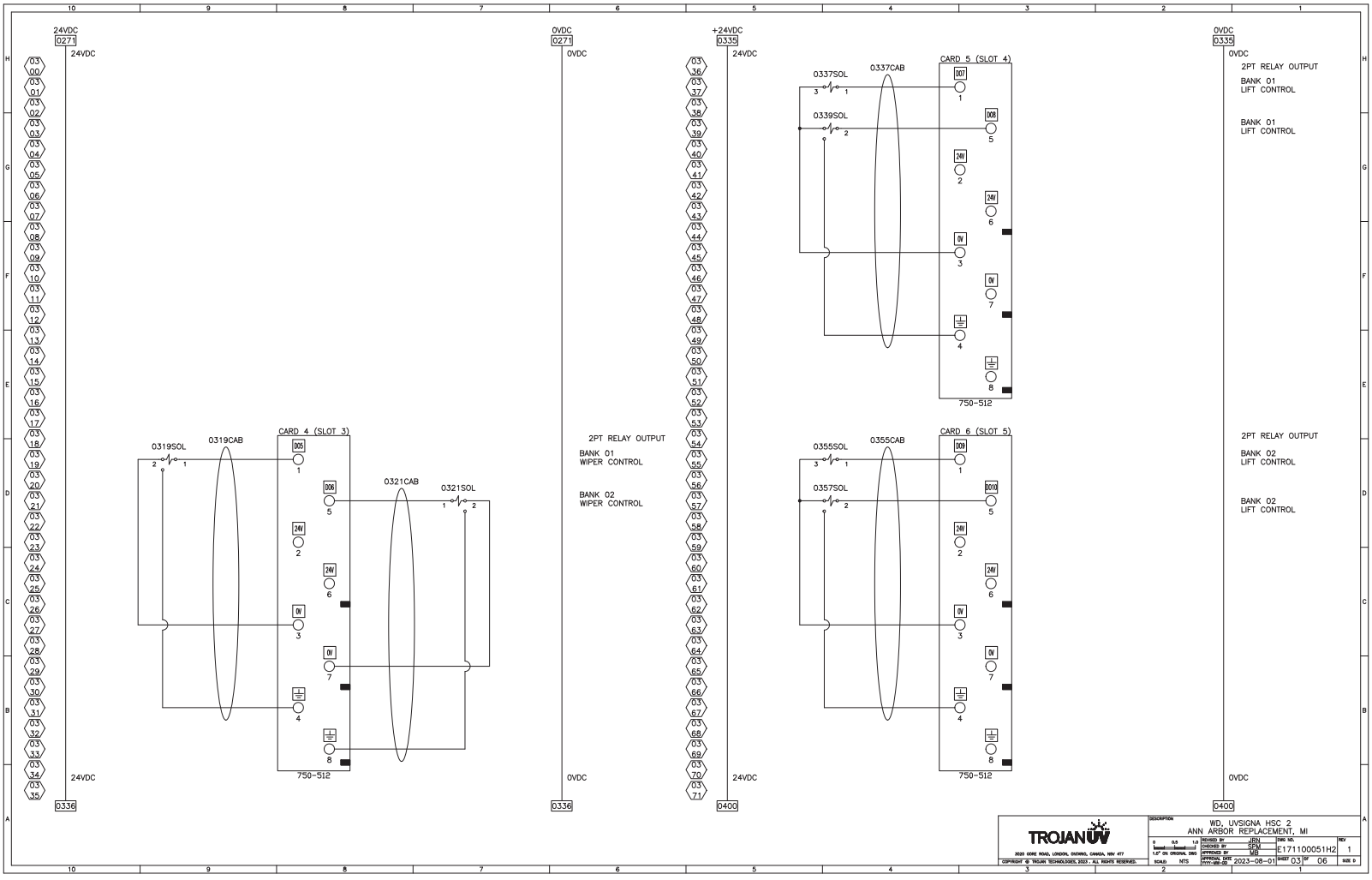


NOTE:
1. IF HSC IS LAST PIECE OF EQUIPMENT IN RS485 COMMUNICATION CHAIN, INSTALL END OF LINE RESISTOR ACROSS RS+ AND RS- TERMINALS.

DESCRIPTION
WD, UVSIGNA HSC 2
ANN ARBOR REPLACEMENT, MI

DRAWN BY	JRN
CHECKED BY	SPM
APPROVED BY	MB
APPROVAL DATE (YYYY-MM-DD)	2023-08-01
DWG NO.	E171100051H2
REV	1
SHEET	02
OF	06
SIZE	D
SCALE	NTS

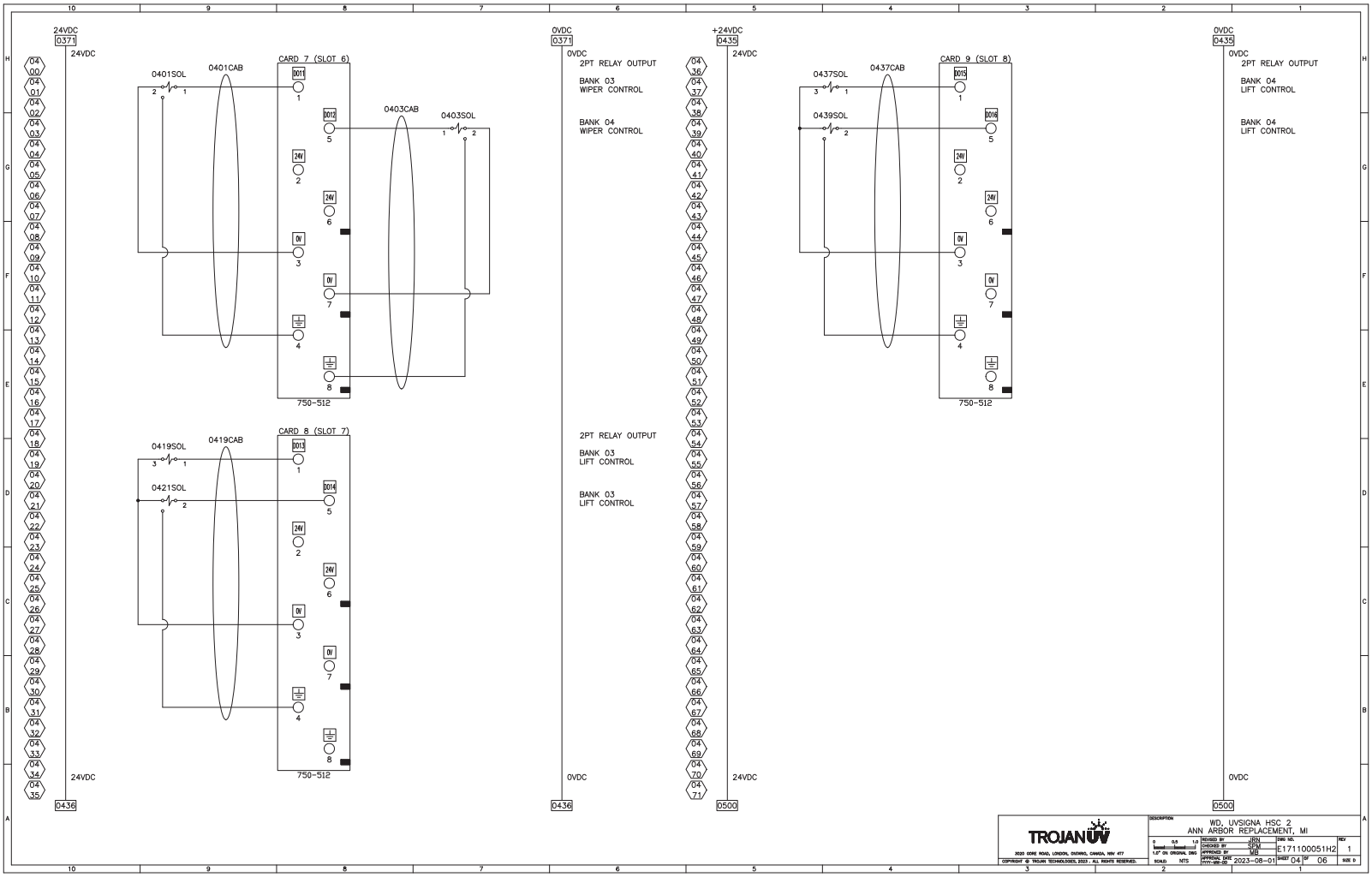
0 5.0 1.0
1.0" ON ORIGINAL DWG



DESCRIPTION
WD, UVSIGNA HSC 2
ANN ARBOR REPLACEMENT, MI

DRAWN BY	JRN	DWG NO.	REV
CHECKED BY	SPM	E171100051H2	1
APPROVED BY	MB		
APPROVAL DATE YYYY-MM-DD	2023-08-01	SHEET 03 OF 06	SIZE D

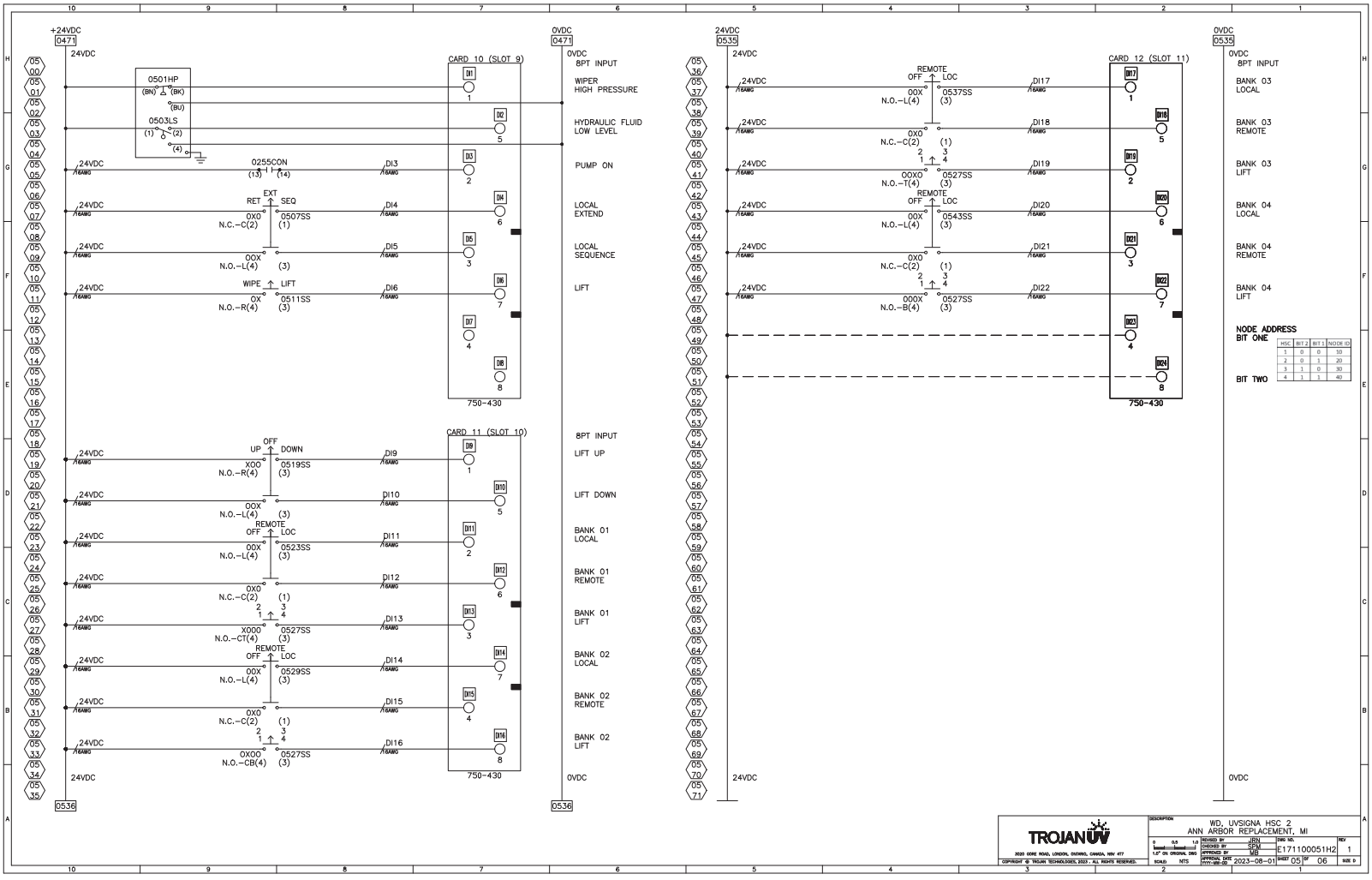
0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS



DESCRIPTION
WD, UVSIGNA HSC 2
ANN ARBOR REPLACEMENT, MI

DRAWN BY	JRN	DWG NO.	REV
CHECKED BY	SPM	E171100051H2	1
APPROVED BY	MS		
APPROVAL DATE YYYY-MM-DD	2023-08-01	SHEET 04 OF 06	SIZE D

1.0" ON ORIGINAL DWG
SCALE: NTS



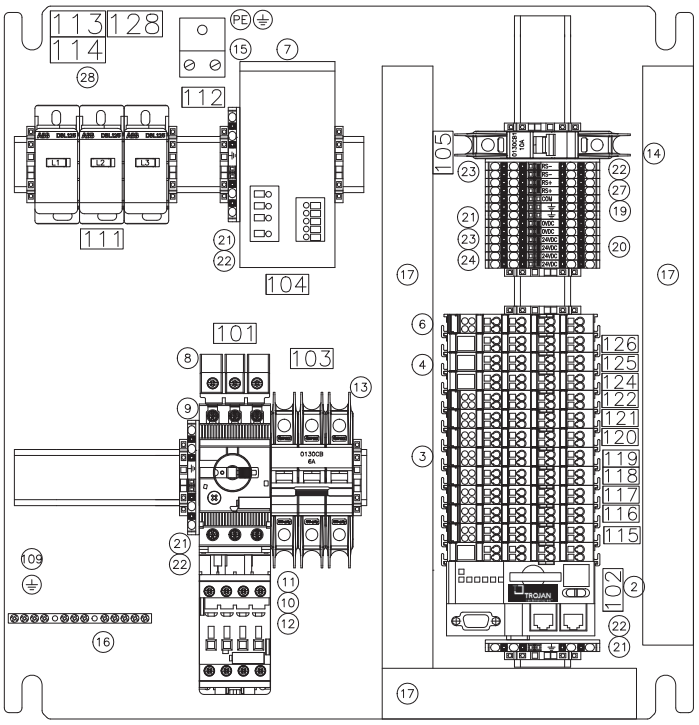
TROJANUV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: WD, UVSIGNA HSC 2
ANN ARBOR REPLACEMENT, MI

DRAWN BY	JRN	DWG NO.	REV
CHECKED BY	SPM	E171100051H2	1
APPROVED BY	MB		
APPROVAL DATE (YYYY-MM-DD)	2023-08-01	SHEET 05 OF 06	SIZE D

0 0.5 1.0
1.0" ON ORIGINAL DWG
SCALE: NTS



ITEM	QTY	NAMEPLATE NUMBER	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3
128	1	EMLP (27x12.5)	MAIN FEED	75C WIRE	
127					
126	1	EMLP (27x12.5)	DI3		
125	1	EMLP (27x12.5)	DI2		
124	1	EMLP (27x12.5)	DI1		
123					
122	1	EMLP (27x12.5)	DO8		
121	1	EMLP (27x12.5)	DO7		
120	1	EMLP (27x12.5)	DO6		
119	1	EMLP (27x12.5)	DO5		
118	1	EMLP (27x12.5)	DO4		
117	1	EMLP (27x12.5)	DO3		
116	1	EMLP (27x12.5)	DO2		
115	1	EMLP (27x12.5)	DO1		
114	1	EMLP (45x25)	INCOMING SUPPLY	480V 60 HZ	
113	1	EMLP (45x25)	ALL FIELD WIRING	USE COPPER	CONDUCTORS ONLY
112	1	EMLP (27x12.5)	TORQUE	50 lb.In	
111	1	EMLP (27x12.5)	TORQUE	31-44 lb.In	
110	1	US-EML (D12.5)	PE		
109	2	US-EML (D12.5)	⏚		
108					
107					
106					
105	1	EMLP (27x12.5)	0130CB1	10A PS	
104	1	EMLP (27x12.5)	0130PS	24VDC	
103	1	EMLP (27x12.5)	0130CB	POWER SUPPLY	
102	1	EMLP (27x12.5)	0215CNTLR	CONTROLLER	
101	1	EMLP (27x12.5)	0120MCB	MOTOR STARTER	
100					

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	TROJAN NUMBER
36	1	CABLE ASSY, HSC G4 RS485	CUSTOM	917750	917750
35					
34					
33					
32					
31					
30					
29					
NOTE 1 → 28	3	DIST BLOCK, 125A ABB	ABB	DBL125	917305-125
27					
26	1	RESISTOR, 120ohm DNET	---	---	913840
25	A/R	TERM BLK, END STOP CLIPFIX 35	PHOENIX CONTACT	3022276	916050-3022276
24	1	TERM BLK, JUMPER 4P FBS 4 5	PHOENIX CONTACT	3030187	916050-3030187
23	3	TERM BLK, JUMPER 2P FBS 2 5	PHOENIX CONTACT	3030161	916050-3030161
22	4	TERM BLK, END PLT D ST 2.5 GU	PHOENIX CONTACT	3030514	916050-3030514
21	5	TERM BLK, PIT 2.5 PE QUAT GND	PHOENIX CONTACT	3209594	916049-3209594
20	6	TERM BLK, PIT 2.5 QUATTRO BLU	PHOENIX CONTACT	3209581	916049-3209581
19	5	TERM BLK, PIT 2.5 QUATTRO GRY	PHOENIX CONTACT	3209578	916049-3209578
18	A/R	TERM BLK, DIN RAIL PERF 35X7.5	PHOENIX CONTACT	0801733	914147
17	A/R	WIRE DUCT, TYPE F LT GRY 1x3	PANDUIT	F1X3LG6 / C1LG6	913437-004
16	1	GROUND BAR, 12 TAP	Tab	35610203	917380-012BLU
NOTE 1 → 15	1	LUG, GND ZCON 600V 1/0-14AWG	BLACKBURN	ADR11-21	917397-1121
14	1	BREAKER, 10A 1P AC/DC C ABB	ABB	SU201M-C10	917139-MC1100
13	1	BREAKER, 6A 3P AC/DC C ABB	ABB	SU203M-C6	917139-MC3060
12	1	STARTER, AUXILIARY CONTACT	ABB	MS132-HKF1-11	917182-HKF111
11	1	STARTER, COUPLING LINK	ABB	BEA16-4	917182-BEA164
10	1	CONTACTOR, AF09 25A 1NO 24V	ABB	AF09-30-10-11	917180-09A024
9	1	STARTER, MS132 2.50A	ABB	MS132-2.5	917182-MS132G
8	1	STARTER, POWER IN FEED 3 PHASE	ABB	MS132-S1-M3-25	917182-S1M325
7	1	PS, 24VDC 3P TRIO 10A	PHOENIX CONTACT	2866459	916051-459
6	1	END MODULE	WAGO	750-600	916554-600
5					
4	3	DI 8CH 24VDC	WAGO	750-430	916554-430
3	8	DO 2CH RELAY	WAGO	750-512	916554-512
2	1	CONTROLLER, 8102T ENET RS485	CUSTOM	916554-8102T	916554-8102T
1	1	BACKPLATE, HSC G4 ELEC	CUSTOM	902041	902041

NOTE:

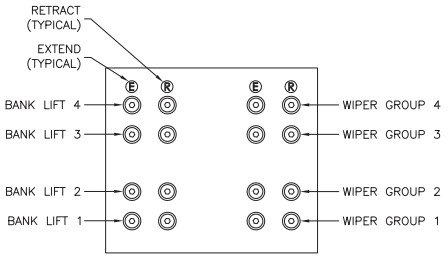
1. ACCORDING TO UL 508A, SECTION 54, ALL FIELD WIRING CONDUCTORS, EXTERNAL TO THE PANEL SHALL BE "COPPER CONDUCTORS ONLY" AND TEMPERATURE RATINGS FOR THE FIELD WIRING CONDUCTORS RATED LESS THAN 100 AMPS SHALL BE 75°C (167°F). REFER THE FOLLOWING BELOW MENTIONED DETAILS FOR FIELD WIRING TERMINATION TIGHTENING TORQUE.

   A. GROUND LUG 5.65 N-m (50 lb-in).
   B. DISTRIBUTION BLOCK 3.5- 5 N-m (30.97 - 44.25 lb-in).

TROJANUV
2020 DORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: WD, UVSIGNA HSC 2
ANN ARBOR REPLACEMENT, MI

DRAWN BY: JRN
CHECKED BY: SPM
APPROVED BY: MB
APPROVAL DATE (YYYY-MM-DD): 2023-08-01
DWG NO.: E171100051H2
REV: 1
SHEET: 06 OF 06
SIZE: D
SCALE: NTS



DETAIL A
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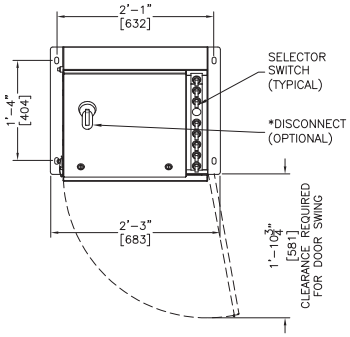

PLAN VIEW
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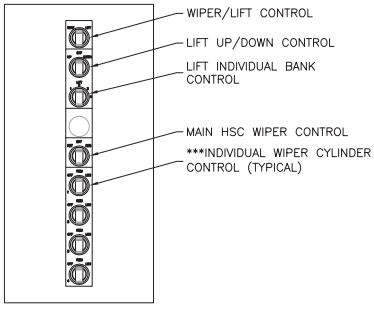

DETAIL B
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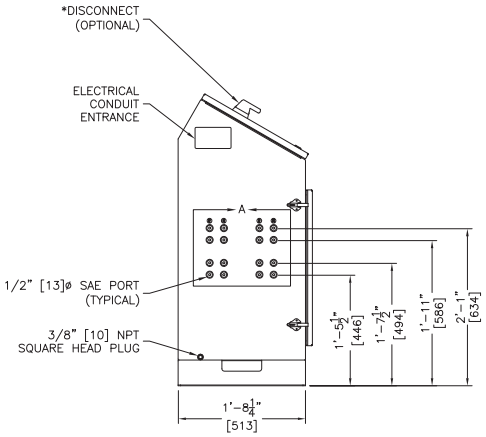
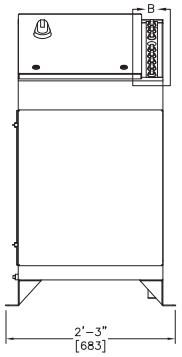
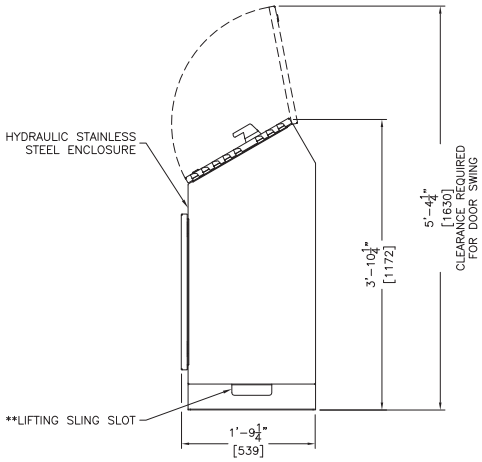


LEFT VIEW
SCALE: NOT TO SCALE



FRONT VIEW
SCALE: NOT TO SCALE



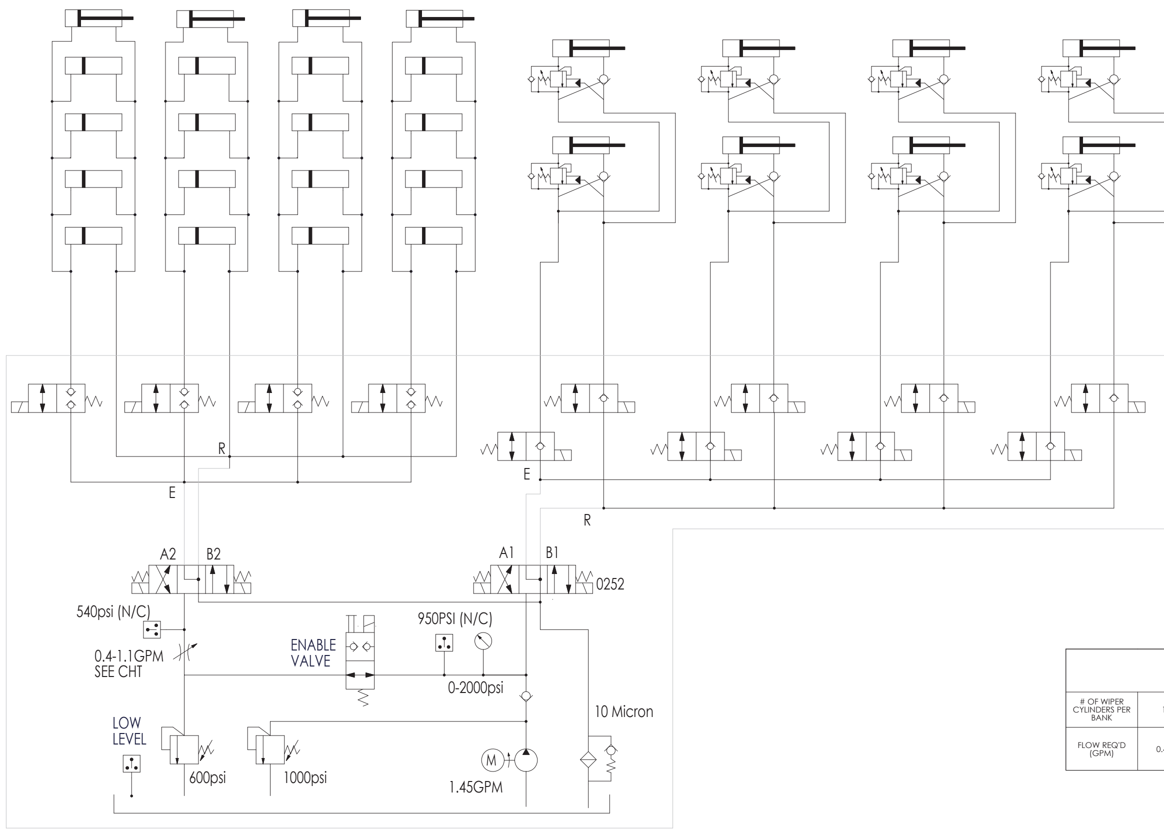
RIGHT VIEW
SCALE: NOT TO SCALE

NOTES:
: HYDRAULIC SYSTEM CENTER (HSC) TO BE 304 SST OR 316 SST (OPTIONAL)
: HSC WEIGHT 310 lbs. [141 kg]
* DISCONNECT WILL BE PROVIDED ON CE VERSION OR AVAILABLE AS AN OPTION ON UL VERSION.
** LIFTING SLING SLOT NOT FOR USE WITH LIFT CART OR LIFT TRUCK.
*** NOTE: THE NUMBER OF INDIVIDUAL WIPER CYLINDER CONTROL SWITCHES WILL VARY DEPENDING ON THE NUMBER IF BANKS. UNUSED PORTS TO BE SEALED BY TROJAN.

[ ] INDICATES mm UNLESS OTHERWISE SHOWN.

TROJANUV
A TROJAN TECHNOLOGIES BUSINESS

DESCRIPTION: STD, TROJANUVSIGNA HYDRAULIC SYSTEM CENTER (HSC) G4 ASSEMBLY		STD. DRAWING NO. SG0024	
DRAWN BY : SAH/MVW	DATE : 17SE21	REFERENCE NO. 907717C	
CHECKED BY : MMB	DATE : 17SE21		
APPROVED BY : CHB	DATE : 17SE21	DWG NO. D01	REV. C
SCALE (8.5x11) : NOT TO SCALE	LOG NUMBER : N/A		



FLOW REQUIREMENT				
# OF WIPER CYLINDERS PER BANK	1	2	3	4
FLOW REQ'D (GPM)	0.40	0.55	0.65	0.80

UVSIGNA 4ROWS - 4 BANKS WIPER/LIFT HYDRAULIC DIAGRAM

UNLESS OTHERWISE SPECIFIED:
DO NOT SCALE DRAWING
INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-2009
DIMENSIONS ARE IN INCHES
TOLERANCES APPLY AS SHOWN BELOW:
2 PL DEC ± 0.01
3 PL DEC ± 0.005
ANGLE ± 1.0
REMOVE ALL BURRS, ALL CORNERS R 0.010" OR BREAK EDGE. CRITICAL CHARACTERISTIC
THIRD ANGLE PROJECTION

SolidWorks MAINTAINED DATA CHANGES SHALL BE INCORPORATED ELECTRONICALLY

TROJAN technologies
TROJANUV Aquafine VIQUA salsnes
3020 GORE RD, LONDON, ONTARIO, CANADA, N5V-4T7

DRAWN BY	SML	DESCRIPTION	HSC, G4
CREATED ON	2013-01-21	DWG NO.	907717C
RELEASE LOG #	12-926	REV	Y
MASS: 0.00 lbs	SCALE 1:8	SHEET 12 OF 16	SIZE D

CURRENT STATUS: Released

PRODUCT-DETAILS

DBL125

DBL125 Screw Clamp Power distribution Terminal Blocks

General Information

Extended Product Type	DBL125
Product ID	1SNL312510R0000
EAN	3472599856585
Catalog Description	DBL125 Screw Clamp Power distribution Terminal Blocks
Long Description	- 8 connections: distribute unipolar and multipolar power lines, or combine several inputs - Mount it on Din rail or plate and save up to 50% rail space compared to conventional copper bars - Reduce the assembly time by 80% by avoiding to use fastening and isolating components - Increase the number of outputs by using the optional input and connecting two DBL together - Easy identification with the reversible cover and delivered pre-printed markers L1, L2, L3, N, PE, +, –.

Ordering

Color	Grey
Minimum Order Quantity	1 piece
Customs Tariff Number	85369010

Popular Downloads

Data Sheet, Technical Information	1SNC166013D0201
Instructions and Manuals	1SNC166001B0201

Dimensions

Product Net Width	28.2 mm
Product Net Height	75 mm
Product Net Depth / Length	50.7 mm
Product Net Weight	122 g

Technical

Rated Cross-Section	35 mm²
Spacing	28.2 mm
Connection Type	Screw Clamp
Function	Feed-through
Number of Levels	1
Connecting Capacity Main Circuit	Screw Clamp / Rigid 1x 10 ... 35 mm²
Rated Current (I_n)	Main Circuit 125 A
Rated Short-time Withstand Current (I_{cw})	for 1 s 4200 A
Rated Impulse Withstand Voltage (U_{imp})	8000 V
Dielectric Test Voltage	2200 V
Pollution Degree	3
Power Loss	4 W
Degree of Protection	acc. to IEC 60529, IEC 60947-1, EN 60529 Main Terminals IP20
Insulation Material	Polyamide
Mounting on DIN Rail	TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715 TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715
Tightening Torque	Main Circuit 3.5 ... 5 N·m

Technical UL/CSA

Maximum Operating Voltage UL/CSA	Main Circuit 1000 V
Connecting Capacity UL/CSA	Stranded 2 AWG
Flammability According to UL94	V-0
Short-Circuit Current Rating (SCCR)	100 kA

Environmental

Ambient Air Temperature	Operation -55 ... +110 °C Storage -55 ... +110 °C
RoHS Status	Following EU Directive 2002/95/EC August 18, 2005 and amendment

Certificates and Declarations (Document Number)

BV Certificate	1SND166008A0200
CB Certificate	1SND166005A0201
CSA Certificate	1SND166007A0201
cUL Certificate	1SND166006A0201
Declaration of Conformity - CE	1SND225005U1000
EAC Certificate	1SND161011A1100
Environmental Information	1SND220095E1000
Instructions and Manuals	1SNC166001B0201
RoHS Information	1SND230557F0201

Classifications

Object Classification Code	X
ETIM 4	EC000276 - Distribution terminal block
ETIM 5	EC000276 - Distribution terminal block
ETIM 6	EC000276 - Distribution terminal block

Container Information

Package Level 1 Units	1 piece
Package Level 1 Width	57 mm
Package Level 1 Depth / Length	95 mm
Package Level 1 Height	37 mm
Package Level 1 Gross Weight	0.14 kg
Package Level 1 EAN	3472599856585
Package Level 2 Units	75 piece
Package Level 2 Width	230 mm
Package Level 2 Depth / Length	380 mm
Package Level 2 Height	310 mm
Package Level 2 Gross Weight	10.5 kg

Categories

Low Voltage Products and Systems → Connection Devices → Terminal Blocks → SNK Series

System pro *M* compact®
Miniature Circuit Breaker SU200M
for branch circuit protection acc. to UL 489

The miniature circuit breaker SU 200 M is ABB's solution for UL 489 branch circuit protection up to 480 Y/277 V AC and 96 V DC. This circuit breaker is an all-round device for AC and DC applications for universal use in North American and global markets due to its approvals acc. to the international standards UL, CSA and IEC. Moreover, SU 200 M is fully compatible with System pro *M* compact® UL 489 accessories.

Features

- High performance MCB with 10 kA interrupting capacity acc. to UL 489 / CSA 22.2 No. 5 and 15 kA breaking capacity acc. to IEC/EN 60947-2
- Certified up to I_n = 40 A at 480 Y/277 V AC acc. to UL 489 / CSA 22.2 No. 5
- Certified for AC and DC use acc. to UL and CSA
- 40 °C reference temperature acc. to UL and CSA
- Current limiting acc. to UL 489
- Clear contact position indication in red/green ("real CPI")

Standards and approvals

Standards	
UL 489	
CSA 22.2 No. 5	
IEC/EN 60947-2	
Approvals	
UL 489	US
CSA 22.2 No. 5	CA
VDE	DE
CCC	CN

Miniature Circuit Breaker SU200M
Technical data
HSC Item 14
Breaker, 10A 1P AC/DC C - ABB SU201M-C10 / Trojan P/N 917139-MC1100 pg. 2/6

General Data		
Standards		UL 489, CSA 22.2 No. 5, IEC/EN 60947-2
Poles		1P, 2P, 3P, 4P
Tripping characteristics		C, K, Z
Rated current I_n		0.2 - 63 A
Rated frequency f		50 / 60 Hz, DC (0 Hz)
Rated insulation voltage U_i acc. to IEC/EN 60664-1		250 V AC (phase to ground), 440 V AC (phase to phase)
Overvoltage category		III
Pollution degree		3
IEC/EN 60947-2		
Rated operational voltage U_e		1P: 230 V AC; 2P, 3P, 4P: 400 V AC
Max. power frequency recovery voltage U_{max}	AC	1P: 253 V AC; 2P, 3P, 4P: 440 V AC
Min. operating voltage		12 V AC, 12 V DC
Rated ultimate short-circuit breaking capacity I_{cu}		15 kA
Rated service short-circuit breaking capacity I_{cs}		≤ 40 A: 11.25 kA > 40 A: 7.5 kA
Rated impulse withstand voltage U_{imp} (1.2/50µs)		4 kV (test voltage 6.2 kV at sea level, 5 kV at 2,000 m)
Dielectric test voltage		2 kV (50 / 60Hz, 1 min.)
Reference temperature for tripping characteristics		30 °C
Electrical endurance		I_n < 30 A: 20,000 ops (AC), I_n ≥ 30 A: 10,000 ops. (AC); 1 cycle (2 s - ON, 13 s - OFF, I_n ≤ 32 A), 1 cycle (2 s - ON, 28 s - OFF, I_n > 32 A)
UL / CSA		
Rated voltage	AC	1P: 277 V AC up to 40 A for C, Z char.,
	AC	277 V AC up to 35 A for K char., 240 V AC
	AC	2P, 3P, 4P: 480 Y / 277 V AC up to 40 A for C, Z char.,
	AC	480 Y / 277 V AC up to 35 A for K char., 240 V AC
	DC	1P: 48 V DC; 2P: 96 V DC (2p in series)
Rated interrupting capacity acc. to UL 1077		–
Short-circuit current rating acc. to UL 489		10 kA
Application		–
Reference temperature for tripping characteristics		40 °C
Electrical endurance		6,000 ops (AC), 6,000 ops. (DC); 1 cycle (1 s - ON, 9 s - OFF)
Mechanical data		
Housing		Insulation group II, RAL 7035
Toggle		Insulation group II, black, sealable
Contact position indication		Real CPI (green OFF / red ON)
Protection degree acc. to DIN EN 60529		IP20*, IP40 in enclosure with cover
Mechanical endurance		20,000 ops.
Shock resistance acc. to IEC/EN 60068-2-27		25 g - 2 shocks - 13 ms
Vibration resistance acc. to IEC/EN 60068-2-6		5g - 20 cycles at 5…150…5 Hz with load 0.8 I_n
Environmental conditions (damp heat cyclic) acc. to IEC/EN 60068-2-30		28 cycles with 55°C/90-96% and 25°C/95-100%
Ambient temperature		-25 ... +55°C
Storage temperature		-40 ... +70 °C
Installation		
Terminal		Failsafe bi-directional cylinder-lift terminal
Cross-section of conductors (top/bottom)		solid, stranded: 35 mm² / 35 mm² flexible: 25 mm² / 25 mm² 18 – 4 AWG
Cross-section of busbars (top/bottom)		10 mm² / 10 mm² 18 – 8 AWG
Torque		2.8 Nm AWG 18-16: 13.3 in-lbs. AWG 14-10: 17.7 in-lbs. AWG 8-4: 39.8 in-lbs.
Screwdriver		No. 2 Pozidrive
Mounting		On DIN rail 35 mm acc. to EN 60715 by fast clip
Mounting position		any
Supply		optional
Dimensions and weight		
Mounting dimensions acc. to DIN 43880		Mounting dimension 3
Pole dimensions (H x D x W)		111 x 69 x 17.5 mm
Pole weight		approx. 125 g
Combination with auxiliary elements		
Auxiliary contact		Yes
Signal contact		Yes
Shunt trip		Yes

Miniature Circuit Breaker SU200M
Tripping characteristics

HSC Item 14
Breaker, 10A 1P AC/DC C - ABB SU201M-C10 / Trojan P/N 917139-MC1100 pg. 3/6

Tripping characteristics

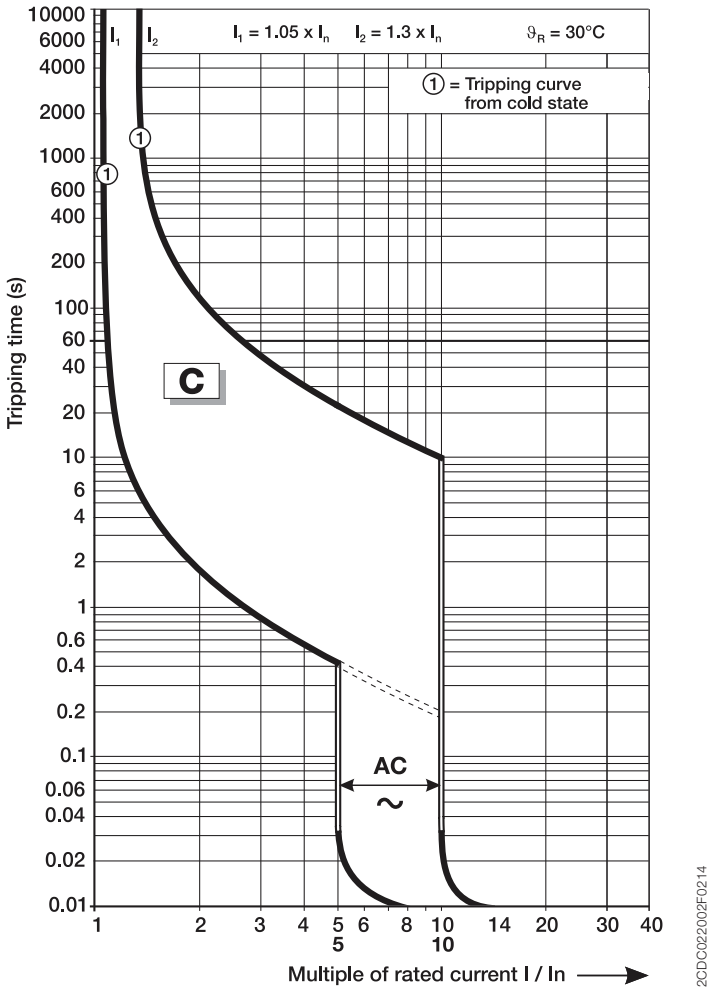
Acc. to	Tripping characte-ristics	Rated current	Thermal release [1]			Electromagnetic release [2]		
			Currents: conventional non-tripping current	conventional tripping current	Tripping time	Range of instantaneous tripping		Tripping time
		I_n	I_1	I_2				
IEC/EN 60947-2	C	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$5 \cdot I_n$	$10 \cdot I_n$	> 0.2 s < 0.2 s
	K	0.2 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$10 \cdot I_n$	$14 \cdot I_n$	> 0.2 s < 0.2 s
	Z	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$2 \cdot I_n$	$3 \cdot I_n$	> 0.2 s < 0.2 s

[1] The thermal releases are calibrated to a nominal reference ambient temperature of 30 °C.
In the case of higher ambient temperatures, the current values fall by approx. 6 % for each 10 K temperature rise.

[2] The indicated tripping values of electromagnetic tripping devices apply to a frequency of 50/60 Hz. The thermal release operates independent of frequency.

[3] As from operating temperature (after I_1 > 1h)

C characteristic



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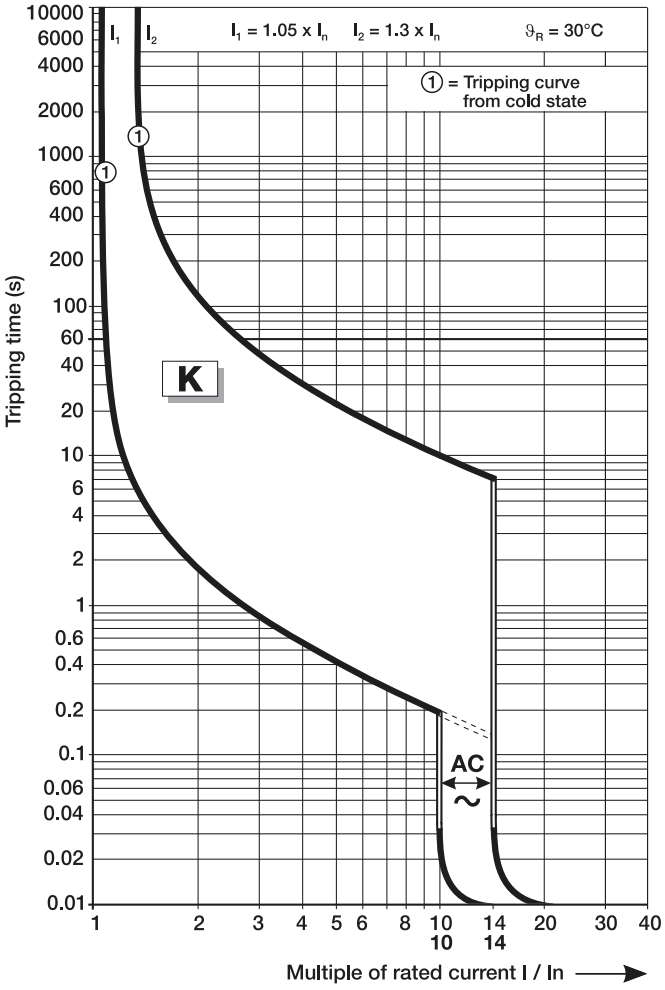
Miniature Circuit Breaker SU200M

Tripping characteristics

HSC Item 14

Breaker, 10A 1P AC/DC C - ABB SU201M-C10 / Trojan P/N 917139-MC1100 pg. 4/6

K characteristic



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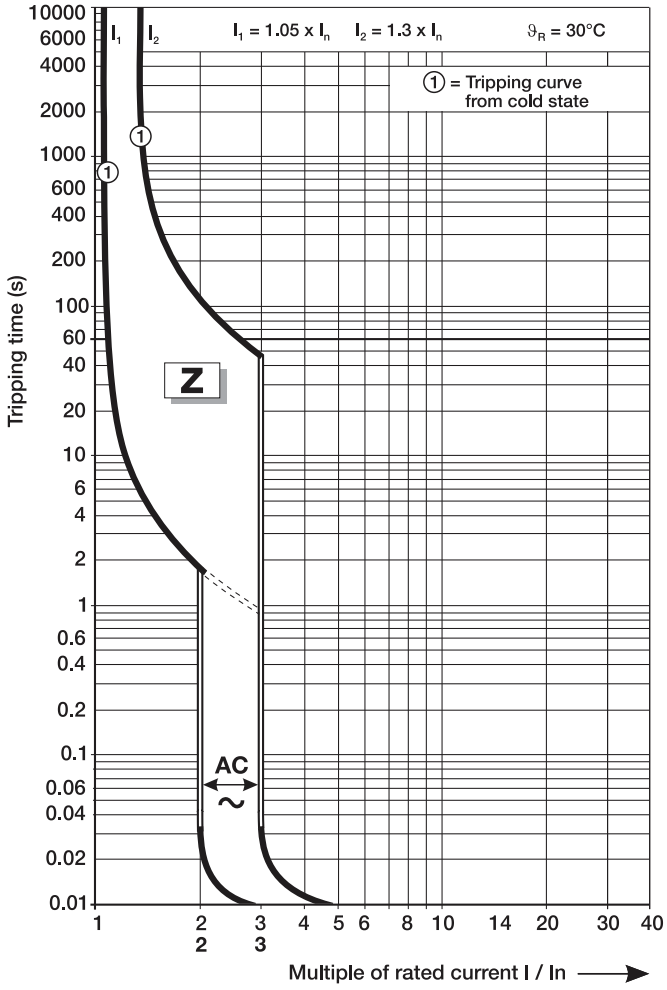
Z characteristic



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Miniature Circuit Breaker SU200M

Current limiting – I_{peak} and I^2t values acc. to UL 489

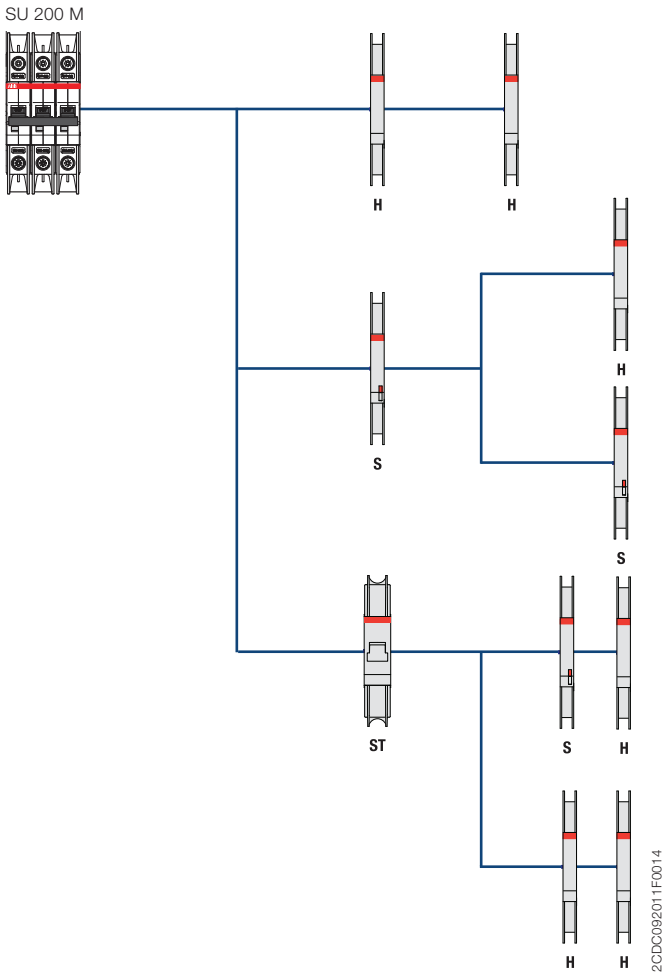
HSC Item 14

Breaker, 10A 1P AC/DC C - ABB SU201M-C10 / Trojan P/N 917139-MC1100 pg. 5/6

Type	Voltage	Current	Power Factor	Phase	I_{peak}	I^2t
		A			kA	kA^2S
SU203M-K0.2	480Y/277	10000	0.45-0.5	3	0.026	0.008
SU203M-K7	480Y/277	4095	0.45-0.5	3	2.3	11.9
SU203M-K7	480Y/277	7500	0.45-0.5	3	3.4	16.7
SU203M-K7	480Y/277	10000	0.45-0.5	3	4.6	19.0
SU203M-K20	480Y/277	4095	0.45-0.5	3	2.9	18.1
SU203M-K20	480Y/277	7500	0.45-0.5	3	4.3	28.1
SU203M-K20	480Y/277	10000	0.45-0.5	3	6.4	34.6
SU203M-K35	480Y/277	4095	0.45-0.5	3	3.4	27.9
SU203M-K35	480Y/277	7500	0.45-0.5	3	4.7	33.1
SU203M-K35	480Y/277	10000	0.45-0.5	3	9.0	72.0
SU203M-C40	480Y/277	4095	0.45-0.5	3	3.4	22.8
SU203M-C40	480Y/277	7500	0.45-0.5	3	5.1	42.5
SU203M-C40	480Y/277	10000	0.45-0.5	3	9.3	74.6
SU201M-K0.2	277	10000	0.45-0.5	1	0.7	0.092
SU201M-K7	277	4095	0.45-0.5	1	2.5	10.5
SU201M-K7	277	7500	0.45-0.5	1	3.4	16.9
SU201M-K7	277	10000	0.45-0.5	1	3.4	14.5
SU201M-K20	277	4095	0.45-0.5	1	2.8	14.7
SU201M-K20	277	7500	0.45-0.5	1	4.1	23.5
SU201M-K20	277	10000	0.45-0.5	1	4.7	32.5
SU201M-K35	277	4095	0.45-0.5	1	3.0	19.8
SU201M-K35	277	7500	0.45-0.5	1	4.7	36.5
SU201M-K35	277	10000	0.45-0.5	1	4.4	22.1
SU201M-C40	277	4095	0.45-0.5	1	3.6	22.9
SU201M-C40	277	7500	0.45-0.5	1	5.3	52.6
SU201M-C40	277	10000	0.45-0.5	1	5.9	44.9
SU203M-K63	240	4095	0.45-0.5	3	3.6	19.9
SU203M-K63	240	7500	0.45-0.5	3	5.1	33.0
SU203M-K63	240	10000	0.45-0.5	3	6.3	43.3
SU201M-K63	240	4095	0.45-0.5	1	3.9	33.8
SU201M-K63	240	7500	0.45-0.5	1	5.2	43.8
SU201M-K63	240	10000	0.45-0.5	1	6.5	61.8

Miniature Circuit Breaker SU200M
Accessories and dimensional drawing
HSC Item 14
Breaker, 10A 1P AC/DC C - ABB SU201M-C10 / Trojan P/N 917139-MC1100 pg. 6/6

Accessory overview

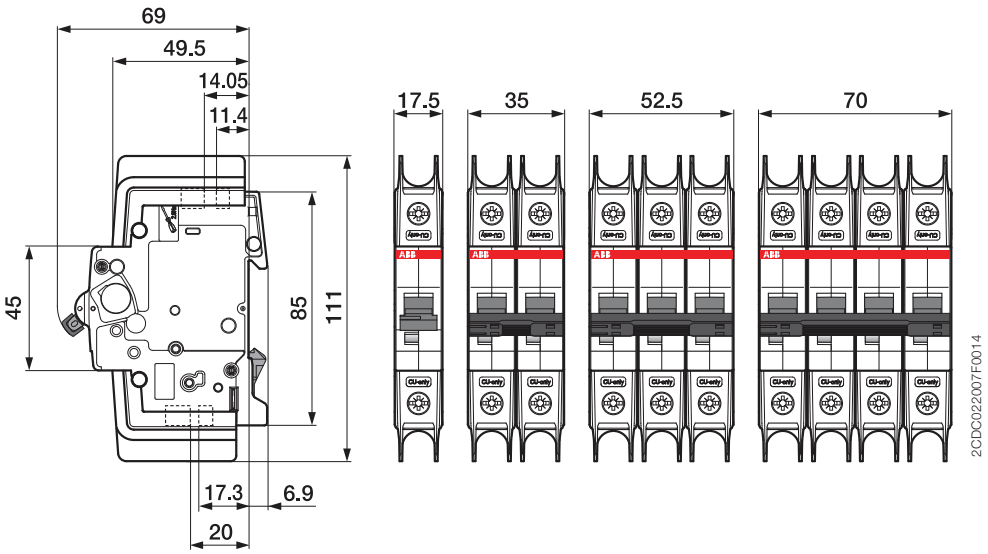


H	Auxiliary contact (change-over contact)	S2C-H6RU
S/H	Signal contact	S2C-S6RU
ST	Shunt trip	S2C-A...U

The certification of the Accessories has been done with one accessory only.

The number of electrical operations is limited to 4,000 operations for the maximum combinations and the combinations including shunt trips.

Dimensional drawing



System pro *M* compact®
Miniature Circuit Breaker SU200M
for branch circuit protection acc. to UL 489

The miniature circuit breaker SU 200 M is ABB's solution for UL 489 branch circuit protection up to 480 Y/277 V AC and 96 V DC. This circuit breaker is an all-round device for AC and DC applications for universal use in North American and global markets due to its approvals acc. to the international standards UL, CSA and IEC. Moreover, SU 200 M is fully compatible with System pro *M* compact® UL 489 accessories.

Features

- High performance MCB with 10 kA interrupting capacity acc. to UL 489 / CSA 22.2 No. 5 and 15 kA breaking capacity acc. to IEC/EN 60947-2
- Certified up to I_n = 40 A at 480 Y/277 V AC acc. to UL 489 / CSA 22.2 No. 5
- Certified for AC and DC use acc. to UL and CSA
- 40 °C reference temperature acc. to UL and CSA
- Current limiting acc. to UL 489
- Clear contact position indication in red/green ("real CPI")

Standards and approvals

Standards	
UL 489	
CSA 22.2 No. 5	
IEC/EN 60947-2	
Approvals	
UL 489	US
CSA 22.2 No. 5	CA
VDE	DE
CCC	CN

Miniature Circuit Breaker SU200M
Technical data
HSC Item 13
Breaker, 6A 1P AC/DC C - ABB SU203M-C6 / Trojan P/N 917139-MC3060 pg. 2/6

General Data		
Standards		UL 489, CSA 22.2 No. 5, IEC/EN 60947-2
Poles		1P, 2P, 3P, 4P
Tripping characteristics		C, K, Z
Rated current I_n		0.2 - 63 A
Rated frequency f		50 / 60 Hz, DC (0 Hz)
Rated insulation voltage U_i acc. to IEC/EN 60664-1		250 V AC (phase to ground), 440 V AC (phase to phase)
Overvoltage category		III
Pollution degree		3
IEC/EN 60947-2		
Rated operational voltage U_e		1P: 230 V AC; 2P, 3P, 4P: 400 V AC
Max. power frequency recovery voltage U_{max}	AC	1P: 253 V AC; 2P, 3P, 4P: 440 V AC
Min. operating voltage		12 V AC, 12 V DC
Rated ultimate short-circuit breaking capacity I_{cu}		15 kA
Rated service short-circuit breaking capacity I_{cs}		≤ 40 A: 11.25 kA > 40 A: 7.5 kA
Rated impulse withstand voltage U_{imp} (1.2/50µs)		4 kV (test voltage 6.2 kV at sea level, 5 kV at 2,000 m)
Dielectric test voltage		2 kV (50 / 60Hz, 1 min.)
Reference temperature for tripping characteristics		30 °C
Electrical endurance		I_n < 30 A: 20,000 ops (AC), I_n ≥ 30 A: 10,000 ops. (AC); 1 cycle (2 s - ON, 13 s - OFF, I_n ≤ 32 A), 1 cycle (2 s - ON, 28 s - OFF, I_n > 32 A)
UL / CSA		
Rated voltage	AC	1P: 277 V AC up to 40 A for C, Z char.,
	AC	277 V AC up to 35 A for K char., 240 V AC
	AC	2P, 3P, 4P: 480 Y / 277 V AC up to 40 A for C, Z char.,
	AC	480 Y / 277 V AC up to 35 A for K char., 240 V AC
	DC	1P: 48 V DC; 2P: 96 V DC (2p in series)
Rated interrupting capacity acc. to UL 1077		–
Short-circuit current rating acc. to UL 489		10 kA
Application		–
Reference temperature for tripping characteristics		40 °C
Electrical endurance		6,000 ops (AC), 6,000 ops. (DC); 1 cycle (1 s - ON, 9 s - OFF)
Mechanical data		
Housing		Insulation group II, RAL 7035
Toggle		Insulation group II, black, sealable
Contact position indication		Real CPI (green OFF / red ON)
Protection degree acc. to DIN EN 60529		IP20*, IP40 in enclosure with cover
Mechanical endurance		20,000 ops.
Shock resistance acc. to IEC/EN 60068-2-27		25 g - 2 shocks - 13 ms
Vibration resistance acc. to IEC/EN 60068-2-6		5g - 20 cycles at 5…150…5 Hz with load 0.8 I_n
Environmental conditions (damp heat cyclic) acc. to IEC/EN 60068-2-30		28 cycles with 55°C/90-96% and 25°C/95-100%
Ambient temperature		-25 ... +55°C
Storage temperature		-40 ... +70 °C
Installation		
Terminal		Failsafe bi-directional cylinder-lift terminal
Cross-section of conductors (top/bottom)		solid, stranded: 35 mm² / 35 mm² flexible: 25 mm² / 25 mm² 18 – 4 AWG
Cross-section of busbars (top/bottom)		10 mm² / 10 mm² 18 – 8 AWG
Torque		2.8 Nm AWG 18-16: 13.3 in-lbs. AWG 14-10: 17.7 in-lbs. AWG 8-4: 39.8 in-lbs.
Screwdriver		No. 2 Pozidrive
Mounting		On DIN rail 35 mm acc. to EN 60715 by fast clip
Mounting position		any
Supply		optional
Dimensions and weight		
Mounting dimensions acc. to DIN 43880		Mounting dimension 3
Pole dimensions (H x D x W)		111 x 69 x 17.5 mm
Pole weight		approx. 125 g
Combination with auxiliary elements		
Auxiliary contact		Yes
Signal contact		Yes
Shunt trip		Yes

Miniature Circuit Breaker SU200M
Tripping characteristics

HSC Item 13
Breaker, 6A 1P AC/DC C - ABB SU203M-C6 / Trojan P/N 917139-MC3060 pg. 3/6

Tripping characteristics

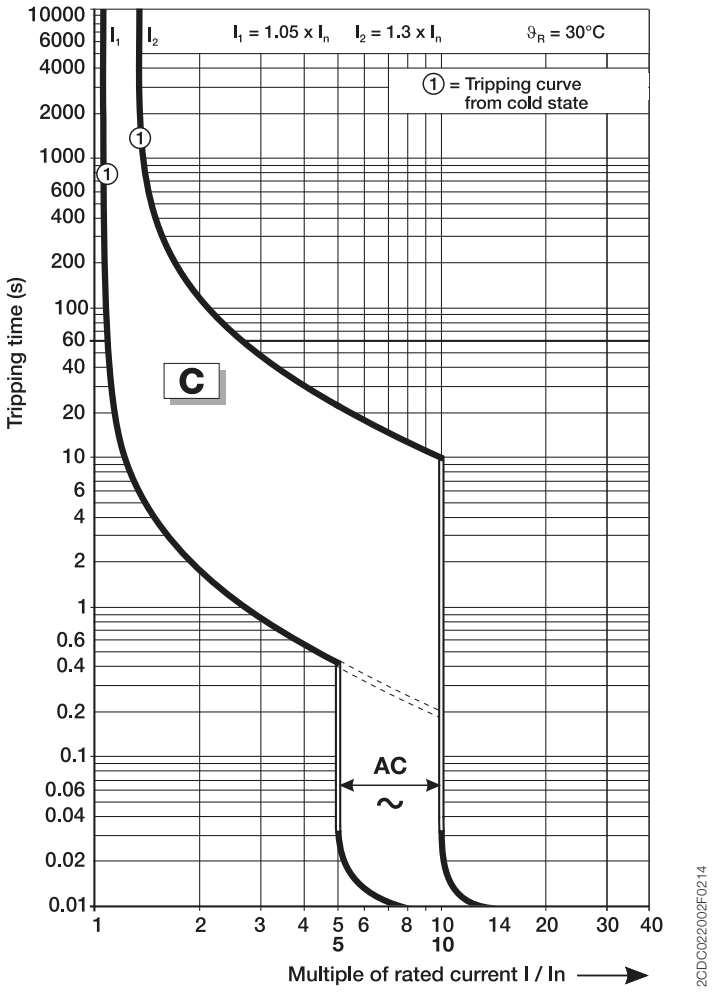
Acc. to	Tripping characte-ristics	Rated current	Thermal release [1]			Electromagnetic release [2]		
			Currents: conventional non-tripping current	conventional tripping current	Tripping time	Range of instantaneous tripping		Tripping time
		I_n	I_1	I_2				
IEC/EN 60947-2	C	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$5 \cdot I_n$	$10 \cdot I_n$	> 0.2 s < 0.2 s
	K	0.2 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$10 \cdot I_n$	$14 \cdot I_n$	> 0.2 s < 0.2 s
	Z	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$2 \cdot I_n$	$3 \cdot I_n$	> 0.2 s < 0.2 s

[1] The thermal releases are calibrated to a nominal reference ambient temperature of 30 °C.
In the case of higher ambient temperatures, the current values fall by approx. 6 % for each 10 K temperature rise.

[2] The indicated tripping values of electromagnetic tripping devices apply to a frequency of 50/60 Hz. The thermal release operates independent of frequency.

[3] As from operating temperature (after I_1 > 1h)

C characteristic



2CDC022002F0214

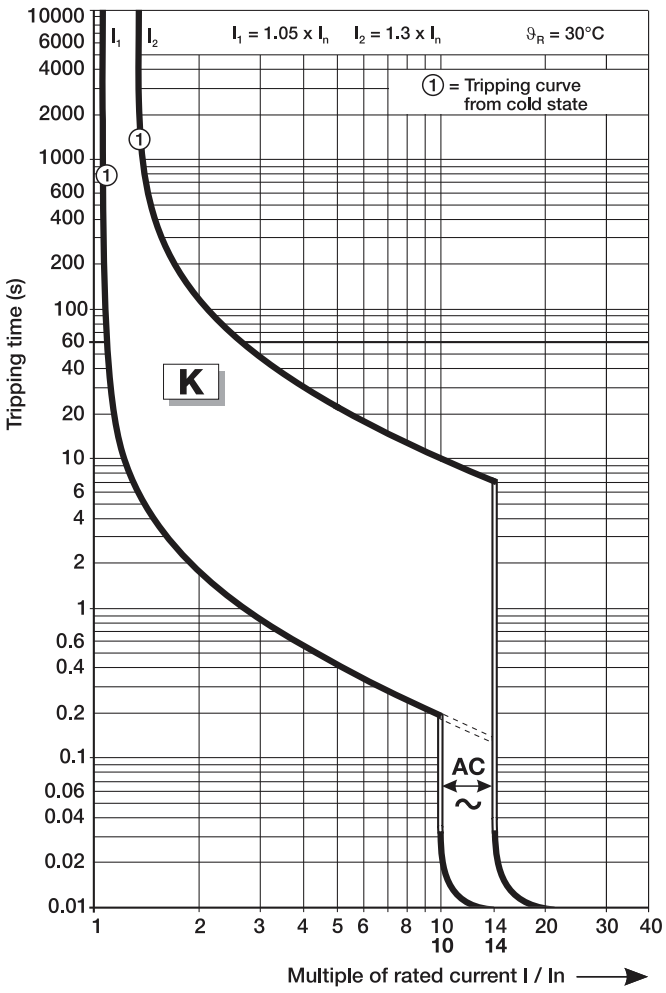
Miniature Circuit Breaker SU200M

Tripping characteristics

HSC Item 13

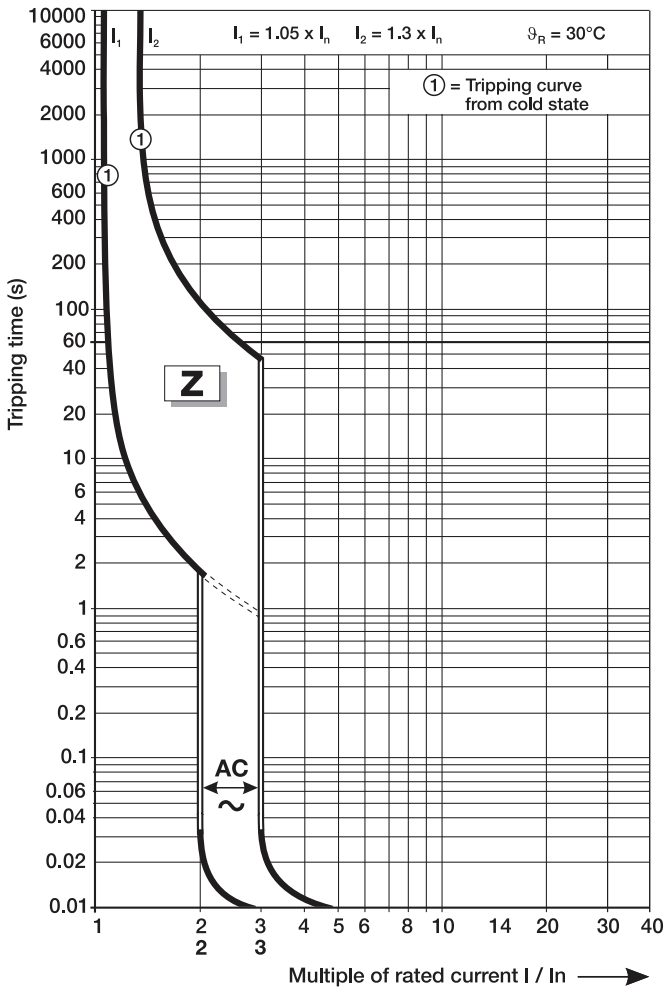
Breaker, 6A 1P AC/DC C - ABB SU203M-C6 / Trojan P/N 917139-MC3060 4/6

K characteristic



2CDC022004F0214

Z characteristic



2CDC022005F0214

Miniature Circuit Breaker SU200M

Current limiting – I_{peak} and I^2t values acc. to UL 489

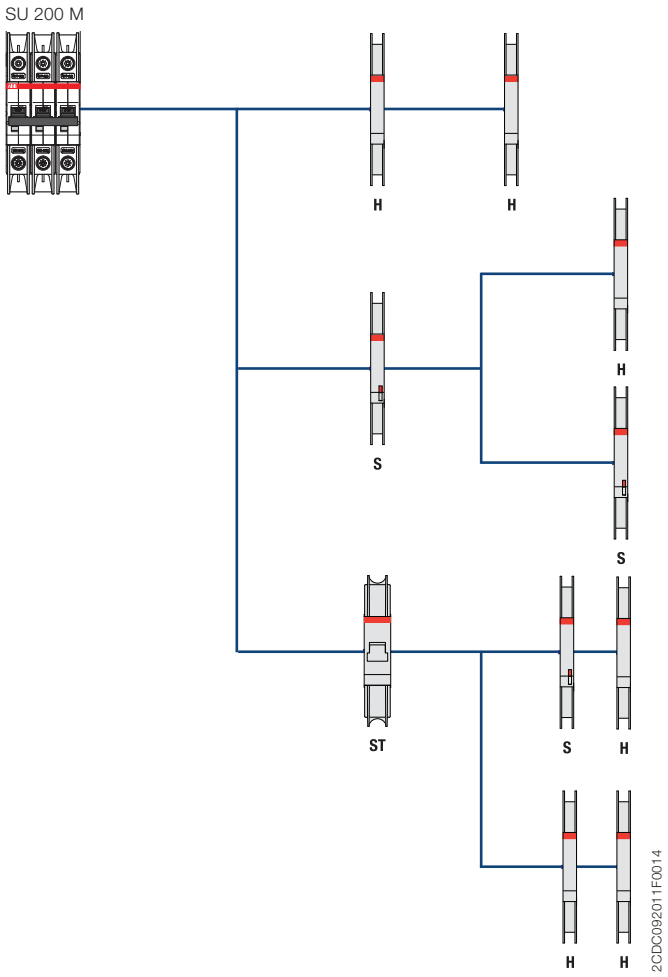
HSC Item 13

Breaker, 6A 1P AC/DC C - ABB SU203M-C6 / Trojan P/N 917139-MC3060 pg. 5/6

Type	Voltage	Current	Power Factor	Phase	I_{peak}	I^2t
		A			kA	kA^2S
SU203M-K0.2	480Y/277	10000	0.45-0.5	3	0.026	0.008
SU203M-K7	480Y/277	4095	0.45-0.5	3	2.3	11.9
SU203M-K7	480Y/277	7500	0.45-0.5	3	3.4	16.7
SU203M-K7	480Y/277	10000	0.45-0.5	3	4.6	19.0
SU203M-K20	480Y/277	4095	0.45-0.5	3	2.9	18.1
SU203M-K20	480Y/277	7500	0.45-0.5	3	4.3	28.1
SU203M-K20	480Y/277	10000	0.45-0.5	3	6.4	34.6
SU203M-K35	480Y/277	4095	0.45-0.5	3	3.4	27.9
SU203M-K35	480Y/277	7500	0.45-0.5	3	4.7	33.1
SU203M-K35	480Y/277	10000	0.45-0.5	3	9.0	72.0
SU203M-C40	480Y/277	4095	0.45-0.5	3	3.4	22.8
SU203M-C40	480Y/277	7500	0.45-0.5	3	5.1	42.5
SU203M-C40	480Y/277	10000	0.45-0.5	3	9.3	74.6
SU201M-K0.2	277	10000	0.45-0.5	1	0.7	0.092
SU201M-K7	277	4095	0.45-0.5	1	2.5	10.5
SU201M-K7	277	7500	0.45-0.5	1	3.4	16.9
SU201M-K7	277	10000	0.45-0.5	1	3.4	14.5
SU201M-K20	277	4095	0.45-0.5	1	2.8	14.7
SU201M-K20	277	7500	0.45-0.5	1	4.1	23.5
SU201M-K20	277	10000	0.45-0.5	1	4.7	32.5
SU201M-K35	277	4095	0.45-0.5	1	3.0	19.8
SU201M-K35	277	7500	0.45-0.5	1	4.7	36.5
SU201M-K35	277	10000	0.45-0.5	1	4.4	22.1
SU201M-C40	277	4095	0.45-0.5	1	3.6	22.9
SU201M-C40	277	7500	0.45-0.5	1	5.3	52.6
SU201M-C40	277	10000	0.45-0.5	1	5.9	44.9
SU203M-K63	240	4095	0.45-0.5	3	3.6	19.9
SU203M-K63	240	7500	0.45-0.5	3	5.1	33.0
SU203M-K63	240	10000	0.45-0.5	3	6.3	43.3
SU201M-K63	240	4095	0.45-0.5	1	3.9	33.8
SU201M-K63	240	7500	0.45-0.5	1	5.2	43.8
SU201M-K63	240	10000	0.45-0.5	1	6.5	61.8

Miniature Circuit Breaker SU200M
Accessories and dimensional drawing
HSC Item 13
Breaker, 6A 1P AC/DC C - ABB SU203M-C6 / Trojan P/N 917139-MC3060 pg. 6/6

Accessory overview

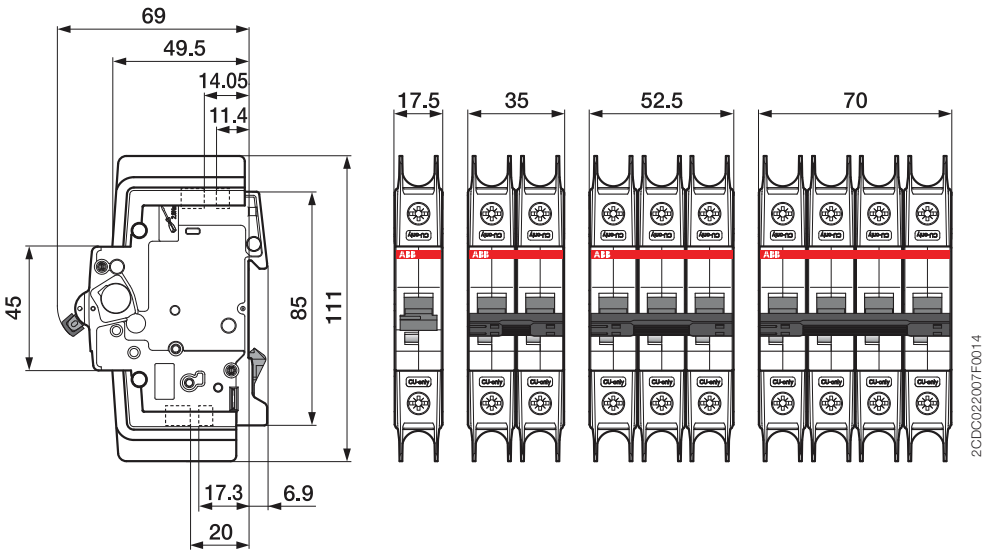


H	Auxiliary contact (change-over contact)	S2C-H6RU
S/H	Signal contact	S2C-S6RU
ST	Shunt trip	S2C-A...U

The certification of the Accessories has been done with one accessory only.

The number of electrical operations is limited to 4,000 operations for the maximum combinations and the combinations including shunt trips.

Dimensional drawing



Extract from the online catalog

TRIO-PS/ 3AC/24DC/10

Order No.: 2866459

http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=2866459

DIN rail power supply unit, primary-switched mode, 3-phase, output: 24 V DC / 10 A

Commercial data	
EAN	4 046356 046701
sales group	H001
Pack	1 Pcs.
Customs tariff	85044082
Gross weight in pieces	1.4361 KG
Net weight per piece	1.4361 KG
Catalog page information	Page 593 (IF-2011)

Product notes

WEEE/RoHS-compliant since: 09/06/2006

http://www.download.phoenixcontact.com
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Product description

TRIO POWER is the DIN-rail-mountable power supply unit with basic functions. With an output voltage of 5 V DC, 12 V DC, 24 V DC, and 48 V DC and 1- and 3-phase versions with 60 W or 960 W, it is particularly suited for use in series production in mechanical engineering. The wide-range input and international certification package allow worldwide implementation.

The high MTBF of 500,000 h stands for high supply reliability. The devices can be connected in parallel to increase the capacity and redundancy.

The clear LED signaling and the device connection with double terminal block for plus and minus for fast potential distribution are further advantages of this device series. A third minus terminal block simplifies the grounding on the

secondary side. All power supply units are idle-proof and short-circuit-proof and provide a regulated and adjustable output voltage.

Technical data

Input data

Nominal input voltage	2x / 3x 400 V AC ... 500 V AC
AC input voltage range	3x 320 V AC ... 575 V AC (for 3-phase operation)
	2x 360 V AC ... 575 V AC (for 2-phase operation)
AC frequency range	45 Hz ... 65 Hz
Current consumption	Approx. 3x 0.6 A (400 V AC)
	3x 0.5 A (480 V AC)
Inrush surge current	< 15 A
Power failure bypass	> 20 ms (400 V AC)
	> 25 ms (480 V AC)
Permissible backup fuse	B6
	B10
	B16
Required backup fuse (device and line protection)	(externally via 3 circuit breakers 6 A, 10 A or 16 A, characteristic B)
Power factor (cos phi)	0.59
Type of protection	Transient surge protection
Protective circuit/component	Varistor

Output data

Nominal output voltage	24 V DC ±1%
Setting range of the output voltage	22.5 V DC ... 29.5 V DC (> 24 V constant capacity)
Output current	10 A (-25°C ... 55°C)
Derating	55 °C ... 70 °C (2.5%/K)
Connection in parallel	Yes, for redundancy and increased capacity
Connection in series	Yes
Max. capacitive load	Unlimited
Current limitation	Approx. 15 A
Control deviation	< 1 % (change in load, static 10% ... 90%)
	< 2 % (change in load, dynamic 10% ... 90%)
	< 0.1 % (change in input voltage ±10%)
Residual ripple	PP
Peak switching voltages nominal load	PP

Maximum power dissipation NO-Load	6 W
Power loss nominal load max.	28 W

General data

Width	60 mm
Height	130 mm
Depth	152.5 mm
Net weight	1.3 kg
Operating voltage display	Green LED
Efficiency	> 89 % (at 400 V AC and nominal values)
Insulation voltage input/output	4 kV AC (type test)
	2 kV AC (routine test)
Degree of protection	IP20
Protection class	I, with PE connection
MTBF (IEC 61709, SN 29500)	> 500000 h (nach EN 29500)
Ambient temperature (operation)	-25 °C ... 70 °C (> 55° C derating)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	95 % (at 25 °C, no condensation)
Mounting position	horizontal DIN rail NS 35, EN 60715
Assembly instructions	Can be aligned: Horizontally 0 mm, vertically 50 mm
Electromagnetic compatibility	Conformance with EMC Directive 2004/108/EC
Noise immunity	EN 61000-6-2:2005
Low Voltage Directive	Conformance with LV directive 2006/95/EC
Standard – Electrical equipment of machines	EN 60204
Standard - Electrical safety	EN 60950-1/VDE 0805 (SELV)
Standard – Electronic equipment for use in electrical power installations and their assembly into electrical power installations	EN 50178/VDE 0160 (PELV)
Standard – Safety extra-low voltage	EN 60950-1 (SELV)
	EN 60204 (PELV)
Standard - Safe isolation	DIN VDE 0100-410
	DIN VDE 0106-1010
Standard – Protection against electric shock	DIN 57100-410
Standard – Protection against shock currents, basic requirements for protective separation in electrical equipment	DIN VDE 0106-101
Standard – Limitation of mains harmonic currents	EN 61000-3-2

UL approvals	UL/C-UL listed UL 508
	UL/C-UL Recognized UL 60950
Surge voltage category	III

Connection data, input

Connection method	Screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	2.5 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	2.5 mm²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	14
Stripping length	9 mm
Screw thread	M2,5

Connection data, output

Connection method	Screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	2.5 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	2.5 mm²
Conductor cross section AWG/kcmil min.	16
Conductor cross section AWG/kcmil max	12
Stripping length	9 mm

Signaling

Status display	"DC OK" LED green
Note on status display	U_{OUT} > 21.5 V: LED lights up

Certificates / Approvals

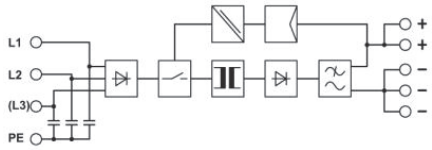
Certification cULus Listed, cULus Recognized

Certifications applied for:

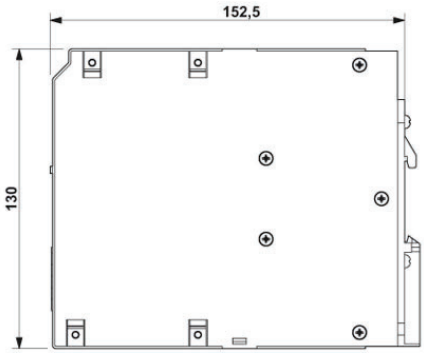
Certification Ex:

Drawings

Block diagram

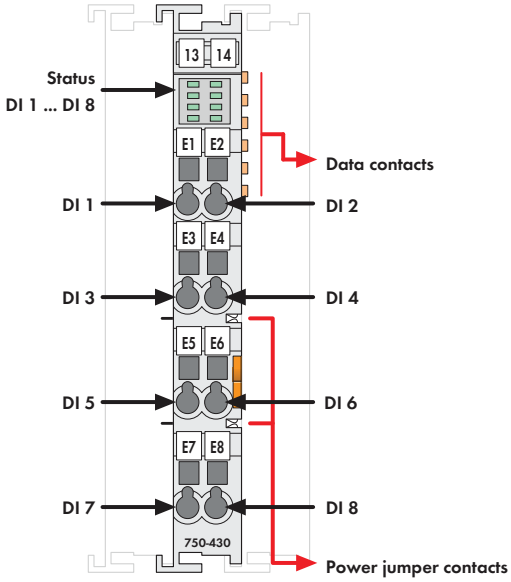


Dimensioned drawing



8-Channel Digital Input Module DC 24 V

1-conductor connection; high-side switching



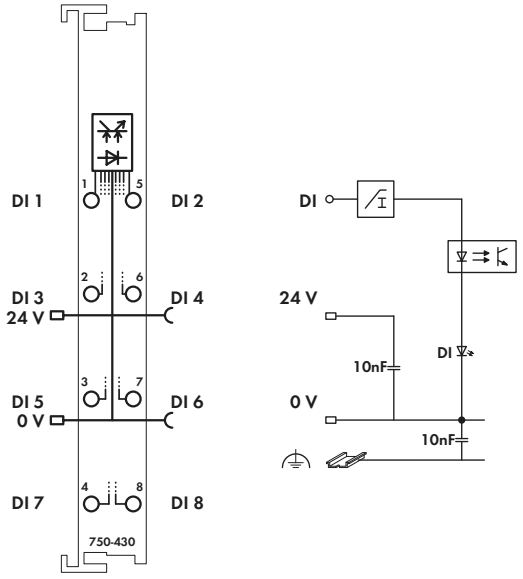


Fig. Series 750 / Technical data see page 28 / Delivery without Mini WSB marker Series 750 / 753 marking see pages 16 ... 17 / 18 ... 19

NOTE: Connection point marking (i.e., 1 ... 8) does not refer to channel assignment

The digital input modules provide 8 channels maintaining a width of only 12 mm. They receive control signals from digital field devices (sensors, etc.).

Each input module has a noise-rejection filter. This filter is available with different time constants.

An optocoupler is used for electrical isolation between the bus and the field side.

Description	Item no.	Pack. unit
8DI 24V DC, 3.0ms	**750-430**	10[1)]
8DI 24V DC, 0.2ms	**750-431**	10[1)]
8DI 24V DC, 3.0ms	**750-430/025-000**	1
(Operating temperature -20 °C ... +60 °C)		
8DI 24V DC, 3.0ms (without connector)	**753-430**	10[1)]
8DI 24V DC, 0.2ms (without connector)	**753-431**	10[1)]

[1)] Also available individually

Accessories		Item no.	Pack. unit
	753 Series connector	**753-110**	25
	Coding elements	**753-150**	100
	**Miniature WSB quick marking system,**		
	plain	**248-501**	5
	with marking	see pages 256 ... 257	

Approvals

Series 750 and 753	
UL 508	
Conformity marking	CE
ANSI/ISA 12.12.01	Class I, Div. 2, Grp. ABCD, T4
Series 750	
EN 60079-15	I M2 / II 3 GD Ex nA IIC T4
	BR-Ex nA II T4
Marine applications	see "Approvals Overview" in section 1

Technical Data

No. of inputs	8
Current consumption (internal)	17 mA
Voltage via power jumper contacts	DC 24 V (-25 % ... +30 %)
Signal voltage (0)	DC -3 V ... +5 V
Signal voltage (1)	DC 15 V ... 30 V
Input filter	3.0 ms (750-430 / 753-430)
	0.2 ms (750-431 / 753-431)
Input current (typ.)	2.8 mA
Isolation	500 V system/supply
Internal bit width	8 bits
Wire connection	CAGE CLAMP®
Cross sections	0.08 mm² ... 2.5 mm² / AWG 28 ... 14
Stripped lengths (750 / 753 Series)	8 ... 9 mm / 0.33 in
	9 ... 10 mm / 0.37 in
Width	12 mm
Weight	48.5 g
EMC CE-Immunity to interference	acc. to EN 50082-2 (1996)
EMC CE-Emission of interference	acc. to EN 50081-1 (1993)
EMC marine applications -	
Immunity to interference	acc. to Germanischer Lloyd (2003)
EMC marine applications -	
Emission of interference	acc. to Germanischer Lloyd (2003)

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HSC Item 03
Wago DO 2CH Relay - WAGO 750-512
Trojan P/N 916554-512 pg. 1/1

2-Channel Relay Output Module AC 230 V, DC 30 V

non-floating; 2 make contacts

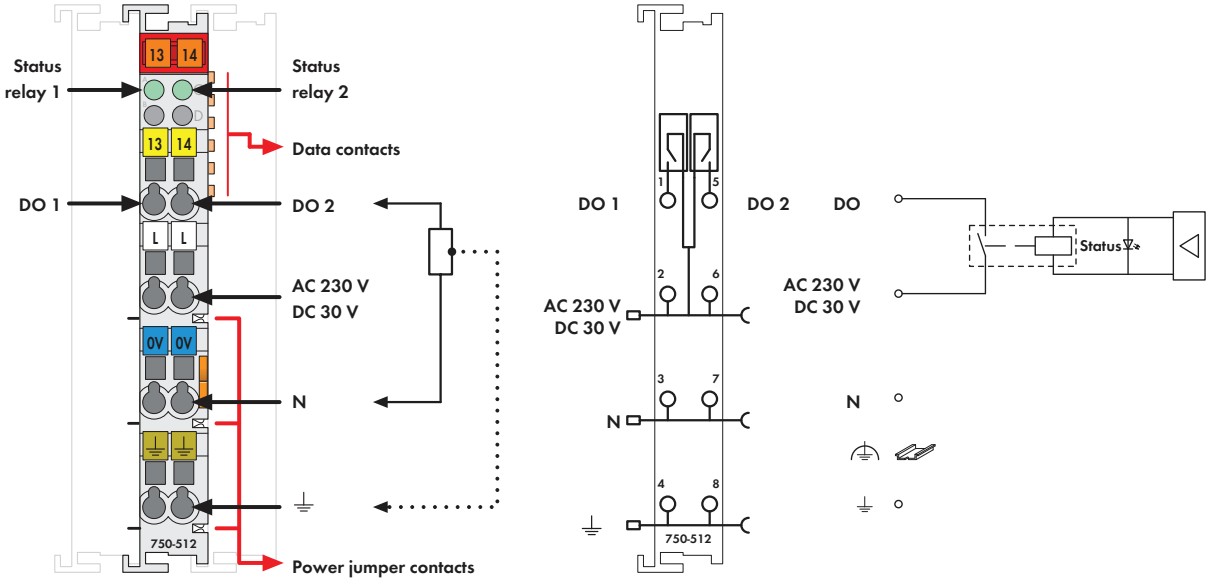

Fig. Series 750 / Technical data see page 28 / Delivery without Mini WSB marker
Series 750 / 753 marking see pages 16 ... 17 / 18 ... 19

The connected load is switched via the digital output (relay contacts) from the control system.

The internal system voltage is used to trigger the relays.

Note that the power jumper contacts supply both "N" (common point) and switched output voltages (this may be DC or AC).

The switched status of the relay is shown by a LED.

The module is a 2-channel, 4-conductor device and actuators with a ground (earth) wire may be directly connected to the module.

Notice:
An additional supply module must be added for operation with AC 250 V/ DC 30 V!

Description	Item no.	Pack. unit
2DO 230V AC 2.0A/ Relay 2NO	**750-512**	10[1)]
2DO 230V AC 2.0A/ Relay 2NO (without connector)	**753-512**	10[1)]

[1)] Also available individually

Accessories		Item no.	Pack. unit
	753 Series connector	**753-110**	25
	Coding elements	**753-150**	100
	**Miniature WSB quick marking system,**		
	plain	**248-501**	5
	with marking	see pages 256 ... 257	

Approvals

Series 750 and 753	
Conformity marking	CE
UL 508	
ANSI/ISA 12.12.01	Class I, Div. 2, Grp. ABCD, T4
Series 750	
EN 60079-15	I M2 / II 3 GD Ex nC IIC T4
Marine applications	see "Approvals Overview" in section 1

Technical Data

No. of outputs	2 make contacts
Current consumption max. (internal)	100 mA
Switching voltage (max.)	AC 250 V / DC 30 V
Switching power	500 VA / 60 W (resistive load)
	cos φ max. =0.4; L/R max = 7 ms
Switching current (min.)	10 mA / 5 V DC
Switching current (max.)	AC / DC 2 A
Switching rate (max.)	30 / min (at nominal load)
Pull-in time (max.)	10 ms
Bounce time (typ.)	1.2 ms
Drop-out time (max.)	10 ms
Contact material	Silver alloy
Mechanical life	2 x 10^7 switching operations
Electrical life	3 x 10^5 switching operations
	(AC 2 A / 250 V) or (DC 2 A / 30 V)
Isolation	1.5 kV eff. (field/system)*;
	* 2.5 kV rated surge voltage;
	Overvoltage category III
Internal bit width	2 bits
Wire connection	CAGE CLAMP®
Cross sections	0.08 mm² ... 2.5 mm² / AWG 28 ... 14
Stripped lengths (750 / 753 Series)	8 ... 9 mm / 0.33 in
	9 ... 10 mm / 0.37 in
Width	12 mm
Weight	54.5 g
EMC CE-Immunity to interference	acc. to EN 50082-2 (1996)
EMC CE-Emission of interference	acc. to EN 50081-1 (1993)
EMC marine applications -	
Immunity to interference	acc. to Germanischer Lloyd (2003)
EMC marine applications -	
Emission of interference	acc. to Germanischer Lloyd (2003)

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Hansastr. 27 • D-32423 Minden Fax: +49(0)571/887-169 www.wago.com

Level Sensor Control Box (LCP)

REV	REVISION DESCRIPTION	LOG NO.	REV'D BY	CHK'D BY	APPRV'D BY	DATE YYYY-MM-DD
G	SEE ECN 21-0532 SUPPORTING DOCUMENTS FOR CHANGES	21-0532	CD	JLW	CHS	2021-07-30

INCOMING SUPPLY
120VAC, 1A, 0.12kVA 1PH 2 WIRE+GND 50/60HZ
SHORT CIRCUIT CURRENT 10kA RMS SYMMETRICAL @120VAC MAX.

120VAC
L1
0101CB
4A
01031
NEUTRAL
N
GND
0115PS
L
N
24VDC 1.75A
POWER SUPPLY
24VDC
0VDC
24VDC
0138
0VDC
0138

24VDC
0135
0VDC
0135
0140LL
24VDC
24VDC
24VDC
NO
01420
C
0143CR
LL-P1
LL-P2
LOW LEVEL SENSOR RELAY
LOW LEVEL SENSOR PROBES
LOW LEVEL (0146, 0149, 0152, 0155)
LL1-1
LL1-2
LOW LEVEL FIRST PDC
LL2-1
LL2-2
LOW LEVEL SECOND PDC
LL3-1
LL3-2
LOW LEVEL THIRD PDC
LL4-1
LL4-2
LOW LEVEL FORTH PDC

NOTES:

1. ELECTRICAL ASSEMBLY TO BE MANUFACTURED AND LABELED AS PER UL 508A REQUIREMENTS AND REQUIREMENTS OF TROJAN SPECIFICATION ES0127.
2. WHERE THERE IS A CONFLICT BETWEEN THIS DOCUMENT AND THE REQUIREMENTS OF ES0127, THE INFORMATION PRESENTED IN THIS DOCUMENT WILL BE USED.
3. ENCLOSURE ENVIRONMENTAL RATING – UL TYPE 4X (IP66)

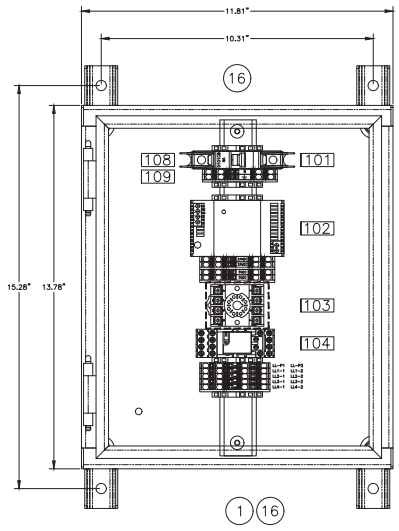
WIRE COLOUR CODING LEGEND

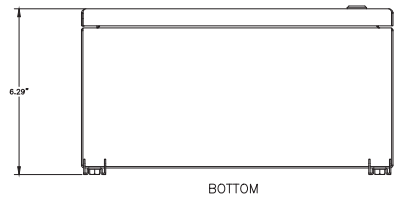
DESCRIPTION	DESIGNATION	WIRE
AC CONTROL	L	RED
	N	WHITE
DC CONTROL	24VDC	BLUE
	0VDC	WHITE/BLUE
GROUND	G	GREEN/YELLOW

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: 2 PL DEC ± N/A
3 PL DEC ± N/A
ANGLE DEC ± N/A
REMOVE ALL BURRS, ALL CORNERS
R 0.010 OR BREAK EDGE
CD – CRITICAL CHARACTERISTIC

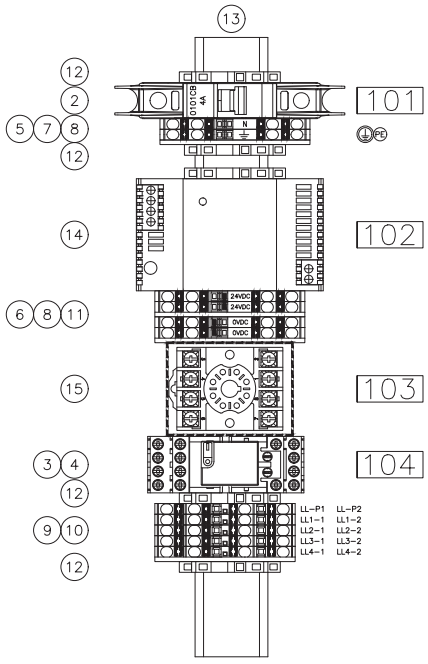
TROJAN UV
3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: LCP ASSY, LOW LEVEL SCHEMATIC
THIRD ANGLE PROJECTION
DWG NO. 340393G
REV G
SCALE: ---
SHEET 01 OF 02
SIZE D





BOTTOM



ITEM	QTY	NAMEPLATE TYPE	DESC 1	DESC 2	DESC 3
101	1	EMLP 27x12.5	0101CB	4A MAIN	
102	1	EMLP 27x12.5	0115PS	24VDC 1.75A	
103	1	EMLP 27x12.5	0140LL	LOW LEVEL	
104	1	EMLP 27x12.5	0143CR	RELAY	
105					
106	A/R	US-EMIL(D12.5)	⏚		
107	1	US-EMIL(D12.5)	PE		
108	1	EMLP 27x12.5	L1		
109	1	EMLP 27x12.5	N		

TABLE 1

P/N	NOUN CODE	ENCLOSURE TYPE	ITEM 1
340393-304	LCP ASSY, LOW LVL304	304SST	338175-304

BILL OF MATERIALS

ITEM #	QUANTITY	DESCRIPTION	MANUFACTURER	MANUFACTURER #	TROJAN #
1	1	ENCLOSURE ASSY 14x12x6 TYPE 4X	CUSTOM	CUSTOM	TABLE 1
2	1	BREAKER, 4A 1P AC/DC C ABB	ABB	SU201M-C4	917139-MC1040
3	1	RELAY, 6A 24VDC 4PDT 250V	ABB	15VR405613R1100	917444-M024DC4L
4	1	RELAY, BASE 2/4PDT STD SCREW	ABB	CR-M4SS	917444-M4SS
5	1	TERM BLK, PIT 2.5 QUATTRO GRY	PHOENIX CONTACT	3209578	916049-3209578
6	4	TERM BLK, PIT 2.5 QUATTRO BLU	PHOENIX CONTACT	3209581	916049-3209581
7	1	TERM BLK, PIT 2.5 PE QUAT GND	PHOENIX CONTACT	3209594	916049-3209594
8	3	TERM BLK, END PLT D ST 2.5 QU	PHOENIX CONTACT	3030514	916050-3030514
9	5	TERM BLK, PITTB 2.5 GRY	PHOENIX CONTACT	3210567	916049-3210567
10	1	TERM BLK, END PLT D PITTB 2.5	PHOENIX CONTACT	3211634	916050-3211634
11	2	TERM BLK, JUMPER 2P FBS 2.5	PHOENIX CONTACT	3030161	916050-3030161
12	5	TERM BLK, END STOP CLIPFIX 355	PHOENIX CONTACT	3022276	916050-3022276
13	12.8	DIN RAIL, PERF 35X7.5 PHOENIX	PHOENIX CONTACT	801733	914147
14	1	PS, 24VDC 1P STEP 1.75A	PHOENIX CONTACT	2868648	916282-648
15	1	SENSOR UV3+ LEVEL LOW	TROJAN	7801702	914345-001
16	1	ENCL,MOUNTING BRACKETS SST	HOFFMAN	CMFKSS	916531

TROJAN UV

3020 GORE ROAD, LONDON, ONTARIO, CANADA, N5V 4T7

DESCRIPTION: LCP ASSY, LOW LEVEL
PANEL LAYOUT

REVISED BY	CD
CHECKED BY	JLW
APPROVED BY	CHS
APPROVAL DATE (YYYY-MM-DD)	2021-07-30
SCALE:	NTS
DWG NO.	340393C
REV	G
SHEET	02 OF 02
SIZE	D

Gems Sensors & Controls

Series DC
For Remote Applications

Series DC controls are designed for applications where only direct current power is available. DC units can be used as differential level controls or single point alarm contactors. Because of solid state reliability, plug-in convenience, and choice of 12 or 24 VDC supply voltage, Warrick DC controls can be used with confidence in many applications.

Contact Design	SPDT 1 N.O. & 1 N.C. (1 form C), non-powered contacts
Contact Rating	5 amp @ 30 VDC or 120 VAC Resistive 1/8 hp
Mode of Operation	Direct/Inverse, factory set
Sensitivity	0 - 1M ohm maximum, factory set
Primary Voltage	12 VDC, 24 VDC, negative ground (±20%)
Supply Current	40 mA when relay energized, 10 mA w/relay de-energized
Secondary Voltage	12 VDC
Terminal Style	Screw connector
Temperature	-50°F to +150°F (-46°C to +65°C)
Options	Time Delay

Series DC

Applications

- Single and Differential Service
- Solar and Wind Powered Pumps
- Portable Cleaning Equipment
- Battery-Powered Level Control
- Well Pumps
- Remote Reservoirs
- Remote Irrigation
- Onboard Ship Level Control

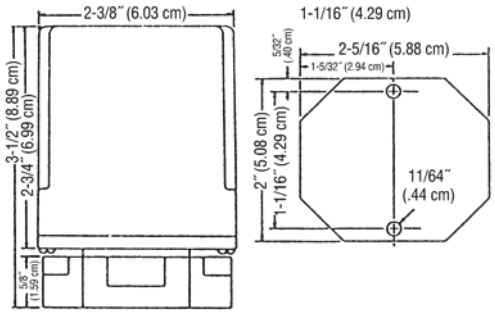
How to Order

Use the **Bold** characters from the chart below to construct a product code.

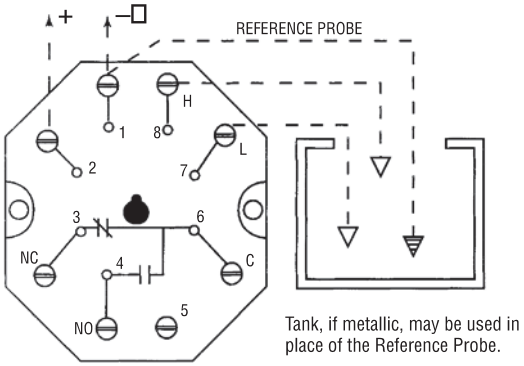
DC X X X X XX XX

- Series: **DC**
- Supply Voltage: **1** – 12 VDC; **2** – 24 VDC
- Sensitivity: **B** – 22K; **C** – 100K; **D** – 470K; **E** – 1M
- Mode of Operation: **D** – Direct; **I** – Inverse
- Enclosure: **0** – None; **1** – NEMA 1; **4** – NEMA 4
- Time Delay (increasing level) **01-30** sec.
- Time Delay (decreasing level) **01-30** sec.

Dimensions



Wiring



Tank, if metallic, may be used in place of the Reference Probe.

WARRICK CONDUCTIVITY SENSORS

Warrick® Sensor Fittings and Probes

Warrick Liquid Level Sensors are available in single- and multi-probe models and with a variety of fittings. The versatility of the Warrick design makes these sensors ideal for a diverse range of applications.

Examples include:

- Food and Beverage
- Caustics and Acids
- Sumps
- Reservoirs
- Pharmaceuticals
- Boilers and Steam Generators
- Ponds
- Sewage and Wastewater

Probe Styles

- Metal Rods
- Wire Suspended
- Corrosion Resistant
- Sanitary

Fitting Styles

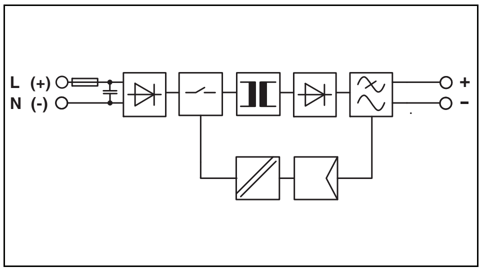
- 3/8˝ to 3˝ Threaded Mount
- Bracket Mount
- Flange Mount
- External Mount
- Sanitary Mount
- Condulet Mount

Sensor Selection Chart

SERIES		3E	3N	3F	3G	3C	3K	3J	3L	3M	3MT	3S	3R	3T	3B	3H	3W	3Y
Page Number		E-20	E-20	E-19	E-19	E-23	E-23	E-18	E-18	E-25	E-25	E-24	E-21	E-21	E-20	E-18	E-22	E-22
Body Options	Flange			•	•													
	Pipe Thread	•			•			•										
	Flat Mount		•		•													
	Side Chamber					•	•											
	Non-Contact Electrodes											•						
	Food Grade Connection									•	•							
	Bracket Mount											•						
Fitting Body Material Options	Brass	•	•	•		•		•										
	PVC		•	•	•													
	1018 Carbon Steel			•														
	Stainless Steel	•		•														
	Forged Steel			•														
	Nylon									•	•							
	Cast Iron	•				•	•	•				•						
Housing Material	Coated Aluminum	•	•	•		•	•	•				•						
	Polycarbonate				•													
Number of Probes	1 to 3		•					•										
	1 to 4					•	•			•	•							
	1 to 7	•		•	•							•						
Electrodes	Electrode Only								•				•	•	•	•	•	•

Power supply unit, 1 AC, 24 V DC, 0.5 A, slim design

Applied for: UL-EX LIS / CUL-EX LIS



Technical data

100 V AC ... 240 V AC
85 V AC ... 264 V AC / 95 V DC ... 250 V DC
45 Hz ... 65 Hz / 0 Hz
Approx. 0.28 A (120 V AC) / Approx. 0.13 A (230 V AC)
< 15 A / < 0.1 A^2s
> 15 ms (120 V AC) / > 90 ms (230 V AC)
1.25 A (slow-blow, internal)
B6, B10, B16

24 V DC ±1%
0.5 A
Yes / Yes
< 0.3 W / < 2.2 W
> 84% (for 230 V AC and nominal values)
< 20 mV_{PP}

LED

0.1 kg / 18 x 90 x 61 mm
horizontal DIN rail NS 35, EN 60715
Can be aligned: horizontal 0 cm, vertical 3 cm
Screw connection
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
IP20 / II
> 500,000 h
-25°C ... 70°C (> 55°C derating)

2 kV AC (routine test) / 4 kV AC (type test)
Conformance with EMC Directive 2004/108/EC
IEC 60950-1/VDE 0805 (SELV), IEC 61558-2-17
EN 50178/VDE 0160 (PELV)
DIN VDE 0100-410, DIN VDE 0106-1010
UL/C-UL listed UL 508, UL/C-UL recognized UL 60950, NEC Class 2 as per UL 1310, UL/C-UL listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D

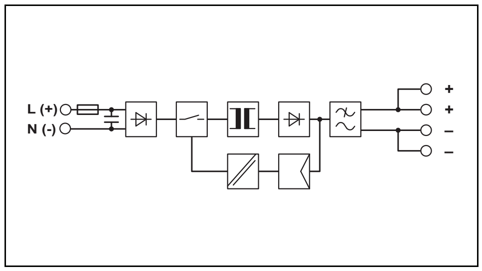
EN 61000-3-2

Ordering data

Type	Order No.	Pcs. / Pkt.
STEP-PS/ 1AC/24DC/0.5	**2868596**	1

Power supply unit, 1 AC, 24 V DC, 0.75 A, flat design

Ex:



Technical data

100 V AC ... 240 V AC
85 V AC ... 264 V AC / 95 V DC ... 250 V DC
45 Hz ... 65 Hz / 0 Hz
Approx. 0.3 A (120 V AC) / Approx. 0.25 A (230 V AC)
< 15 A / < 0.1 A^2s
> 15 ms (120 V AC) / > 70 ms (230 V AC)
1.25 A (slow-blow, internal)
B6, B10, B16

24 V DC ±1%
0.75 A
Yes / Yes
< 0.5 W / < 3.6 W
> 84% (for 230 V AC and nominal values)
< 75 mV_{PP}

LED

0.1 kg / 36 x 90 x 43 mm
horizontal DIN rail NS 35, EN 60715
Can be aligned: horizontal 0 cm, vertical 3 cm
Screw connection
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
IP20 / II
> 500,000 h
-25°C ... 70°C (> 55°C derating)

2 kV AC (routine test) / 4 kV AC (type test)
Conformance with EMC Directive 2004/108/EC
IEC 60950-1/VDE 0805 (SELV), IEC 61558-2-17
EN 50178/VDE 0160 (PELV)
DIN VDE 0100-410, DIN VDE 0106-1010
UL/C-UL listed UL 508, UL/C-UL recognized UL 60950, NEC Class 2 as per UL 1310, UL/C-UL listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D

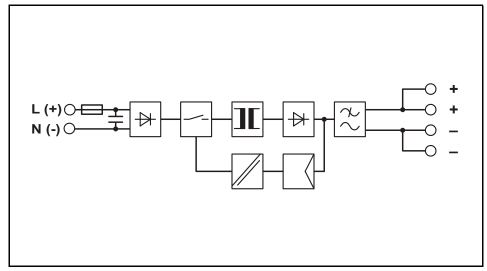
EN 61000-3-2

Ordering data

Type	Order No.	Pcs. / Pkt.
STEP-PS/ 1AC/24DC/0.75/FL	**2868622**	1

Power supply, 1 AC, 24 V DC, 0.75 A

Ex:



Technical data

100 V AC ... 240 V AC
85 V AC ... 264 V AC / 95 V DC ... 250 V DC
45 Hz ... 65 Hz / 0 Hz
Approx. 0.3 A (120 V AC) / Approx. 0.2 A (230 V AC)
< 15 A / < 0.1 A^2s
> 15 ms (120 V AC) / > 70 ms (230 V AC)
1.25 A (slow-blow, internal)
B6, B10, B16

24 V DC ±1%
0.75 A
Yes / Yes
< 0.5 W / 3.6 W
> 84% (for 230 V AC and nominal values)
< 75 mV_{PP}

LED

0.1 kg / 36 x 90 x 61 mm
horizontal DIN rail NS 35, EN 60715
Can be aligned: horizontal 0 cm, vertical 3 cm
Screw connection
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
IP20 / II
> 500,000 h
-25°C ... 70°C (> 55°C derating)

2 kV AC (routine test) / 4 kV AC (type test)
Conformance with EMC Directive 2004/108/EC
IEC 60950-1/VDE 0805 (SELV), IEC 61558-2-17
EN 50178/VDE 0160 (PELV)
DIN VDE 0100-410, DIN VDE 0106-1010
UL/C-UL listed UL 508, UL/C-UL recognized UL 60950, NEC Class 2 as per UL 1310, UL/C-UL listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D

EN 61000-3-2

Ordering data

Type	Order No.	Pcs. / Pkt.
STEP-PS/ 1AC/24DC/0.75	**2868635**	1

STEP POWER - Power supply units for distributor boards and flat control panels

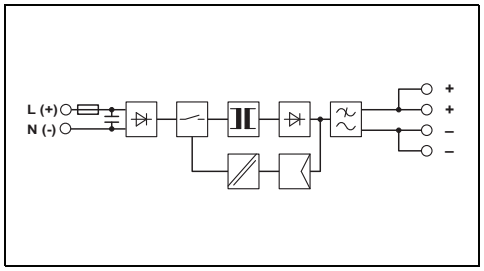
– Energy savings thanks to maximum energy efficiency and incredibly low no-load losses
– Flexible assembly by simply snapping the product onto the DIN rail or screwing it onto an even surface
– Reliable power supply thanks to the high MTBF (mean time between failures) of more than 500,000 hours and the UI characteristic curve
– Approved for DeviceNet: 24 V DC, 100 W (NEC Class 2)

STEP POWER, 100 W

– Output power limited to 100 W: Specifically for applications that require certification according to UL 1310/508 listed Class 2

Power supply, 1 AC, 24 V DC, 1.75 A

Ex:

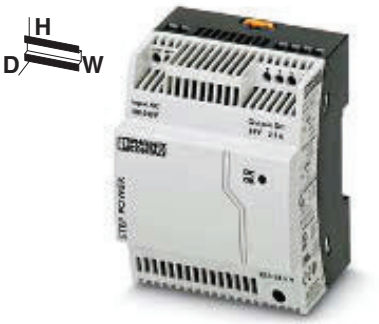


Technical data

Input data	
Nominal input voltage range	100 V AC ... 240 V AC
Input voltage range AC/DC	85 V AC ... 264 V AC / 95 V DC ... 250 V DC
Frequency range	45 Hz ... 65 Hz / 0 Hz
Current consumption (nominal load)	Approx. 0.6 A (120 V AC) / Approx. 0.3 A (230 V AC)
Inrush current limitation at 25°C (typ.) / I^2t	< 15 A / < 0.6 A^2s
Mains buffering (I_N, typ.)	> 25 ms (120 V AC) / > 150 ms (230 V AC)
Input fuse	3.15 A (slow-blow, internal)
Recommended backup fuse, LS switch	B6, B10, B16
Output data	
Nominal output voltage	24 V DC ±1%
Setting range of the output voltage	22.5 V DC ... 29.5 V DC (> 24 V constant capacitance)
Output current	1.75 A
Can be connected in parallel / series	Yes / Yes
Max. power dissipation (idling/nominal load)	< 0.7 W / 5 W
Efficiency (typ.)	> 89% (for 230 V AC and nominal values)
Residual ripple	< 60 mV_{PP}
Signaling	
Signaling DC OK	LED
General data	
Weight / Dimensions W x H x D	0.2 kg / 54 x 90 x 61 mm
Installation position	horizontal DIN rail NS 35, EN 60715
Spacing when mounting	Can be aligned: horizontal 0 cm, vertical 3 cm
Connection method	Screw connection
Input connection data solid / stranded / AWG	0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
Output connection data solid / stranded / AWG	0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
Degree of protection / Protection class	IP20 / II
MTBF (at nominal load, 40°C)	> 500,000 h
Ambient temperature (operation)	-25°C ... 70°C (> 55°C derating)
Standards / regulations	
Insulation voltage input/output	2 kV AC (routine test) / 4 kV AC (type test)
Electromagnetic compatibility	Conformance with EMC Directive 2004/108/EC
Electrical safety, safety transformer	IEC 60950-1/VDE 0805 (SELV), IEC 61558-2-17
Electronic equipm. for electrical power installations	EN 50178/VDE 0160 (PELV)
Safe isolation	DIN VDE 0100-410, DIN VDE 0106-1010
UL approvals	UL/C-UL listed UL 508, UL/C-UL recognized UL 60950, NEC Class 2 as per UL 1310, UL/C-UL listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D
Limitation of harmonic line currents	EN 61000-3-2

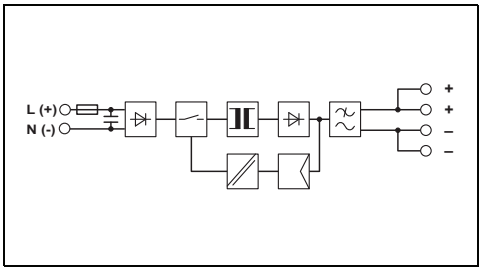
Ordering data

Description	Type	Order No.	Pcs. / Pkt.
Power supply unit, primary-switched	**STEP-PS/ 1AC/24DC/1.75**	**2868648**	1



**Power supply,
1 AC, 24 V DC, 2.5 A**

Ex:



Technical data

100 V AC ... 240 V AC
85 V AC ... 264 V AC / 95 V DC ... 250 V DC
45 Hz ... 65 Hz / 0 Hz
Approx. 0.8 A (120 V AC) / Approx. 0.4 A (230 V AC)
< 15 A / < 0.6 A²s
> 20 ms (120 V AC) / > 100 ms (230 V AC)
3.15 A (slow-blow, internal)
B6, B10, B16

24 V DC ±1%
22.5 V DC ... 29.5 V DC (> 24 V constant capacitance)

2.5 A
Yes / Yes
< 0.7 W / 9.9 W
> 86% (for 230 V AC and nominal values)
< 80 mV_{PP}

LED

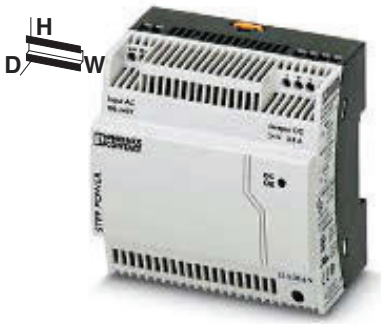
0.3 kg / 72 x 90 x 61 mm
horizontal DIN rail NS 35, EN 60715
Can be aligned: horizontal 0 cm, vertical 3 cm
Screw connection
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
IP20 / II
> 500,000 h
-25°C ... 70°C (> 55°C derating)

2 kV AC (routine test) / 4 kV AC (type test)
Conformance with EMC Directive 2004/108/EC
IEC 60950-1/VDE 0805 (SELV), IEC 61558-2-17
EN 50178/VDE 0160 (PELV)
DIN VDE 0100-410, DIN VDE 0106-1010
UL/C-UL listed UL 508, UL/C-UL recognized UL 60950, NEC Class 2 as per UL 1310, UL/C-UL listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D

EN 61000-3-2

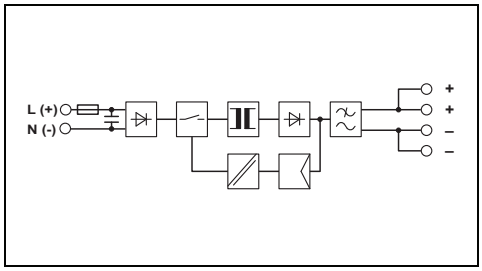
Ordering data

Type	Order No.	Pcs. / Pkt.
STEP-PS/ 1AC/24DC/2.5	2868651	1



**Power supply,
1 AC, 24 V DC, 100 W
NEC Class 2**

Ex:



Technical data

100 V AC ... 240 V AC
85 V AC ... 264 V AC / 95 V DC ... 250 V DC
45 Hz ... 65 Hz / 0 Hz
Approx. 1.3 A (120 V AC) / Approx. 0.8 A (230 V AC)
< 15 A / < 1 A²s
> 25 ms (120 V AC) / > 120 ms (230 V AC)
4 A (slow-blow, internal)
B6, B10, B16

24 V DC ±1%
22.5 V DC ... 25 V DC (> 24 V constant capacitance)

3.8 A
No / No
< 0.7 W / 11.8 W
> 88% (for 230 V AC and nominal values)
< 80 mV_{PP}

LED

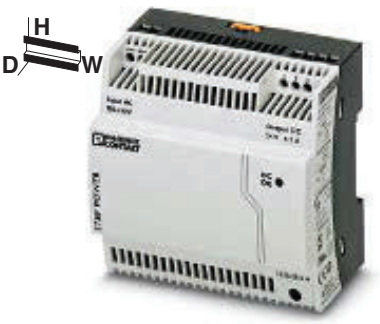
0.4 kg / 90 x 90 x 61 mm
horizontal DIN rail NS 35, EN 60715
Can be aligned: horizontal 0 cm, vertical 3 cm
Screw connection
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
IP20 / II
> 500,000 h
-25°C ... 70°C (> 55°C derating)

2 kV AC (routine test) / 4 kV AC (type test)
Conformance with EMC Directive 2004/108/EC
IEC 60950-1/VDE 0805 (SELV), IEC 61558-2-17
EN 50178/VDE 0160 (PELV)
DIN VDE 0100-410, DIN VDE 0106-1010
UL/C-UL listed UL 508, UL/C-UL recognized UL 60950, NEC Class 2 as per UL 1310, UL/C-UL listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D

EN 61000-3-2

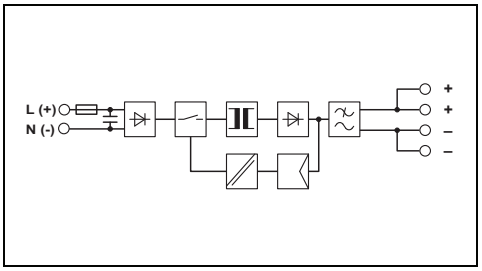
Ordering data

Type	Order No.	Pcs. / Pkt.
STEP-PS/ 1AC/24DC/3.8/C2LPS	2868677	1



**Power supply,
1 AC, 24 V DC, 4.2 A**

Ex:



Technical data

100 V AC ... 240 V AC
85 V AC ... 264 V AC / 95 V DC ... 250 V DC
45 Hz ... 65 Hz / 0 Hz
Approx. 1.3 A (120 V AC) / Approx. 0.8 A (230 V AC)
< 15 A / < 1 A²s
> 20 ms (120 V AC) / > 100 ms (230 V AC)
4 A (slow-blow, internal)
B6, B10, B16

24 V DC ±1%
22.5 V DC ... 29.5 V DC (> 24 V constant capacitance)

4.2 A
Yes / Yes
< 0.7 W / 13.2 W
> 88% (for 230 V AC and nominal values)
< 40 mV_{PP}

LED

0.4 kg / 90 x 90 x 61 mm
horizontal DIN rail NS 35, EN 60715
Can be aligned: horizontal 0 cm, vertical 3 cm
Screw connection
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
0.2 - 2.5 mm^2 / 0.2 - 2.5 mm^2 / 24 - 12
IP20 / II
> 500,000 h
-25°C ... 70°C (> 55°C derating)

2 kV AC (routine test) / 4 kV AC (type test)
Conformance with EMC Directive 2004/108/EC
IEC 60950-1/VDE 0805 (SELV), IEC 61558-2-17
EN 50178/VDE 0160 (PELV)
DIN VDE 0100-410, DIN VDE 0106-1010
UL/C-UL listed UL 508, UL/C-UL recognized UL 60950, UL/C-UL listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D

EN 61000-3-2

Ordering data

Type	Order No.	Pcs. / Pkt.
STEP-PS/ 1AC/24DC/4.2	2868664	1

Pluggable interface relays CR-M
Miniature relays

Pluggable interface relays are used for electrical isolation, amplification and signal matching between the electronic controlling, e.g. PLC (programmable logic controller), PC or field bus systems and the sensor / actuator level. They don't use additional internal protective circuits and thus are overload-proof against short-time variations like current or voltage peaks.

2CDC 291 002 S0015

Characteristics
- Standard miniature relays with mechanical status indication
- 13 different rated control supply voltages:
  DC versions: 12 V, 24 V, 48 V, 60 V, 110 V, 125 V, 220 V
  AC versions: 24 V, 48 V, 60 V, 110 V, 120 V, 230 V
- Output: 2 c/o (SPDT) contacts (12 A), 3 c/o (SPDT) contacts (10 A) or 4 c/o (SPDT) contacts (6 A)
- Available with or without LED
- 4 c/o (SPDT) contact version optionally equipped with gold contacts, LED and free wheeling diode
- Integrated test button for manual actuation and locking of output contacts (DC coil = blue, AC coil = orange) that can be removed if necessary
- Cadmium-free contact material
- Suited for logical and standard sockets
- Width on socket: 27 mm (1.063 in)
- Pluggable function modules: reverse polarity protection/ free wheeling diode, LED indication, RC elements, overvoltage protection

Approvals

cULus	ANSI/UL 508, CAN/CSA C22.2 No.14	
CSA	CAN/CSA C22.2 No.14	
VDE	VDE	(except 125 V DC devices)
EAC	EAC	
Lloyds Register	Lloyds Register	(only devices with 4 c/o (SPDT) contacts)
CCC	CCC	
RMRS	RMRS	(except 60 V and 125 V devices)

Marks

CE CE

LCP Item 03, 04
Relay, 6A 24VDC 4PDT 250V - ABB 1SVR405613R1100 / Trojan P/N 917444-M024DC4L
Relay, Base 24VDC 4PDT STD Screw - ABB CR-M4SS / Trojan P/N 917444-M4SS Page 2/4

Type	Rated control supply voltage U_s	Order code
CR-M012DC2L	12 V DC	1SVR 405 611 R4100
CR-M024DC2L	24 V DC	1SVR 405 611 R1100
CR-M048DC2L	48 V DC	1SVR 405 611 R6100
CR-M060DC2L	60 V DC	1SVR 405 611 R4300
CR-M110DC2L	110 V DC	1SVR 405 611 R8100
CR-M125DC2L	125 V DC	1SVR 405 611 R8300
CR-M220DC2L	220 V DC	1SVR 405 611 R9100
CR-M024AC2L	24 V AC	1SVR 405 611 R0100
CR-M048AC2L	48 V AC	1SVR 405 611 R5100
CR-M110AC2L	110 V AC	1SVR 405 611 R7100
CR-M120AC2L	120 V AC	1SVR 405 611 R2100
CR-M230AC2L	230 V AC	1SVR 405 611 R3100

Interface relays with LED, 3 c/o (SPDT) contacts: 250 V, 10 A

CR-M012DC3L	12 V DC	1SVR 405 612 R4100
CR-M024DC3L	24 V DC	1SVR 405 612 R1100
CR-M048DC3L	48 V DC	1SVR 405 612 R6100
CR-M060DC3L	60 V DC	1SVR 405 612 R4300
CR-M110DC3L	110 V DC	1SVR 405 612 R8100
CR-M125DC3L	125 V DC	1SVR 405 612 R8300
CR-M220DC3L	220 V DC	1SVR 405 612 R9100
CR-M024AC3L	24 V AC	1SVR 405 612 R0100
CR-M048AC3L	48 V AC	1SVR 405 612 R5100
CR-M110AC3L	110 V AC	1SVR 405 612 R7100
CR-M120AC3L	120 V AC	1SVR 405 612 R2100
CR-M230AC3L	230 V AC	1SVR 405 612 R3100

Interface relays with LED, 4 c/o (SPDT) contacts: 250 V, 6 A

CR-M012DC4L	12 V DC	1SVR 405 613 R4100
CR-M024DC4L	24 V DC	1SVR 405 613 R1100
CR-M048DC4L	48 V DC	1SVR 405 613 R6100
CR-M060DC4L	60 V DC	1SVR 405 613 R4300
CR-M110DC4L	110 V DC	1SVR 405 613 R8100
CR-M125DC4L	125 V DC	1SVR 405 613 R8300
CR-M220DC4L	220 V DC	1SVR 405 613 R9100
CR-M024AC4L	24 V AC	1SVR 405 613 R0100
CR-M048AC4L	48 V AC	1SVR 405 613 R5100
CR-M110AC4L	110 V AC	1SVR 405 613 R7100
CR-M120AC4L	120 V AC	1SVR 405 613 R2100
CR-M230AC4L	230 V AC	1SVR 405 613 R3100

Interface relays with LED and free wheeling diode, 4 c/o (SPDT) contacts: 250 V, 6 A

CR-M024DC4LD	24 V DC	1SVR 405 614 R1100

Interface relays with gold contacts, 4 c/o (SPDT) contacts: 250 V, 6 A

CR-M024DC4G	24 V DC	1SVR 405 618 R1000
CR-M024AC4G	24 V AC	1SVR 405 618 R0000
CR-M110AC4G	110 V AC	1SVR 405 618 R7000
CR-M230AC4G	230 V AC	1SVR 405 618 R3000

CR-P/M 62C	6-24 V AC/DC	red, for DC: A1+, A2-	1SVR 405 655 R0000
CR-P/M 62CV	6-24 V AC/DC	green, for DC: A1+, A2-	1SVR 405 655 R1000
CR-P/M 62D	24-60 V AC/DC	red, for DC: A1+, A2-	1SVR 405 655 R4000
CR-P/M 62DV	24-60 V AC/DC	green, for DC: A1+, A2-	1SVR 405 655 R4100
CR-P/M 92C	110-230 V AC / 110 V DC	red, for DC: A1+, A2-	1SVR 405 655 R0100
CR-P/M 92CV	110-230 V AC / 110 V DC	green, for DC: A1+, A2-	1SVR 405 655 R1100

Varistor - Overvoltage protection

CR-P/M 72	24 V AC		1SVR 405 656 R0000
CR-P/M 72A	115 V AC		1SVR 405 656 R1000
CR-P/M 82	230 V AC		1SVR 405 656 R2000

Plug to replace the test button (Packing unit = 100 pieces)

CR-MP			1SVR 405 658 R2000

Sockets

Type	Version	Connection	Order code

Logical sockets

CR-M2LS	for 2 c/o (SPDT) contacts	screw	1SVR 405 651 R1100
CR-M3LS	for 3 c/o (SPDT) contacts	screw	1SVR 405 651 R2100
CR-M4LS	for 2 or 4 c/o (SPDT) contacts	screw	1SVR 405 651 R3100
CR-M2LC	for 2 c/o (SPDT) contacts	spring	1SVR 405 651 R1200
CR-M4LC	for 2 or 4 c/o (SPDT) contacts	spring	1SVR 405 651 R3200

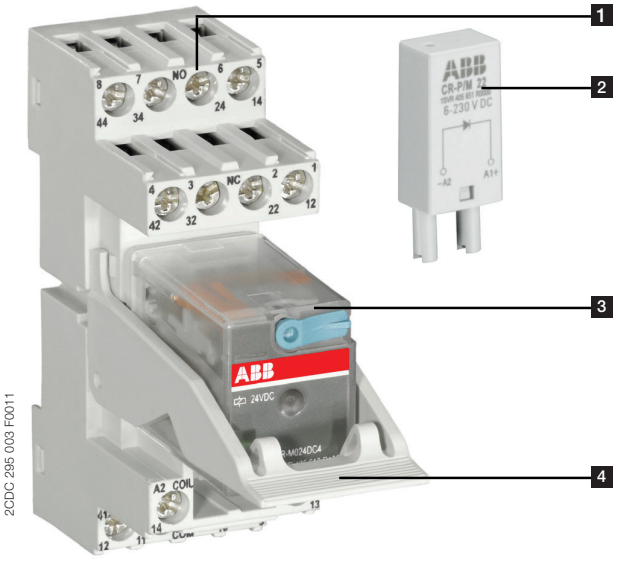
Standard sockets

CR-M2SS	for 2 c/o (SPDT) contacts	screw	1SVR 405 651 R1000
CR-M3SS	for 3 c/o (SPDT) contacts	screw	1SVR 405 651 R2000
CR-M4SS	for 2 or 4 c/o (SPDT) contacts	screw	1SVR 405 651 R3000
CR-M2SF	for 2 c/o (SPDT) contacts	fork type screw	1SVR 405 651 R1300
CR-M4SF	for 2 or 4 c/o (SPDT) contacts	fork type screw	1SVR 405 651 R3300

Accessories for CR-M sockets

CR-MH	Plastic holder	1SVR 405 659 R1000
CR-MH1	Metall holder	1SVR 405 659 R1100
CR-MJ	Jumper bar for sockets with screw clamps	1SVR 405 658 R6000
CR-MM	Marker	1SVR 405 658 R1000

Operating controls



1 **Socket**

2 **Pluggable function module**

3 **Interface relay**

4 **Holder**

Application

Interface relays are electromechanic and electronic input and output modules for electrical isolation, levelling, noise suppression or signal amplifi cation between control unit and process.

Operating mode

When control supply voltage is applied, the output contacts get closed. When control supply voltage is switched off, the contacts fall back into their starting position. Manual operation and locking of the output relays is possible via the integrated test button.

Note:

During operation of the relay the test button is warming up. To manually press the test button, first switch off the supply voltage of the relay and wait for a while until the button cools down (or press without delay, using protective gloves or insulated tools).

Press the button smoothly and quickly. As long as the button is pressed the n/o contacts are closed. Releasing the button opens the n/o contacts. A 90 degree rotation of the test button closes the n/o contacts permanently. Reverse rotation of the test button re-opens the n/o contacts.

Miniature Circuit Breaker SU200M
for branch circuit protection acc. to UL 489

The miniature circuit breaker SU 200 M is ABB's solution for UL 489 branch circuit protection up to 480 Y/277 V AC and 96 V DC. This circuit breaker is an all-round device for AC and DC applications for universal use in North American and global markets due to its approvals acc. to the international standards UL, CSA and IEC. Moreover, SU 200 M is fully compatible with System pro *M* compact® UL 489 accessories.

Features

- High performance MCB with 10 kA interrupting capacity acc. to UL 489 / CSA 22.2 No. 5 and 15 kA breaking capacity acc. to IEC/EN 60947-2
- Certified up to I_n = 40 A at 480 Y/277 V AC acc. to UL 489 / CSA 22.2 No. 5
- Certified for AC and DC use acc. to UL and CSA
- 40 °C reference temperature acc. to UL and CSA
- Current limiting acc. to UL 489
- Clear contact position indication in red/green ("real CPI")

Standards and approvals

Standards	
UL 489	
CSA 22.2 No. 5	
IEC/EN 60947-2	
Approvals	
UL 489	US
CSA 22.2 No. 5	CA
VDE	DE
CCC	CN

General Data		
Standards		UL 489, CSA 22.2 No. 5, IEC/EN 60947-2
Poles		1P, 2P, 3P, 4P
Tripping characteristics		C, K, Z
Rated current I_n		0.2 - 63 A
Rated frequency f		50 / 60 Hz, DC (0 Hz)
Rated insulation voltage U_i acc. to IEC/EN 60664-1		250 V AC (phase to ground), 440 V AC (phase to phase)
Overvoltage category		III
Pollution degree		3
IEC/EN 60947-2		
Rated operational voltage U_e		1P: 230 V AC; 2P, 3P, 4P: 400 V AC
Max. power frequency recovery voltage U_{max}	AC	1P: 253 V AC; 2P, 3P, 4P: 440 V AC
Min. operating voltage		12 V AC, 12 V DC
Rated ultimate short-circuit breaking capacity I_{cu}		15 kA
Rated service short-circuit breaking capacity I_{cs}		≤ 40 A: 11.25 kA > 40 A: 7.5 kA
Rated impulse withstand voltage U_{imp} (1.2/50µs)		4 kV (test voltage 6.2 kV at sea level, 5 kV at 2,000 m)
Dielectric test voltage		2 kV (50 / 60Hz, 1 min.)
Reference temperature for tripping characteristics		30 °C
Electrical endurance		I_n < 30 A: 20,000 ops (AC), I_n ≥ 30 A: 10,000 ops. (AC); 1 cycle (2 s - ON, 13 s - OFF, I_n ≤ 32 A), 1 cycle (2 s - ON, 28 s - OFF, I_n > 32 A)
UL / CSA		
Rated voltage	AC	1P: 277 V AC up to 40 A for C, Z char.,
	AC	277 V AC up to 35 A for K char., 240 V AC
	AC	2P, 3P, 4P: 480 Y / 277 V AC up to 40 A for C, Z char.,
	AC	480 Y / 277 V AC up to 35 A for K char., 240 V AC
	DC	1P: 48 V DC; 2P: 96 V DC (2p in series)
Rated interrupting capacity acc. to UL 1077		–
Short-circuit current rating acc. to UL 489		10 kA
Application		–
Reference temperature for tripping characteristics		40 °C
Electrical endurance		6,000 ops (AC), 6,000 ops. (DC); 1 cycle (1 s - ON, 9 s - OFF)
Mechanical data		
Housing		Insulation group II, RAL 7035
Toggle		Insulation group II, black, sealable
Contact position indication		Real CPI (green OFF / red ON)
Protection degree acc. to DIN EN 60529		IP20*, IP40 in enclosure with cover
Mechanical endurance		20,000 ops.
Shock resistance acc. to IEC/EN 60068-2-27		25 g - 2 shocks - 13 ms
Vibration resistance acc. to IEC/EN 60068-2-6		5g - 20 cycles at 5…150…5 Hz with load 0.8 I_n
Environmental conditions (damp heat cyclic) acc. to IEC/EN 60068-2-30		28 cycles with 55°C/90-96% and 25°C/95-100%
Ambient temperature		-25 ... +55°C
Storage temperature		-40 ... +70 °C
Installation		
Terminal		Failsafe bi-directional cylinder-lift terminal
Cross-section of conductors (top/bottom)		solid, stranded: 35 mm² / 35 mm² flexible: 25 mm² / 25 mm² 18 – 4 AWG
Cross-section of busbars (top/bottom)		10 mm² / 10 mm² 18 – 8 AWG
Torque		2.8 Nm AWG 18-16: 13.3 in-lbs. AWG 14-10: 17.7 in-lbs. AWG 8-4: 39.8 in-lbs.
Screwdriver		No. 2 Pozidrive
Mounting		On DIN rail 35 mm acc. to EN 60715 by fast clip
Mounting position		any
Supply		optional
Dimensions and weight		
Mounting dimensions acc. to DIN 43880		Mounting dimension 3
Pole dimensions (H x D x W)		111 x 69 x 17.5 mm
Pole weight		approx. 125 g
Combination with auxiliary elements		
Auxiliary contact		Yes
Signal contact		Yes
Shunt trip		Yes

Tripping characteristics

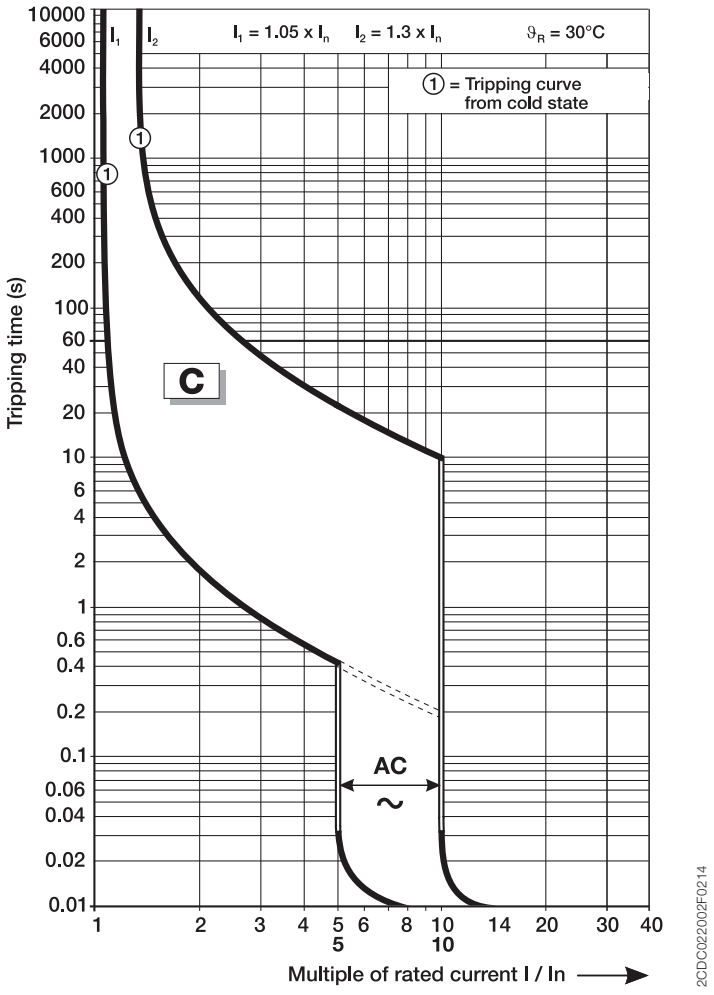
Acc. to	Tripping characte-ristics	Rated current	Thermal release [1]			Electromagnetic release [2]		
			Currents: conventional non-tripping current	conventional tripping current	Tripping time	Range of instantaneous tripping		Tripping time
		I_n	I_1	I_2				
IEC/EN 60947-2	C	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$5 \cdot I_n$	$10 \cdot I_n$	> 0.2 s < 0.2 s
	K	0.2 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$10 \cdot I_n$	$14 \cdot I_n$	> 0.2 s < 0.2 s
	Z	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h [3]	$2 \cdot I_n$	$3 \cdot I_n$	> 0.2 s < 0.2 s

[1] The thermal releases are calibrated to a nominal reference ambient temperature of 30 °C.
In the case of higher ambient temperatures, the current values fall by approx. 6 % for each 10 K temperature rise.

[2] The indicated tripping values of electromagnetic tripping devices apply to a frequency of 50/60 Hz. The thermal release operates independent of frequency.

[3] As from operating temperature (after I_1 > 1h)

C characteristic



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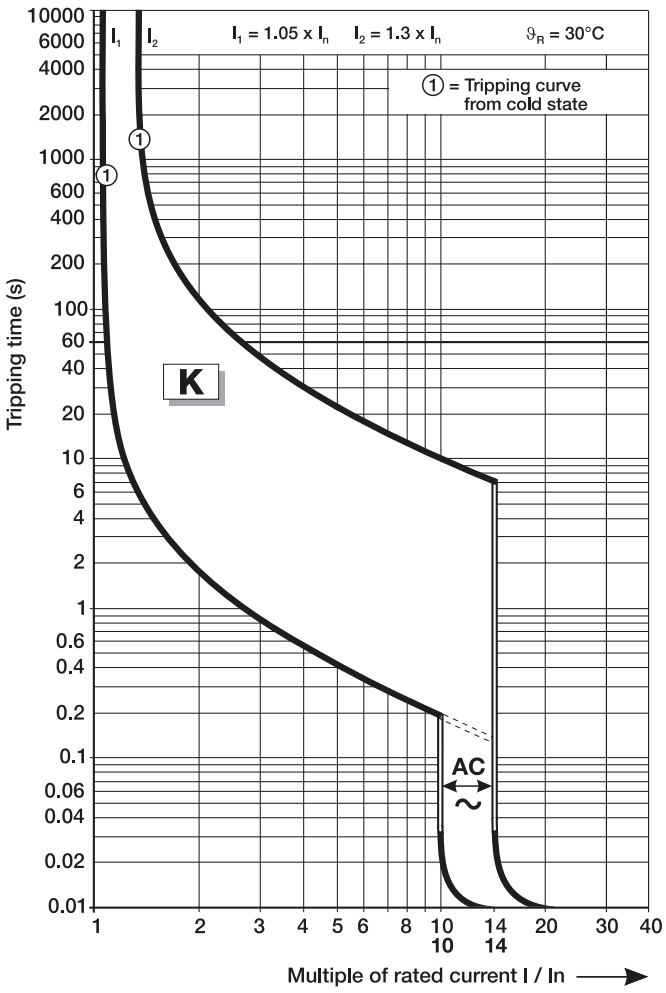
K characteristic



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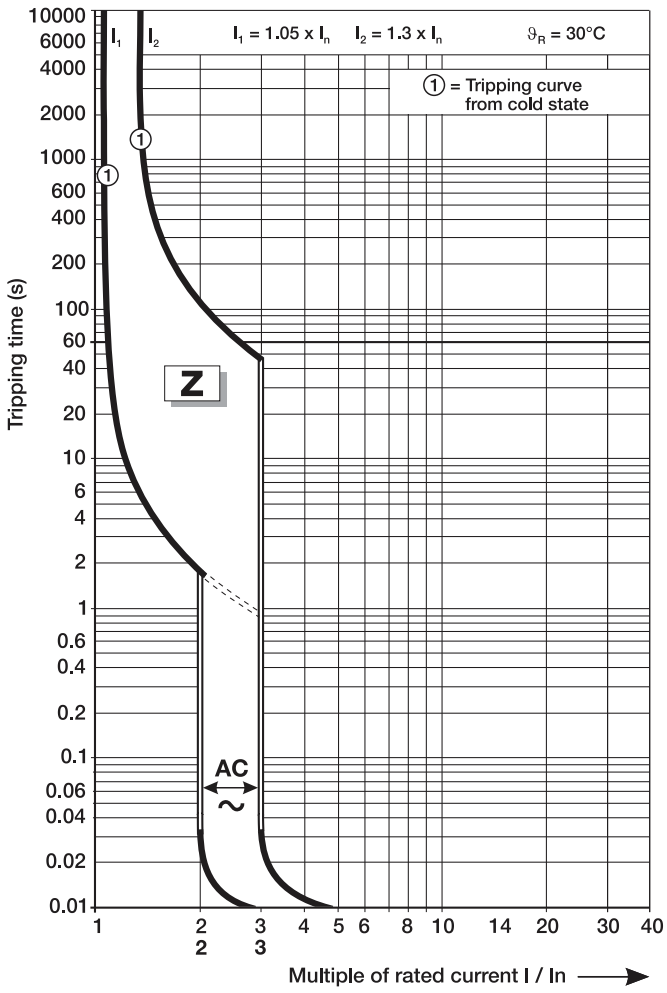
Z characteristic



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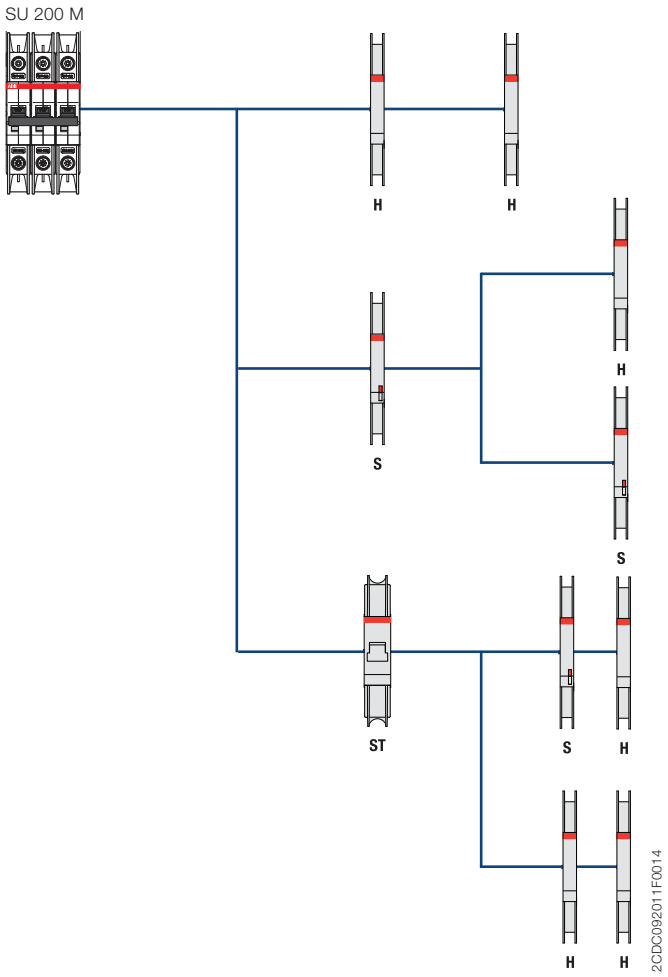
LCP Item 02
Breaker, 4A 1P AC/DC C - ABB SU201M-C4 / Trojan P/N 917139-MC1040 pg. 5/6

Type	Voltage	Current	Power Factor	Phase	I_{peak}	I^2t
		A			kA	kA^2S
SU203M-K0.2	480Y/277	10000	0.45-0.5	3	0.026	0.008
SU203M-K7	480Y/277	4095	0.45-0.5	3	2.3	11.9
SU203M-K7	480Y/277	7500	0.45-0.5	3	3.4	16.7
SU203M-K7	480Y/277	10000	0.45-0.5	3	4.6	19.0
SU203M-K20	480Y/277	4095	0.45-0.5	3	2.9	18.1
SU203M-K20	480Y/277	7500	0.45-0.5	3	4.3	28.1
SU203M-K20	480Y/277	10000	0.45-0.5	3	6.4	34.6
SU203M-K35	480Y/277	4095	0.45-0.5	3	3.4	27.9
SU203M-K35	480Y/277	7500	0.45-0.5	3	4.7	33.1
SU203M-K35	480Y/277	10000	0.45-0.5	3	9.0	72.0
SU203M-C40	480Y/277	4095	0.45-0.5	3	3.4	22.8
SU203M-C40	480Y/277	7500	0.45-0.5	3	5.1	42.5
SU203M-C40	480Y/277	10000	0.45-0.5	3	9.3	74.6
SU201M-K0.2	277	10000	0.45-0.5	1	0.7	0.092
SU201M-K7	277	4095	0.45-0.5	1	2.5	10.5
SU201M-K7	277	7500	0.45-0.5	1	3.4	16.9
SU201M-K7	277	10000	0.45-0.5	1	3.4	14.5
SU201M-K20	277	4095	0.45-0.5	1	2.8	14.7
SU201M-K20	277	7500	0.45-0.5	1	4.1	23.5
SU201M-K20	277	10000	0.45-0.5	1	4.7	32.5
SU201M-K35	277	4095	0.45-0.5	1	3.0	19.8
SU201M-K35	277	7500	0.45-0.5	1	4.7	36.5
SU201M-K35	277	10000	0.45-0.5	1	4.4	22.1
SU201M-C40	277	4095	0.45-0.5	1	3.6	22.9
SU201M-C40	277	7500	0.45-0.5	1	5.3	52.6
SU201M-C40	277	10000	0.45-0.5	1	5.9	44.9
SU203M-K63	240	4095	0.45-0.5	3	3.6	19.9
SU203M-K63	240	7500	0.45-0.5	3	5.1	33.0
SU203M-K63	240	10000	0.45-0.5	3	6.3	43.3
SU201M-K63	240	4095	0.45-0.5	1	3.9	33.8
SU201M-K63	240	7500	0.45-0.5	1	5.2	43.8
SU201M-K63	240	10000	0.45-0.5	1	6.5	61.8

LCP Item 02
Breaker, 4A 1P AC/DC C - ABB SU201M-C4 / Trojan P/N 917139-MC1040 pg. 6/6

Accessory overview

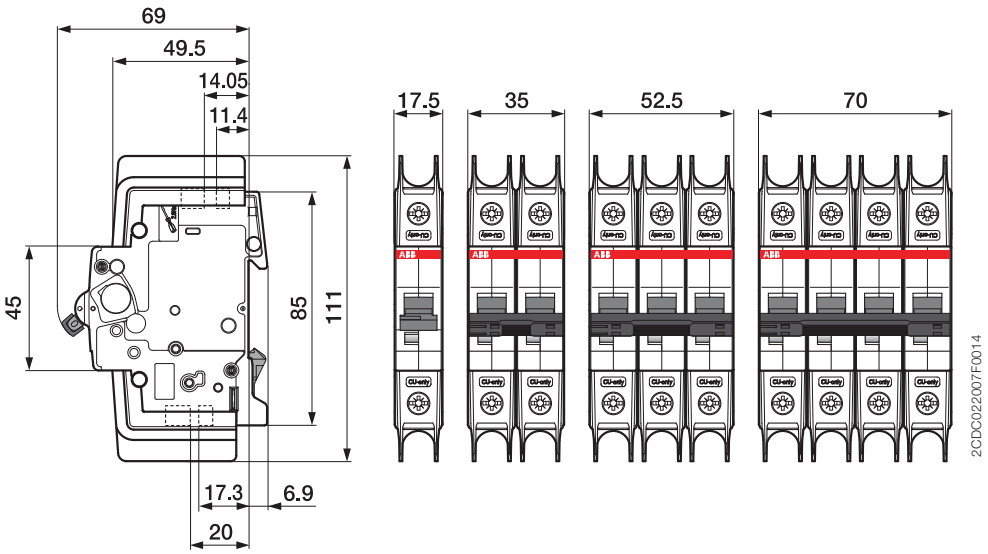


H	Auxiliary contact (change-over contact)	S2C-H6RU
S/H	Signal contact	S2C-S6RU
ST	Shunt trip	S2C-A...U

The certification of the Accessories has been done with one accessory only.

The number of electrical operations is limited to 4,000 operations for the maximum combinations and the combinations including shunt trips.

Dimensional drawing



CONTROLS PHILOSOPHY

SECTION CONTENTS

CP171100051 - Rev 1.2

Scada List

TROJAN UV

Water Confidence™

UVSIGNA CONTROLS PHILOSOPHY – Ann Arbor Replacement, MI

Project # 171100051
Build Sheet Rev. E

Table of Contents

1. GENERAL

The objective of this document is to provide details regarding the control strategy for the Trojan UVSigna™ disinfection system. The controls philosophy outlines the major hardware components, system status, alarm conditions and the modes of operation of the UV system.

1.01 Acronyms and Abbreviations

BCB	Bank Control Board
HSC	Hydraulic System Center
PDC	Power Distribution Center
RED	Reduction Equivalent Dose
SBC	Sensor Based Control
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control And Data Acquisition
SCC	System Control Center
UV	Ultraviolet
UVT	Ultraviolet Transmittance
UVI	Ultraviolet Intensity

1.02 Controller I/O Layout

The following is the list of controller hardware included in the SCC.

Type	Details
Operator Interface	Beijer 15” Colour Touchscreen
Controller Processor	Allen Bradley ControlLogix 1756-L73
Communication	Allen Bradley 1756-EN2T
Board Communication	ProSoft MVI56E-MCM
Analog Input Card	Allen Bradley 1756-IF8
Discrete Output Card	Allen Bradley 1756-OB16E
Discrete Input Card	Allen Bradley 1756-IB16

ProSoft Modbus Communications

Port No.	Function	Devices	Addresses
1	Channel 1 PDC Communication Channel 1 HSC Communication	Bank 1A, Bank 1B, Bank 1C, Bank 1D, HSC 1A,	11, 12, 13, 14, 10,
2	Channel 2 PDC Communication Channel 2 HSC Communication	Bank 2A, Bank 2B, Bank 2C, Bank 2D, HSC 2A,	21, 22, 23, 24, 10,

Analog Input Card

- UV Transmittance

Discrete Output Card

- No Common Minor Alarm
- No Common Major Alarm
- No Common Critical Alarm
- Open Inlet Gate(1 per Channel)
- Close Inlet Gate (1 per Channel)
- Open Outlet Gate (1 per Channel)
- Close Outlet Gate (1 per Channel)

Discrete Input Card

- Inlet Gate Ready (Remote) (1 per Channel)
- Inlet Gate Opened (1 per Channel)
- Inlet Gate Closed (1 per Channel)
- Outlet Gate Ready (Remote) (1 per Channel)
- Outlet Gate Opened (1 per Channel)
- Outlet Gate Closed (1 per Channel)
- No UPS Alarm
- On UPS Battery

1.03 Site Specific Configurations

The following parameters were used to configure the UV system and are specific to the site.

Item	Configuration	Description
Number of Channels	2	
Number of Banks per Channel	4 (3 duty +1 redundant)	
Number of Rows per Bank	2	
Number of Lamps per Bank	24	

Item	Configuration	Description
Number of HSCs per Channel	1	
HSC Locking Latch Option	No	
High Water Level Sensing	No	
Low Water Level Sensing	Yes - Probe	1/Channel
Analog Water Level Sensing	No	
UV Intensity Measurement	Yes	1/Bank
UVT Measurement	Analog	
Flow Measurement	SCADA	
SCADA	Ethernet IP	
UPS	Yes	
Inlet Gate Present	Yes – Control	
Outlet Gate Present	Yes – (Isolation Gate)	
System Peak Flow	54.0 MGD	
Peak Flow Per Channel	27.0 MGD	
Validation Report	2 Row High UVT IUVA Carollo MS2T1 V1.0	
Microbe Sensitivity	MS2	
D10	20.0	
Design Target RED	30 mJ/cm²	
Design UVT	60%	
EOLL Hours	15000	
Fouling Factor	0.94	

1.04 Custom (Site Specific) Programming

- Beijer 15” HMI
- Bank SCADA control modes – Each bank can be placed in PCS Remote, PCS ON, or PCS OFF
- SCADA Inlet Gate open and close command signals; Each Inlet Gate will normally be controlled in Auto by the UV PLC using hardwired I/O, with remote manual control by SCADA as an option if Remote mode is selected at the UV PLC.
- SCADA map to be provided as a separate Excel document
- Outlet Isolation Gate; These gates can be opened and closed manually from the HMI
- Factory Acceptance Testing required.

1.05 Safety Features

The UVSigna control strategy employs equipment protection measures as well as monitoring of a number of alarm conditions that will result in control action designed to maintain the delivered RED.

The first critical interlock condition that will disable a bank of UV lamps is a “Bank Not in Place” alarm. The alarm input is wired directly to the contactor of the respective bank; the BCB will also override all lamps under its control to an off state immediately. This alarm will also disable the automatic wiping functionality of the affected bank.

The second critical condition that will disable a bank of UV lamps is a PDC “Panel High Temperature” alarm. This alarm input is wired directly to the BCB of the respective bank (one BCB per bank); the BCB will override all lamps under its control to an off state immediately.

The third critical condition that will disable a bank(s) of UV lamps is a “Low Water Level” alarm. Each channel is equipped with a separate channel low water level sensor. The signal from this sensor is connected to the BCB “Low Water Level” discrete input of each bank in the channel as a “Bank Low Water Level” for local protection of the bank.

Certain other alarm conditions will trigger a control action that may result in a bank being shut down and another bank coming on in its place, or will result in all banks running at full power. These alarm conditions are more fully described later in this document.

2. CONTROL SYSTEM OVERVIEW

2.01 System Control Center (SCC)

SCC provides the following functionality:

- System Setup
- Control and Monitoring of:
  - System
  - Channels
  - Banks
  - Lamp Drivers
  - Lamps
  - HSC/Wiper Groups
  - Inlet Gates
  - Outlet Gates
- Alarming
- Trending and Data Logging
- Process Parameter Measurement:
  - Flow
  - UV Transmittance (UVT)
- Equipment Pacing
- SCADA Communication

The SCC communicates to the BCB(s) and HSC(s) through one or more Modbus RS-485 networks, dependent on the site configuration.

2.01.1 Controller Fault System Control Behavior

A Controller fault is major in nature and no control action can be taken. Refer to Section 2.04 *System Fault Conditions* for more information.

2.02 Power Distribution Center (PDC)

The Power Distribution Center (PDC) houses the components used to control bank(s). The controller for each bank is Trojan's Bank Control Board (BCB). The BCB performs the following functions:

- Lamp Driver power control
- Bank operating mode: "Local On" / "Local Off" / "Remote"
- Bank Hours/Cycle management
- UV Intensity (UVI) measurement
- Dose pacing
- Monitor and response to critical system interlocks
- PDC protection

The PDC also houses the Lamp Drivers for the banks under its control, and the electrical power distribution network used to route power to each Lamp Driver. The BCB(s) communicates with the Lamp Drivers through a Modbus RS-485 network and the SCC through a separate Modbus RS-485 network.

2.03 Hydraulic System Center (HSC)

The controller of the HSC controls the hydraulic operations for up to four (4) banks in the system; the banks controlled by the same HSC must be in the same channel. The hydraulic operations for each bank include the wiping control of one wiper group per bank, and the bank lifting control. The HSC performs the following functions:

- Automatic wiping controls
- Manual wiping operations
- Hydraulic parameter measurements
- Hydraulic pump protection
- UV bank lift operation (raising and lowering of bank)

The HSC(s) communicates with the SCC through a Modbus RS-485 network.

2.04 System Fault Conditions

The UV system is subject to a number of fault conditions, which may be a minor, major or critical in nature. All alarms are subject to a minor, major, critical or individually configured alarm delay timers. The following table describes and depicts alarm structure.

Critical Alarms:	Indicates that immediate attention is required. The UV system will partially or completely shut down until the fault is cleared. Alarms may be latched and require a reset from the Operator Interface after the alarm condition is remedied.		
System Level	**Alarm Name**	**Description**	**Controls Action In Remote Auto**
System	SCC Run On UPS	The SCC is running on UPS power after a SCC power loss.	No control action taken.
Channel	Outlet Gate Not Fully Open	The outlet gate is not fully open	Channel is flagged as unhealthy. Another channel will be brought online if possible
	Inlet Gate Failed To Start Opening	Gate is commanded to open but the Closed Limit Switch is still closed. (Latched)	Channel is flagged as unhealthy and banks in channel time-off for the Closed Channel Delay time. Inlet Gate will not be commanded to move. Another channel will be brought online if possible.
Bank	PDC High Temperature Shutdown	The PDC temperature has increased beyond the high limit. (Latched)	BCB will turn off the lamp drivers, bank flagged as unhealthy. Another bank will be brought online if possible.
	Bank Not In Place	The “Bank Not In Place” proximity sensor indicates that the bank is not in place in the channel. (Latched)	BCB will turn off the lamp drivers, bank flagged as unhealthy. Another bank will be brought online if possible.
	Bank Low Water Level Shutdown	With flow present, channel water level is below the low mechanical setpoint after the low water alarm time has expired.	BCB will turn off the lamp drivers, bank flagged as unhealthy. Another bank will be brought online if possible.

Major Alarms:	Indicates that immediate attention is required, otherwise damage may occur or disinfection performance may be compromised. The UV system does not shutdown; however, control actions may be taken to achieve disinfection.

System Level	Alarm Name	Description	Controls Action In Remote Auto
System	Low UV Dose	Calculated RED is below the System RED setpoint.	Open all channels and run all available banks at full power
	Not Enough Healthy Channels (latched)	System requires more channels for disinfection than are available	Open all channels and run all available banks at full power
	UVT Meter Fault	The 4-20mA UVT signal input is below 2mA or above 20.5mA OR the UVT value is below the “UVT Meter Fault Setpoint” for the “UVT Meter Fault Delay”	Use “Default” UVT and run the system at full capacity for disinfection.
	Low UVT – Out of Validation Range	UVT is below Low UVT Validation Range setpoint.	Open all channels and run all available banks at full power
	High Flow – Out of Validation Range	Flow is above High Flow Validation Range setpoint.	Open all channels and run all available banks at full power.
	Low Flow	Flow is below preset setpoint.	All banks will time-off if minimum number of banks configured as “0” and minimum number of channels configured as “0” or “1”.
	Controller Fault	Controller/module fault exists.	Controller faults out. No action can be taken.
HSC	SCC-HSC Communication Fault	The HSC is not responding to polling from SCC.	Remote wiping disabled for this HSC.
	HSC Hydraulic Tank Low Level	Hydraulic tank low level pressure signal is detected.	HSC turns hydraulic pump off immediately. Wipers and lifting are disabled for this HSC.
	HSC Pump Fault	The hydraulic pump fails to turn on/off when requested. (Latched)	HSC turns hydraulic pump off immediately. Wipers and lifting are disabled for this HSC until condition reset at HSC.
Channel	Not Enough Healthy Banks Available	There are not enough banks available to meet the RED setpoint.	Banks in the channel are run at 100% power until another healthy channel can be brought online (if available) or the fault is cleared.
	Inlet Gate Fail to Open	Gate is commanded to open but the Open Limit Switch is not closed. (Latched)	Channel is flagged as unhealthy and banks in channel stay on. Inlet Gate will not be commanded to move. Another channel will be brought online if possible.
	Inlet Gate Fail to Start Closing	Gate is commanded to close but the Open Limit Switch is still closed. (Latched)	Channel is flagged as unhealthy and banks in channel stay on. Inlet Gate will not be commanded to move. Another channel will be brought online if possible.
	Inlet Gate Fail to Close	Gate is commanded to close but the Closed Limit Switch is not closed. (Latched)	Channel is flagged as unhealthy and banks in channel stay on. Inlet Gate will not be commanded to move. Another channel will be brought online if possible.
	Outlet Gate Failed To Start Opening	Gate is commanded to open but the Closed Limit Switch is still closed. (Latched)	No control action taken
	Outlet Gate Fail to Open	Gate is commanded to open but the Open Limit Switch is not closed. (Latched)	No control action taken

System Level	Alarm Name	Description	Controls Action In Remote Auto
	Outlet Gate Fail to Start Closing	Gate is commanded to close but the Open Limit Switch is still closed. (Latched)	No control action taken
	Outlet Gate Fail to Close	Gate is commanded to close but the Closed Limit Switch is not closed. (Latched)	No control action taken
Bank	SCC-PDC Communication Fault	The BCB is not responding to polling from the SCC.	Bank is flagged as unhealthy. The bank is run at full power by BCB if option selected at Operator Interface.
	Multiple Lamp Failure	Number of failed lamps has reached or exceeded Multiple Lamp Failure Setpoint. (Latched)	Bank is flagged as unhealthy. Another bank will be brought online if possible.
	BCB Dipswitch Mismatch	The Dipswitch configuration on the BCB does not match the expected configuration.	Bank is flagged as unhealthy. Another bank will be brought online if possible.
	Bank Configuration Mismatch	The bank configuration in the System Settings does not match the actual configuration of the bank at the BCB.	Bank is flagged as unhealthy. Another bank will be brought online if possible.
	Not Enough Healthy Lamps	There are no lamps in the bank available to operate.	BCB will turn off the lamp drivers, bank is flagged as unhealthy. Another bank will be brought online if possible.
	UVI Sensor Fault - SBC	The signal from the bank UVI sensor is faulted. Alarm applicable only if the operator configurable “Use Theoretical” setting is set as “Never”.	No control action taken.
	UVI Sensor Lower Than Expected – SBC - Latched	The UVI sensor is reading lower than the theoretical limit value.	Bank is flagged as unhealthy. Another bank will be brought online if possible.
	Wiper Group Jammed	Wiper hits high pressure within “Minimum Wiper Travel Time” when this wiper is moving. (Latched).	The affected wiper group is disabled until condition reset at HSC.
	Wiper Travel Time Exceeded	The wiper has exceeded the maximum travel time while retracting or extending. (Latched)	The affected wiper group is disabled until condition reset at HSC.

Minor Alarms:	Indicates that the UV system requires maintenance but it is operating in compliance. Alarms are not latched and no reset is required. No other actions will be taken.		
System Level	**Alarm Name**	**Description**	**Controls Action In Remote Auto**
System	Controller Battery Low	The battery in the controller is low and will not be able to maintain the program in the event of a power failure.	No control action taken.
	System Power On Reset	System has experienced a power on reset condition.	Maintain normal operation as it was prior to power outage.
	SCC Power Restored	SCC power has been restored.	No control action taken.
	UPS Fault	The UPS backup for the SCC has a fault.	No control action taken.
	SCADA Fault	The Plant SCADA network has stopped communication with the Controller.	If SCADA is used to provide flow and the SCADA Alarm Action System Setting is set to “Alarm and

System Level	Alarm Name	Description	Controls Action In Remote Auto
			Default", the "Default" Flow will be used.
	System In Transition	Indicates that a Low UV Dose Alarm was inhibited during a System Transition (bringing on channel or bank).	No control action taken.
	Low UVT Alarm	UVT is below preset low limit setpoint.	No control action taken.
	UVT Below Design Value	UVT is below the design value.	No control action taken.
	UVT Meter Override Value Used	Manually entered UVT Override value is being used.	No control action taken.
	High UVT – Out of Validation Range	Check Validation Range mode only –UVT is above High UVT Validation Range setpoint.	No control action taken.
	Flow Meter Override Value Used	Manually entered Flow Override value is being used.	No control action taken.
	Low Flow – Out of Validation Range	Check Validation Range mode only – Flow is below Low Flow Validation Range setpoint.	No control action taken.
HSC	HSC Remote Wipe Inhibited	Conditions exists that will not allow a remote wipe of any HSC wiper groups.	Remote wiping is disabled for this HSC.
Channel	Channel Design Flow Exceeded	Channel Flow exceeds the Design Flow setpoint.	No control action taken.
	Channel Maximum Flow Velocity Exceeded	Channel Flow exceeds the Maximum Flow Velocity setpoint.	No control action taken.
	Channel Flow Limit For Wiping Exceeded	Channel Flow exceeds the Maximum Flow for Wiping setpoint.	Wiper groups in the channel will be disabled
	Inlet Gate Not In Remote Auto	Gate is not in Remote Auto.	Channel is flagged as unhealthy and the Inlet Gate will not be commanded to move. Banks will remain on. Another channel will be brought online if possible.
	Channel Maintenance Mode Enabled	Channel has been placed into Maintenance Mode	Channel will be unable to run in Auto mode. Channel and Bank Alarms to SCADA will be masked.
Bank	Bank Not In Remote Auto	The bank is not in "Remote Auto" Mode.	Bank is excluded from Auto Pacing.
	Bank Low Water Level Warning	With flow present, channel water level is below the low mechanical setpoint for less than the minor alarm time.	No control action taken.
	PDC Fan Failure	The PDC fan has a fault, as indicated by a BCB input.	No control action taken.
	PDC High Temperature Warning	Warning that the PDC cabinet temperature is increasing as indicated by a BCB input.	No control action taken.
	Lamp Failure	One or more lamps have failed in the bank.	No control action taken.
	Lamp Lifetime Exceeded	One or more of the lamps in the bank have exceeded the lamp lifetime setpoint.	No control action taken.
	Lamp Driver Communication Failure	Indicates a communication failure between the BCB and lamp driver(s).	No control action taken.

System Level	Alarm Name	Description	Controls Action In Remote Auto
	Lamp Driver Failure	Indicates a lamp driver(s) has failed in the bank.	Bank is flagged as unhealthy. Another bank will be brought online if possible.
	UVI Sensor Fault – Non SBC	The signal from the bank UVI sensor is faulted. Alarm applicable only if the operator configurable “Use Theoretical” setting is set as “Always” or “On Failure”.	No control action taken.
	UVI Sensor Lower Than Expected – Non SBC	The UVI sensor is reading lower than the theoretical limit value.	No control action taken
	UVI Sensor Reference Check Required	The UVI Sensor Reference Check Required timer has expired; a reference check of the bank UVI sensor(s) is required to maintain system performance.	No control action taken - Human intervention is required to perform a UVI sensor reference check.
	UVI Sensor Reference Check Active	A UVI Sensor Reference Check is currently being performed on the bank.	Remote wiping disabled for the associated wiper group.
	Wiper Not In Remote	Wiper Group is not set to “Remote” at the HSC.	No control action taken.
	Wiper Position Unknown	The wiper has lost its “Home” position due to a Wiper Group Jammed or Wiper Retract Travel Time Exceeded Fault. (Latched)	The affected wiper group is disabled until condition reset at HSC.
	Lift Attempted With Lamps Energized	Lifting the banks was attempted while the lamps were still energized.	No control action taken.

2.05 Security

The SCC controller will be configured with security access restrictions according to the three (3) different access levels defined in the table below.

Level	User	Description of Access	User Name
1	No Login*** (Default)	User may view all unrestricted data.	- - -
2	Operator	User may view all unrestricted data and enter process data, control process equipment and adjust process control setpoints. The password protection can be removed by placing the “Operator Login Required” System Setting to “No”.	OP
3	Maintenance	User has access to configuration of process control strategies and displays	OP1

*** The Login button will show “LOGIN” when there are no users logged in.

3. BANK CONTROL

3.01 Control Architecture

The control system architecture has been designed such that each bank in the system will be controlled by a separate Bank Control Board (BCB). Each bank consists of an array of lamp drivers that monitor and control up to two (2) UV lamps each. Lamp drivers are connected through a Modbus RS-485 communication link to the Bank's BCB, which generates the necessary signals to control the lamp drivers. Lamp and lamp driver status information is passed back to the BCB. The SCC Controller does not communicate directly with the lamps or lamp drivers, but will route desired bank commands to the associated BCB.

All BCB's communicate with the SCC to accept commands and exchange status information related to its associated bank. Additionally, the BCB has four critical alarms which will shut down a bank:

3.01.1 "Bank Not In Place"

A "Bank Not In Place" alarm is generated when a bank is not in place in the channel. The alarm input is wired directly to the contactor of the respective bank; the BCB will also override all lamps under its control to an off state immediately. A "Bank Not in Place" alarm will also disable the automatic wiping functionality of the affected bank.

3.01.2 "PDC High Temperature Shutdown"

A "PDC High Temperature Shutdown" alarm is generated when the internal temperature of the PDC exceeds the high limit. This alarm input is wired directly to the BCB of the respective bank (one BCB per bank); the BCB will override all lamps under its control to an off state immediately.

3.01.3 "Bank Low Water Level"

A "Low Water Level" alarm is generated when the water level in a channel is below the fixed level sensor. The signal from this sensor is connected to the BCB "Low Water Level" discrete input of each bank in the channel as a "Bank Low Water Level" for local protection of the bank.

3.01.4 "Bank PDC Disconnect OFF"

A "Bank PDC Disconnect OFF" alarm is generated when the corresponding Bank's disconnect feedback contacts transitions from closed to open circuit. The disconnect feedback is directly connected to the respective Bank's BCB. The BCB will override all lamps under its control to an off state immediately.

3.02 Bank Control Mode Selection

The UVSigna banks can be operated in "Local Off", "Local On" or "Remote" Control Modes. The selection of "Local Off", "Local On" or "Remote" Mode is made through a 3-way selector switch mounted on the associated PDC, which is wired to the BCB. When a bank is in "Local Off" Mode, all lamp drivers are de-energized. When a bank is in "Local On" Mode, the BCB will energize the bank at full power. When a bank is in the "Remote" Mode, the SCC is in control of the bank. There are three Bank Remote Modes of Operation: "Off", "On" and "Auto".

3.03 Bank Control Mode Operation

There are five possible operational modes that a bank can be placed into: “Local On”, “Local Off”, “Remote Off”, “Remote On” and “Remote Auto”. When a bank is in “Local” Mode (“Local On” or “Local Off”), the SCC has no control over the bank. When a bank is in “Remote” Mode, the SCC is responsible for controlling the bank.

3.03.1 “Local Off”

When a bank is placed into “Local Off”, the bank will be commanded to turn off immediately if it was running. The bank will remain off while in this mode of operation.

3.03.2 “Local On”

When a bank is placed into “Local On”, the bank will operate at 100% power level.

3.03.3 “Remote Off”

When a bank is placed into “Remote Off”, the bank will be commanded to turn off immediately if it was running. A warning screen will prompt the user for confirmation. The bank will remain off while in this mode of operation.

3.03.4 “Remote On”

When a bank is placed into “Remote On”, the bank will operate at 100% power level.

3.03.5 “Remote Auto”

A bank in “Remote Auto” is controlled by the Auto Pacing routine. The SCC will control the number of banks that are operating and the BCB will determine the power level the bank must operate at to meet the Target Dose.

In “Remote Auto” Mode, all banks are requested to turn on for a configured warm-up time, and then will change to the power level that is requested by the Auto Pacing routine within the BCB once the warm-up timers expire. Additionally, all banks running in “Remote Auto” Mode in a channel will be forced to full power any time any additional bank within the channel is in a warm-up phase. When a bank is no longer required by the Auto Pacing routine, the bank will remain running at a minimum power level until a configured Bank Time-Off period expires. The Auto Pacing routine is further described in Section 9 *Auto Pacing*.

The following table summarizes the available bank control modes:

Bank Mode	BCB Power Level Control	Power Level
Local Off	BCB	Off
Local On	BCB	100%
Remote Off	SCC	Off
Remote On	SCC	100%
Remote Auto	SCC	Off or 30% - 100% Auto Pacing Routine Set

As a bank operates, each BCB will record the Bank Hours, Bank Cycles, Bank Lamp Hours, and Individual Lamp Hours. An operator can reset/override the Bank Cycles, Bank Lamp Hours, and Individual Lamp Hours from the Operator Interface. When an operator resets/overrides the Bank Lamp Hours all Individual Lamp Hours are automatically set.

3.04 Bank Fault System Control Behavior

Banks are subject to a number of fault conditions which may be a minor priority and identify a service requirement, may be major priority and result in a bank either being shut down when in “Remote Auto” Mode or run at full power as required, or may be critical and prevent the bank from running in any mode. All alarms are subject to a minor, major, critical or individually configured alarm delay timers. Refer Section 2.04 *System Fault Conditions* for more information.

4. HYDRAULIC CONTROL

4.01 Control Architecture

Each Hydraulic System Center (HSC) is able to control the hydraulic operations for up to four (4) banks in the system; the banks controlled by the same HSC must be in the same channel. Additional HSC units will be provided as required to control additional banks in the channel. The SCC will communicate to each HSC in the channel separately at unique configured addresses. The hydraulic operations for each bank include:

- Wiping Control – one wiper group per bank
- Bank Lifting Control

The HSC contains a controller which is used to monitor the hydraulic operation related inputs and to control the wiping and bank lifting functionality of each bank. The SCC Controller communicates with each HSC Controller using a Modbus RS-485 network. Through this network, the SCC Controller is able to send commands and configuration settings to HSC, and read HSC and Wiper Group status.

4.02 HSC Lift Control

In addition to controlling the wiping operations, each HSC also controls the bank lifting operation. Bank lifting uses the existing hydraulic pump from the wiping system to hydraulically lift banks in and out of a channel, one at a time. Since the same pump is used for both lifting and wiping operation, the HSC can only perform one operation at a time. The HSC has a two-position selector switch used to select HSC “Lift” or “Wiping” Mode. While the HSC is in “Lift” Mode, no wiping will be permitted for any of the wiper groups controlled by the HSC. If the HSC Mode is changed from “Wiping” to “Lift” while a wiping operation is taking place, a lift request will not be completed until the wiping in progress is completed.

4.03 Wiping Control Modes

If Wiping Control is enabled, each bank in the system will have a separate wiper group assigned to it. Each wiper group can be set to “Local Off”, “Local On” or “Remote” Control Modes. The mode selection is made through a 3-way selector switch mounted on the HSC, which is wired to discrete inputs of the HSC Controller.

4.03.1 Wiper Group “Local Off” Mode

When a Wiper Group Control Mode is set to “Local Off” the wiper will be inhibited from wiping.

4.03.2 Wiper Group “Local On” Mode

When a Wiper Group Control Mode is set to “Local On”, the wiper group will wipe based on local commands made through the Wiper Operation Selection Switch: “Extend”, “Retract” or “Sequence”. If more than one wiper group in a HSC is placed into “Local On” Mode, only the first wiper group placed into “Local On” will begin to operate - all other wiper groups set to “Local On” will be ignored. The HSC is only capable of wiping one group at a time. When the HSC Wiper Operation Selection Switch is switched to “Local Retract”, a wiper retract sequence will occur and then the hydraulic system will be shut down. When the HSC Wiper Operation Selection Switch is switched to “Local Extend”, a wiper extend sequence will occur and then the hydraulic system will be shut down. When the HSC Wiper

Operation Selection Switch is switched to “Local Sequence”, a wiper extend sequence will occur, followed immediately by a wiper retract sequence and then the hydraulic system will be shut down.

4.03.3 Wiper Group “Remote” Mode

When a wiper group is in “Remote” a wipe sequence may be initiated by an operator through the Operator Interface (Manual Wipe Request), or initiated by the HSC based on an operator selectable elapsed time basis (Automatic Wipe Request). The SCC Controller can request a remote wipe of a bank when the measured UV Intensity is lower than expected (negative deviation) in an attempt to rectify possible lamp and UVI sleeve fouling.

Manual Remote Wipe Request – Single Wiper Group

Through the “Wiper Detail” Screen on the Operator Interface, the operator can request a manual remote wipe sequence of a single wiper group in “Remote” Mode. Only one wiper group can be wiped at a time. As a result, if any wiper group in a HSC is currently wiping, the Manual Remote Wipe Request is not available to the operator for all wiper groups in that HSC.

Manual Remote Wipe Request – All Wiper Groups

Through the “Wiper Overview” Screen on the Operator Interface, the operator can request a manual remote wipe sequence of all wiper groups in the system in “Remote” Mode. The HSC will co-ordinate the order in which wiper groups controlled by the same HSC are wiped, one at a time.

The SCC Controller will inhibit a Manual Wipe Request of all Wiper Groups if the HSC is inhibited from Remote Wiping, or all wiper groups in each HSC are inhibited from Remote Wiping.

Automatic Wipe Request

All Wiper Groups in “Remote” Mode in a HSC will be scheduled by the HSC for an automatic wipe when the “Wiper Cycle Time Delay” has elapsed. This time delay is an operator enterable System Setting from the Operator Interface sent to each HSC – if this value is set to 0 the Automatic Wiper functionality is disabled.

For each HSC in the system, when the “Wiper Cycle Time Delay” has elapsed in the HSC Controller, a wipe sequence will be scheduled for all configured wiper groups in “Remote” Mode in the HSC. The HSC will control the order in which the wiper groups will be wiped, one at a time. Once the automatic wipe has been completed, the “Wiper Cycle Time Delay” will be reset.

Controller Remote Wipe Request

The SCC Controller can request a remote wipe of the bank. When the measured UV Intensity is lower than expected (UV Intensity negative deviation), the SCC Controller will request a remote wipe of the bank in an attempt to rectify any possible sleeve fouling.

If the negative deviation still exists after the bank has been wiped, or the SCC Controller is inhibited from requesting a remote wipe of the bank, a “UVI Sensor Lower Than Expected Fault” will be initiated.

The following table further summarizes the available control modes:

Mode	Action Initiated By	Wiper Action
Wiping - Local Off	HSC	Off
Wiping - Local Extend	HSC	Initiate extend sequence
Wiping - Local Retract	HSC	Initiate retract sequence
Wiping - Local Sequence	HSC	Initiate extend and then retract sequence
Wiping - Remote Auto	HSC	Automatic sequence initiated for all enabled wiper groups
	SCC	Operator Interface initiated Manual Remote Wipe sequences of a single wiper group or of all wiper groups in the system
	SCC	Controller initiated Remote Wipe sequence for UVI negative deviation
Bank Lifting	HSC	Wiper operations in progress are completed, and then wiping is inhibited.

4.04 Hydraulic System Fault System Control Behavior

Wipers and the lifting mechanism are subject to a number of fault conditions, which may be critical in nature and result in a HSC being shut off. Some wiper fault conditions - whether they are critical, major, or minor - must be reset by placing all wiper groups of the HSC into “Local Off” mode. All alarms are subject to a minor, major or critical alarm delay timers. Refer to Section 2.04 *System Fault Conditions* for more information.

5. FLOW INPUT

A flow signal or flow value over SCADA is required for the Auto Pacing functionality in the UVSigna System. UVSigna will use one flow signal input or flow value over SCADA for control and assume that the flow is split evenly between active channels, and assumes that all of the flow allocated to a channel will pass through all banks in that channel. Flow can be displayed in m^3/hour, m^3/day, GPM, L/s and US MGD units as standard options.

5.01 Flow Measurement Modes

5.01.1 SCADA Analog Flow Signal

An analog flow signal is passed from a Plant Network through a configured SCADA system to a designated address in the SCC Controller. The signal must be passed as a 16-bit integer value that represents an engineering unit signal multiplied by a variable scaling factor. The UV Controller will divide this value by the variable scaling factor to get a scaled flow with 1 or more decimal places of accuracy. When flow is received from SCADA, the debouncing filter routine will not be used. If a SCADA communication fault occurs with the “SCADA Alarm Action” system setting set to “Alarm and Default”, the system flow will be set to the “Default Flow” system setting. An operator may adjust the “Default” Flow value at any time through the system settings screen of the Operator Interface.

The operator can manually override the flow from the System Overview screen of the Operator Interface.

5.02 Flow Fault System Control Behavior

Depending on channel flow conditions and/or flow meter status a critical or major alarm could be generated resulting in the system running at full capacity for disinfection. All alarms are subject to a minor, major, critical or individually configured alarm delay timers. A fault with an individually configured alarm delay timer could result in banks timing off under certain configurable conditions. Refer to Section 2.04 *System Fault Conditions* for more information.

6. UVT INPUT SIGNAL

A UVT signal is required for the UVSigna Auto Pacing functionality. UVSigna will use one UVT signal input for control and assume that the effluent flow through all operating banks is at the same UVT value. UVT is displayed as a percentage (%).

6.01 UVT Measurement Modes

6.01.1 Analog UVT Signal

A 4-20mA analog UVT signal is brought in through the SCC Controller analog input card. The raw signal counts are passed through a signal scaling routine to convert to the percentage value, and then passed through a debouncing filter routine. If an analog UVT meter fault occurs, the system UVT will be set to the set to the “Default” UVT System Setting. An operator may adjust the “Default” UVT value at any time through the System Settings screen of the Operator Interface.

The operator can manually override the UVT from the System Overview screen of the Operator Interface. A minor alarm will be posted to indicate that the UVT meter override value is being used.

6.02 UVT Fault System Control Behavior

UVT faults may be major in nature resulting in the system running at full capacity for disinfection or minor with no control action taken. Refer to Section 2.04 *System Fault Conditions* for more information.

7. INTENSITY INPUT SIGNAL

A UV Intensity sensor is provided for each UV bank. This signal originates from a sensor probe mounted within a bank of lamps, and is terminated at the BCB.

7.01 Intensity Measurement Modes

Measured Intensity is required for dose calculations. The UV Intensity value is calculated at the BCB using the UVI sensor signal, and is made available to the SCC Controller as a raw mA value (for analog UVI sensors only) and as a scaled value in mW/cm^2. The UVI sensor value is continuously compared against a theoretical value determined from the UVI sensor equation associated with the selected dose calculation method. The resulting Sensor Deviation percentage is used by the BCB to determine whether the sensor is currently reading lower than expected and is compared to configured Alarm Setpoints for alarm and warning indications.

A reference sensor check procedure can be initiated by the operator through the Operator Interface; this procedure will step through the process of checking the output of a UV Intensity sensor against a calibrated sensor.

7.02 Intensity Fault System Behavior

Intensity faults may be major in nature resulting in the affected bank being flagged as unhealthy and remote wipe request by the controller to be inhibited. Depending on the minor fault condition remote wipe requests can also be inhibited by the controller; other minor fault conditions result in no control action taken. Refer to Section 2.04 *System Fault Conditions* for more information. The system may optionally be configured to use the theoretical sensor value when a sensor fault occurs.

NOTE: The UVI value on the Bank Screen will display a ">" symbol if the UVI Deviation value is more than the Positive Deviation % value that is hard coded in the SCC Controller at 20%. For dose pacing purposes, the BCB will clamp the UVI reading at 1.2x the expected UVI value that is constantly calculated. The S/S0 ratio that is calculated will also be clamped at a maximum value of 1.0 by the BCB.

8. AUTO PACING

Auto Pacing consists of Equipment Pacing and Dose Pacing and applies to banks in "Remote Auto" mode.

Equipment Pacing is executed by the SCC Controller, and will determine the number of UV channels and banks required to achieve the System Target RED at design conditions.

Dose Pacing is completed by each BCB in the UV System. The BCB will independently determine the bank power required to meet the Bank RED Target set by the SCC Controller.

Both of these pacing operations are covered in the sections below.

8.01 Equipment Pacing (SCC Controller)

8.01.1 Control Architecture

The UVSigna control system will allow the staging of banks in individual channels as required. In addition, the system can control a single upstream channel isolation inlet gate per channel. If the channel isolation devices cannot be monitored by the SCC Controller, a channel can be "Enabled" or "Disabled" from the Operator Interface to allow operators to indicate when a channel is required to disinfect process flow.

8.01.2 Channel Control Operation

The UVSigna control system maintains one channel in operation at all times as a minimum (adjustable as required to meet the plant operating strategy). The control priority is to ensure that the flow of effluent through the UV channels does not exceed hydraulic design capacities at any time, regardless of the current system disinfection capabilities. Although this strategy may result in un-disinfected effluent being passed through a UV channel, it ensures that flooding conditions are avoided if at all possible and prevents the risk of equipment damage due to extreme channel flow velocities.

Each channel is equipped with a separate channel low water level sensor. The signal from this sensor is connected to the BCB Low Water Level discrete input of each bank in the channel. The Low Water Level status for each channel is provided to the SCC Controller through the Modbus RS-485 communications protocol between the SCC Controller and the BCBs. The SCC Controller uses this status for alarming as well as control of the banks when under SCC control (Remote Mode). The Low Water Level discrete inputs at the BCBs provide local protection of the bank when in “Remote” or “Local” Mode.

Channels are assigned a Lead/Lag status by the SCC Controller. This will be updated every time a channel priority sort occurs. Lag channels are brought in and out of operation by the Equipment Pacing routine as required. The number of banks required to be on and the RED Target of these banks is also determined by the Equipment Pacing routine. Each channel maintains a healthy status which requires that there be no inlet gate or outlet gate alarms for the channel, and that the required number of banks for dose pacing in that channel is available. If these conditions are not met, the channel will become unhealthy.

Number of Channels Required

The Channel Control Operation of the Equipment Pacing routine will determine how many channels are required based upon two evaluation criteria:

- Hydraulic Flow and Velocity Requirements
- Channel Disinfection Dose Capacity Requirements

To determine the number of channels required for Hydraulic Flow requirements, a “Channel Peak Flow” multiplied by a “Channel Open (% Peak Flow)” limit is calculated for the system. The System Flow will be compared to the “Peak Flow x Percentage” limit to determine how many channels are required to operate. The Peak Flow per channel may be determined and adjusted based on head loss, flow velocity and plant operating strategy.

Each channel will separately calculate its Channel Dose Capacity based on the available banks in the channel, the predicted flow, current system parameters and System Settings. The number of channels required to meet the Channel Disinfection Dose Capacity criteria is calculated by determining how many channels are required to ensure each channel in operation can meet the System RED target.

The number of channels required to be in operation will always be the **greater** of the number of channels required for Hydraulic Flow and the number of channels required to meet the Channel Disinfection Capacity requirements.

Opening Channels

If the number of channels required is greater than the current number of channels operating, a lag channel will be immediately called to operate. The manner in which the channel is opened depends on whether a Low Water Level situation is present.

If all banks within the channel do not have an active Low Water Level status, the required number of banks in the channel will be requested to energize. After the banks have been requested for a configurable time delay, the inlet gate will be requested to open..

If any of the banks within the channel have an active Low Water Level status, the inlet gate will be requested to open immediately. Banks in the channel that have an active Low Water Level Warning can be energized. Banks in the channel that have an active Low Water Level Alarm will not be able to energize until sufficient water level is present to clear the alarm status. Once the inlet gate starts to open, banks with a Low Water Level status will start a Bank Low Water Level Delay timer. If the Low Water Level condition is not cleared before the Bank Low Water Level Delay timer expires, the bank will be shut down with a Critical Low Water Level Alarm initiated by the SCC Controller. If there are not enough healthy banks in the channel to meet the System RED setpoint, the channel will become unhealthy.

NOTE: Once the SCC Controller initiates a Critical Low Water Level Alarm for banks in a channel with flow present, this alarm cannot be cleared EXCEPT by re-establishing a water level that clears the contact input and resets the alarm logic or by pressing the Bank Fault Reset pushbutton on the Bank Overview screen of the Operator Interface. If a channel closes with banks that have Critical Low Water Alarms, the channel may not be called into operation again unless there are enough banks without a fault OR a Not Enough Healthy Channels condition exists.

Closing Channels

If the number of channels required is less than the current number of channels operating, a lag channel will begin a Channel Closing Delay timer (typically 15 to 30 minutes), and will remain open until the timer expires. If at any time the Channel Control routine requests the lag channel to operate while it is timing off, the Channel Closing Delay timer will be reset. Once the Channel Closing Delay Timer expires, the inlet gate will begin to close. When the inlet gate reaches the fully closed position, all banks in the channel will advance their Bank Time-Off timer to the “Bank Running in Closed Channel Delay Time” value and will be shut off when this timer expires.

Priority and Availability

The order in which channels are called to run is determined by the priority and availability of the channels.

Priority: Each channel in the system is assigned a unique priority used to determine the order in which channels will be called to operate.

Availability: The availability of each channel is dependent on Channel Health.

The Equipment Pacing routine will try to run the “*Number of Channels Required*”, starting with the highest priority channel (Lead) first. If the Lead Channel is **not** available, then the routine will try to run the next priority channel (1st Lag). If the routine cannot find enough available channels to run a system fault (“Not Enough Healthy Channels”) is generated.

If a channel running in “Auto” Mode (controlled by Auto Pacing) becomes unavailable, another channel will be requested to run in its place. If another channel is not available to run, a system fault (“Not Enough Healthy Channels”) is generated.

Not Enough Healthy Channels (NEHC)

If the number of healthy channels is less than the number of channels required, a “Not Enough Healthy Channels” (NEHC) alarm is latched for the system. When this alarm is active, all channels in the system will be opened, and all banks in all channels will be run at full power including any banks previously shut down for lamp or lamp driver faults. It is possible in this condition for some banks to remain off due to:

- Bank(s) not in “Remote Auto” Mode
- “Bank Not In Place” Fault
- “PDC High Temperature Shutdown” Fault
- SCC to BCB Communication Fault
- Low Water Level Shutdown Faults

Channel Maintenance Mode

Each channel has the ability to be put into maintenance mode. In this mode, no auto pacing will occur and the equipment in the channel will not run regardless of the presence of flow. The relative channel and bank alarms to SCADA will be masked except for the Maintenance Mode alarm. All equipment can be run individually either in manual or in local.

8.01.3 Bank Control Operation

The Bank Control Operation of the Equipment Pacing routine is used to control the number of UV banks that are operating in each channel, and the RED Target for each bank. Banks are assigned a Lead/Lag status by the SCC Controller. This will be updated every time a bank priority sort occurs. Lag banks are brought in and out of operation by the Equipment Pacing routine as required.

Number of Banks Required

The Bank Control Operation of the Equipment Pacing routine will determine how many banks are required based upon a Bank Dose Capacity – the maximum dose that a bank can achieve based on a predicted flow, current system parameters and System Settings. Each channel will separately calculate the number of banks required based on the Bank Dose Capacities of the available banks in the channel. The number of banks required in each channel can vary. Each “Remote Auto” bank in a channel will run at the necessary power level to achieve the Bank RED Target. The power level for each bank can be different (dependent on factors such as UV Intensity and lamp failures). The bank power level can be modulated between 30% and 100% power.

Bank Turning On

If the required number of banks is greater than the current number of banks operating, a lag bank will be immediately called to operate. When the Equipment Pacing routine determines that more banks are required to be started, the request is processed immediately by the bank control routine. If a lag bank is required to be energized, its bank control routine will energize the lamps in the bank and execute the bank warm-up routine. During this time, all operating banks in “Remote Auto” in the channel will also be held at full power. Once all banks are warmed up in the channel, they will go to the power level assigned by the BCB Dose Pacing routine (based on the Bank RED Target set by the Equipment Pacing routine). Banks will not be included in the dose calculations until their warm-up is complete.

Bank Turning Off

If the required number of banks is less than the current number of banks operating, a lag bank will be called to shut down. The bank control routine will initiate a Bank Time-Off timer (typically 15 to 30 minutes). While a bank is timing-off, it will run at the minimum operating power level (30%) for the duration of the Bank Time-Off Delay. Once the Bank Time-Off timer expires, the bank will be shut off. If the bank is required for Equipment Pacing during the Bank Time-Off delay time, the bank will exit the time-off sequence, reset the Bank Time-Off timer and begin to Auto Pace once again. The Bank Time-Off timer serves to minimize the number of bank on/off cycles due to fluctuating process conditions.

Priority and Availability

The order in which banks are called to run is determined by the priority and availability of the banks.

Priority: Each bank in a channel is assigned a unique priority used to determine the order in which banks will be called to run or turned off.

Availability: The availability of each bank is dependent on the Bank Mode and Bank Health.

The Equipment Pacing routine will try to run the "*Number of Banks Required*", starting with the highest priority bank (Lead) first. If the Lead Bank is **not** available, then the routine will try to run the next priority bank (1st Lag). This continues until the routine either finds enough available banks to run or there are not enough available banks and a channel fault ("Not Enough Healthy Banks") is generated.

If a bank running in "Remote Auto" Mode (controlled by Auto Pacing) becomes unavailable, another bank will requested to run in its place. If another bank is not available to run, a channel fault ("Not Enough Healthy Banks") is generated.

Not Enough Healthy Banks (NEHB)

If the number of banks required to meet the required System RED are not available in the channel, a channel "Not Enough Healthy Banks" (NEHB) alarm will be generated. This alarm will cause all available "Remote Auto" banks in the channel to be turned on and run at 100% power until another healthy channel can be brought on-line (if available), or the fault is cleared. The fault will be cleared once the number of banks required to run in the channel to meet the required System RED is less than or equal to the number of healthy banks in the channel.

Banks that are in "Remote Off" Mode or banks that have an "Inoperable Alarm" will remain off, while banks that are in "Remote On" Mode will continue to run in "Remote On" Mode at 100% power level.

8.01.4 Lead/Lag Priority Sort

In order to maintain even wear on all equipment, UVSigna has functionality designed to automatically sort the priority of the channels and banks within channels.

Channel priority sort is based on an Automatic Sort Timer set by the operator at the Operator Interface. The expiration of this timer will initiate a Channel Sort. The order of priority of the channels in the system is assigned based on the sum of the runtime hours of all banks in each channel. The highest priority channel will be the channel with the lowest runtime hours.

An operator can override the automatic sort logic at any time and assign a specific priority to each channel by changing to a Manual Channel Priority Mode. No automatic sorting will occur.

Bank priority is continuously evaluated and sorted. The order of priority of the banks in a channel is determined based on bank lamp hours, bank mode, and bank health. Banks that are faulted, not in auto, and have high lamp hours will have the lowest priority. Healthy banks in remote auto with low lamp hours will have the highest priority. Sorting based on bank lamp hours will only occur if the hours difference between two banks is greater than the entered Bank Sort Hours Difference.

An operator can override the automatic sort logic at any time and assign a specific priority to each bank by changing to a Manual Bank Priority Mode. No automatic sorting will occur.

8.02 Dose Pacing

The Dose Pacing routine in the BCB is used to control the bank operating power level to meet or exceed the Bank RED Target set by the SCC Controller. All lamps operating in a UV bank will operate at the same power level and are modulated between 30% and 100% power by the Dose Pacing routine.

8.02.1 Dose Calculation

Each bank in the system independently calculates the RED (in mJ/cm^2) it is delivering based on:

- Flow through the bank
- Input UVT signal (or manually entered value)
- Microbe Sensitivity (D10)
- Number of lamps configured
- Number of lamps in operation (account for faults, etc.)
- UV Intensity Sensor reading
- Bank Power Level
- Number of banks on in the channel

When the Dose Pacing routine determines that a bank must increase or decrease its power, the power is staged to allow the UV Intensity sensor reading to respond to the change in bank power.

The RED delivered by each channel is calculated based on the average UV Intensity Sensor feedback of all operating banks, regardless of their operational status (“Local On”, “Remote Auto”, “Remote On”).

The System RED is set to the lowest calculated channel RED of all channels with flow present. If the System RED value falls below the Target RED value, a Low UV Dose alarm condition is set.

8.03 Auto Pacing Fault System Control Behavior

Auto Pacing faults may be critical in nature resulting in a channel to be flagged as unhealthy. A major fault will result in the system to run at full capacity for disinfection. Refer to Section 2.04 *System Fault Conditions* for more information.

9. INLET GATE CONTROL

9.01 Inlet Gate Control Architecture

UVSigna provides “Remote Auto” or “Remote Manual” control of a single upstream inlet gate for each UV channel. The Inlet gate control is based upon a 5-wire electrical interface where the following signals are used:

- Gate Ready (Remote) Signal – contact from gate is closed when gate is ready for SCC Controller control
- Gate Open Limit Signal – contact from gate is closed when gate is fully open
- Gate Closed Limit Signal – contact from gate is closed when gate is fully closed
- Gate Open Command Signal – contact to gate is closed when gate is requested to open
- Gate Close Command Signal – contact to gate is closed when gate is requested to close

The command output signals from the SCC Controller will only stay closed while the gate is in a transition phase and will open once the gate reaches the correct limit switch.

9.02 Inlet Gate Control Modes

When inlet gates are configured as “Present”, they may be configured to either allow the SCC Controller to “Monitor and Control” the Inlet Gate or allow the SCC Controller to simply “Monitor” the status of the Inlet Gate.

9.02.1 Monitor and Control

A system that is configured to allow the SCC Controller to “Monitor and Control” the Inlet Gate will allow “Local”, “Remote Manual” and “Remote Auto” control of one Inlet Gate per channel.

9.02.1.1 “Local” Inlet Gate Control Mode

When an Inlet Gate is operated locally (“Local” mode of operation), the Gate Ready (Remote) signal will not be active. The SCC Controller will continue to monitor the position of the Inlet Gate, but will no longer have remote control of the gate.

9.02.1.2 “Remote Manual” Inlet Gate Control Mode

When the Gate Ready (Remote) signal is active, the gate is ready for SCC Controller control (Remote Mode). When in the “Remote Manual” mode of operation, an Inlet Gate will be able to be commanded opened or closed by an operator from the Operator Interface. While in “Remote Manual”, all Inlet Gate travel alarms will be able to be activated if the Inlet Gate fails to respond in the expected manner.

9.02.1.3 “Remote Auto” Inlet Gate Control Mode

When the Gate Ready (Remote) signal is active, the gate is ready for SCC Controller control (Remote Mode). Inlet Gates that are in the “Remote Auto” mode of operation will be opened or closed as required by the Channel Control routine in order to meet the current flow conditions or dose requirements of the system.

A system that is configured to allow the SCC Controller to control Inlet Gate Cracking will request the inlet gate to open for an adjustable amount of time when a low water level condition exists in the channel when it is called to operate. The gate opening will pause until one of three conditions occur: the low water level in the channel clears; the water level reaches an adjustable level setpoint (for systems with ultrasonic sensors only); or the inlet gate cracking maximum wait time delay expires.

Each Inlet Gate that is controlled by the SCC Controller can generate latched alarm conditions as described in the following section. An Inlet Gate that is faulted will open all command output contacts and will not respond to further command requests from the SCC Controller until the operator unlatches the gate alarms on the Channel Overview screen of the Operator Interface. If an alarm is generated, all latched Inlet Gate alarms will be automatically reset one time in order to allow the SCC Controller to try to get as many available Inlet Gates to open as possible under the following conditions:

- "Not Enough Healthy Channels" alarm is generated
- "Peak Flow in a Channel Exceeded" alarm is generated

9.02.2 Monitor Status Only

When inlet gates are configured as "Present" and "Monitor Only", the SCC Controller will read two discrete inputs from the inlet gate (Gate Open Limit signal and Gate Closed Limit signal). These signals indicate when a channel is required to disinfect process flow. A channel that is designated as closed will begin timing-off the banks in that channel for a "Closed Channel" time off delay and all flow will be assumed to be passed through the remaining open channel(s).

9.03 Inlet Gate Fault System Control Behavior

Inlet Gate faults may be critical in nature resulting in the channel to be flagged as unhealthy and the banks in the affected channel to time-off for the Closed Channel Delay time. Major and minor faults result in the channel to be flagged as unhealthy and the banks in the affected channel to stay on. In any Inlet Gate fault condition the Inlet Gate will not be commanded to move. Refer to Section 2.04 *System Fault Conditions* for more information.

10. OUTLET GATE CONTROL

10.01 Outlet Gate Control Architecture

UVSigna provides “Remote Manual” control of a single downstream Outlet gate for each UV channel. The Outlet gate control is based upon a 5-wire electrical interface where the following signals are used:

- Gate Ready (Remote) Signal – contact from gate is closed when gate is ready for SCC Controller control
- Gate Open Limit Signal – contact from gate is closed when gate is fully open
- Gate Closed Limit Signal – contact from gate is closed when gate is fully closed
- Gate Open Command Signal – contact to gate is closed when gate is requested to open
- Gate Close Command Signal – contact to gate is closed when gate is requested to close

The command output signals from the SCC Controller will only stay closed while the gate is in a transition phase and will open once the gate reaches the correct limit switch.

10.02 Outlet Gate Control Modes

10.02.1 Monitor and Control

The system is configured to allow the SCC Controller to “Monitor and Control” the Outlet Gate, which allows “Local”, “Remote Manual” and “Remote Auto” control of one Outlet Gate per channel.

10.02.1.1 “Local” Outlet Gate Control Mode

When an Outlet Gate is operated locally (“Local” mode of operation), the Gate Ready (Remote) signal will not be active. The SCC Controller will continue to monitor the position of the Outlet Gate, but will no longer have remote control of the gate.

10.02.1.2 “Remote Manual” Outlet Gate Control Mode

When the Gate Ready (Remote) signal is active, the gate is ready for SCC Controller control (Remote Mode). When in the “Remote Manual” mode of operation, an Outlet Gate will be able to be commanded opened or closed by an operator from the Operator Interface. While in “Remote Manual”, all Outlet Gate travel alarms will be able to be activated if the Outlet Gate fails to respond in the expected manner.

Each Outlet Gate that is controlled by the SCC Controller can generate latched alarm conditions as described in the following section. An Outlet Gate that is faulted will open all command output contacts and will not respond to further command requests from the SCC Controller until the operator unlatches the gate alarms on the Channel Overview screen of the Operator Interface.

11. POWER FAILURE DETECTION

11.01 Power Failure at SCC

When a power failure occurs at the SCC controller, the SCC Controller control program will detect that it is running its first pass of the program. When this occurs, the control logic returns the system to normal operation as it was before the power failure occurred. When the SCC is in a power failure state, BCBs that are in “Remote Auto” Mode will operate in accordance with the “Communication Failure Action” System Setting: “Stay Same” or “Turn On”. When the system is configured for “Stay Same” operation, if a bank in “Remote Auto” was running when communications was lost with the SCC, the BCB will run the bank at full power. Otherwise, if the bank in “Remote Auto” was off when communications was lost with the SCC, the bank will remain off. Alternatively, if the system is configured for “Turn On” operation, a bank in “Remote Auto” will be run at full power by the BCB when communications is lost with the SCC.

11.02 Power Failure Detected by BCB

When a power failure occurs at the BCB for a sufficient duration, the BCB that experiences the power failure will set a Power on Reset bit for five (5) minutes.

11.03 Power Failure Fault System Control Behavior

Power failure faults may be critical or minor in nature resulting in no control action to be taken. When a “System Power on Reset” alarm occurs the controller will maintain normal operation as it was prior to the power outage. Refer to Section 2.04 *System Fault Conditions* for more information.

12. SYSTEM TRENDING

The Operator Interface will store trended data in files that are accessible for file transfer while the UV system is in operation (either through removable media or file transfer). The data files can be imported into Excel for diagnostic purposes. All data trended will be sampled on a change in data, with a maximum sampling rate of 1 minute, and stored to a data log file. A maximum of 1,000,000 data points is available for storing data history, providing over 60 days of data history. The following data points will be trended:

- Current System Flow
- Current UVT
- Reduction Equivalent Dose (RED)

A Trend window on the Operator Interface will be configured to display Flow, UVT and RED on the same screen. The Trend window will be configured with a moving 8 hour timescale and will display Flow, UVT and RED as engineering units.

13. PLANT SCADA INTERFACE

13.01 Plant SCADA Interface Architecture

The UV system template provides a selection of data which is available to the plant SCADA system to allow remote monitoring of the UV system over Ethernet IP.

The SCC Controller will act as a slave node only and will not initiate any communication messaging or data transfers, but will respond to polling messages on the required network address. SCADA information will be available in a selection of contiguous 16-bit integer addresses as defined in the SCADA map data table (separate Excel document).

13.02 SCADA Fault Conditions

A SCADA fault is minor in nature and depending on configuration settings the “Default” flow will be used. Refer to 2.04 *System Fault Conditions* for more information.

Revision History

Rev	Description	Revision By	Approved By	Date
1.0	For Submittal Approval	MLL	EK	July 18, 2023
1.1	Updated CP based on customer comments	MLL	EK	Aug 8, 2023
1.2	Flow from SCADA, removed analog water level sensors	MLL	EK	Sept 28, 2023
1.2	Minor correction per PM request	EK	EK	Oct 5, 2023

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CTRL[0]	INT	UV system total flow	Flow Units	x Flow Scaling Factor
N_SCADA_CTRL[1]	INT	spare word		
N_SCADA_CTRL[2]	INT	spare word		
N_SCADA_CTRL[3]	INT	spare word		
N_SCADA_CTRL[4]	INT	spare word		
N_SCADA_CTRL[5].0	BOOL	SBR system flow present	1=Full Flow Present	
N_SCADA_CTRL[5].1	BOOL	SCADA heartbeat signal	2s On then 2s Off	
N_SCADA_CTRL[5].2	BOOL	spare bit		
N_SCADA_CTRL[5].3	BOOL	spare bit		
N_SCADA_CTRL[5].4	BOOL	spare bit		
N_SCADA_CTRL[5].5	BOOL	spare bit		
N_SCADA_CTRL[5].6	BOOL	spare bit		
N_SCADA_CTRL[5].7	BOOL	spare bit		
N_SCADA_CTRL[5].8	BOOL	spare bit		
N_SCADA_CTRL[5].9	BOOL	spare bit		
N_SCADA_CTRL[5].10	BOOL	spare bit		
N_SCADA_CTRL[5].11	BOOL	spare bit		
N_SCADA_CTRL[5].12	BOOL	spare bit		
N_SCADA_CTRL[5].13	BOOL	spare bit		
N_SCADA_CTRL[5].14	BOOL	spare bit		
N_SCADA_CTRL[5].15	BOOL	spare bit		
N_SCADA_CTRL[6].0	BOOL	CH1 Inlet Gate SCADA Open Command	1 = Open Command	
N_SCADA_CTRL[6].1	BOOL	CH1 Inlet Gate SCADA Close Command	1 = Close Command	
N_SCADA_CTRL[6].2	BOOL	CH1 Inlet Gate SCADA Manual Mode	1 = Manual Mode	
N_SCADA_CTRL[6].3	BOOL	Reserved		
N_SCADA_CTRL[6].4	BOOL	Reserved		
N_SCADA_CTRL[6].5	BOOL	Reserved		
N_SCADA_CTRL[6].6	BOOL	CH2 Inlet Gate SCADA Open Command	1 = Open Command	
N_SCADA_CTRL[6].7	BOOL	CH2 Inlet Gate SCADA Close Command	1 = Close Command	
N_SCADA_CTRL[6].8	BOOL	CH2 Inlet Gate SCADA Manual Mode	1 = Manual Mode	
N_SCADA_CTRL[6].9	BOOL	Reserved		
N_SCADA_CTRL[6].10	BOOL	Reserved		
N_SCADA_CTRL[6].11	BOOL	Reserved		
N_SCADA_CTRL[6].12	BOOL	spare bit		
N_SCADA_CTRL[6].13	BOOL	spare bit		
N_SCADA_CTRL[6].14	BOOL	spare bit		
N_SCADA_CTRL[6].15	BOOL	spare bit		
N_SCADA_CTRL[7]		Bank 1A SCADA Control	0 = Local SCC Control 1 = SCADA ON 2 = SCADA OFF 3 = SCADA Auto	
N_SCADA_CTRL[8]		Bank 1B SCADA Control	0 = Local SCC Control 1 = SCADA ON 2 = SCADA OFF 3 = SCADA Auto	
N_SCADA_CTRL[9]		Bank 1C SCADA Control	0 = Local SCC Control 1 = SCADA ON 2 = SCADA OFF 3 = SCADA Auto	
N_SCADA_CTRL[10]		Bank 1D SCADA Control	0 = Local SCC Control 1 = SCADA ON 2 = SCADA OFF 3 = SCADA Auto	

N_SCADA_CTRL[11]		Bank 2A SCADA Control	0 = Local SCC Control 1 = SCADA ON 2 = SCADA OFF 3 = SCADA Auto	
N_SCADA_CTRL[12]		Bank 2B SCADA Control	0 = Local SCC Control 1 = SCADA ON 2 = SCADA OFF 3 = SCADA Auto	
N_SCADA_CTRL[13]		Bank 2C SCADA Control	0 = Local SCC Control 1 = SCADA ON 2 = SCADA OFF 3 = SCADA Auto	
N_SCADA_CTRL[14]		Bank 2D SCADA Control	0 = Local SCC Control 1 = SCADA ON 2 = SCADA OFF 3 = SCADA Auto	

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_SYS[0].0	BOOL	Common minor alarm	1 = Fault	
N_SCADA_SYS[0].1	BOOL	Common major alarm	1 = Fault	
N_SCADA_SYS[0].2	BOOL	Common critical alarm	1 = Fault	
N_SCADA_SYS[0].3	BOOL	Common hsc alarm	1 = Fault	
N_SCADA_SYS[0].4	BOOL	Watchdog pulse	2s On then 2s Off	
N_SCADA_SYS[0].5	BOOL	spare bit		
N_SCADA_SYS[0].6	BOOL	spare bit		
N_SCADA_SYS[0].7	BOOL	spare bit		
N_SCADA_SYS[0].8	BOOL	spare bit		
N_SCADA_SYS[0].9	BOOL	spare bit		
N_SCADA_SYS[0].10	BOOL	spare bit		
N_SCADA_SYS[0].11	BOOL	spare bit		
N_SCADA_SYS[0].12	BOOL	spare bit		
N_SCADA_SYS[0].13	BOOL	spare bit		
N_SCADA_SYS[0].14	BOOL	spare bit		
N_SCADA_SYS[0].15	BOOL	spare bit		
N_SCADA_SYS[1].0	BOOL	SCC run on UPS	1 = Fault	
N_SCADA_SYS[1].1	BOOL	reserved		
N_SCADA_SYS[1].2	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].3	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].4	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].5	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].6	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].7	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].8	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].9	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].10	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].11	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].12	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].13	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].14	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[1].15	BOOL	spare bit for critical system alarms		
N_SCADA_SYS[2].0	BOOL	Low UV dose alarm	1 = Fault	
N_SCADA_SYS[2].1	BOOL	Not enough healthy channels	1 = Fault	
N_SCADA_SYS[2].2	BOOL	UVT meter fault	1 = Fault	
N_SCADA_SYS[2].3	BOOL	Low UVT - out of validation range	1 = Fault	
N_SCADA_SYS[2].4	BOOL	reserved		
N_SCADA_SYS[2].5	BOOL	High flow - out of validation range	1 = Fault	
N_SCADA_SYS[2].6	BOOL	Low flow alarm	1 = Fault	
N_SCADA_SYS[2].7	BOOL	SCC Controller fault	1 = Fault	
N_SCADA_SYS[2].8	BOOL	spare bit for major system alarms		
N_SCADA_SYS[2].9	BOOL	spare bit for major system alarms		
N_SCADA_SYS[2].10	BOOL	spare bit for major system alarms		
N_SCADA_SYS[2].11	BOOL	spare bit for major system alarms		
N_SCADA_SYS[2].12	BOOL	spare bit for major system alarms		
N_SCADA_SYS[2].13	BOOL	spare bit for major system alarms		
N_SCADA_SYS[2].14	BOOL	spare bit for major system alarms		
N_SCADA_SYS[2].15	BOOL	spare bit for major system alarms		
N_SCADA_SYS[3].0	BOOL	SCC Controller low battery	1 = Fault	
N_SCADA_SYS[3].1	BOOL	System power on reset	1 = Fault	
N_SCADA_SYS[3].2	BOOL	SCC power restored	1 = Fault	
N_SCADA_SYS[3].3	BOOL	UPS fault	1 = Fault	
N_SCADA_SYS[3].4	BOOL	SCADA fault detected	1 = Fault	
N_SCADA_SYS[3].5	BOOL	System in transition	1 = In Transition	

N_SCADA_SYS[3].6	BOOL	UVT below design value	1 = Fault	
N_SCADA_SYS[3].7	BOOL	Low UVT alarm	1 = Fault	
N_SCADA_SYS[3].8	BOOL	UVT meter override value used	1 = Fault	
N_SCADA_SYS[3].9	BOOL	High UVT – out of validation range	1 = Fault	
N_SCADA_SYS[3].10	BOOL	Flow meter override value used	1 = Fault	
N_SCADA_SYS[3].11	BOOL	Low flow – out of validation range	1 = Fault	
N_SCADA_SYS[3].13	BOOL	spare bit for minor system alarms		
N_SCADA_SYS[3].14	BOOL	spare bit for minor system alarms		
N_SCADA_SYS[3].15	BOOL	spare bit for minor system alarms		
N_SCADA_SYS[4]	INT	System flow	Flow Units	x Flow Scaling Factor
N_SCADA_SYS[5]	INT	Calculated system UV dose	mJ/cm2	x100
N_SCADA_SYS[6]	INT	UV transmittance	%	x10
N_SCADA_SYS[7]	INT	Flow Scaling Factor	1=1 2=10 3=100 4=0.1 5=0.01	
N_SCADA_SYS[9]	INT	spare word		
N_SCADA_SYS[10]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH1[0].0	BOOL	CH 1 minor alarm	1 = Fault	
N_SCADA_CH1[0].1	BOOL	CH 1 major alarm	1 = Fault	
N_SCADA_CH1[0].2	BOOL	CH 1 critical alarm	1 = Fault	
N_SCADA_CH1[0].3	BOOL	CH 1 HSC alarm	1 = Fault	
N_SCADA_CH1[0].4	BOOL	CH 1 in operation	1 = In Operation	
N_SCADA_CH1[0].5	BOOL	CH 1 low water level condition	1 = Low Water	
N_SCADA_CH1[0].6	BOOL	CH 1 inlet gate fully open	1 = Open	
N_SCADA_CH1[0].7	BOOL	CH 1 inlet gate fully closed	1 = Closed	
N_SCADA_CH1[0].8	BOOL	CH 1 Offline Mode enabled	1 = Offline Enabled	
N_SCADA_CH1[0].9	BOOL	CH 1 Outlet gate fully open	1 = Open	
N_SCADA_CH1[0].10	BOOL	CH 1 Outlet gate fully closed	1 = Closed	
N_SCADA_CH1[0].11	BOOL	spare bit		
N_SCADA_CH1[0].12	BOOL	spare bit		
N_SCADA_CH1[0].13	BOOL	spare bit		
N_SCADA_CH1[0].14	BOOL	spare bit		
N_SCADA_CH1[0].15	BOOL	spare bit		
N_SCADA_CH1[1].0	BOOL	Reserved	1 = Fault	
N_SCADA_CH1[1].1	BOOL	CH 1 not enough healthy banks	1 = Fault	
N_SCADA_CH1[1].2	BOOL	Reserved	1 = Fault	
N_SCADA_CH1[1].3	BOOL	CH 1 design flow exceeded	1 = Fault	
N_SCADA_CH1[1].4	BOOL	CH 1 maximum flow velocity exceeded	1 = Fault	
N_SCADA_CH1[1].5	BOOL	CH 1 flow limit for wiping exceeded	1 = Fault	
N_SCADA_CH1[1].6	BOOL	CH 1 inlet gate failed to start opening	1 = Fault	
N_SCADA_CH1[1].7	BOOL	CH 1 inlet gate failed to open	1 = Fault	
N_SCADA_CH1[1].8	BOOL	CH 1 inlet gate failed to start closing	1 = Fault	
N_SCADA_CH1[1].9	BOOL	CH 1 inlet gate failed to close	1 = Fault	
N_SCADA_CH1[1].10	BOOL	CH 1 inlet gate not in remote auto	1 = Fault	
N_SCADA_CH1[1].11	BOOL	Reserved		
N_SCADA_CH1[1].12	BOOL	Reserved		
N_SCADA_CH1[1].13	BOOL	Reserved		
N_SCADA_CH1[1].14	BOOL	Reserved		
N_SCADA_CH1[1].15	BOOL	CH 1 maintenance mode enabled	1 = Enabled	
N_SCADA_CH1[2].0	BOOL	CH 1 Outlet gate failed to start opening	1 = Fault	
N_SCADA_CH1[2].1	BOOL	CH 1 Outlet gate failed to open	1 = Fault	
N_SCADA_CH1[2].2	BOOL	CH 1 Outlet gate failed to start closing	1 = Fault	
N_SCADA_CH1[2].3	BOOL	CH 1 Outlet gate failed to close	1 = Fault	
N_SCADA_CH1[2].4	BOOL	CH 1 Outlet gate Not Fully Open	1 = Fault	
N_SCADA_CH1[2].5	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].6	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].7	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].8	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].9	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].10	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].11	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].12	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].13	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].14	BOOL	spare bit for channel alarms		
N_SCADA_CH1[2].15	BOOL	spare bit for channel alarms		
N_SCADA_CH1[3].0	BOOL	HSC 1A hydraulic tank low level	1 = Fault	
N_SCADA_CH1[3].1	BOOL	HSC 1A pump fault	1 = Fault	
N_SCADA_CH1[3].2	BOOL	HSC 1A - SCC communciation fault	1 = Fault	
N_SCADA_CH1[3].3	BOOL	HSC 1A remote wipe inhibited	1 = Inhibited	
N_SCADA_CH1[3].4	BOOL	Reserved		
N_SCADA_CH1[3].5	BOOL	Reserved		
N_SCADA_CH1[3].6	BOOL	Reserved		
N_SCADA_CH1[3].7	BOOL	Reserved		
N_SCADA_CH1[3].8	BOOL	spare bit for hsc alarms		

N_SCADA_CH1[3].9	BOOL	spare bit for hsc alarms		
N_SCADA_CH1[3].10	BOOL	spare bit for hsc alarms		
N_SCADA_CH1[3].11	BOOL	spare bit for hsc alarms		
N_SCADA_CH1[3].12	BOOL	spare bit for hsc alarms		
N_SCADA_CH1[3].13	BOOL	spare bit for hsc alarms		
N_SCADA_CH1[3].14	BOOL	spare bit for hsc alarms		
N_SCADA_CH1[3].15	BOOL	spare bit for hsc alarms		
N_SCADA_CH1[4]	INT	Reserved		
N_SCADA_CH1[5]	INT	Reserved		
N_SCADA_CH1[6]	INT	spare word		
N_SCADA_CH1[7]	INT	spare word		
N_SCADA_CH1[8]	INT	spare word		
N_SCADA_CH1[9]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH2[0].0	BOOL	CH 2 minor alarm	1 = Fault	
N_SCADA_CH2[0].1	BOOL	CH 2 major alarm	1 = Fault	
N_SCADA_CH2[0].2	BOOL	CH 2 critical alarm	1 = Fault	
N_SCADA_CH2[0].3	BOOL	CH 2 HSC alarm	1 = Fault	
N_SCADA_CH2[0].4	BOOL	CH 2 in operation	1 = In Operation	
N_SCADA_CH2[0].5	BOOL	CH 2 low water level condition	1 = Low Water	
N_SCADA_CH2[0].6	BOOL	CH 2 inlet gate fully open	1 = Open	
N_SCADA_CH2[0].7	BOOL	CH 2 inlet gate fully closed	1 = Closed	
N_SCADA_CH2[0].8	BOOL	CH 2 Offline Mode enabled	1 = Offline Enabled	
N_SCADA_CH2[0].9	BOOL	CH 2 Outlet gate fully open	1 = Open	
N_SCADA_CH2[0].10	BOOL	CH 2 Outlet gate fully closed	1 = Closed	
N_SCADA_CH2[0].11	BOOL	spare bit		
N_SCADA_CH2[0].12	BOOL	spare bit		
N_SCADA_CH2[0].13	BOOL	spare bit		
N_SCADA_CH2[0].14	BOOL	spare bit		
N_SCADA_CH2[0].15	BOOL	spare bit		
N_SCADA_CH2[1].0	BOOL	Reserved		
N_SCADA_CH2[1].1	BOOL	CH 2 not enough healthy banks	1 = Fault	
N_SCADA_CH2[1].2	BOOL	Reserved		
N_SCADA_CH2[1].3	BOOL	CH 2 design flow exceeded	1 = Fault	
N_SCADA_CH2[1].4	BOOL	CH 2 maximum flow velocity exceeded	1 = Fault	
N_SCADA_CH2[1].5	BOOL	CH 2 flow limit for wiping exceeded	1 = Fault	
N_SCADA_CH2[1].6	BOOL	CH 2 inlet gate failed to start opening	1 = Fault	
N_SCADA_CH2[1].7	BOOL	CH 2 inlet gate failed to open	1 = Fault	
N_SCADA_CH2[1].8	BOOL	CH 2 inlet gate failed to start closing	1 = Fault	
N_SCADA_CH2[1].9	BOOL	CH 2 inlet gate failed to close	1 = Fault	
N_SCADA_CH2[1].10	BOOL	CH 2 inlet gate not in remote auto	1 = Fault	
N_SCADA_CH2[1].11	BOOL	Reserved		
N_SCADA_CH2[1].12	BOOL	Reserved		
N_SCADA_CH2[1].13	BOOL	Reserved		
N_SCADA_CH2[1].14	BOOL	Reserved		
N_SCADA_CH2[1].15	BOOL	CH 2 maintenance mode enabled	1 = Enabled	
N_SCADA_CH2[2].0	BOOL	CH 2 Outlet gate failed to start opening	1 = Fault	
N_SCADA_CH2[2].1	BOOL	CH 2 Outlet gate failed to open	1 = Fault	
N_SCADA_CH2[2].2	BOOL	CH 2 Outlet gate failed to start closing	1 = Fault	
N_SCADA_CH2[2].3	BOOL	CH 2 Outlet gate failed to close	1 = Fault	
N_SCADA_CH2[2].4	BOOL	CH 2 Outlet gate Not Fully Open	1 = Fault	
N_SCADA_CH2[2].5	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].6	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].7	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].8	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].9	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].10	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].11	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].12	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].13	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].14	BOOL	spare bit for channel alarms		
N_SCADA_CH2[2].15	BOOL	spare bit for channel alarms		
N_SCADA_CH2[3].0	BOOL	HSC 2A hydraulic tank low level	1 = Fault	
N_SCADA_CH2[3].1	BOOL	HSC 2A pump fault	1 = Fault	
N_SCADA_CH2[3].2	BOOL	HSC 2A - SCC communciation fault	1 = Fault	
N_SCADA_CH2[3].3	BOOL	HSC 2A remote wipe inhibited	1 = Inhibited	
N_SCADA_CH2[3].4	BOOL	Reserved		
N_SCADA_CH2[3].5	BOOL	Reserved		
N_SCADA_CH2[3].6	BOOL	Reserved		
N_SCADA_CH2[3].7	BOOL	Reserved		
N_SCADA_CH2[3].8	BOOL	spare bit for hsc alarms		

N_SCADA_CH2[3].9	BOOL	spare bit for hsc alarms		
N_SCADA_CH2[3].10	BOOL	spare bit for hsc alarms		
N_SCADA_CH2[3].11	BOOL	spare bit for hsc alarms		
N_SCADA_CH2[3].12	BOOL	spare bit for hsc alarms		
N_SCADA_CH2[3].13	BOOL	spare bit for hsc alarms		
N_SCADA_CH2[3].14	BOOL	spare bit for hsc alarms		
N_SCADA_CH2[3].15	BOOL	spare bit for hsc alarms		
N_SCADA_CH2[4]	INT	Reserved		
N_SCADA_CH2[5]	INT	Reserved		
N_SCADA_CH2[6]	INT	spare word		
N_SCADA_CH2[7]	INT	spare word		
N_SCADA_CH2[8]	INT	spare word		
N_SCADA_CH2[9]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH1[10].0	BOOL	Bank 1A minor alarm	1 = Fault	
N_SCADA_CH1[10].1	BOOL	Bank 1A major alarm	1 = Fault	
N_SCADA_CH1[10].2	BOOL	Bank 1A critical alarm	1 = Fault	
N_SCADA_CH1[10].3	BOOL	Bank 1A HSC alarm	1 = Fault	
N_SCADA_CH1[10].4	BOOL	Bank 1A in operation	1 = Operating	
N_SCADA_CH1[10].5	BOOL	spare bit		
N_SCADA_CH1[10].6	BOOL	spare bit		
N_SCADA_CH1[10].7	BOOL	spare bit		
N_SCADA_CH1[10].8	BOOL	spare bit		
N_SCADA_CH1[10].9	BOOL	spare bit		
N_SCADA_CH1[10].10	BOOL	spare bit		
N_SCADA_CH1[10].11	BOOL	spare bit		
N_SCADA_CH1[10].12	BOOL	spare bit		
N_SCADA_CH1[10].13	BOOL	spare bit		
N_SCADA_CH1[10].14	BOOL	spare bit		
N_SCADA_CH1[10].15	BOOL	spare bit		
N_SCADA_CH1[11].0	BOOL	Bank 1A wiper jammed	1 = Fault	
N_SCADA_CH1[11].1	BOOL	Bank 1A wiper travel time exceeded	1 = Fault	
N_SCADA_CH1[11].2	BOOL	Bank 1A wiper not in remote	1 = Fault	
N_SCADA_CH1[11].3	BOOL	Bank 1A wiper unknown position	1 = Fault	
N_SCADA_CH1[11].4	BOOL	Bank 1A lift attempted with lamps energized	1 = Fault	
N_SCADA_CH1[11].5	BOOL	Bank 1A lift up attempted with locking latch disengaged	1 = Fault	
N_SCADA_CH1[11].6	BOOL	Bank 1A lift down attempted with locking latch engaged	1 = Fault	
N_SCADA_CH1[11].7	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[11].8	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[11].9	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[11].10	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[11].11	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[11].12	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[11].13	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[11].14	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[11].15	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[12].0	BOOL	Bank 1A PDC high temp shutdown	1 = Fault	
N_SCADA_CH1[12].1	BOOL	Bank 1A not in place	1 = Fault	
N_SCADA_CH1[12].2	BOOL	Bank 1A low water level shutdown	1 = Fault	
N_SCADA_CH1[12].3	BOOL	Bank 1A PDC disconnect off	1 = Off	
N_SCADA_CH1[12].4	BOOL	Bank 1A SCC-PDC comm fault	1 = Fault	
N_SCADA_CH1[12].5	BOOL	Bank 1A multi lamp failure	1 = Fault	
N_SCADA_CH1[12].6	BOOL	Bank 1A configuration mismatch	1 = Fault	
N_SCADA_CH1[12].7	BOOL	Bank 1A not enough healthy lamps	1 = Fault	
N_SCADA_CH1[12].8	BOOL	Bank 1A UVI sensor faulted - SBC	1 = Fault	
N_SCADA_CH1[12].9	BOOL	Bank 1A UVI lower than expected	1 = Fault	
N_SCADA_CH1[12].10	BOOL	Bank 1A BCB DIPSwitch mismatch	1 = Fault	
N_SCADA_CH1[12].11	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[12].12	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[12].13	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[12].14	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[12].15	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[13].0	BOOL	reserved		
N_SCADA_CH1[13].1	BOOL	Bank 1A not in remote auto	1 = Fault	
N_SCADA_CH1[13].2	BOOL	Bank 1A low level warning	1 = Fault	
N_SCADA_CH1[13].3	BOOL	Bank 1A PDC fan failure	1 = Fault	
N_SCADA_CH1[13].4	BOOL	reserved		
N_SCADA_CH1[13].5	BOOL	Bank 1A PDC high temperature warning	1 = Fault	
N_SCADA_CH1[13].6	BOOL	Bank 1A lamp failure	1 = Fault	
N_SCADA_CH1[13].7	BOOL	Bank 1A lamp lifetime exceeded	1 = Fault	
N_SCADA_CH1[13].8	BOOL	Bank 1A lamp driver failure	1 = Fault	
N_SCADA_CH1[13].9	BOOL	Bank 1A lamp driver comm failure	1 = Fault	
N_SCADA_CH1[13].10	BOOL	Bank 1A lamp disabled	1 = Disabled	
N_SCADA_CH1[13].11	BOOL	Bank 1A UVI sensor faulted - Non SBC	1 = Fault	
N_SCADA_CH1[13].12	BOOL	Bank 1A UVI lower than expected warning	1 = Fault	
N_SCADA_CH1[13].13	BOOL	Bank 1A UVI reference check required	1 = Fault	

N_SCADA_CH1[13].14	BOOL	Bank 1A UVI reference check active	1 = Active	
N_SCADA_CH1[13].15	BOOL	spare bit for bank minor alarm		
N_SCADA_CH1[14]	INT	Bank 1A lamp hours	Hours	x1
N_SCADA_CH1[15]	INT	Bank 1A lamp power	Power (%)	x1
N_SCADA_CH1[16]	INT	Bank 1A UVI	mW/cm2	x1000
N_SCADA_CH1[17]	INT	spare word		
N_SCADA_CH1[18]	INT	spare word		
N_SCADA_CH1[19]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH1[20].0	BOOL	Bank 1B minor alarm	1 = Fault	
N_SCADA_CH1[20].1	BOOL	Bank 1B major alarm	1 = Fault	
N_SCADA_CH1[20].2	BOOL	Bank 1B critical alarm	1 = Fault	
N_SCADA_CH1[20].3	BOOL	Bank 1B HSC alarm	1 = Fault	
N_SCADA_CH1[20].4	BOOL	Bank 1B in operation	1 = Operating	
N_SCADA_CH1[20].5	BOOL	spare bit		
N_SCADA_CH1[20].6	BOOL	spare bit		
N_SCADA_CH1[20].7	BOOL	spare bit		
N_SCADA_CH1[20].8	BOOL	spare bit		
N_SCADA_CH1[20].9	BOOL	spare bit		
N_SCADA_CH1[20].10	BOOL	spare bit		
N_SCADA_CH1[20].11	BOOL	spare bit		
N_SCADA_CH1[20].12	BOOL	spare bit		
N_SCADA_CH1[20].13	BOOL	spare bit		
N_SCADA_CH1[20].14	BOOL	spare bit		
N_SCADA_CH1[20].15	BOOL	spare bit		
N_SCADA_CH1[21].0	BOOL	Bank 1B wiper jammed	1 = Fault	
N_SCADA_CH1[21].1	BOOL	Bank 1B wiper travel time exceeded	1 = Fault	
N_SCADA_CH1[21].2	BOOL	Bank 1B wiper not in remote	1 = Fault	
N_SCADA_CH1[21].3	BOOL	Bank 1B wiper unknown position	1 = Fault	
N_SCADA_CH1[21].4	BOOL	Bank 1B lift attempted with lamps energized	1 = Fault	
N_SCADA_CH1[21].5	BOOL	Bank 1B lift up attempted with locking latch disengaged	1 = Fault	
N_SCADA_CH1[21].6	BOOL	Bank 1B lift down attempted with locking latch engaged	1 = Fault	
N_SCADA_CH1[21].7	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[21].8	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[21].9	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[21].10	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[21].11	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[21].12	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[21].13	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[21].14	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[21].15	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[22].0	BOOL	Bank 1B PDC high temp shutdown	1 = Fault	
N_SCADA_CH1[22].1	BOOL	Bank 1B not in place	1 = Fault	
N_SCADA_CH1[22].2	BOOL	Bank 1B low water level shutdown	1 = Fault	
N_SCADA_CH1[22].3	BOOL	Bank 1B PDC disconnect off	1 = Off	
N_SCADA_CH1[22].4	BOOL	Bank 1B SCC-PDC comm fault	1 = Fault	
N_SCADA_CH1[22].5	BOOL	Bank 1B multi lamp failure	1 = Fault	
N_SCADA_CH1[22].6	BOOL	Bank 1B configuration mismatch	1 = Fault	
N_SCADA_CH1[22].7	BOOL	Bank 1B not enough healthy lamps	1 = Fault	
N_SCADA_CH1[22].8	BOOL	Bank 1B UVI sensor faulted - SBC	1 = Fault	
N_SCADA_CH1[22].9	BOOL	Bank 1B UVI lower than expected	1 = Fault	
N_SCADA_CH1[22].10	BOOL	Bank 1B BCB DIPSwitch mismatch	1 = Fault	
N_SCADA_CH1[22].11	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[22].12	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[22].13	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[22].14	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[22].15	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[23].0	BOOL	reserved		
N_SCADA_CH1[23].1	BOOL	Bank 1B not in remote auto	1 = Fault	
N_SCADA_CH1[23].2	BOOL	Bank 1B low level warning	1 = Fault	
N_SCADA_CH1[23].3	BOOL	Bank 1B PDC fan failure	1 = Fault	
N_SCADA_CH1[23].4	BOOL	reserved		
N_SCADA_CH1[23].5	BOOL	Bank 1B PDC high temperature warning	1 = Fault	
N_SCADA_CH1[23].6	BOOL	Bank 1B lamp failure	1 = Fault	
N_SCADA_CH1[23].7	BOOL	Bank 1B lamp lifetime exceeded	1 = Fault	
N_SCADA_CH1[23].8	BOOL	Bank 1B lamp driver failure	1 = Fault	
N_SCADA_CH1[23].9	BOOL	Bank 1B lamp driver comm failure	1 = Fault	
N_SCADA_CH1[23].10	BOOL	Bank 1B lamp disabled	1 = Disabled	
N_SCADA_CH1[23].11	BOOL	Bank 1B UVI sensor faulted - Non SBC	1 = Fault	
N_SCADA_CH1[23].12	BOOL	Bank 1B UVI lower than expected warning	1 = Fault	
N_SCADA_CH1[23].13	BOOL	Bank 1B UVI reference check required	1 = Fault	

N_SCADA_CH1[23].14	BOOL	Bank 1B UVI reference check active	1 = Active	
N_SCADA_CH1[23].15	BOOL	spare bit for bank minor alarm		
N_SCADA_CH1[24]	INT	Bank 1B lamp hours	Hours	x1
N_SCADA_CH1[25]	INT	Bank 1B lamp power	Power (%)	x1
N_SCADA_CH1[26]	INT	Bank 1B UVI	mW/cm2	x1000
N_SCADA_CH1[27]	INT	spare word		
N_SCADA_CH1[28]	INT	spare word		
N_SCADA_CH1[29]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH1[30].0	BOOL	Bank 1C minor alarm	1 = Fault	
N_SCADA_CH1[30].1	BOOL	Bank 1C major alarm	1 = Fault	
N_SCADA_CH1[30].2	BOOL	Bank 1C critical alarm	1 = Fault	
N_SCADA_CH1[30].3	BOOL	Bank 1C HSC alarm	1 = Fault	
N_SCADA_CH1[30].4	BOOL	Bank 1C in operation	1 = Operating	
N_SCADA_CH1[30].5	BOOL	spare bit		
N_SCADA_CH1[30].6	BOOL	spare bit		
N_SCADA_CH1[30].7	BOOL	spare bit		
N_SCADA_CH1[30].8	BOOL	spare bit		
N_SCADA_CH1[30].9	BOOL	spare bit		
N_SCADA_CH1[30].10	BOOL	spare bit		
N_SCADA_CH1[30].11	BOOL	spare bit		
N_SCADA_CH1[30].12	BOOL	spare bit		
N_SCADA_CH1[30].13	BOOL	spare bit		
N_SCADA_CH1[30].14	BOOL	spare bit		
N_SCADA_CH1[30].15	BOOL	spare bit		
N_SCADA_CH1[31].0	BOOL	Bank 1C wiper jammed	1 = Fault	
N_SCADA_CH1[31].1	BOOL	Bank 1C wiper travel time exceeded	1 = Fault	
N_SCADA_CH1[31].2	BOOL	Bank 1C wiper not in remote	1 = Fault	
N_SCADA_CH1[31].3	BOOL	Bank 1C wiper unknown position	1 = Fault	
N_SCADA_CH1[31].4	BOOL	Bank 1C lift attempted with lamps energized	1 = Fault	
N_SCADA_CH1[31].5	BOOL	Bank 1C lift up attempted with locking latch disengaged	1 = Fault	
N_SCADA_CH1[31].6	BOOL	Bank 1C lift down attempted with locking latch engaged	1 = Fault	
N_SCADA_CH1[31].7	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[31].8	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[31].9	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[31].10	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[31].11	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[31].12	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[31].13	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[31].14	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[31].15	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[32].0	BOOL	Bank 1C PDC high temp shutdown	1 = Fault	
N_SCADA_CH1[32].1	BOOL	Bank 1C not in place	1 = Fault	
N_SCADA_CH1[32].2	BOOL	Bank 1C low water level shutdown	1 = Fault	
N_SCADA_CH1[32].3	BOOL	Bank 1C PDC disconnect off	1 = Off	
N_SCADA_CH1[32].4	BOOL	Bank 1C SCC-PDC comm fault	1 = Fault	
N_SCADA_CH1[32].5	BOOL	Bank 1C multi lamp failure	1 = Fault	
N_SCADA_CH1[32].6	BOOL	Bank 1C configuration mismatch	1 = Fault	
N_SCADA_CH1[32].7	BOOL	Bank 1C not enough healthy lamps	1 = Fault	
N_SCADA_CH1[32].8	BOOL	Bank 1C UVI sensor faulted - SBC	1 = Fault	
N_SCADA_CH1[32].9	BOOL	Bank 1C UVI lower than expected	1 = Fault	
N_SCADA_CH1[32].10	BOOL	Bank 1C BCB DIPSwitch mismatch	1 = Fault	
N_SCADA_CH1[32].11	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[32].12	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[32].13	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[32].14	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[32].15	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[33].0	BOOL	Reserved		
N_SCADA_CH1[33].1	BOOL	Bank 1C not in remote auto	1 = Fault	
N_SCADA_CH1[33].2	BOOL	Bank 1C low level warning	1 = Fault	
N_SCADA_CH1[33].3	BOOL	Bank 1C PDC fan failure	1 = Fault	
N_SCADA_CH1[33].4	BOOL	reserved		
N_SCADA_CH1[33].5	BOOL	Bank 1C PDC high temperature warning	1 = Fault	
N_SCADA_CH1[33].6	BOOL	Bank 1C lamp failure	1 = Fault	
N_SCADA_CH1[33].7	BOOL	Bank 1C lamp lifetime exceeded	1 = Fault	
N_SCADA_CH1[33].8	BOOL	Bank 1C lamp driver failure	1 = Fault	
N_SCADA_CH1[33].9	BOOL	Bank 1C lamp driver comm failure	1 = Fault	
N_SCADA_CH1[33].10	BOOL	Bank 1C lamp disabled	1 = Disabled	
N_SCADA_CH1[33].11	BOOL	Bank 1C UVI sensor faulted - Non SBC	1 = Fault	
N_SCADA_CH1[33].12	BOOL	Bank 1C UVI lower than expected warning	1 = Fault	
N_SCADA_CH1[33].13	BOOL	Bank 1C UVI reference check required	1 = Fault	

N_SCADA_CH1[33].14	BOOL	Bank 1C UVI reference check active	1 = Active	
N_SCADA_CH1[33].15	BOOL	spare bit for bank minor alarm		
N_SCADA_CH1[34]	INT	Bank 1C lamp hours	Hours	x1
N_SCADA_CH1[35]	INT	Bank 1C lamp power	Power (%)	x1
N_SCADA_CH1[36]	INT	Bank 1C UVI	mW/cm2	x1000
N_SCADA_CH1[37]	INT	spare word		
N_SCADA_CH1[38]	INT	spare word		
N_SCADA_CH1[39]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH1[40].0	BOOL	Bank 1D minor alarm	1 = Fault	
N_SCADA_CH1[40].1	BOOL	Bank 1D major alarm	1 = Fault	
N_SCADA_CH1[40].2	BOOL	Bank 1D critical alarm	1 = Fault	
N_SCADA_CH1[40].3	BOOL	Bank 1D HSC alarm	1 = Fault	
N_SCADA_CH1[40].4	BOOL	Bank 1D in operation	1 = Operating	
N_SCADA_CH1[40].5	BOOL	spare bit		
N_SCADA_CH1[40].6	BOOL	spare bit		
N_SCADA_CH1[40].7	BOOL	spare bit		
N_SCADA_CH1[40].8	BOOL	spare bit		
N_SCADA_CH1[40].9	BOOL	spare bit		
N_SCADA_CH1[40].10	BOOL	spare bit		
N_SCADA_CH1[40].11	BOOL	spare bit		
N_SCADA_CH1[40].12	BOOL	spare bit		
N_SCADA_CH1[40].13	BOOL	spare bit		
N_SCADA_CH1[40].14	BOOL	spare bit		
N_SCADA_CH1[40].15	BOOL	spare bit		
N_SCADA_CH1[41].0	BOOL	Bank 1D wiper jammed	1 = Fault	
N_SCADA_CH1[41].1	BOOL	Bank 1D wiper travel time exceeded	1 = Fault	
N_SCADA_CH1[41].2	BOOL	Bank 1D wiper not in remote	1 = Fault	
N_SCADA_CH1[41].3	BOOL	Bank 1D wiper unknown position	1 = Fault	
N_SCADA_CH1[41].4	BOOL	Bank 1D lift attempted with lamps energized	1 = Fault	
N_SCADA_CH1[41].5	BOOL	Bank 1D lift up attempted with locking latch disengaged	1 = Fault	
N_SCADA_CH1[41].6	BOOL	Bank 1D lift down attempted with locking latch engaged	1 = Fault	
N_SCADA_CH1[41].7	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[41].8	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[41].9	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[41].10	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[41].11	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[41].12	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[41].13	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[41].14	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[41].15	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH1[42].0	BOOL	Bank 1D PDC high temp shutdown	1 = Fault	
N_SCADA_CH1[42].1	BOOL	Bank 1D not in place	1 = Fault	
N_SCADA_CH1[42].2	BOOL	Bank 1D low water level shutdown	1 = Fault	
N_SCADA_CH1[42].3	BOOL	Bank 1D PDC disconnect off	1 = Off	
N_SCADA_CH1[42].4	BOOL	Bank 1D SCC-PDC comm fault	1 = Fault	
N_SCADA_CH1[42].5	BOOL	Bank 1D multi lamp failure	1 = Fault	
N_SCADA_CH1[42].6	BOOL	Bank 1D configuration mismatch	1 = Fault	
N_SCADA_CH1[42].7	BOOL	Bank 1D not enough healthy lamps	1 = Fault	
N_SCADA_CH1[42].8	BOOL	Bank 1D UVI sensor faulted - SBC	1 = Fault	
N_SCADA_CH1[42].9	BOOL	Bank 1D UVI lower than expected	1 = Fault	
N_SCADA_CH1[42].10	BOOL	Bank 1D BCB DIPSwitch mismatch	1 = Fault	
N_SCADA_CH1[42].11	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[42].12	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[42].13	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[42].14	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[42].15	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH1[43].0	BOOL	reserved		
N_SCADA_CH1[43].1	BOOL	Bank 1D not in remote auto	1 = Fault	
N_SCADA_CH1[43].2	BOOL	Bank 1D low level warning	1 = Fault	
N_SCADA_CH1[43].3	BOOL	Bank 1D PDC fan failure	1 = Fault	
N_SCADA_CH1[43].4	BOOL	reserved		
N_SCADA_CH1[43].5	BOOL	Bank 1D PDC high temperature warning	1 = Fault	
N_SCADA_CH1[43].6	BOOL	Bank 1D lamp failure	1 = Fault	
N_SCADA_CH1[43].7	BOOL	Bank 1D lamp lifetime exceeded	1 = Fault	
N_SCADA_CH1[43].8	BOOL	Bank 1D lamp driver failure	1 = Fault	
N_SCADA_CH1[43].9	BOOL	Bank 1D lamp driver comm failure	1 = Fault	
N_SCADA_CH1[43].10	BOOL	Bank 1D lamp disabled	1 = Disabled	
N_SCADA_CH1[43].11	BOOL	Bank 1D UVI sensor faulted - Non SBC	1 = Fault	

N_SCADA_CH1[43].12	BOOL	Bank 1D UVI lower than expected warning	1 = Fault	
N_SCADA_CH1[43].13	BOOL	Bank 1D UVI reference check required	1 = Fault	
N_SCADA_CH1[43].14	BOOL	Bank 1D UVI reference check active	1 = Active	
N_SCADA_CH1[43].15	BOOL	spare bit for bank minor alarm		
N_SCADA_CH1[44]	INT	Bank 1D lamp hours	Hours	x1
N_SCADA_CH1[45]	INT	Bank 1D lamp power	Power (%)	x1
N_SCADA_CH1[46]	INT	Bank 1D UVI	mW/cm2	x1000
N_SCADA_CH1[47]	INT	spare word		
N_SCADA_CH1[48]	INT	spare word		
N_SCADA_CH1[49]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH2[10].0	BOOL	Bank 2A minor alarm	1 = Fault	
N_SCADA_CH2[10].1	BOOL	Bank 2A major alarm	1 = Fault	
N_SCADA_CH2[10].2	BOOL	Bank 2A critical alarm	1 = Fault	
N_SCADA_CH2[10].3	BOOL	Bank 2A HSC alarm	1 = Fault	
N_SCADA_CH2[10].4	BOOL	Bank 2A in operation	1 = Operating	
N_SCADA_CH2[10].5	BOOL	spare bit		
N_SCADA_CH2[10].6	BOOL	spare bit		
N_SCADA_CH2[10].7	BOOL	spare bit		
N_SCADA_CH2[10].8	BOOL	spare bit		
N_SCADA_CH2[10].9	BOOL	spare bit		
N_SCADA_CH2[10].10	BOOL	spare bit		
N_SCADA_CH2[10].11	BOOL	spare bit		
N_SCADA_CH2[10].12	BOOL	spare bit		
N_SCADA_CH2[10].13	BOOL	spare bit		
N_SCADA_CH2[10].14	BOOL	spare bit		
N_SCADA_CH2[10].15	BOOL	spare bit		
N_SCADA_CH2[11].0	BOOL	Bank 2A wiper jammed	1 = Fault	
N_SCADA_CH2[11].1	BOOL	Bank 2A wiper travel time exceeded	1 = Fault	
N_SCADA_CH2[11].2	BOOL	Bank 2A wiper not in remote	1 = Fault	
N_SCADA_CH2[11].3	BOOL	Bank 2A wiper unknown position	1 = Fault	
N_SCADA_CH2[11].4	BOOL	Bank 2A lift attempted with lamps energized	1 = Fault	
N_SCADA_CH2[11].5	BOOL	Bank 2A lift up attempted with locking latch disengaged	1 = Fault	
N_SCADA_CH2[11].6	BOOL	Bank 2A lift down attempted with locking latch engaged	1 = Fault	
N_SCADA_CH2[11].7	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[11].8	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[11].9	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[11].10	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[11].11	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[11].12	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[11].13	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[11].14	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[11].15	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[12].0	BOOL	Bank 2A PDC high temp shutdown	1 = Fault	
N_SCADA_CH2[12].1	BOOL	Bank 2A not in place	1 = Fault	
N_SCADA_CH2[12].2	BOOL	Bank 2A low water level shutdown	1 = Fault	
N_SCADA_CH2[12].3	BOOL	Bank 2A PDC disconnect off	1 = Off	
N_SCADA_CH2[12].4	BOOL	Bank 2A SCC-PDC comm fault	1 = Fault	
N_SCADA_CH2[12].5	BOOL	Bank 2A multi lamp failure	1 = Fault	
N_SCADA_CH2[12].6	BOOL	Bank 2A configuration mismatch	1 = Fault	
N_SCADA_CH2[12].7	BOOL	Bank 2A not enough healthy lamps	1 = Fault	
N_SCADA_CH2[12].8	BOOL	Bank 2A UVI sensor faulted - SBC	1 = Fault	
N_SCADA_CH2[12].9	BOOL	Bank 2A UVI lower than expected	1 = Fault	
N_SCADA_CH2[12].10	BOOL	Bank 2A BCB DIPSwitch mismatch	1 = Fault	
N_SCADA_CH2[12].11	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[12].12	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[12].13	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[12].14	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[12].15	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[13].0	BOOL	reserved		
N_SCADA_CH2[13].1	BOOL	Bank 2A not in remote auto	1 = Fault	
N_SCADA_CH2[13].2	BOOL	Bank 2A low level warning	1 = Fault	
N_SCADA_CH2[13].3	BOOL	Bank 2A PDC fan failure	1 = Fault	
N_SCADA_CH2[13].4	BOOL	reserved		
N_SCADA_CH2[13].5	BOOL	Bank 2A PDC high temperature warning	1 = Fault	
N_SCADA_CH2[13].6	BOOL	Bank 2A lamp failure	1 = Fault	
N_SCADA_CH2[13].7	BOOL	Bank 2A lamp lifetime exceeded	1 = Fault	
N_SCADA_CH2[13].8	BOOL	Bank 2A lamp driver failure	1 = Fault	
N_SCADA_CH2[13].9	BOOL	Bank 2A lamp driver comm failure	1 = Fault	
N_SCADA_CH2[13].10	BOOL	Bank 2A lamp disabled	1 = Disabled	
N_SCADA_CH2[13].11	BOOL	Bank 2A UVI sensor faulted - Non SBC	1 = Fault	

N_SCADA_CH2[13].12	BOOL	Bank 2A UVI lower than expected warning	1 = Fault	
N_SCADA_CH2[13].13	BOOL	Bank 2A UVI reference check required	1 = Fault	
N_SCADA_CH2[13].14	BOOL	Bank 2A UVI reference check active	1 = Active	
N_SCADA_CH2[13].15	BOOL	spare bit for bank minor alarm		
N_SCADA_CH2[14]	INT	Bank 2A lamp hours	Hours	x1
N_SCADA_CH2[15]	INT	Bank 2A lamp power	Power (%)	x1
N_SCADA_CH2[16]	INT	Bank 2A UVI	mW/cm2	x1000
N_SCADA_CH2[17]	INT	spare word		
N_SCADA_CH2[18]	INT	spare word		
N_SCADA_CH2[19]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH2[20].0	BOOL	Bank 2B minor alarm	1 = Fault	
N_SCADA_CH2[20].1	BOOL	Bank 2B major alarm	1 = Fault	
N_SCADA_CH2[20].2	BOOL	Bank 2B critical alarm	1 = Fault	
N_SCADA_CH2[20].3	BOOL	Bank 2B HSC alarm	1 = Fault	
N_SCADA_CH2[20].4	BOOL	Bank 2B in operation	1 = Operating	
N_SCADA_CH2[20].5	BOOL	spare bit		
N_SCADA_CH2[20].6	BOOL	spare bit		
N_SCADA_CH2[20].7	BOOL	spare bit		
N_SCADA_CH2[20].8	BOOL	spare bit		
N_SCADA_CH2[20].9	BOOL	spare bit		
N_SCADA_CH2[20].10	BOOL	spare bit		
N_SCADA_CH2[20].11	BOOL	spare bit		
N_SCADA_CH2[20].12	BOOL	spare bit		
N_SCADA_CH2[20].13	BOOL	spare bit		
N_SCADA_CH2[20].14	BOOL	spare bit		
N_SCADA_CH2[20].15	BOOL	spare bit		
N_SCADA_CH2[21].0	BOOL	Bank 2B wiper jammed	1 = Fault	
N_SCADA_CH2[21].1	BOOL	Bank 2B wiper travel time exceeded	1 = Fault	
N_SCADA_CH2[21].2	BOOL	Bank 2B wiper not in remote	1 = Fault	
N_SCADA_CH2[21].3	BOOL	Bank 2B wiper unknown position	1 = Fault	
N_SCADA_CH2[21].4	BOOL	Bank 2B lift attempted with lamps energized	1 = Fault	
N_SCADA_CH2[21].5	BOOL	Bank 2B lift up attempted with locking latch disengaged	1 = Fault	
N_SCADA_CH2[21].6	BOOL	Bank 2B lift down attempted with locking latch engaged	1 = Fault	
N_SCADA_CH2[21].7	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[21].8	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[21].9	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[21].10	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[21].11	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[21].12	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[21].13	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[21].14	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[21].15	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[22].0	BOOL	Bank 2B PDC high temp shutdown	1 = Fault	
N_SCADA_CH2[22].1	BOOL	Bank 2B not in place	1 = Fault	
N_SCADA_CH2[22].2	BOOL	Bank 2B low water level shutdown	1 = Fault	
N_SCADA_CH2[22].3	BOOL	Bank 2B PDC disconnect off	1 = Off	
N_SCADA_CH2[22].4	BOOL	Bank 2B SCC-PDC comm fault	1 = Fault	
N_SCADA_CH2[22].5	BOOL	Bank 2B multi lamp failure	1 = Fault	
N_SCADA_CH2[22].6	BOOL	Bank 2B configuration mismatch	1 = Fault	
N_SCADA_CH2[22].7	BOOL	Bank 2B not enough healthy lamps	1 = Fault	
N_SCADA_CH2[22].8	BOOL	Bank 2B UVI sensor faulted - SBC	1 = Fault	
N_SCADA_CH2[22].9	BOOL	Bank 2B UVI lower than expected	1 = Fault	
N_SCADA_CH2[22].10	BOOL	Bank 2B BCB DIPSwitch mismatch	1 = Fault	
N_SCADA_CH2[22].11	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[22].12	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[22].13	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[22].14	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[22].15	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[23].0	BOOL	Bank 2B not sealed		
N_SCADA_CH2[23].1	BOOL	Bank 2B not in remote auto	1 = Fault	
N_SCADA_CH2[23].2	BOOL	Bank 2B low level warning	1 = Fault	
N_SCADA_CH2[23].3	BOOL	Bank 2B PDC fan failure	1 = Fault	
N_SCADA_CH2[23].4	BOOL	reserved		
N_SCADA_CH2[23].5	BOOL	Bank 2B PDC high temperature warning	1 = Fault	
N_SCADA_CH2[23].6	BOOL	Bank 2B lamp failure	1 = Fault	
N_SCADA_CH2[23].7	BOOL	Bank 2B lamp lifetime exceeded	1 = Fault	
N_SCADA_CH2[23].8	BOOL	Bank 2B lamp driver failure	1 = Fault	
N_SCADA_CH2[23].9	BOOL	Bank 2B lamp driver comm failure	1 = Fault	
N_SCADA_CH2[23].10	BOOL	Bank 2B lamp disabled	1 = Disabled	
N_SCADA_CH2[23].11	BOOL	Bank 2B UVI sensor faulted - Non SBC	1 = Fault	
N_SCADA_CH2[23].12	BOOL	Bank 2B UVI lower than expected warning	1 = Fault	
N_SCADA_CH2[23].13	BOOL	Bank 2B UVI reference check required	1 = Fault	

N_SCADA_CH2[23].14	BOOL	Bank 2B UVI reference check active	1 = Active	
N_SCADA_CH2[23].15	BOOL	spare bit for bank minor alarm		
N_SCADA_CH2[24]	INT	Bank 2B lamp hours	Hours	x1
N_SCADA_CH2[25]	INT	Bank 2B lamp power	Power (%)	x1
N_SCADA_CH2[26]	INT	Bank 2B UVI	mW/cm2	x1000
N_SCADA_CH2[27]	INT	spare word		
N_SCADA_CH2[28]	INT	spare word		
N_SCADA_CH2[29]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH2[30].0	BOOL	Bank 2C minor alarm	1 = Fault	
N_SCADA_CH2[30].1	BOOL	Bank 2C major alarm	1 = Fault	
N_SCADA_CH2[30].2	BOOL	Bank 2C critical alarm	1 = Fault	
N_SCADA_CH2[30].3	BOOL	Bank 2C HSC alarm	1 = Fault	
N_SCADA_CH2[30].4	BOOL	Bank 2C in operation	1 = Operating	
N_SCADA_CH2[30].5	BOOL	spare bit		
N_SCADA_CH2[30].6	BOOL	spare bit		
N_SCADA_CH2[30].7	BOOL	spare bit		
N_SCADA_CH2[30].8	BOOL	spare bit		
N_SCADA_CH2[30].9	BOOL	spare bit		
N_SCADA_CH2[30].10	BOOL	spare bit		
N_SCADA_CH2[30].11	BOOL	spare bit		
N_SCADA_CH2[30].12	BOOL	spare bit		
N_SCADA_CH2[30].13	BOOL	spare bit		
N_SCADA_CH2[30].14	BOOL	spare bit		
N_SCADA_CH2[30].15	BOOL	spare bit		
N_SCADA_CH2[31].0	BOOL	Bank 2C wiper jammed	1 = Fault	
N_SCADA_CH2[31].1	BOOL	Bank 2C wiper travel time exceeded	1 = Fault	
N_SCADA_CH2[31].2	BOOL	Bank 2C wiper not in remote	1 = Fault	
N_SCADA_CH2[31].3	BOOL	Bank 2C wiper unknown position	1 = Fault	
N_SCADA_CH2[31].4	BOOL	Bank 2C lift attempted with lamps energized	1 = Fault	
N_SCADA_CH2[31].5	BOOL	Bank 2C lift up attempted with locking latch disengaged	1 = Fault	
N_SCADA_CH2[31].6	BOOL	Bank 2C lift down attempted with locking latch engaged	1 = Fault	
N_SCADA_CH2[31].7	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[31].8	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[31].9	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[31].10	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[31].11	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[31].12	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[31].13	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[31].14	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[31].15	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[32].0	BOOL	Bank 2C PDC high temp shutdown	1 = Fault	
N_SCADA_CH2[32].1	BOOL	Bank 2C not in place	1 = Fault	
N_SCADA_CH2[32].2	BOOL	Bank 2C low water level shutdown	1 = Fault	
N_SCADA_CH2[32].3	BOOL	Bank 2C PDC disconnect off	1 = Off	
N_SCADA_CH2[32].4	BOOL	Bank 2C SCC-PDC comm fault	1 = Fault	
N_SCADA_CH2[32].5	BOOL	Bank 2C multi lamp failure	1 = Fault	
N_SCADA_CH2[32].6	BOOL	Bank 2C configuration mismatch	1 = Fault	
N_SCADA_CH2[32].7	BOOL	Bank 2C not enough healthy lamps	1 = Fault	
N_SCADA_CH2[32].8	BOOL	Bank 2C UVI sensor faulted - SBC	1 = Fault	
N_SCADA_CH2[32].9	BOOL	Bank 2C UVI lower than expected	1 = Fault	
N_SCADA_CH2[32].10	BOOL	Bank 2C BCB DIPSwitch mismatch	1 = Fault	
N_SCADA_CH2[32].11	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[32].12	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[32].13	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[32].14	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[32].15	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[33].0	BOOL	reserved		
N_SCADA_CH2[33].1	BOOL	Bank 2C not in remote auto	1 = Fault	
N_SCADA_CH2[33].2	BOOL	Bank 2C low level warning	1 = Fault	
N_SCADA_CH2[33].3	BOOL	Bank 2C PDC fan failure	1 = Fault	
N_SCADA_CH2[33].4	BOOL	reserved		
N_SCADA_CH2[33].5	BOOL	Bank 2C PDC high temperature warning	1 = Fault	
N_SCADA_CH2[33].6	BOOL	Bank 2C lamp failure	1 = Fault	
N_SCADA_CH2[33].7	BOOL	Bank 2C lamp lifetime exceeded	1 = Fault	
N_SCADA_CH2[33].8	BOOL	Bank 2C lamp driver failure	1 = Fault	
N_SCADA_CH2[33].9	BOOL	Bank 2C lamp driver comm failure	1 = Fault	
N_SCADA_CH2[33].10	BOOL	Bank 2C lamp disabled	1 = Disabled	
N_SCADA_CH2[33].11	BOOL	Bank 2C UVI sensor faulted - Non SBC	1 = Fault	
N_SCADA_CH2[33].12	BOOL	Bank 2C UVI lower than expected warning	1 = Fault	
N_SCADA_CH2[33].13	BOOL	Bank 2C UVI reference check required	1 = Fault	

N_SCADA_CH2[33].14	BOOL	Bank 2C UVI reference check active	1 = Active	
N_SCADA_CH2[33].15	BOOL	spare bit for bank minor alarm		
N_SCADA_CH2[34]	INT	Bank 2C lamp hours	Hours	x1
N_SCADA_CH2[35]	INT	Bank 2C lamp power	Power (%)	x1
N_SCADA_CH2[36]	INT	Bank 2C UVI	mW/cm2	x1000
N_SCADA_CH2[37]	INT	spare word		
N_SCADA_CH2[38]	INT	spare word		
N_SCADA_CH2[39]	INT	spare word		

Tag Name	Data Type	Description	Units	Scaling
N_SCADA_CH2[40].0	BOOL	Bank 2D minor alarm	1 = Fault	
N_SCADA_CH2[40].1	BOOL	Bank 2D major alarm	1 = Fault	
N_SCADA_CH2[40].2	BOOL	Bank 2D critical alarm	1 = Fault	
N_SCADA_CH2[40].3	BOOL	Bank 2D HSC alarm	1 = Fault	
N_SCADA_CH2[40].4	BOOL	Bank 2D in operation	1 = Operating	
N_SCADA_CH2[40].5	BOOL	spare bit		
N_SCADA_CH2[40].6	BOOL	spare bit		
N_SCADA_CH2[40].7	BOOL	spare bit		
N_SCADA_CH2[40].8	BOOL	spare bit		
N_SCADA_CH2[40].9	BOOL	spare bit		
N_SCADA_CH2[40].10	BOOL	spare bit		
N_SCADA_CH2[40].11	BOOL	spare bit		
N_SCADA_CH2[40].12	BOOL	spare bit		
N_SCADA_CH2[40].13	BOOL	spare bit		
N_SCADA_CH2[40].14	BOOL	spare bit		
N_SCADA_CH2[40].15	BOOL	spare bit		
N_SCADA_CH2[41].0	BOOL	Bank 2D wiper jammed	1 = Fault	
N_SCADA_CH2[41].1	BOOL	Bank 2D wiper travel time exceeded	1 = Fault	
N_SCADA_CH2[41].2	BOOL	Bank 2D wiper not in remote	1 = Fault	
N_SCADA_CH2[41].3	BOOL	Bank 2D wiper unknown position	1 = Fault	
N_SCADA_CH2[41].4	BOOL	Bank 2D lift attempted with lamps energized	1 = Fault	
N_SCADA_CH2[41].5	BOOL	Bank 2D lift up attempted with locking latch disengaged	1 = Fault	
N_SCADA_CH2[41].6	BOOL	Bank 2D lift down attempted with locking latch engaged	1 = Fault	
N_SCADA_CH2[41].7	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[41].8	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[41].9	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[41].10	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[41].11	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[41].12	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[41].13	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[41].14	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[41].15	BOOL	spare bit for bank wiper alarms		
N_SCADA_CH2[42].0	BOOL	Bank 2D PDC high temp shutdown	1 = Fault	
N_SCADA_CH2[42].1	BOOL	Bank 2D not in place	1 = Fault	
N_SCADA_CH2[42].2	BOOL	Bank 2D low water level shutdown	1 = Fault	
N_SCADA_CH2[42].3	BOOL	Bank 2D PDC disconnect off	1 = Off	
N_SCADA_CH2[42].4	BOOL	Bank 2D SCC-PDC comm fault	1 = Fault	
N_SCADA_CH2[42].5	BOOL	Bank 2D multi lamp failure	1 = Fault	
N_SCADA_CH2[42].6	BOOL	Bank 2D configuration mismatch	1 = Fault	
N_SCADA_CH2[42].7	BOOL	Bank 2D not enough healthy lamps	1 = Fault	
N_SCADA_CH2[42].8	BOOL	Bank 2D UVI sensor faulted - SBC	1 = Fault	
N_SCADA_CH2[42].9	BOOL	Bank 2D UVI lower than expected	1 = Fault	
N_SCADA_CH2[42].10	BOOL	Bank 2D BCB DIPSwitch mismatch	1 = Fault	
N_SCADA_CH2[42].11	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[42].12	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[42].13	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[42].14	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[42].15	BOOL	spare bit for bank critical/major alarm		
N_SCADA_CH2[43].0	BOOL	reserved		
N_SCADA_CH2[43].1	BOOL	Bank 2D not in remote auto	1 = Fault	
N_SCADA_CH2[43].2	BOOL	Bank 2D low level warning	1 = Fault	
N_SCADA_CH2[43].3	BOOL	Bank 2D PDC fan failure	1 = Fault	
N_SCADA_CH2[43].4	BOOL	reserved		
N_SCADA_CH2[43].5	BOOL	Bank 2D PDC high temperature warning	1 = Fault	
N_SCADA_CH2[43].6	BOOL	Bank 2D lamp failure	1 = Fault	
N_SCADA_CH2[43].7	BOOL	Bank 2D lamp lifetime exceeded	1 = Fault	
N_SCADA_CH2[43].8	BOOL	Bank 2D lamp driver failure	1 = Fault	
N_SCADA_CH2[43].9	BOOL	Bank 2D lamp driver comm failure	1 = Fault	
N_SCADA_CH2[43].10	BOOL	Bank 2D lamp disabled	1 = Disabled	
N_SCADA_CH2[43].11	BOOL	Bank 2D UVI sensor faulted - Non SBC	1 = Fault	
N_SCADA_CH2[43].12	BOOL	Bank 2D UVI lower than expected warning	1 = Fault	
N_SCADA_CH2[43].13	BOOL	Bank 2D UVI reference check required	1 = Fault	

N_SCADA_CH2[43].14	BOOL	Bank 2D UVI reference check active	1 = Active	
N_SCADA_CH2[43].15	BOOL	spare bit for bank minor alarm		
N_SCADA_CH2[44]	INT	Bank 2D lamp hours	Hours	x1
N_SCADA_CH2[45]	INT	Bank 2D lamp power	Power (%)	x1
N_SCADA_CH2[46]	INT	Bank 2D UVI	mW/cm2	x1000
N_SCADA_CH2[47]	INT	spare word		
N_SCADA_CH2[48]	INT	spare word		
N_SCADA_CH2[49]	INT	spare word		

WARRANTIES

SECTION CONTENTS

TROJANUV WATER CONFIDENCE™

171100051 - Ann Arbor Replacement, MI - Equipment Limited Warranty

The following terms and conditions will govern the equipment warranty provided by Trojan Technologies to the Owner/Operator:

Period of Coverage: Trojan Technologies ("Trojan") warrants to the Owner/Operator noted above (the "Customer") that if within 12 calendar months from equipment Substantial Completion (the "Warranty Period"), equipment manufactured by Trojan (the "Equipment") will be free from defects in material and workmanship and will function in accordance with the specifications agreed to by Trojan for the Equipment.

> "Substantial Completion" is the date on which the Equipment commissioning and start-up is sufficiently completed such that the Equipment is capable of being put into operation such that the Owner can utilize the Equipment for its intended disinfection use.

Customer must notify Trojan in writing within 5 days of the date of any Equipment failure. This notification shall include a description of the problem, a copy of the operator's log, a copy of the Customer's maintenance record and any analytical results detailing the problem. If Customer has not maintained the operator's log and maintenance record in the manner directed in the Operation and Maintenance manual, or does not notify Trojan of the problem as specified above, this warranty may, in Trojan's discretion, be invalid.

If a defect occurs, Trojan will, at its option, repair or replace the defective component free of charge, provided that:

1. Customer fully cooperates with Trojan, in the manner requested by Trojan, in attempting to diagnose and resolve the problem by way of telephone support. If the problem can be diagnosed and verified by telephone support and a replacement part is required, Trojan will either ship at Trojan's expense, a repaired, reworked or new part to the Customer, who will install such part as directed by Trojan, or direct Customer to acquire, at Trojan's expense, such part from a third party and to install such part as directed by Trojan;
2. In the event that Trojan determines that the problem cannot be resolved by way of telephone support and/or shipment by Trojan, or acquisition by the Customer of a replacement part for installation by the Customer, Trojan will send one or more persons to make an onsite inspection of the problem. If an onsite visit is made, Trojan personnel will evaluate the problem and repair or replace any Equipment determined to be in breach of this warranty. If the problem is not attributable to a breach of this warranty, Trojan reserves the right to invoice the Customer for this service; and
3. The Equipment is covered and the failure occurs within the Warranty Period

Trojan will, at its option, use new and/or reconditioned parts in performing warranty repair. Trojan has the right to use parts or products of original or improved design in the repair or replacement.

The products or general components replaced or repaired free of charge under the Equipment Limited Warranty are warranted only for the *remaining* portion of the original Equipment Limited Warranty Period.

Limitations: This warranty shall not apply to any failure or defect which results from:

- the Equipment not being operated and maintained in strict accordance with instructions specified in the Operation and Maintenance manual or Product Bulletin or which results from mishandling, misuse, neglect, improper storage, improper operation of the Equipment with other equipment furnished by the Customer or by other third parties or from defects in designs or specifications furnished by or on behalf of the Customer by a person other than Trojan.
- Equipment that has been altered or repaired after start-up by anyone except: (a) authorized representatives of Trojan, or (b) Customer acting under specific written instructions from Trojan.
- Use of parts not supplied or approved by Trojan

This warranty does not cover:

- Equipment components manufactured by third parties but furnished to Customer by Trojan are warranted by the original manufacturer, only to the extent of the original manufacturer's warranty
- Normal wear and tear of the product
- Consumable components including but not limited to wiper seals, cleaning chemical, batteries
- Trojan supplied components that are the subject of a separate warranty
- Costs related to removal, installation, or troubleshooting of a component
- Physical damage
- Improper installation
- Acts of God, terrorism, biological infestations, or input voltage that create operating conditions beyond the minimum or maximum limits listed in the Operations Manual including high input voltage from generators and lightening strikes
- Damage caused by improper return packaging
- Taxes, duties or brokerage fees (if any)

This warranty is the exclusive remedy for all claims based on a failure of or defect in the Equipment, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or fitness for a particular purpose shall apply to the Equipment.

Trojan does not assume any liability for personal injury or property damage caused by use or misuse of the Equipment. Trojan shall not in any event be liable for special, incidental, indirect or consequential damages including, without limitation, lost profits, lost business opportunities, lost revenue or loss or depreciation of goodwill, even if it has been advised of the possibility thereof. Trojan's liability shall, in all instances, be limited to repair or replacement of Equipment in breach of this warranty and shall not exceed the cost of such repair or replacement. This liability with respect to repair or replacement will terminate upon the expiration date of this warranty.

In addition to the foregoing, in no event shall Trojan's liability relating to the Equipment, or the agreement between Trojan and the Customer relating to the Equipment, exceed that portion of the purchase price for the Equipment which is actually paid to Trojan.

TrojanUV - A Division of Trojan Technologies Group ULC
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TrojanUV Solo Lamp™ Limited Warranty
TrojanUVSigna™

Warranty Coverage:

The following warranty applies to Trojan Technologies Low Pressure Lamps (the "Lamps") for the TrojanUVSigna. The warranty is only valid with respect to a Lamp that is properly stored, handled and installed as specified in the Operation and Maintenance manual supplied with the system in which the Lamp is installed or as outlined in subsequent Product Bulletins. Without limiting the generality of the foregoing, any excess vibration or improper operation of a Lamp shall void this warranty. In addition, Trojan Technologies shall not be liable for any Lamp failure which results from UV equipment not being operated and maintained in strict accordance with the instructions set out in the Operation and Maintenance manual or as outlined in Product Bulletins.

In order to process any Lamp warranty claim, Trojan Technologies requires the Customer to provide a copy of the operator's log, all maintenance records and a completed Warranty Claim Form within one (1) month of the lamp failure. If these conditions are not met, the warranty claim will not be valid.

Trojan Technologies reserves the right to require the Customer to return a failed Lamp to Trojan Technologies' facilities for inspection. If upon request the lamp is not returned to Trojan Technologies, the warranty claim will not be valid.

Period of Coverage:

When a Lamp has been stored, handled and installed as specified in the Operation and Maintenance manual or as outlined in Product Bulletins, and the relevant UV equipment has been operated and maintained in accordance with instructions specified in the Operation and Maintenance manual, and:

1. The Lamp fails within the first 9,000 hours of operation; Trojan Technologies shall provide the Customer with a replacement Lamp free of charge.
2. The Lamp fails after 9,000 hours and prior to 15,000 hours of operation; Trojan Technologies shall provide the Customer with a replacement Lamp at a discounted price. The following formula is used to determine the discounted price for the replacement Lamp:

   Replacement Lamp Price = ((Lamp Operating Hours) / 15,000 x Lamp List Price)

Regardless of actual Lamp operating hours, the Lamp warranty is void if the date of Lamp failure occurs more than thirty-six (36) calendar months after the Lamp shipment date from Trojan Technologies.

The above operating conditions of Lamps are based on an average of 12 On/Off cycles, per 24 hour period, accumulated over the total guaranteed life of the Lamp.

Limitations:

This limited warranty does not cover:

- Lamps that have been used with parts not supplied or approved by Trojan Technologies
- Lamps that have been physically damaged or fail due to corrosion, exposure to contaminants (e.g. effluent), incorrect installation or operation
- Costs related to troubleshooting, removal, or installation
- Damage caused by improper return packaging
- Taxes, duties or brokerage fees (if any)

The above warranty is the exclusive remedy for all claims based on a failure of or defect in a Lamp, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or of fitness for a particular purpose shall apply to a Lamp.

Trojan Technologies does not assume any liability for personal injury or property damage caused by use or misuse of a Lamp. Trojan Technologies shall not, in any case, be liable for special, incidental, indirect or consequential damages, even if it has been advised of the possibility thereof. Trojan Technologies' liability shall not, in any case, exceed the cost of replacement of a defective Lamp.

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TROJANUV
WATER CONFIDENCE™

Sleeve Limited Warranty
TrojanUVSigna™

Warranty Coverage:

The following warranty applies to the Trojan Technologies Sleeve (the "Sleeve") for the TrojanUVSigna. The warranty is only valid with respect to a new Sleeve that is purchased as: (i) a component of a new system, or (ii) a spare part shipped with a new system, and that is properly stored, handled and installed as specified in the Operation and Maintenance manual supplied with the system in which the Sleeve is installed or as outlined in Product Bulletins. Without limiting the generality of the foregoing, any excess vibration or improper operation of the Sleeve shall void this warranty. In addition, Trojan Technologies shall not be liable for any Sleeve failure which results from UV equipment not being operated and maintained in strict accordance with the instructions set out in the Operation and Maintenance manual or Product Bulletins.

In order to assess and process any Sleeve warranty claim, Trojan Technologies requires the Customer to provide a copy of the operator's log, and all maintenance records within one (1) month of the failure otherwise the warranty shall be void.

Trojan Technologies also reserves the right to require the Customer to return failed Sleeves to Trojan Technologies' facilities for inspection. Failure to return the Sleeve or provide logs or records when requested shall void the warranty.

Period Of Coverage:

Where a Sleeve has been stored, handled and installed as specified in the Operation and Maintenance manual or as outlined in a Product Bulletin, and the relevant UV equipment has been operated and maintained in accordance with instructions specified in the Operation and Maintenance manual or Product Bulletin, and the water quality is within the specification agreed to by Trojan for the UV Equipment, and:

1. the Sleeve breaks within one (1) calendar year after the Warranty Start Date, Trojan Technologies shall provide the Customer with a replacement Sleeve free of charge;
2. the Sleeve breaks after the first (1^{rst}, and before the Tenth (10^{th}), anniversary of the Warranty Start Date, Trojan Technologies shall provide the Customer with a replacement Sleeve at a discounted price. The following formula is used to determine the discounted price for replacement Sleeves:

   Replacement Sleeve Price = ((Number of Elapsed Months) / 60 x Sleeve List Price)

The "Warranty Start Date" is, in the case of a Sleeve forming part of a new system installation or shipped as a spare part with a new system, the commissioning date of the new system and, in the case of a Sleeve purchased as a replacement component, the shipment date of the Sleeve. One "Elapsed Month" shall be deemed to have passed at the beginning of the day in each subsequent month that is the same calendar day as the day on which the Warranty Start Date falls, or the first day of the next following month if the Warranty Start Date falls on a day not present in any particular month. (For example, if the Warranty Start Date is January 10, one Elapsed Month will have occurred on each of February 10 and March 10, but if the Warranty Start Date is January 29, one Elapsed Month will have occurred on each of March 1 and March 29.)

Limitations:

This limited warranty does not cover:

- Sleeves that have been used with parts not supplied or approved by Trojan Technologies
- Sleeves that have been physically damaged, damaged by debris, improper installation or removal, incorrect operation of the UV system or subject to abnormal stresses
- Sleeves that have been operated in air with the lamps on
- Normal wear and tear of the sleeve (e.g. scratches cause by effluent grit)
- Costs related to removal, installation, or troubleshooting
- Damage caused by improper return packaging.
- Taxes, duties or brokerage fees, if any

The above warranty is the exclusive remedy for all claims based on a failure of or defect in a Sleeve, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or of fitness for a particular purpose shall apply to a Sleeve.

Trojan Technologies does not assume any liability for personal injury or property damage caused by use or misuse of a Sleeve. Trojan Technologies shall not in any case be liable for special, incidental, indirect or consequential damages, even if it has been advised of the possibility thereof. Trojan Technologies' liability shall not, in any case, exceed the cost of the Sleeve.

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Lamp Driver Limited Warranty
TrojanUVSigna™

Warranty Coverage:

The following warranty applies to the Trojan Technologies Lamp Driver (the "Lamp Driver") for the Trojan TrojanUVSigna. The warranty is only valid with respect to a new Lamp Driver that is purchased as: (i) a component of a new system, (ii) a spare part shipped with a new system, or (iii) a purchased replacement component, and that is properly stored, handled and installed as specified in the Operation and Maintenance manual supplied with the system in which the Lamp Driver is installed or as outlined in subsequent Product Bulletins. Without limiting the generality of the foregoing, any excess vibration or improper operation of the Lamp Driver shall void this warranty. In addition, Trojan Technologies shall not be liable for any Lamp Driver failure which results from UV equipment not being operated and maintained in strict accordance with the instructions set out in the Operation and Maintenance manual or Product Bulletins.

Trojan Technologies reserves the right to require the Customer to return failed Lamp Drivers to Trojan Technologies' facilities for inspection along with the operator's log and maintenance records. Failure to return the Lamp Driver or provide logs or records when requested shall void the warranty.

Period Of Coverage:

Where a Lamp Driver has been stored, handled and installed as specified in the Operation and Maintenance manual, and the relevant UV equipment has been operated and maintained in accordance with instructions specified in the Operation and Maintenance manual or Product Bulletin, and:

1. The Lamp Driver fails within one (1) calendar year after the Warranty Start Date, Trojan Technologies shall provide the Customer with a replacement Driver free of charge.

2. The Lamp Driver fails after the first (1st), and before the tenth (10^{th}) anniversary of the Warranty Start Date, Trojan Technologies shall provide the Customer with a replacement Lamp Driver at a discounted price. The following formula is used to determine the discounted price for the replacement Driver:

   Replacement Lamp Driver Price = ((Number of Elapsed Months) / 120 x List Price)

The "Warranty Start Date" is, in the case of a Lamp Driver forming part of a new system installation or shipped as a spare part with a new system, the commissioning date of the new system. In the case of a Lamp Driver purchased as a replacement component, warranty start date is the shipment date of the Lamp Driver. One "Elapsed Month" shall be deemed to have passed at the beginning of the day in each subsequent month that is the same calendar day as the day on which the Warranty Start Date falls, or the first day of the next following month if the Warranty Start Date falls on a day not present in any particular month. For example, if the Warranty Start Date is January 10, one Elapsed Month will have occurred on each of February 10 and March 10, but if the Warranty Start Date is January 29, one Elapsed Month will have occurred on each of March 1 and March 29.

In order to assess and process any Lamp Driver warranty claim, Trojan Technologies requires the Customer to notify Trojan by submitting a completed Warranty Claim Form within one (1) month of the component failure. Failure to meet these terms will void the Lamp Driver warranty.

Limitations:

This limited warranty does not cover:

- Lamp Drivers that have been used with parts not supplied or approved by Trojan Technologies
- Lamp Drivers that have been physically damaged or fail due to corrosion, improper installation, exposure to moisture or abnormal stresses
- Damage caused by power quality disturbances falling outside the acceptable voltage tolerance of the ITIC (CBEMA) curve referenced from IEEE Standard 1100-2005
- Costs related to troubleshooting, removal or installation
- Damage caused by improper return packaging
- Taxes, duties or brokerage fees, if any.

The above warranty is the exclusive remedy for all claims based on a failure of or defect in a Lamp Driver, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or of fitness for a particular purpose shall apply to a Lamp Driver.

Trojan Technologies does not assume any liability for personal injury or property damage caused by use or misuse of a Lamp Driver. Trojan Technologies shall not in any case be liable for special, incidental, indirect or consequential damages, even if it has been advised of the possibility thereof. Trojan Technologies' liability shall not, in any case, exceed the cost of the Lamp Driver.

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UV Intensity Sensor Limited Warranty
TrojanUVSigna™

Warranty Coverage:

The following warranty applies to the Trojan Technologies UV Intensity Sensor (the "Sensor") for the TrojanUVSigna. The warranty is only valid with respect to a new Sensor that is purchased as: (i) a component of a new system, (ii) a spare part shipped with a new system, or (iii) a purchased replacement component, and that is properly stored, handled and installed as specified in the Operation and Maintenance manual supplied with the system in which the Sensor is installed or as outlined in Product Bulletins. Without limiting the generality of the foregoing, any excess vibration or improper operation of the Sensor shall void this warranty. In addition, Trojan Technologies shall not be liable for any Sensor failure which results from UV equipment not being operated and maintained in strict accordance with the instructions set out in the Operation and Maintenance manual or Product Bulletins.

In order to assess and process any Sensor warranty claim, Trojan Technologies requires the customer to notify Trojan within one (1) month of the failure and submit a completed Sensor Claim Form (See Attachment) otherwise the warranty shall be void.

Trojan Technologies reserves the right to require the Customer to return failed Sensors to Trojan Technologies' facilities for inspection along with the operator's log and maintenance records. Failure to return the Sensor or provide logs or records when requested shall void the warranty. Trojan Technologies will cover the return shipping expense.

Period Of Coverage:

Where a Sensor has been stored, handled and installed as specified in the Operation and Maintenance manual, and the relevant UV equipment has been operated and maintained in accordance with instructions specified in the Operation and Maintenance manual or Product Bulletin, and:

1. the Sensor fails within one (1) calendar year after the Warranty Start Date, Trojan Technologies shall provide the Customer with a replacement Sensor free of charge;
2. the Sensor fails after the first (1st), and before the fifth (5th), anniversary of the Warranty Start Date, Trojan Technologies shall provide the Customer with a replacement Sensor at a discounted price. The following formula is used to determine the discounted price for replacement Sensors:

   Replacement Sensor Price = ((Number of Elapsed Months) / 60 x Sensor List Price)

The "Warranty Start Date" is, in the case of a Sensor forming part of a new system installation or shipped as a spare part with a new system, the commissioning date of the new system and, in the case of a Sensor purchased as a replacement component, the shipment date of the Sensor. One "Elapsed Month" shall be deemed to have passed at the beginning of the day in each subsequent month that is the same calendar day as the day on which the Warranty Start Date falls, or the first day of the next following month if the Warranty Start Date falls on a day not present in any particular month. (For example, if the Warranty Start Date is January 10, one Elapsed Month will have occurred on each of February 10 and March 10, but if the Warranty Start Date is January 29, one Elapsed Month will have occurred on each of March 1 and March 29.)

Limitations:

This limited warranty does not cover:

- Sensor Calibration. Calibration is considered a routine maintenance item.
- Sensors that have been used with parts not supplied or approved by Trojan Technologies.
- Sensors that have been physically damaged or fail due to corrosion, improper installation, exposure to moisture, or abnormal stresses.
- Costs related to removal, installation, or troubleshooting.
- Damage caused by improper return packaging.
- Taxes, duties or brokerage fees, if any.

The above warranty is the exclusive remedy for all claims based on a failure of or defect in a Sensor, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or of fitness for a particular purpose shall apply to a Sensor.

Trojan Technologies does not assume any liability for personal injury or property damage caused by use or misuse of a Sensor. Trojan Technologies shall not in any case be liable for special, incidental, indirect or consequential damages, even if it has been advised of the possibility thereof. Trojan Technologies' liability shall not, in any case, exceed the cost of the Sensor.

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Performance Guarantee

Trojan Technologies certifies to Ann Arbor Replacement, MI that the TrojanUVSigna™ Disinfection Equipment supplied will disinfect to the limits of

- < 200 Fecal Coliform /100mL based upon a 30 Day Geometric Mean
- < 400 Fecal Coliform /100mL based upon a 7 Day Geometric Mean

and provided the following criteria is upheld.

PEAK FLOW: 54 MGD

SUSPENDED SOLIDS: ≤ 30 mg/L Based on a Maximum

UV TRANSMITTANCE @ 253.7 nm: 60% Minimum

TROJAN LAMP HOURS: ≤ 15,000

DOSE: ≥ 30 mJ/cm²

This performance guarantee is also contingent upon proper care and maintenance of the unit, as detailed within the Operation and Maintenance Manual, and the use of Trojan approved parts. The performance guarantee is specific to the plant treatment process and water quality reviewed at the time of bid and conditioned on the absence of water and operating conditions which may adversely affect the equipment provided, including water conditions falling outside of the parameters listed above.

Replacement Parts Price Guarantee

TROJAN TECHNOLOGIES hereby certifies to Ann Arbor Replacement, MI that the ULTRAVIOLET DISINFECTION EQUIPMENT replacement parts prices will not exceed the following:

- Lamp $ 500.00 each
- Ballast/ lamp driver $ 700.00 each
- Quartz Sleeve $ 150.00 each
- Wiper $ 10.00 each

The percent increase in prices, in the subsequent 10 years, will not exceed the percent increase in the Producers Price Index or fair market value unless unusual circumstances can be cited. Also note pricing does not include freight/shipping charges.

TROJANUV

Warranty Claim Form

Complete all applicable info

Check one:
- ☐ Lamp Driver
- ☐ Lamp
- ☐ UV Sensor

Check one:
- ☐ TrojanUV3000PTP
- ☐ TrojanUV3000B
- ☐ TrojanUV3000
- ☐ TrojanUV3000Plus
- ☐ TrojanUV4000
- ☐ TrojanUV4000Plus
- ☐ TrojanUVSigna
- ☐ TrojanUVSonus

Site/Project Name: _____

Project/Serial #: _____

Part Number: _____

Warranty Claim Form

For electronic copy of form please contact our Customer Care Representatives (CCR's) at na.warranty@trojanuv.com

No.	Date of Installation	Date of Failure	Bank #	Bank Letter	Module or Array	Position / Sensor #	Bank Hours at Install	Bank Hours at Failure	Net Operating Hours	On/Off Cycles	Date Code and Serial Number
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

Notes:

Completed By: _____

Phone #: _____

Email: _____

*** Submit failures on warranty claim form monthly otherwise warranty claim may be void.**

* Items that are damaged, show signs of corrosion, have been exposed to water, or were not handled, installed, or operated according to the O&M manual are not valid for warranty.

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January 1, 2017

Recycling Program for Trojan Customers.

HERE'S HOW OUR RECYCLING PROGRAM WORKS:

- Trojan Client Services provides you with a Lamp Recycling form to complete. The form includes such details as pick up address, contact information, lamp quantity, package dimensions, most recent sales order number, special shipping requirements, need for recycling certificate etc.
- Trojan Client Services makes arrangements with our Shipping Department for the pick up at your site.
- Lamps are then shipped from your site to the recycling facility for proper recycling.

According to 40 CFR 261.24 of the United States Environmental Protection Agency's Federal Registry, most fluorescent lamps contain enough mercury to be considered a hazardous waste. If placed in a landfill, the mercury becomes an environmental threat that has the potential to migrate into air and water supplies. Benefits of the recycling of fluorescent lamps include saved landfill space, reduced raw material production needs, and the prevention of toxic material from entering the environment.

Several years ago Trojan Technologies established a UV lamp recycling program for you, our valued customers. Lamps purchased from Trojan and authorized distributors are recycled at no cost to you. Used lamps are delivered to one of two (2) USEPA-approved lamp recycling centers. We use the services of two companies, Environment Recycling and Fluorescent Lamp Recycling.

Contact your Trojan Manufacturer's Representative or our Client Services Department to take advantage of this recycling program.

"If it's not a Genuine Trojan part, it shouldn't be part of your Trojan system."

3020 Gore Road London, Ontario, Canada N5V 4T7
T. 519.457.3400 F. 519.457.3030 www.trojanuv.com

TROJAN UV
WATER CONFIDENCE™

TROJAN UV
WATER CONFIDENCE™

LAMP RECYCLING Request Form

COMPLETED BY:		DATE SUBMITTED:	
COMPANY:			

PICK-UP ADDRESS	
SITE NAME:	
ADDRESS:	
STATE/PROV:	
COUNTRY:	
ZIP/POSTAL CODE:	
CONTACT NAME:	
PHONE #:	
FAX #:	
ADDITIONAL ADDRESS INFO. i.e. Hours of operation; lobby or warehouse	

DESCRIPTION OF THE GOODS TO BE PICKED UP

QUANTITY PIECES	PART #	DESCRIPTION OF GOODS

SPECIAL INSTRUCTIONS:

FINAL DIMENSIONS OF PACKAGED GOODS TO BE RECYCLED

QUANTITY	SKID OR BOX?	DIMENSIONS (L x W x H) (inches)	WEIGHT PER SKID OR BOX (lbs)
		TOTAL WEIGHT:	

EMAIL completed form to: crm@trojanuv.com

FAX completed form to: 1-800-591-0585

GET GENUINE.

"If it's not a Genuine Trojan part, it shouldn't be part of your Trojan system."

3020 Gore Road
London, Ontario CAN N5V 4T7
www.trojanuv.com

SAFETY DATA SHEETS (SDS)

SECTION CONTENTS

TROJAN UV™

Water Confidence™

SAFETY DATA SHEET

1 Product and Company Identification

Product identifier	Low Pressure High Output Amalgam UV Lamp
CAS #	Mixture
Product use	Ultraviolet (UV) Lamp
Recommended restrictions	None known
Manufacturer information	Trojan Technologies
	3020 Gore Road
	London, ON N5V 4T7 CA
	Phone: 519-457-3400
	Phone: 888-220-6118
Technical assistance #	
Within North America	Phone: 866-388-0488
Outside North America	Phone: 519-457-2318

2 Hazards Identification

Physical hazards	Not applicable to intact lamps.
Health hazards	Not applicable to intact lamps.
Environmental hazards	Not applicable to intact lamps.
WHMIS 2015 defined hazards	
Label elements	
Hazard symbol	Not applicable to intact lamps.
Signal word	Not applicable to intact lamps.
Hazard statement	Not applicable to intact lamps.
WHMIS 2015: Health Hazard(s) not otherwise classified (HHNOC)	None known
WHMIS 2015: Physical Hazard(s) not otherwise classified (PHNOC)	None known
Hazard(s) not otherwise classified (HNOC)	None known
Supplemental information	None

3 Composition/Information on Ingredients

Components	**CAS#**	**Percent**
Indium	7440-74-6	<0.1
Mercury	7439-97-6	<0.1
Composition Comments	*Lamp consisting of quartz glass containing mercury amalgamated with metal(s).	

4 First Aid Measures

Inhalation	Not applicable to intact lamps.
Skin Contact	Not applicable to intact lamps.
Eye Contact	Not applicable to intact lamps.
Ingestion	Not applicable to intact lamps.
General Information	Burns caused by overexposure or severe injuries caused by fragment of quartz glass should be treated by a physician. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. If you feel unwell, seek medical advice (show the label where possible). Show this safety data sheet to the doctor in attendance. Avoid contact with eyes and skin. Keep out of reach of children. There are no known health hazards from exposure to intact, un-energized lamps.

5 Fire Fighting Measures

Flammable properties	Not flammable by WHMIS/OSHA criteria.
Suitable extinguishing media	Extinguishing powder, foam, or water.
Unsuitable extinguishing media	Not available
Specific hazards arising from the chemical	Not available
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.
Hazardous combustion	May include and are not limited to: Mercury, metallic oxides.
Products	Lamp is not combustible.

6 Accidental Release Measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Methods and materials for containment	In the event of a lamp breakage, appropriate action should be taken to contain the amalgam mercury. In a dry scenario where the lamp is not operating, solid amalgam mercury can be easily captured. In an operating closed- or open-channel system, a lamp breakage inside an intact sleeve can be easily captured. In an operating closed- or open-channel system, in case of a lamp and sleeve breakage in a system treating the water flow, no containment measure is available. Prevent entry of the solid amalgam mercury into waterways, sewers, or other catchment systems.
Methods and materials for cleanup	If lamps are broken, ventilate the area where the breakage occurred. Take the usual precautions for collecting broken glass. Clean up with a mercury vacuum cleaner or with other suitable means that avoids dust and mercury vapor generation. DO NOT USE A STANDARD VACUUM.

Place collected materials in a closed container to avoid generating dust.

In the event of a lamp breakage, appropriate action should be taken to contain the spill (solid Hg amalgam).

Additional guidance on cleaning up broken lamps may be obtained at:
http://www2.epa.gov/cfl/cleaning-broken-cfl#instructions.

Environmental precautions

Do not discharge into lakes, streams, ponds or public waters.

Do not contaminate water courses or ground.

Prevent entry into waterways, sewers, basements or confined areas.

This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Prevent entry into waterways, sewers, basements or confined areas.

This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water.

7 Handling and Storage

Precautions for safe handling

Handle carefully to avoid breakage.

Ensure adequate ventilation.

Use good industrial hygiene practices in handling this material.

Conditions for safe storage, including any incompatibilities

Keep out of reach of children. Keep in properly labeled containers.

8 Exposure Controls/Personal Protection

Occupational exposure limits

US. ACGIH Threshold Limit Values Components	Type	Value
Indium (CAS 7440-74-6)	TWA	0.1 mg/m^3
Mercury (CAS 7440-74-6)	TWA	0.025 mg/m^3

US. OSHA Table Z-2 (29 CFR 1910.1000) Components	Type	Value
Mercury (CAS 7439-97-6)	TWA	0.1 mg/m^3

Exposure limits

Exposure to mercury is only possible due to lamp breakage, refer Section 6.

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Use only under good ventilation conditions.

Individual protection measures, such as personal protective equipment, Eye/face protection

Avoid contact with eyes. Wear appropriate safety glasses with side shields (or goggles).

In operation, UV lamps emit non-ionizing radiation in the 180~400 nanometer wavelength region of the electromagnetic spectrum. The UV light intensity greatly exceeds levels found in nature.

Exposure can result in temporary or permanent eye injury, skin burns or other serious effects.

Individuals present where UV lamps are in operation are at risk for UV exposure if the appropriate shielding and Personal Protective Equipment (PPE) are not used.

Refer to product manuals and product warning labels for safe operating procedures and Personal Protective Equipment.

Skin protection: Hand protection

Avoid contact with the skin. Wear impervious gloves. Confirm from a reputable supplier first. If glass is broken, use cut resistance gloves to prevent injury.

Other	Emergency responders should wear impermeable clothing and footwear when responding to a situation where contact with the mercury liquid is possible. Wash hands IMMEDIATELY if mercury leakage occurs. Contaminated clothes must be changed immediately and discarded appropriately.
Respiratory protection	Where exposure guideline levels may be exceeded, use an approved NIOSH respirator.
Thermal hazards	Not applicable
General safety and hygiene consideration	Ultraviolet radiation is emitted from the lamps. Use of approved eye and skin protection to block UV radiation. Handle in accordance with good industrial hygiene and safety practice.

9 Physical and Chemical Properties

Appearance	Article (Solid)
Color	Colorless
Form	Quartz tube containing amalgam mercury and other metals.
Odor	Odorless
Odor Threshold	Not available
Physical State	Solid
pH	Not available
Freezing point	Not available
Boiling point	Not applicable
Pour point	Not available
Evaporation rate	Not available
Flash point	Not applicable
Auto-ignition temperature	Not available
Flammability limits in air, upper, % by volume	Not available
Flammability limits in air, lower, % by volume	Not available
Vapor pressure	In case of breakage, mercury vapor pressure: <0.01 mm Hg at room temperature.

10 Stability and Reactivity

Reactivity	Amalgam mercury is contained in a glass tube and therefore is not able to react with chemicals within the surrounding environment.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Chemical stability	Stable under recommended storage conditions.
Conditions to avoid	None identified for intact lamps.
Incompatible materials	Amalgam mercury is contained in a glass tube and therefore is not able to react with chemicals within the surrounding area.
Hazardous decomposition products	None identified for intact lamps. In case of breakage: May include and are not limited to: Mercury, metallic oxides.

11 Toxicological Information

Toxicological data			
Components		**Species**	**Test Results**
Indium (CAS 7440-74-6)			
LC50			
Not Available			
LD50			
Not Available			
Mercury (CAS 7439-97-6)			
Acute			
Inhalation			
LC50		Rat	2.3 ppm, 4 hr
LD50			
Not Available			

Emergency overview	The lamp, which consists of quartz glass, is not dangerous under regular conditions. This item is a manufactured article. The mercury within the lamp is only available if the lamp is broken. Please follow standard health and safety guidelines for the use of this product.
The following statements are applicable only in case of accidental breakage of the lamp:	
Routes of exposure	Eye, Skin contact, Skin absorption, Inhalation, Ingestion.
Information on likely routes of exposure:	
Eyes	May cause irritation.
Skin	May cause irritation.
US ACGIH Threshold Limit Values: Skin designation	
Mercury (CAS 7439-97-6)	Hg Can be absorbed through the skin.
US. NIOSH: Pocket Guide to Chemical Hazards	
Mercury (CAS 7439-97-6)	VAP Hg Can be absorbed through the skin.
Inhalation	May cause respiratory tract irritation.
Ingestion	May cause stomach distress, nausea or vomiting.
Dermal	May cause irritation.
Chronic Effects	Long-term occupational exposure to moderate to high levels of mercury (0.035 to 0.1 mg/m3) has resulted in both nervous system and kidney effects. Significant toxicity has been observed in animals exposed to low concentrations.
Signs and symptoms	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

12 Ecological Information

Ecotoxicity		See below	
Ecotoxicological data			
Components		**Species**	**Test Results**
Mercury (CAS 7439-97-6)			
Aquatic			
Fish	LC50	Indian catfish (Heteropneustes fossils)	0.099 mg/l, 96 hours
Persistence and degradability		Not available	
Bioaccumulation / Accumulation		Not available	
US CWA Bioaccumulative Chemicals of Concern: Listed substance			
		Mercury (CAS 7439-97-6)	Listed
		US CWA Bioaccumulative Chemicals of Concern: Listed substance	

Mobility in environmental media	Not available
Environmental effects	Not available
Aquatic toxicity	Not available
Partition coefficient	Not available
Chemical fate information	Not available

13 Disposal Information

Disposal instructions	Waste must be disposed of in accordance with federal, state/provincial and local environmental control regulations. This material and its container must be disposed of as hazardous waste.
Waste from residues / unused Products	Not available
Contaminated packaging	Not available

14 Transport Information

UN number	
TDG/US DOT	3506
IMDG/IMO	3506
IATA/ICAO	3506
Remarks TDG/US DOT	This product is not subject to the transportation regulations of dangerous goods by road (ADR) based on special provision 366 (<1 kg mercury per article).
Remarks IMDG/IMO	This product is not subject to the transportation regulations of dangerous goods by sea (IMDG) based on special provision 366 (<1 kg mercury per article).
* Remarks IATA/ICAO	For transport exemptions consult IATA special provisions A48, A69 and A191.
UN proper shipping name	
TDG/US DOT	MERCURY CONTAINED IN MANUFACTURED ARTICLES
IMDG/IMO	MERCURY CONTAINED IN MANUFACTURED ARTICLES
IATA/ICAO	MERCURY CONTAINED IN MANUFACTURED ARTICLES
Transport hazard class(es)	
TDG/US DOT	8 (6.1)
IMDG/IMO	8 (6.1)
IATA/ICAO	8 (6.1)
Packing group	
TDG/US DOT	none
IMDG/IMO	none
IATA/ICAO	none
Environmental hazards	
Marine pollutant	No

15 Regulatory Information

Canadian federal regulations	This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Canada CEPA Schedule I: Listed substance

Mercury (CAS 7439-97-6)	Listed

Canada WHMIS Ingredient Disclosure: Threshold limits

Indium (CAS 7440-74-6)	1%

	Mercury (CAS 7439-97-6)	0.1%

WHMIS classification Exempt - Manufactured article

Occupational Safety and Health Administration (OSHA)

29 CFR 1910.1200 hazardous chemical

No

US federal regulations This product is a manufactured article and is exempt.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

Mercury (CAS 7439-97-6) 1.0 %

Substance is not eligible for the de minimis exemption except for the purposes of supplier notification requirements.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Reportable threshold

Mercury (CAS 7439-97-6)	10 lbs

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance

Mercury (CAS 7439-97-6)	Listed

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Mercury (CAS 7439-97-6)	1.0 % One-Time Export Notification only.

US CWA Bioaccumulative Chemicals of Concern: Listed substance

Mercury (CAS 7439-97-6)	Listed

US CWA Section 307(a)(1) Toxic Pollutants: Listed substance

Mercury (CAS 7439-97-6)	Listed

CERCLA Hazardous Substance List (40 CFR 302.4)

Mercury (CAS 7439-97-6)	Listed

US CAA Section 112(i) High-Risk Hazardous Air Pollutants (HAPs): Weight factor

Mercury (CAS 7439-97-6)	100

US CAA Section 112(i) High-Risk Hazardous Air Pollutants (HAPs): Listed substance

Mercury (CAS 7439-97-6)	Listed

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Mercury (CAS 7439-97-6)	Listed

CERCLA (Superfund) reportable quantity

Mercury: 1

Superfund Amendments and Reauthorization Act of 1986 (SARA) Hazard categories

Immediate Hazard	- Yes
Delayed Hazard	- Yes
Fire Hazard	- No
Pressure Hazard	- No Reactivity
Hazard	- No

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

State regulations

US - California Hazardous Substances (Director's): Listed substance

Indium (CAS 7440-74-6)	Listed
Mercury (CAS 7439-97-6)	Listed

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Mercury (CAS 7439-97-6)

US - Illinois Chemical Safety Act: Listed substance

Mercury (CAS 7439-97-6)

US - Louisiana Spill Reporting: Listed substance

Mercury (CAS 7439-97-6)

US - Michigan Critical Materials Register: Parameter number

Mercury (CAS 7439-97-6)

US - Minnesota Haz Subs: Listed substance

Indium (CAS 7440-74-6)	Listed
Mercury (CAS 7439-97-6)	Listed

US - New Jersey RTK - Substances: Listed substance

Indium (CAS 7440-74-6)	Listed
Mercury (CAS 7439-97-6)	Listed

US - New York Release Reporting: Hazardous Substances: Listed substance

Mercury (CAS 7439-97-6)

US - North Carolina Toxic Air Pollutants: Listed substance

Mercury (CAS 7439-97-6)

US - Pennsylvania RTK - Hazardous Substances: All compounds of this substance are considered environmental hazards

Mercury (CAS 7439-97-6)

US - Texas Effects Screening Levels: Listed substance

Indium (CAS 7440-74-6)	Listed
Mercury (CAS 7439-97-6)	Listed

US - Washington Chemical of High Concern to Children: Listed substance

Mercury (CAS 7439-97-6)

US. Massachusetts RTK - Substance List

Indium (CAS 7440-74-6)	Listed
Mercury (CAS 7439-97-6)	Listed

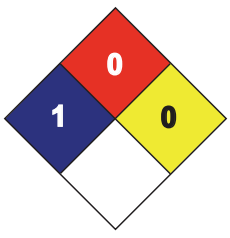
16 Other Information

Disclaimer

The information in the sheet was written based on the best knowledge and experience currently available. Information contained herein was obtained from sources considered technically accurate and reliable. While every effort has been made to ensure full disclosure of product hazards, in some cases data is not available and is so stated. Since conditions of actual product use are beyond control of the supplier, it is assumed that users of this material have been fully trained according to the requirements of all applicable legislation and regulatory instruments. No warranty, expressed or implied, is made and supplier will not be liable for any losses, injuries or consequential damages which may result from the use of or reliance on any information contained in this document.

NFPA Code	(Health: 1) (Flammability: 0) (Reactivity: 0)
Issue Date	22-January-2018
Version #	01
Effective Date	22-January-2018
Prepared by	Manufacturer Personnel

LEGEND	
Severe	4
Serious	3
Moderate	2
Slight	1
Minimal	0



Other Information

For an updated SDS, please contact the supplier/manufacturer listed on the first page of the document.

In the event of a lamp breakage, appropriate action should be taken to contain the spill. Lamp breakage can occur in several scenarios, each requiring different action. In an operating closed- or open-channel system, a lamp and sleeve break will be very difficult to contain since the mercury vapor will quickly condense, be diluted, and subsequently carried away by the flowing wastewater/water stream. Please refer to the Section 6 in order to respond to a lamp breakage.

Ac

TROJAN technologies

SAFETY DATA SHEET

1 Product and Company Identification

Product identifier	ActiClean™ Gel
CAS #	Glass cleaner
Recommended restrictions	None known
Manufacturer information	Trojan Technologies
	3020 Gore Road
	London, ON N5V 4T7 CA
	Phone: 519-457-3400
	Phone: 888-220-6118
CANUTEC	Phone: 613-996-6666

2 Hazards Identification

Physical hazards	Not classified
Health hazards	Not classified
Environmental hazards	Not classified
WHMIS 2015 defined hazards Label elements	
Hazard symbol	None
Signal word	None
Hazard statement	The mixture does not meet the criteria for classification.
Precaution statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
WHMIS 2015: Health Hazard(s) not otherwise classified (HHNOC)	None known
WHMIS 2015: Physical Hazard(s) not otherwise classified (PHNOC)	None known
Hazard(s) not otherwise classified (HNOC)	None known
Supplemental information	None

3 Composition/Information on Ingredients

Mixture Composition comments	This product is considered non-hazardous by WHMIS/OSHA criteria.

4 First Aid Measures

Inhalation	If symptoms develop move victim to fresh air. If symptoms persist, obtain medical attention.
Skin Contact	Flush with cool water. Wash with soap and water. Obtain medical attention if irritation persists.
Eye Contact	Hold eye open and rinse gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
Ingestion	Rinse mouth. Do not induce vomiting. If vomiting occurs, have victim lean forward to reduce risk of aspiration. Never give anything by mouth if victim is unconscious, or convulsing.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat patient symptomatically.
General Information	If feeling unwell, seek medical advice (show the label and SDS where possible). Ensure medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Avoid contact with eyes and skin. Keep out of reach of children.

5 Fire Fighting Measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO_2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.
Hazardous combustion Products	May include and are not limited to: Oxides of carbon.

6 Accidental Release Measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, refer to Section 8.
Methods and materials for containment and cleanup	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
Environmental precautions	Never return spills to original containers for re-use. For waste disposal, refer to Section 13.

7 Handling and Storage

Precautions for safe handling	Wash thoroughly after handling. Use good industrial hygiene practices in handling this material. When using do not eat or drink.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials (refer to Section 10). Keep out of reach of children.

8 Exposure Controls/Personal Protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Individual protection measures, such as personal protective equipment, Eye/face protection	
Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection:	
Hand protection	Impervious gloves. Confirm with reputable supplier first.
Other	Wear suitable protective clothing. As required by employer code.
Respiratory protection	Not normally required.
Thermal hazards	Not applicable
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. When using do not eat or drink.

9 Physical and Chemical Properties

Appearance	Gel
Physical State	Liquid
Form	Gel
Colour	Off-white
Odor	Odorless
Odor Threshold	Not available
pH	1
Melting Point / Freezing Point	-5ºC (23ºF)
Initial Boiling Point	> 100ºC (> 212ºF)
Pour Point	Not available
Specific gravity	1.1
Partition coefficient (n-octanol/water)	Not available
Flash Point	Not available
Evaporation Rate	Not available
Flammability (solid, gas)	Not applicable
Upper/Lower Explosive Limits	Not available
Vapor Pressure	Not available
Vapor Density	Not available
Relative Density	Not available
Solubility(ies)	Not available
Auto-ignition Temperature	Not available

Decomposition Temperature	Not available
Viscosity	Viscous
Other information:	
Explosive properties	Not explosive
Oxidizing properties	Not oxidizing

10 Stability and Reactivity

Reactivity	Reacts violently with strong alkaline substances. This product may react with reducing agents. This product may react with strong oxidizing agents.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Chemical stability	Material is stable under normal conditions.
Conditions to avoid	Do not mix with other chemicals.
Incompatible materials	Not corrosive to SAE 1020 Steel or non-clad Aluminum based on test data (UN Manual of Tests and Criteria, Part III, Section 37.1 -Corrosion to metals). May react with soft metals such as aluminum and zinc producing flammable hydrogen gas, Caustics, and Lead.
Hazardous decomposition products	May include and are not limited to : Oxides of carbon.

11 Toxicological Information

Routes of exposure	Eye, Skin contact, Inhalation, Ingestion.
Information on likely routes of exposure	
Ingestion	Expected to be a low ingestion hazard. May cause stomach distress, nausea or vomiting.
Inhalation	Health injuries are not known or expected under normal use.
Skin contact	Not corrosive or irritating to skin based on test data. No adverse effects due to skin contact are expected.
Eye contact	Not corrosive or irritating to eyes based on test data.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.
Information on toxicological effects	
Acute toxicity	Not available
Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Exposure minutes	Not available
Erythema value	Not available
Oedema value	Not available
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Corneal opacity value	Not available
Iris lesion value	Not available
Conjunctival reddening value	Not available
Recover days	Not available
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizers.
Skin sensitization	This product is not expected to cause skin sensitization.
Mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

Crystalline silica (CAS 14808-60-7)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Teratogenicity	Not available
Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Not classified
Aspiration hazard	Not an aspiration hazard.

12 Ecological Information

Ecotoxicity	Not available
Persistence and degradability	Not available
Bioaccumulative potential	
Mobility in soil	Not available
Mobility in general	Not available
Other adverse effects	Not available

13 Disposal Information

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose in accordance with all applicable regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14 Transport Information

Transport of Dangerous Goods (TDG) Proof of Classification	In accordance with Part 2.2.1 (SOR/2014-152) of the Transportation of Dangerous Goods. Regulations, we certify that the classification of this product is correct as of the SDS date of issue.

U.S. Department of Transportation (DOT)

Not regulated as dangerous goods.

Transportation of Dangerous Goods (TDG - Canada)

Not regulated as dangerous goods.

15. Regulatory Information

Canadian federal regulations This product has been classified in accordance with the hazard criteria of the HPR and the SDS contains all the information required by the HPR.

Canada DSL Challenge Substances: Listed substance

Crystalline silica (CAS 14808-60-7)	Listed

Export Control List (CEPA 1999, Schedule 3)	Not listed
Greenhouse Gases	Not listed
Precursor Control Regulations	Not regulated
WHMIS 2015 Classifications	Not applicable
US federal regulations	
TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)	Not regulated
CERCLA Hazardous Substance List (40 CFR 302.4)	
Phosphoric acid (CAS 7664-38-2)	Listed
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)	Not listed
Superfund Amendments and Reauthorization Act of 1986 (SARA)	
Hazard categories	
Immediate Hazard - No	
Delayed Hazard - No	
Fire Hazard - No	
Pressure Hazard - No	
Reactivity Hazard - No	
SARA 302 Extremely hazardous substance	No
SARA 311/312 Hazardous chemical	No
SARA 313 (TRI reporting)	Not regulated
Other federal regulations	
Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List	Not regulated
Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)	Not regulated
US state regulations	
US state regulations	
US - California Hazardous Substances (Director's): Listed substance	
Phosphoric acid (CAS 7664-38-2)	Listed
US - Illinois Chemical Safety Act: Listed substance	
Phosphoric acid (CAS 7664-38-2)	Listed
US - Louisiana Spill Reporting: Listed substance	
Phosphoric acid (CAS 7664-38-2)	Listed
US - Minnesota Haz Subs: Listed substance	
Crystalline silica (CAS 14808-60-7)	Listed
Phosphoric acid (CAS 7664-38-2)	Listed
Urea (CAS 57-13-6)	Listed
US - New Jersey RTK - Substances: Listed substance	
Crystalline silica (CAS 14808-60-7)	
Phosphoric acid (CAS 7664-38-2)	

US - Texas Effects Screening Levels: Listed substance

Crystalline silica (CAS 14808-60-7)	Listed
Phosphoric acid (CAS 7664-38-2)	Listed
Urea (CAS 57-13-6)	Listed

US. Massachusetts RTK - Substance List

Crystalline silica (CAS 14808-60-7)

Phosphoric acid (CAS 7664-38-2)

US. New Jersey Worker and Community Right-to-Know Act Not regulated

US. Pennsylvania Worker and Community Right-to-Know Law

Crystalline silica (CAS 14808-60-7)

Phosphoric acid (CAS 7664-38-2)

US. Rhode Island RTK

Phosphoric acid (CAS 7664-38-2)

US. California Proposition 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

Crystalline silica (CAS 14808-60-7) Listed: October 1, 1988

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA)	Yes

*A “Yes” indicates that all components of this product comply with the inventory requirements administered by the governing country(s).

16. Other Information

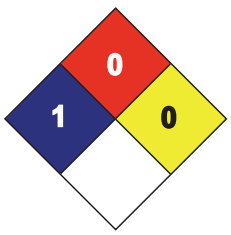
Disclaimer

The information in the sheet was written based on the best knowledge and experience currently available. Information contained herein was obtained from sources considered technically accurate and reliable. While every effort has been made to ensure full disclosure of product hazards, in some cases data is not available and is so stated. Since conditions of actual product use are beyond control of the supplier, it is assumed that users of this material have been fully trained according to the requirements of all applicable legislation and regulatory instruments. No warranty, expressed or implied, is made and supplier will not be liable for any losses, injuries or consequential damages which may result from the use of or reliance on any information contained in this document.

NFPA Code (Health: 1) (Flammability: 0) (Reactivity: 0)

Issue Date	22-January-2018
Version #	01
Effective Date	22-January-2018
Prepared by	Manufacturer Personnel

LEGEND	
Severe	4
Serious	3
Moderate	2
Slight	1
Minimal	0



Other Information For an updated SDS, please contact the supplier/manufacturer listed on the first page of the document.

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **MOBIL DTE 10 EXCEL 15**
Product Description: Base Oil and Additives
Product Code: 201560103610, 622605-00, 97AY97
Intended Use: Hydraulic fluid

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX 77389 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	www.exxon.com, www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Aspiration toxicant: Category 1.

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:
H304: May be fatal if swallowed and enters airways.

Precautionary Statements:
P273: Avoid release to the environment.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P331: Do NOT induce vomiting.P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis. May be irritating to the eyes, nose, throat, and lungs.

ENVIRONMENTAL HAZARDS

Expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	1	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	1*	Flammability:	1	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
2,6-DI-TERT-BUTYLPHENOL	128-39-2	0.1 - < 1%	H315, H400(M factor 1), H410(M factor 1)
ALKYL DITHIOPHOSPHATE	CONFIDENTIAL	0.1 - < 1%	H319(2A), H400(M factor 1), H410(M factor 1)
HYDROTREATED LIGHT PARAFFINIC DISTILLATES, PETROLEUM	64742-55-8	40 - < 50%	H304
SEVERELY HYDROTREATED HEAVY PARAFFINIC DISTILLATE	64742-54-7	40 - < 55%	H304
SOLVENT DEWAXED HEAVY PARAFFINIC DISTILLATE	64742-65-0	1 - < 5%	H304

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek

immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Pressurized mists may form a flammable mixture.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >125°C (257°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The

National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid contact with skin. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The type of container used to store the material may affect static accumulation and dissipation. Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
HYDROTREATED LIGHT PARAFFINIC DISTILLATES, PETROLEUM	Mist.	TWA	5 mg/m3		N/A	OSHA Z1
HYDROTREATED LIGHT PARAFFINIC DISTILLATES, PETROLEUM	Mist.	TWA	5 mg/m3		N/A	ACGIH
SEVERELY HYDROTREATED HEAVY PARAFFINIC DISTILLATE	Mist.	TWA	5 mg/m3		N/A	OSHA Z1
SEVERELY HYDROTREATED HEAVY PARAFFINIC DISTILLATE	Mist.	TWA	5 mg/m3		N/A	ACGIH
SOLVENT DEWAXED HEAVY PARAFFINIC DISTILLATE	Mist.	TWA	5 mg/m3		N/A	OSHA Z1
SOLVENT DEWAXED HEAVY PARAFFINIC DISTILLATE	Mist.	TWA	5 mg/m3		N/A	ACGIH

Exposure limits/standards for materials that can be formed when handling this product: When mists/aerosols can occur the following are recommended: 5 mg/m³ - ACGIH TLV (inhalable fraction), 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

No biological limits allocated.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode.

Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

If prolonged or repeated contact is likely, chemical resistant gloves are recommended. If contact with forearms is likely, wear gauntlet style gloves.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

If prolonged or repeated contact is likely, chemical, and oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Amber
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.84
Flammability (Solid, Gas): N/A
Flash Point [Method]: >125°C (257°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 232°C (450°F) [Estimated]
Decomposition Temperature: N/D
Vapor Density (Air = 1): > 2 at 101 kPa [Estimated]
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 °C [Estimated]
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5 [Estimated]

Solubility in Water: Negligible
Viscosity: >14 cSt (14 mm2/sec) at 40 °C | 4.05 cSt (4.05 mm2/sec) at 100°C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -51°C (-60°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin Corrosion/Irritation: No end point data for material.	May dry the skin leading to discomfort and dermatitis. Based on assessment of the components.
Eye	
Serious Eye Damage/Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: No end point data for material.	Not expected to be a skin sensitizer. Based on assessment of the components.
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-

	chemical properties of the material.
Germ Cell Mutagenicity: No end point data for material.	Not expected to be a germ cell mutagen. Based on assessment of the components.
Carcinogenicity: No end point data for material.	Not expected to cause cancer. Based on assessment of the components.
Reproductive Toxicity: No end point data for material.	Not expected to be a reproductive toxicant. Based on assessment of the components.
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: No end point data for material.	Not expected to cause organ damage from prolonged or repeated exposure. Based on assessment of the components.

OTHER INFORMATION

For the product itself:

Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

ECOTOXICITY

Material -- Expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

OTHER ECOLOGICAL INFORMATION

VOC: 13.4 G/L [ASTM E1868-10]

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

Marine Pollutant: No

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, ENCS, KECI, PICCS, TCSI, TSCA

Special Cases:

Inventory	Status
IECSC	Restrictions Apply
NDSL	Restrictions Apply

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

SARA (311/312) REPORTABLE GHS HAZARD CLASSES: Aspiration Hazard

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
HYDROTREATED LIGHT PARAFFINIC DISTILLATES, PETROLEUM	64742-55-8	1, 4

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H319(2A): Causes serious eye irritation; Serious Eye Damage/Irr, Cat 2A
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Composition: Component Table information was modified.
Section 01: Company Mailing Address information was modified.
Section 08: Exposure Limits Table information was modified.
Section 12: information was modified.
Section 15: National Chemical Inventory Listing information was modified.
Section 15: SARA (311/312) REPORTABLE GHS HAZARD CLASSES information was added.
Section 15: SARA (311/312) REPORTABLE HAZARD CATEGORIES information was deleted.
Section 15: Special Cases Table information was modified.

Internal Use Only
MHC: 2A, 0B, 0, 0, 1, 1 PPEC: C

DGN: 7086947XUS (1013890)

SAFETY DATA SHEET

Issuing Date: 11-Nov-2011 **Revision Date: 20-May-2017** **Revision Number: 2**

NGHS/English

1 IDENTIFICATION

Product identifier

Product Name Mixture

Other means of identification

Product Codes WPS-JLI-055

Synonyms JET-LUBE® CC LUBE™, ILEX CC LUBE™

Recommended use of the chemical and restrictions on use

Recommended Use

Uses advised against

Details of the supplier of the safety data sheet

Supplier Identification Jet Lube of Canada Ltd

Address Jet Lube, LLC
930 Whitmore Drive
Rockwall, Texas USA 75087
TEL: +1-713-670-5700 (8am-5pm CST)

Telephone JLC Office 1.780.463.7441

Toll Free 1.888.771.7775

E-mail Sales@jetlubecanada.com

Emergency telephone number

Company Emergency Phone Number 1-800-699-6318

Emergency Telephone Number CHEMTREC: +1-703-527-3887 (INTERNATIONAL)

1-800-424-9300 (NORTH AMERICA)

2 HAZARDS IDENTIFICATION

Classification

Not classified

Appearance	Physical state	Odor
Colorless to off-white	Gel	Slight

GHS Label elements, including precautionary statements

Not classified

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary Statements - Response

IF exposed or concerned: Get medical advice/attention

Precautionary Statements - Storage

Store locked up

Precautionary Statements - Disposal

Dispose of contents/container to an approved waste disposal plant.

Other information

May be harmful if swallowed.

Unknown acute toxicity

99.2% of the mixture consists of ingredient(s) of unknown toxicity 0 % of the mixture consists of ingredient(s) of unknown acute oral toxicity.

99.2% of the mixture consists of ingredient(s) of unknown acute dermal toxicity.

99.2% of the mixture consists of ingredient(s) of unknown acute inhalation toxicity (gas).

99.2% of the mixture consists of ingredient(s) of unknown acute inhalation toxicity (vapor).

99.2% of the mixture consists of ingredient(s) of unknown acute inhalation toxicity (dust/mist).

3 Composition/Information on Ingredients

Substance

Not applicable

Mixture

Synonyms JET-LUBE® CC LUBE™, ILEX CC LUBE™

Chemical Name	CAS#	Percent	Hazardous Material Information Review Act registry number (HMIRA registry #)	Date HMIRA filed and date exemption granted (if applicable)
Lubricating greases a complex combination of hydrocarbons having carbon numbers predominantly in the range of C12 through C50. may contain organic salts of alkali metals, alkaline earth metals, etc	74869-21-9	90-100	-	-

4 FIRST AID MEASURES

First aid measures

General advice IF exposed or concerned: Get medical advice/attention.

Inhalation Remove to fresh air.

Eye contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.

Skin contact Wash skin with soap and water.

Ingestion Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects, both acute and delayed

Symptoms No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5 FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	CAUTION: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous Combustion Products	Carbon oxides.
Explosion Data	
Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6 Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Personal precautions	Ensure adequate ventilation.
Other Information	Refer to protective measures listed in Section 7 and Section 8.

Environmental precautions

Environmental precautions	Refer Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Dam up. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.

7 Handling and Storage

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place.

8 Exposure Controls/Personal Protection

Control parameters

Exposure Limits	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering controls	Showers Eyewash stations Ventilation systems

Individual protection measures, such as personal protective equipment

Eye/face protection	No special protective equipment required.
Hand protection	Wear suitable gloves.
Skin and body protection	Wear suitable protective clothing.
Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
General hygiene considerations	Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling the product.

9 Physical and Chemical Properties

Physical and Chemical Properties		
Physical state	Gel	
Appearance	Colorless to off-white	
Odor	Slight	
Color	No information available	
Odor Threshold	Not applicable	
Property	**Values**	**Remarks Method**
pH	7	
Melting / freezing point	260 °C	None known
Boiling point / boiling range	316 °C	
Flash Point	> 232 °C	
Evaporation Rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability limit	No data available	
Lower flammability limit	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	0.876	
Water Solubility	Negligible	
Solubility(ies)	No data available	None known
Partition coefficient: n-octanol/water	Not applicable	
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	No information available	
Oxidizing properties	No information available	
Other Information		
Softening Point	No information available	
Molecular Weight	No information available	
VOC Content (%)	None	
Liquid Density	No information available	
Bulk Density	No information available	
Particle Size	No information available	
Particle Size Distribution	No information available	

10 Stability and Reactivity

Reactivity	No information available.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	None under normal processing.
Hazardous Polymerization	Hazardous polymerization does not occur.
Conditions to avoid	None known based on information supplied.
Incompatible materials	None known based on information supplied.
Hazardous Decomposition Products	Carbon oxides.

11 Toxicological Information

Information on likely routes of exposure

Product Information

Inhalation	Specific test data for the substance or mixture is not available.
Eye contact	Specific test data for the substance or mixture is not available.
Skin contact	Specific test data for the substance or mixture is not available.
Ingestion	Specific test data for the substance or mixture is not available.

Information on toxicological effects

Symptoms No information available.

Numerical measures of toxicity

Acute Toxicity

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	2,298.00 mg/kg
Unknown acute toxicity	99.2% of the mixture consists of ingredient(s) of unknown toxicity 0 % of the mixture consists of ingredient(s) of unknown acute oral toxicity. 99.2% of the mixture consists of ingredient(s) of unknown acute dermal toxicity. 99.2% of the mixture consists of ingredient(s) of unknown acute inhalation toxicity (gas). 99.2% of the mixture consists of ingredient(s) of unknown acute inhalation toxicity (vapor). 99.2% of the mixture consists of ingredient(s) of unknown acute inhalation toxicity (dust/mist).

Component Information

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Lubricating greases a complex combination of hydrocarbons having carbon numbers predominantly in the range of C12 through C50. may contain organic salts of alkali metals, alkaline earth metals, etc.	= 2280 mg/kg (Rat)	-	-

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	No information available.
Serious eye damage/eye irritation	No information available.
Respiratory or skin sensitization	No information available.

Germ cell mutagenicity	No information available.
Carcinogenicity	Based on available data, the classification criteria are not met.
Reproductive toxicity	No information available.
STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.

12 Ecological Information

Ecotoxicity

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna Flea)
Lubricating greases a complex combination of hydrocarbons having carbon numbers predominantly in the range of C12 through C50. may contain organic salts of alkali metals, alkaline earth metals, etc.	>1001 mg/l	96h LC50: > 2000 mg/L (Salmo gairdneri)	-	-

Persistence and Degradability	No information available.
Bioaccumulation	There is no data for this product.
Mobility	No information available.
Other adverse effects	No information available.

13 Disposal Information

Waste treatment methods

Waste from residues/unused products

Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.

Contaminated packaging Do not reuse empty containers.

14 Transport Information

DOT	NOT REGULATED
Proper Shipping Name	NOT REGULATED
Hazard Class	N/A
TDG	NOT REGULATED
MEX	NOT REGULATED
ICAO	NOT REGULATED
IATA	NOT REGULATED
Proper Shipping Name	NOT REGULATED
IMDG/IMO	NOT REGULATED
RID	NOT REGULATED
ADR	NOT REGULATED
ADN	NOT REGULATED

15 Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture

International Regulations

Ozone-depleting substances (ODS)	Not applicable
Persistent Organic Pollutants	Not applicable
Export Notification requirements	Not applicable

International Inventories

TSCA	Contact supplier for inventory compliance status.
DSL/NDSL	Complies
EINECS/ELINCS	Complies
ENCS	Not determined
KECL	Complies
PICCS	Complies
AICS	Not determined

Legend

TSCA	United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL	Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS	European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS	Japan Existing and New Chemical Substances
KECL	Korean Existing and Evaluated Chemical Substances
PICCS	Philippines Inventory of Chemicals and Chemical Substances
AICS	Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Acute Health Hazard	No
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

US State Regulations

California Proposition 65	This product does not contain any Proposition 65 chemicals.
U.S. State Right-to-Know Regulations	This product does not contain any substances above threshold limits that are regulated by state right-to-know.

16 Other Information

NEFA	**Health hazards 0**	**Flammability 1**	**Instability 0**	**Physical and Chemical Properties -**
HMIS	**Health hazards 1**	**Flammability 1**	**Physical hazards 0**	**Personal Protection X**

Prepared by

Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issue Date 11-Nov-2011

Revision Date 20-May-2017

Revision Note Initial Release

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

1 Product and Company Identification

Product identifier	100% T Reference Solution
CAS #	Mixture
Product use	Analytical Calibration
Recommended restrictions	None known
Manufacturer information	Trojan Technologies
	3020 Gore Road
	London, ON N5V 4T7 CA
	Phone: 519-457-3400
	Phone: 888-220-6118
CANUTEC	Phone: 613-996-6666

2 Hazards Identification

Physical hazards	Not classified
Health hazards	Not classified
Environmental hazards	Not classified
WHMIS 2015 defined hazards Label elements	
Hazard symbol	None
Signal word	None
Hazard statement	The mixture does not meet the criteria for classification.
Precaution statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
WHMIS 2015: Health Hazard(s) not otherwise classified (HHNOC)	None known
WHMIS 2015: Physical Hazard(s) not otherwise classified (PHNOC)	None known
Hazard(s) not otherwise classified (HNOC)	None known
Supplemental information	None

3 Composition/Information on Ingredients

Mixture Composition comments	This product is considered non-hazardous by WHMIS/OSHA criteria.

4 First Aid Measures

Inhalation	If symptoms develop move victim to fresh air. If symptoms persist, obtain medical attention.
Skin Contact	Flush with cool water. Wash with soap and water. Obtain medical attention if irritation persists.
Eye Contact	Hold eye open and rinse gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
Ingestion	Rinse mouth. Do not induce vomiting. If vomiting occurs, have victim lean forward to reduce risk of aspiration. Never give anything by mouth if victim is unconscious, or convulsing.
Indication of immediate medical attention and special treatment needed	Direct contact with eyes may cause temporary irritation.
General Information	If feeling unwell, seek medical advice (show the label and SDS where possible). Ensure medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Avoid contact with eyes and skin. Keep out of reach of children.

5 Fire Fighting Measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO_2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.
Hazardous combustion Products	May include and are not limited to: Oxides of carbon.

6 Accidental Release Measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, refer Section 8.
Methods and materials for containment and cleanup	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
Environmental precautions	Never return spills to original containers for re-use. For waste disposal, refer Section 13.

7 Handling and Storage

Precautions for safe handling	Wash thoroughly after handling. Use good industrial hygiene practices in handling this material. When using do not eat or drink.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials (refer Section 10. Keep out of reach of children.

8 Exposure Controls/Personal Protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Individual protection measures, such as personal protective equipment, Eye/face protection	
Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection: Hand protection Other	Impervious gloves. Confirm with reputable supplier first. Wear suitable protective clothing. As required by employer code.
Respiratory protection	Not normally required
Thermal hazards	Not applicable
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. When using do not eat or drink.

9 Physical and Chemical Properties

Appearance	Liquid
Odor	Odorless
Odor Threshold	Not available
pH	~7
Melting Point / Freezing Point	0ºC (32ºF)
Initial Boiling Point	100ºC (212ºF)
Specific gravity	1.00
Flash Point	Not applicable
Evaporation Rate	Not available
Flammability (solid, gas)	Not applicable
Vapor Pressure	Not available
Vapor Density	Not available
Relative Density	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Other information:	
Explosive properties	Not explosive
Oxidizing properties	Not oxidizing

10 Stability and Reactivity

Reactivity	None known
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Chemical stability	Material is stable under normal conditions.
Conditions to avoid	Do not mix with other chemicals.
Incompatible materials	Not corrosive to SAE 1020 Steel or non-clad Aluminum based on test data (UN Manual of Tests and Criteria, Part III, Section 37.1 -Corrosion to metals).
Hazardous decomposition products	May include and are not limited to : Oxides of carbon.

11 Toxicological Information

Routes of exposure	Eye, Skin contact, Inhalation, Ingestion.
Information on likely routes of exposure	
Ingestion	Expected to be a low ingestion hazard. May cause stomach distress, nausea or vomiting.
Inhalation	Health injuries are not known or expected under normal use.
Skin contact	Not corrosive or irritating to skin based on test data.
	No adverse effects due to skin contact are expected.
Eye contact	Not corrosive or irritating to eyes based on test data.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.
Information on toxicological effects	
Acute toxicity	Not available
Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Exposure minutes	Not available
Erythema value	Not available
Oedema value	Not available
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Corneal opacity value	Not available
Iris lesion value	Not available
Conjunctival reddening value	Not available
Recover days	Not available
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizers.
Skin sensitization	This product is not expected to cause skin sensitization.
Mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	
US - California Proposition 65 - CRT: Listed date/Carcinogenic substance	
	Formaldehyde (CAS 50-00-0)
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)	
	Not listed
Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Teratogenicity	Not available

Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Not classified
Aspiration hazard	Not an aspiration hazard.

12 Ecological Information

Ecotoxicity	Not available
Persistence and degradability	Not available
Bioaccumulative potential	
Mobility in soil	Not available
Mobility in general	Not available
Other adverse effects	Not available
Aquatic toxicity	Toxic to aquatic life.

13 Disposal Information

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose in accordance with all applicable regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14 Transport Information

Transport of Dangerous Goods (TDG) Proof of Classification	In accordance with Part 2.2.1 (SOR/2014-152) of the Transportation of Dangerous Goods. Regulations, we certify that the classification of this product is correct as of the SDS date of issue.

U.S. Department of Transportation (DOT)

Not regulated as dangerous goods.

Transportation of Dangerous Goods (TDG - Canada)

Not regulated as dangerous goods.

15. Regulatory Information

Canadian federal regulations	This product has been classified in accordance with the hazard criteria of the HPR and the SDS contains all the information required by the HPR.	
Canada DSL Challenge Substances: Listed substance		
	Formaldehyde (CAS 50-00-0)	Listed
Export Control List (CEPA 1999, Schedule 3)		Not listed
Greenhouse Gases		Not listed
Precursor Control Regulations		Not regulated
WHMIS Classifications		Not applicable
US federal regulations		
TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)		Not regulated
CERCLA Hazardous Substance List (40 CFR 302.4)		
	Formaldehyde (CAS 50-00-0)	Listed
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)		Not listed
Superfund Amendments and Reauthorization Act of 1986 (SARA)		
Hazard categories		
	Immediate Hazard - No	
	Delayed Hazard - No	
	Fire Hazard - No	
	Pressure Hazard - No	
	Reactivity Hazard - No	
SARA 302 Extremely hazardous substance		No
SARA 311/312 Hazardous chemical		No
SARA 313 (TRI reporting)		No
Other federal regulations		
Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List		Not regulated
Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)		Not regulated

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA)	Yes

*A “Yes” indicates that all components of this product comply with the inventory requirements administered by the governing country(s).

16. Other Information

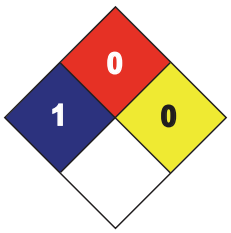
Disclaimer

The information in the sheet was written based on the best knowledge and experience currently available. Information contained herein was obtained from sources considered technically accurate and reliable. While every effort has been made to ensure full disclosure of product hazards, in some cases data is not available and is so stated. Since conditions of actual product use are beyond control of the supplier, it is assumed that users of this material have been fully trained according to the requirements of all applicable legislation and regulatory instruments. No warranty, expressed or implied, is made and supplier will not be liable for any losses, injuries or consequential damages which may result from the use of or reliance on any information contained in this document.

NFPA Code (Health: 1) (Flammability: 0) (Reactivity: 0)

Issue Date	02-March-2018
Version #	01
Effective Date	02-March-2018
Prepared by	Manufacturer Personnel

LEGEND	
Severe	4
Serious	3
Moderate	2
Slight	1
Minimal	0



Other Information

For an updated SDS, please contact the supplier/manufacturer listed on the first page of the document.

SAFETY DATA SHEET

1 Product and Company Identification

Product identifier	Quartz Cuvette Cleaner
Synonym	P19311, Cuvette Cleaner
CAS #	Mixture
Product use	For use with Trojan P254 UV Photometer
Recommended restrictions	None known
Manufacturer information	Trojan Technologies
	3020 Gore Road
	London, ON N5V 4T7 CA
	Phone: 519-457-3400
	Phone: 888-220-6118
CANUTEC	Phone: 613-996-6666

2 Hazards Identification

Classification of the chemical

This material is classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015).

Health hazards

Corrosive to Metals.

Skin Corrosion/Irritation.

Serious eye damage/eye irritation.

Specific Target Organ Toxicity, Single Exposure.

WHMIS 2015 defined hazard

Hazard symbol

Signal word DANGER!

Hazard statement

May be corrosive to metals.

Causes severe skin burns and eye damage.

May cause respiratory irritation.

Precautionary statement

Prevention

Do not breathe mist or vapor.

Wash thoroughly after handling.

Wear protective gloves/clothing and eye/face protection.

Keep away from combustible material.

Response

If swallowed: Rinse mouth. DO NOT induce vomiting.

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

IF INHALED: Remove person to fresh air and keep comfortable for breathing.

Immediately call a POISON CENTRE or doctor/physician.

Absorb spillage to prevent material damage.

Storage

Keep in a cool place.

Store in original, vented, closed containers.

Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Other hazards	Other hazards which do not result in classification: Ingestion can cause irritation and corrosive action in the mouth, stomach and digestive tract. Toxic fumes, gases or vapors may evolve on burning. May intensify fire; Nitric acid is an oxidizer.

3 Composition/Information on Ingredients

Components	CAS#	Percent
Nitric Acid	7697-37-2	6-13

4 First Aid Measures

Inhalation	If symptoms develop move victim to fresh air. If symptoms persist, obtain medical attention. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen by qualified medical personnel only. Seek immediate medical attention/advice.
Skin Contact	In case of contact, immediately flush skin with plenty of water for at least 30 minutes. Get medicalattention. Remove contaminated clothing and launder before use.
Eye Contact	In case of contact or suspected contact, immediately flush eyes with plenty of water for at least 20 to 30 minutes and get medical attention immediately after flushing.
Ingestion	Guard against aspiration into lungs by having the individual turn on to their left side. Rinse mouth with water. Seek immediate medical attention. Do not induce vomiting. Never give anything by mouth if victim is rapidly losing consciousness, unconscious or convulsing.
General Information	If feeling unwell, seek medical advice (show the label and SDS where possible). Ensure medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Avoid contact with eyes and skin. Keep out of reach of children.

5 Fire Fighting Measures

Suitable extinguishing media	Fires should be flooded with large amounts of water. Avoid using other types of extinguishing materials, such as foam or dry chemicals.
Unsuitable extinguishing media	Avoid using Carbon dioxide or other similar extinguishing agents as they are not effective in fires involving oxidizers.
Specific hazards arising from the chemical	Substance releases oxygen when heated, which may increase the severity of an existing fire. Burning produces obnoxious and toxic fumes. Contact with most metals will generate flammable hydrogen gas. Contact with water will generate considerable heat.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Indication of immediate medical attention required	Treat patient symptomatically.
Specific methods	Fight fires from a safe distance. Evacuate personnel to safe areas. Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode. A full-body chemical resistant suit should be worn. Move containers from fire area if safe to do so. Water spray may be useful in cooling equipment exposed to heat and flame.
General fire hazards	No unusual fire or explosion hazards noted.
Hazardous combustion Products	Oxygen; Nitrogen oxides.

6 Accidental Release Measures

Personal precautions, protective equipment and emergency procedures	All persons dealing with clean-up should wear the appropriate protective equipment including self-contained breathing apparatus. Keep all other personnel upwind and away from the spill/release. Restrict access to area until completion of clean-up. Refer to protective measures listed in Section 7 and Section 8.
Methods and materials for containment and cleanup	Neutralize with lime slurry, limestone, or soda ash. Isolate spill and stop leak where safe. Flush area with water to remove trace residue. Contain spill with sand or other inert materials. Pick up solids and put in an appropriate sealed container for later disposal. Isolate hazard area and restrict access.

7 Handling and Storage

Precautions for safe handling	Avoid breathing vapor. Avoid contact with eyes, skin and clothing. Use with adequate ventilation.
Conditions for safe storage, including any incompatibilities	Tanks must be diked. Store in a cool, dry, well ventilated area. Place away from incompatible materials. Will corrode incompatible metals and many plastic materials. 304 or 347 stainless steel are acceptable materials of construction. Tanks should be vented and painted white or in light, heat-reflecting colors. Ensure that all pumps, valves, meters are of compatible material.

8 Exposure Controls/Personal Protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Individual protection measures, such as personal protective equipment:	
Eye/face protection	Wear eye/face protection. Chemical splash goggles are recommended. A full face shield may also be necessary.
Skin protection:	Wash hands IMMEDIATELY if mercury leakage occurs.
Hand protection	Impervious gloves. Confirm with reputable supplier first.
Other	Where contact is likely, wear chemical-resistant gloves, a chemical suit, rubber boots, and chemical safety goggles plus a face shield. Ensure that eyewash stations and safety showers are proximal to the work-station location.
Respiratory protection	If airborne concentrations exceed the Occupational Exposure Limit, use a NIOSH/MSHA approved full face-piece respirator with acid gas cartridges. Do not use organic vapor and acid gas combination cartridges as these contain charcoal, which is incompatible with oxidizing acids.
Thermal hazards	Not applicable
General hygiene considerations	Handle in accordance with good industrial hygiene and safety practice.

9 Physical and Chemical Properties

Appearance	Clear to Brownish/Yellow
Physical state	Liquid
Odor	Slightly Pungent, Antiseptic like
Odor Threshold	Not available
pH	Not available
Melting Point / Freezing point	Not available
Initial Boiling point	Not applicable
Pour point	Not available

Specific gravity	1.096
Partition coefficient (n-octanol/water)	Not available
Flash Point	Not available
Evaporation Rate	Not available
Flammability(solid, gas)	Not applicable
Upper/Lower Explosive Limits	Not available
Vapor Pressure	Not available
Vapor Density	Not available
Relative Density	Not available
Solubility(ies)	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Viscosity	Viscous
Other information:	
Explosive properties	May be reactive and decompose violently.
Oxidizing properties	Oxidizer; Will accelerate combustion and increase the risk of fire and explosion in combustible or flammable materials.

10 Stability and Reactivity

Reactivity	Corrosive to mild metals such as copper, aluminum, brass, iron, and mild steel. Not corrosive to 304L or 316 stainless steel. Will release flammable and potentially explosive hydrogen gas on contact with amphoteric metals.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Chemical stability	Material is stable under normal conditions.
Conditions to avoid	Do not mix with other chemicals.
Incompatible materials	Alkalies. Reducing agents. Combustible materials. Metals. Organic materials. Acids. Moisture.
Hazardous decomposition products	May include and are not limited to: Oxides of carbon.

11 Toxicological Information

Routes of exposure	Eye, Skin contact, Inhalation, Ingestion.
Information on likely routes of exposure:	
Ingestion	Corrosive! May cause severe pain in the mouth, chest and abdomen, leading to cough, vomiting and collapse. Ingestion may cause gastritis possibly progressing to necrosis or hemorrhage.
Inhalation	Causes severe respiratory irritation. Material is irritating to mucous membrane and upper respiratory tract. Exposure can cause coughing, chest pains and difficulty in breathing. Vapors may cause pulmonary edema.
Skin contact	Corrosive. Concentrated nitric acid chars the tissue with a characteristic yellow coloration. Causes severe burns. Severe and fatal skin burns can occur with necrosis and scarring. No adverse effects due to skin contact are expected.
Eye contact	Corrosive to eye tissue and may cause severe damage or blindness.
Information on toxicological effects:	
Acute toxicity	Not available
Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Exposure minutes	Not available

Erythema value	Not available
Oedema value	Not available
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Corneal opacity value	Not available
Iris lesion value	Not available
Conjunctival reddening value	Not available
Recover days	Not available
Respiratory or skin sensitization:	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	No components are listed as carcinogens by ACGIH, IARC, OSHA or NTP.
Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Teratogenicity	Not available
Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Not classified
Aspiration hazard	Not an aspiration hazard.

12 Ecological Information

Ecotoxicity	Product may cause harm in the environment due to its low pH. Do not allow material to contaminate ground water system.
Persistence and degradability	Not available
Bioaccumulative potential	
Mobility in soil	Not available
Mobility in general	Not available
Other adverse effects	Not available
Aquatic toxicity	Toxic to aquatic life.

13 Disposal Information

Disposal instructions	Waste must be disposed of in accordance with federal, state/provincial and local environmental control regulations. This material and its container must be disposed of as hazardous waste.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues/unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14 Transport Information

DOT		IATA	
UN-No	UN2031	**UN-No**	UN2031
Proper Shipping Name	Nitric Acid	**Proper Shipping Name**	Nitric Acid
Hazard Class	8	**Hazard Class**	8
Subsidiary Hazard Class	5.1	**Subsidiary Hazard Class**	5.1
Packing Group	II	**Packing Group**	II

TDG		IMDG/IMO	
UN-No	UN2031	**UN-No**	UN2031
Proper Shipping Name	Nitric Acid	**Proper Shipping Name**	Nitric Acid
Hazard Class	8	**Hazard Class**	8
Packing Group	II	**Packing Group**	II

15 Regulatory Information

Canadian federal regulations This product has been classified in accordance with the hazard criteria of the HPR and the SDS contains all the information required by the HPR.

Canada DSL Challenge Substances: Listed substance

Nitric Acid (CAS 7697-37-2) Listed

Export Control List (CEPA 1999, Schedule 3) Not listed

Greenhouse Gases Not listed

Precursor Control Regulations Not regulated

WHMIS classification C Oxidizing Materials

E Corrosive Materials

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Nitric acid (CAS 7697-37-2) Listed

CERCLA Hazardous Substance List (40 CFR 302.4)

Nitric acid (CAS 7697-37-2) Listed

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) Not listed

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard	- Yes
Delayed Hazard	- No
Fire Hazard	- No
Pressure Hazard	- No
Reactivity Hazard	- Yes

SARA 302 Extremely hazardous substance

Nitric acid (CAS 7697-37-2) Listed

SARA 311/312 Hazardous chemical

Nitric acid (CAS 7697-37-2) Listed

SARA 313 (TRI reporting)

Nitric acid (CAS 7697-37-2) Listed

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List Not regulated

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130) Not regulated

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA)	Yes

***A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)**

16 Other Information

Disclaimer

The information in the sheet was written based on the best knowledge and experience currently available. Information contained herein was obtained from sources considered technically accurate and reliable. While every effort has been made to ensure full disclosure of product hazards, in some cases data is not available and is so stated. Since conditions of actual product use are beyond control of the supplier, it is assumed that users of this material have been fully trained according to the requirements of all applicable legislation and regulatory instruments. No warranty, expressed or implied, is made and supplier will not be liable for any losses, injuries or consequential damages which may result from the use of or reliance on any information contained in this document.

NFPA Code (Health: 3) (Flammability: 0) (Reactivity: 0)

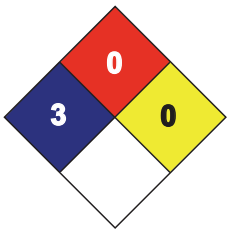
Issue Date 12-March-2018

Version # 01

Effective Date 12-March-2018

Prepared by Manufacturer Personnel

LEGEND	
Severe	4
Serious	3
Moderate	2
Slight	1
Minimal	0



Other Information For an updated SDS, please contact the supplier/manufacturer listed on the first page of the document.

TEST PROTOCOLS

SECTION CONTENTS

TROJAN UV™

Water Confidence™

TROJAN TECHNOLOGIES

PERFORMANCE TEST PLAN

ANN ARBOR WASTEWATER TREATMENT FACILITY, MI

TROJAN UV™

WATER CONFIDENCE™

CONFIDENTIAL

Performance Test Protocol
Effluent Quality & Disinfection Tests

A system performance test is intended to assure the Customer that the UV equipment will perform as designed. Following is a recommended Performance Test Protocol for Ann Arbor Wastewater Treatement Facility, MI.

1. General

The general scope and focus of the performance test are outlined in this section.

THE CRITERION FOR A PASS FOR ALL POST UV SAMPLES IS:

1) **COUNT= 200 Fecal Coliform/100ml based upon a 30 day Geometric Mean**
2) **COUNT – 400 Fecal Coliform/100ml based upon a 7 day Geometric Mean**

1.1 Objective

The objective of the performance test is to demonstrate that the UV equipment as installed achieves the design disinfection limits, as indicated in Trojan's Performance Guarantee. Specifically, the TROJAN SYSTEM UVSIGNA™ disinfection equipment supplied must disinfect to the limits indicated in the above paragraph.

1.2 Design Parameters

- Peak Flow @ 60% Average UV Transmission – 54 MGD (27 MGD per channel)
- Suspended solids do not exceed 30 mg/L, 30 day average of grab samples

1.3 Test Duration

The duration of the test shall be six (6) day period (about 2 days per channel or channel combination)

1.4 Test Records

UV disinfection efficiency may be determined using the following information:

- Flow rate
- Lamp bank power settings (expressed as a percentage of maximum)
- Hours of operation of each bank
- Time of last lamp cleaning
- Calculated UV Dose (mJ/cm^2)
- Percent UV transmission (%UVT)
- Influent total suspended solids, TSS (mg/L)
- Influent and effluent Fecal Coliform expressed as CFU/100mL

2. Performance Test Description

A detailed description of the Performance Test Procedure is contained in this section. It is essential that the %UV transmission (%UVT), total suspended solids (TSS), and the indicator organism are tested **simultaneously** with **grab samples** to correctly determine the results of UV disinfection and the limitations placed on UV disinfection by the effluent quality. These tests must be performed in accordance with the Sampling and Testing Procedures specified in Section 3 of this document.

2.1 Independent Laboratory Involvement

An accredited laboratory approved by the Owner and Engineer before being retained for this work by the Trojan Technologies, shall perform sample collection, analysis and test reports. Laboratory personnel are responsible to collect, preserve and transport the samples to the laboratory, conduct the required analyses, and report the results to the ENGINEER on a daily basis. The CONTRACTOR and Trojan Technologies shall submit a copy of the final test report to the ENGINEER.

2.2 Performance Test Procedure

Samples shall not be taken within the first two hours after the channel under test has been brought on line.

One (1) sets of samples shall be collected twice a day for two days per channel or channel combination. One set of samples shall consist of %UVT, TSS and sample(s) for E.coli microbiological analysis collected upstream of the UV system **and** two microbiological samples (2^{nd} downstream sample is optional but recommended) for E.coli collected downstream of the UV system once each day during the six (6) day period (about 2 days per channel or channel combination) to reflect varying flow conditions.

The performance test shall proceed in AUTOMATIC MODE at a flow rate that does not exceed the design limits. Hydraulically stressing the plant, to accumulate effluent and generate greater flows, shall not be permitted. Spiking the influent with solids, chemicals or microorganisms shall not be permitted. Artificially increasing the flow rate through the UV equipment may increase the TSS and the particle size above the design limits. Increasing the TSS, particle size, or hydraulic parameters above design limits will render performance test results invalid.

2.3 Test Records

For each channel tested, the following data shall be recorded:

1. The date and time of day that the samples were taken.
2. The flow rate through the UV disinfection channel at the time of sampling measured from the plant effluent flow meter and displayed on the UV system control screen.
3. The power settings of each bank of lamps displayed on the UV SCC screen.
4. The hours of operation of each bank displayed on the UV system control screen.
5. The time of last lamp cleaning.
6. The calculated UV dose measured in milliwatt-seconds/cm^2 displayed on the UV system control screen.

Each set of samples shall include the following analyses:

7. The membrane filter (MF) or most probable number (MPN) E.coli count per 100 mL in the UV disinfection channel influent (upstream) and effluent (downstream).
8. The percent UV transmittance (%UVT) at a wavelength of 254 nanometers of the UV disinfection channel.
9. The total suspended solids (TSS) concentration in the UV disinfection channel influent.

This information may be recorded in Table 1 - Performance Test Protocol Datasheet.

3. Sampling and Testing Procedures

Sample collection and preservation shall be in accordance with section 9060 A and 9060 B in Standard Methods for The Examination of Water and Wastewater, 21st edition. TSS samples shall be measured using Section 2540 D in Standard Methods for The Examination of Water and Wastewater, 21st edition. Microbiological samples are to be taken as grab samples = samples taken at a specific time and location. Microbiological samples may NOT be taken as composite samples = blended samples taken over a given time period and then combined.

3.1 Grab Sampling Procedures

- Plunge the bottle under water quickly – avoid surface scum and foam, if present. The sample should be taken in the centre of the channel and in the middle of the water depth profile.
- Fill the bottle to 2.5 cm from the top. Air space allows proper mixing of the sample during analysis.
- Immediately store samples on ice & in the dark to prevent photo-repair or dark repair.
- Attention must be taken when sampling undisinfected, pre-UV influent, which normally has high counts of E.coli bacteria (~1,000,000CFU/100mL) and sampling UV disinfected effluent with lower bacterial counts (~100CFU/100mL). Take extreme care to label bottles correctly, keep samples organized and ensure that effluent and influent samples do not contaminate one another.

IF ANY UNCERTAINTY EXISTS CONCERNING A SAMPLE THROW IT AWAY AND RESAMPLE.

Transit time and temperature are very important factors that influence the number of E.coli bacteria surviving disinfection. The samples should be delivered on ice to the selected laboratory within 1 to 8 hours and processed as soon as possible. If this is not possible, refrigerate at 4°C and culture within 24 hours. **Do not use dry ice**. Samples that have been frozen cannot be cultured.

3.2 Indicator Organism (TCC/100mL)

Microbiological samples determine the level of disinfection using indicator organisms such as E.coli bacteria. These organisms indicate the degree of disinfection and are used as an indicator of the possible presence of pathogens associated with fecal wastes.

Microbiological sample bottles are heat sterilized by an autoclave and may contain sodium thiosulphate (a chlorine-neutralizing chemical that absorbs UV and results in low %UVT values). Bottles may also contain EDTA, also a UV absorbing chemical used to neutralize the toxic effect of metals on bacteria.

%UVT samples must be collected in clean plastic bottles in the <u>absence</u> of these chemicals – see Section 3.3.

SAMPLE	DESCRIPTION
Upstream Location:	UV Influent - before the effluent is exposed to UV light
Downstream Location:	UV Effluent - after disinfection (within ten (10) feet)
Sample Type:	Grab sample
Container:	Sterile, plastic bottle
Volume:	no less than 250 mL
Analysis Method:	Membrane Filtration - Section 9222D in Standard Methods for the Examination of Water and Wastewater, 21st Edition.
Or	
	Most Probable Number - Section 9221E in Standard Methods for the Examination of Water and Wastewater, 21st Edition. Perform serial dilutions on all samples to yield an actual E.coli count (no < or > values permitted)

3.3 UV Transmission Test (%UVT)

UV transmittance is a measure of the amount of UV energy that is not absorbed by chemicals or solids in wastewater. UV transmittance is measured at a wavelength of 254 nm as a percentage compared to distilled water set at 100%T.

SAMPLE	DESCRIPTION
Location:	UV Influent, before the effluent is exposed to UV light
Sample Type:	Grab sample
Container:	Clean, plastic bottle - **No preservatives added, some chemicals strongly absorb UV resulting in lower %UVT**
Volume:	500mL
Analysis Method:	Section 5910 B in Standard Methods for the Examination of Water and Wastewater, 21st Edition measured at 254nm.

- Whole or unfiltered effluent %UVT is read at 254nm wavelength, using a spectrophotometer equipped with a UV lamp. %UVT on unfiltered or whole effluent is due to the absorbance of UV by dissolved chemicals, colloids and particles in the effluent.
- A 1 cm **quartz** cuvette is required, since glass and plastic will not transmit light at this wavelength.
- Ensure sample is uniformly well-shaken to obtain reliable TSS measurements.

3.4 Total Suspended Solids (TSS)

Wastewater effluents contain suspended solids composed of bacteria-laden particles. The concentration of TSS and the size of the particles that protect the bacteria are two limiting factors that determine UV dose required to achieve disinfection.

SAMPLE	DESCRIPTION
Location:	UV Influent, before the effluent is exposed to UV light
Sample Type:	Grab sample
Container:	Clean, plastic bottle, no preservatives added.
Volume:	500mL or 1 litre for tertiary treated effluents
Analysis Method:	Section 2540 B in Standard Methods for the Examination of Water and Wastewater, 21st Edition.

- Ensure sample is uniformly well-shaken to obtain reliable TSS measurements.

TABLE 1 - Performance Test Protocol Datasheet

Sample	Date	Time	Flow (MGD)	Bank # ___		Bank # ___		Calculated UV Dose (mJ/cm^2)	UV Trans. (@ 254nm)	Influent TSS (mg/L)	Total E.coli Count/100mL			
				Power Setting	Lamp Hours	Power Setting	Lamp Hours				Influent	Effluent Sample 1	Effluent Sample 2 Optional	Comments Optional
1														
2														
3														
4														
5														
6														

System Commissioning Checklist

Project:	171100051	Ann Arbor, MI

1 PROJECT INFORMATION

	Project Number	171100051
	Project Name	Ann Arbor, MI

Project Configuration

	# of Channels	2	Design Dose	30	mJ/cm^2
	# of Banks/Channel	4	Design Flow	54.00	MGD(US)
	# of Lamps/Bank	24	Design UVT	60	%
	Level Controller	Fixed Weir	# of PDCs	4	
	Inlet Gate Control	YES	PDC Cooling	AIR-CONDITIONING	
	Online UVT	YES	# of HSCs	2	

Project Documentation

1.01	Controls Philosophy Revision	
1.02	Project Layout Drawing Revision	
1.03	SCC Electrical Drawing Revision	
1.04	PDC Electrical Drawing Revision	
1.05	HSC Electrical Drawing Revision	

2 SYSTEM INFORMATION

		Value	Note Recorded
SCC (System Control Center)			
2.01	PLC Type	CompactLogix	
2.02	HMI Type	SCC HMI - Beijer -15" (Outdoor 4X Rated)	
2.03	PLC Program Revision		
2.04	PLC IP Address		
2.05	HMI Program Revision		
2.06	HMI IP Address		
2.07	HMI Serial Number		
2.08	Other* IP Address: _____		
2.09	Other* IP Address: _____		
PDC (Power Distribution Center)			
2.10	Bank Control Board Firmware - All Banks		
HSC (Hydraulic System Center)			
2.11	HSC Controller Program Revision		
2.12	Hydraulic pump overload setting		

* Managed Switch, Gateway Device, Converter, etc.

TECHNICIAN SIGN-OFF

I certify the UVSigna system 'Ann Arbor, MI' has been commissioned fully. Any outstanding issues are noted on the start-up certificate and page 15 below.

Date	Service Technician Name	Signature

Lines marked as " --- " are not applicable to this project

Project: 171100051 | Ann Arbor, MI

3 SYSTEM MEASUREMENTS

	Measurement Location	Value from Trojan Drawing	Measured Value	Within Tolerance	Note Recorded
3.01	Channel 1 Width			☐	☐
3.02	---	---	---	☐	☐
3.03	---	---	---	☐	☐
3.04	---	---	---	☐	☐
3.05	Channel 1 Depth from Grating			☐	☐
3.06	---	---	---	☐	☐
3.07	---	---	---	☐	☐
3.08	---	---	---	☐	☐
3.09	Low Level Sensor box - Centerline of bolt holes			☐	☐
3.10	Low Level Sensor short rod - distance from cut rod to channel floor (Top of Arc)			☐	☐
3.11	Ch 1 Width at level controller			☐	☐
3.12	---	---	---	☐	☐
3.13	---	---	---	☐	☐
3.14	---	---	---	☐	☐
3.15	Weir Ramp height			☐	☐
3.16	Weir Ramp length			☐	☐
3.17	Staging Area Width - Ch 1			☐	☐
3.18	---	---	---	☐	☐
3.19	---	---	---	☐	☐
3.20	---	---	---	☐	☐
3.21	Staging Area Length - Ch 1			☐	☐
3.22	---	---	---	☐	☐
3.23	---	---	---	☐	☐
3.24	---	---	---	☐	☐
3.25	Cable Trough or Cable Tray Width			☐	☐
3.26	Cable trough lids: ☐ None ☐ Solid ☐ Ventilated				☐
3.27	Lamp Cable Conduit Diameter			☐	☐

Technician verification: All dimensions are within tolerance	Initials:	

Lines marked as " --- " are not applicable to this project

Project: 171100051 Ann Arbor, MI

4 PRELIMINARY INSPECTION		Reference	Status	Note Recorded
UV Channel				
4.01	Verify effluent flow will be available for start-up, level control device calibration, and system testing	Check with contractor		
4.02	UV Channel(s) clean, dry, and free of debris			
4.03	Bank frames installed at correct angle and not warped			
4.04	Grout applied around bank frames correctly	Installation Manual		
4.05	Water level rods have been secured correctly	Installation Manual		
4.06	Weir installed at correct elevation, level, and sealed properly	Layout Drawing		
4.07	Inlet/Outlet gate(s) sealed properly			
Control Panels				
4.08	Cabinets installed in correct location			
4.09	All panels have 3' (1m) clearance in front of doors for safe access			
4.10	PDC(s) has 3' (1m) clearance from air conditioner to any obstructions			
4.11	---			
Electrical and Control Wiring				
4.12	All cables enter in secure and sealed glands			
4.13	All unused cable gland holes are sealed with hole plugs			
4.14	All wire terminals are secure in their terminal blocks			
4.15	All wires have been pull tested to ensure connections are tight			
Connections and Interfacing				
4.16	Communication wiring installed between devices	Layout Drawing		
4.17	Wiring is correctly daisy chained between panels. HSC must be first or last device in chain	Electrical Drawings		
4.18	End of Line (EOL) resistor is installed in HSC terminal blocks if HSC is last in the chain			
4.19	Ensure all selector switches are set to the OFF position			
4.20	Verify cables & hoses are routed neatly and correctly bundled in spiral wrap or in cable track.			
4.21	Cables and hoses are routed in one bundle	12 cables max/bundle		
4.22	SCC to SCADA communication wiring complete	Controls Philosophy		
4.23	SCC to Plant Digital/Analog wiring complete	Controls Philosophy		
4.24	Short LWL rod is connected to P1 terminal in Level Control Panel. Short rod cut to top of lamp arc.	Electrical Drawings		
4.25	LWL wiring is routed properly from Level Control Panel	Electrical Drawings		
4.26	Hydraulic lines installed from HSC(s) to Bank(s)			
4.27	HSC reservoir is filled with Mineral Oil			

Lines marked as " --- " are not applicable to this project

Project:	171100051	Ann Arbor, MI

	PRELIMINARY INSPECTION (cont'd)	Reference	Status	Note Recorded
Control Equipment				
4.28	Flowmeter installed & connected	Electrical Drawings		
4.29	---	---		
4.30	All inlet/outlet gate wiring installed & connected	Electrical Drawings		
4.31	---	---		
4.32	All Lamp cords have been labelled and terminated in the PDC(s)			
4.33	All Lamp Drivers are securely installed in the driver racks. All lamp connectors are connected to the correct driver output			
4.34	All Lamp Driver clips are fully engaged on the driver on both sides			

5	PRELIMINARY ELECTRICAL INSPECTION	Reference	Status	Note Recorded
5.01	Transformer(s) feeding UV equipment rated correctly for voltage and current, taking into consideration any other loads that may be using this transformer	Layout Drawing		
5.02	Verify cabinet amperage ratings & breaker ratings	Record in Table A		
5.03	Incoming power terminated in all UV equipment electrical panels and not energized			
5.04	Incoming power conductors all sized correctly	Record in Table A		
5.05	Verify neutral to ground bonding has been completed at the transformer	Verify with Electrician		
5.06	Measure and record the NO LOAD voltage at the closest point to the UV system without energizing any equipment. Measure all neutral to ground voltages	Record in Tables B, C, D, E		

A. BREAKER / DISCONNECT / CONDUCTOR VERIFICATION

Rating Location	SCC	PDC	HSC	LCP	Other
Cabinet Amperage Rating					
Cabinet's Main Breaker Amperage Rating					
Electrical Supply Panel Breaker Amperage Rating					
Supply Conductor Size					

All Electrical Panels have +5% / -10% Acceptable Voltage Range (VAC $_{RMS}$)					
PDC Nominal Voltage	480	PDC Upper Limit	504	PDC Lower Limit	432
HSC Nominal Voltage	480	HSC Upper Limit	504	HSC Lower Limit	432
SCC Nominal Voltage	120	SCC Upper Limit	126	SCC Lower Limit	108

LCP Nominal Voltage	120	LCP Upper Limit	126	LCP Lower Limit	108

Lines marked as " --- " are not applicable to this project

Project:	171100051	Ann Arbor, MI

B. PDC ELECTRICAL VERIFICATION

Tolerance: 432 - 504 VAC

Measurement Location		PDC: NO LOAD	PDC: FULL LOAD	PDC: NO LOAD	PDC: FULL LOAD	PDC: NO LOAD	PDC: FULL LOAD	PDC: NO LOAD	PDC: FULL LOAD
Voltage	L1 - N								
	L2 - N								
	L3 - N								
	N - GND*								
	L1 - L2								
	L1 - L3								
	L2 - L3								
Current		FULL LOAD		FULL LOAD		FULL LOAD		FULL LOAD	
	L1								
	L2								
	L3								
	Neutral								
	GND								

B. PDC ELECTRICAL VERIFICATION

Tolerance: 432 - 504 VAC

Measurement Location		PDC: NO LOAD	PDC: FULL LOAD	PDC: NO LOAD	PDC: FULL LOAD	PDC: NO LOAD	PDC: FULL LOAD	PDC: NO LOAD	PDC: FULL LOAD
Voltage	L1 - N								
	L2 - N								
	L3 - N								
	N - GND*								
	L1 - L2								
	L1 - L3								
	L2 - L3								
Current		FULL LOAD		FULL LOAD		FULL LOAD		FULL LOAD	
	L1								
	L2								
	L3								
	Neutral								

	GND				

***Max allowed Neutral to Ground voltage = 5 VAC**

Lines marked as " --- " are not applicable to this project

Project: 171100051 Ann Arbor, MI

C. HSC ELECTRICAL VERIFICATION

Tolerance: 432 - 504 VAC

Measurement Location		HSC: NO LOAD	HSC: FULL LOAD	HSC: NO LOAD	HSC: FULL LOAD	HSC: NO LOAD	HSC: FULL LOAD	HSC: NO LOAD	HSC: FULL LOAD
Voltage	L1 - GND								
	L2 - GND								
	L3 - GND								
	L1 - L2								
	L1 - L3								
	L2 - L3								
Current		FULL LOAD		FULL LOAD		FULL LOAD		FULL LOAD	
	L1								
	L2								
	L3								
	GND								

C. HSC ELECTRICAL VERIFICATION

Tolerance: 432 - 504 VAC

Measurement Location		HSC: NO LOAD	HSC: FULL LOAD	HSC: NO LOAD	HSC: FULL LOAD	HSC: NO LOAD	HSC: FULL LOAD	HSC: NO LOAD	HSC: FULL LOAD
Voltage	L1 - GND								
	L2 - GND								
	L3 - GND								
	L1 - L2								
	L1 - L3								
	L2 - L3								
Current		FULL LOAD		FULL LOAD		FULL LOAD		FULL LOAD	
	L1								
	L2								
	L3								
	GND								

For a balanced system:

If the system has an equal load on each phase then the Line 1, 2, and 3 phase currents should be very close to each other.

The neutral current should not be greater than any of the line phase currents, and will generally have a value close to the difference in the highest and lowest phase currents.

The ground current is system specific but should be close to zero.

Lines marked as " --- " are not applicable to this project

Project: 171100051 Ann Arbor, MI

D. SCC ELECTRICAL VERIFICATION

Tolerance: 108 - 126 VAC

	Measurement Location	NO LOAD	FULL LOAD		Measurement Location	FULL LOAD
Voltage	L - N			Current	L	
	N - GND*				N	
	24VDC - 0VDC				GND	

E. LCP ELECTRICAL VERIFICATION

Tolerance: 108 - 126 VAC

Measurement Location		LCP: 1	LCP: 2	LCP: 3	LCP: 4
		FULL LOAD	FULL LOAD	FULL LOAD	FULL LOAD
Voltage	L - N				
	N - GND*				

***Max allowed Neutral to Ground voltage = 5 VAC**

6	SYSTEM START-UP	Reference	Status	Note Recorded
HSC Electrical Energization				
6.01	If the NO LOAD voltage measurements for the HSC are satisfactory then energize the breaker feeding the HSC	Verify with Electrician		
6.02	Double-check the NO LOAD voltage measurements inside the HSC without energizing the internal breaker	Record in Table C		
6.03	Energize the internal breaker in the HSC and turn the hydraulic pump on			
6.04	Verify correct rotation of pump motor			
6.05	Measure the FULL LOAD voltage and current of the HSC cabinet with the hydraulic motor running	Record in Table C		
6.06	Ensure the hydraulic pump current overload setting is suitable for the FULL LOAD current measured	Record on line 2.12		
6.07	Verify communications between the SCC and HSC(s)			
6.08	Clean all construction dust and debris from the HSC(s)			
SCC Electrical Energization & Configuration				
6.09	If the NO LOAD voltage measurements for the SCC are satisfactory then energize the breaker feeding power to the SCC	Verify with Electrician		
6.10	Double-check the NO LOAD voltage measurements inside the SCC without energizing the internal breaker	Record in Table D		
6.11	Energize the internal breaker for the HMI and Controller			
6.12	Verify operation of the HMI and Controller			

6.13	Measure the FULL LOAD voltage and current of the SCC	Record in Table D		
6.14	Verify the HMI internal settings			
6.15	Verify the system configuration settings in the HMI and record any settings that have been changed	Project Software Verification		

Lines marked as " --- " are not applicable to this project

Project: 171100051 Ann Arbor, MI

	SYSTEM START-UP (cont'd)	Reference	Status	Note Recorded
6.16	---			
UV Bank Preparation				
6.17	Install all lamps and sleeves			
6.18	Inject all wiper fill ports with ActiClean			
6.19	Install UVI sensors and set the gap between the UVI Sensor and the Lamp/Sleeve. Loosen the UVI sensor hardware at top of bank, Retract wipers and re-tighten sensor hardware at top of bank.			
6.20	Confirm cable management adheres to Trojan standard. Refer to TrojanUV Solo Lamp Cable Installation Guideline (DC00601-017)			
6.21	Ensure labels are on both ends of the lamp power cable			
6.22	Ensure enough slack is available at the bank to easily attach and remove the lamp power cord			
PDC Electrical Energization				
6.23	If the NO LOAD voltage measurements for the PDC are satisfactory then energize the breaker in the cabinet that feeds power to the PDC	Verify with Electrician Record in table B		
6.24	Energize the PDC and verify the voltage under LOW LOAD is still acceptable			
6.25	Verify communications between the SCC and PDC(s)			
6.26	Verify communications between the BCB and lamp drivers			
6.27	Confirm the AC unit operation. Verify the phase indicator LED is ON for each AC unit			
Level Control Panel (LCP)				
6.28	If the NO LOAD voltage measurements for the LCP are satisfactory then energize the breaker in the cabinet that feeds power to the LCP	Verify with Electrician		
6.29	Energize the breaker in the LCP and confirm the operation of the low water circuit			
6.30	Measure the FULL LOAD voltage for each LCP	Record in Table E		
6.31	---			
Water Level Control Device				

6.32	Fill channel with effluent and verify the level control device does not leak			
6.33	Provide low and high flow and verify water level is maintained			

Lines marked as " --- " are not applicable to this project

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7	SYSTEM OPERATION	Reference	Status	Note Recorded
7.01	For each HSC, bleed air out of the HSC to UV bank hydraulic lines for both lifting and wiping.	Installation Manual		
7.02	Connect extend hose to cylinder and retract port to a pail. Fully extend cylinder to fill with fluid then reconnect retract line. Repeat for all cylinders.			
7.03	Run the wipers a few times to observe the operation of each wiper group to bleed any additional air from the system			
7.04	Monitor the HSC pressure levels while wiping	Record in Table F		
7.05	Top up the reservoir with more fluid as required	Check dip stick level		
7.06	Measure the actual extend and retract time required for the wipers to move	Record in Table F		
7.07	Set the max travel time equal to the longest time measured + 30 seconds and record values below	Record in Table F		
7.07A	**Max Travel Time Programmed:**			
7.07B	**Min Travel Time Programmed:**			
7.08	Test local ON wiper operation using the sequence mode for all wiper groups			
7.09	Lift all banks and ensure correct fitting of the locking plates			
7.10	Adjust the bank in place sensor and verify correct operation by confirming bank not in place alarm is generated when bank is lifted			
7.11	With all configuration settings confirmed, ensure all lamps are energized on all banks			
7.12	Verify the low water level sensor operation and input to the BCB			
7.13	Test local ON operation of the UV banks. Confirm lamp power cord LEDs are operating (if provided)			
7.14	Verify remote auto operation of the banks and ensure all lamps are functioning			
7.15	Place banks in Remote Hand at 100% power, wait until warm-up timer has expired to confirm lamps are at 100% power			
7.16	Measure the FULL LOAD voltage and current at each PDC	Record in Table B		

7.17	Compare the FULL LOAD voltage and current readings to the nameplate ratings for the PDC and HSC			
7.18	Verify UVI sensor operation for all banks			

Lines marked as " --- " are not applicable to this project

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F. HSC TESTING

HSC#	Wiper Group 1	Wiper Group 2	Wiper Group 3	Wiper Group 4	High Pressure Switch Setting			
Extend Pressure					Pressure Relief Valve Setting			
Retract Pressure					Oil Level As Left:			
Extend Time					¼	½	¾	Full
Retract Time								

F. HSC TESTING

HSC#	Wiper Group 1	Wiper Group 2	Wiper Group 3	Wiper Group 4	High Pressure Switch Setting			
Extend Pressure					Pressure Relief Valve Setting			
Retract Pressure					Oil Level As Left:			
Extend Time					¼	½	¾	Full
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HSC#	Wiper Group 1	Wiper Group 2	Wiper Group 3	Wiper Group 4	High Pressure Switch Setting			
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F. HSC TESTING

HSC#	Wiper Group 1	Wiper Group 2	Wiper Group 3	Wiper Group 4	High Pressure Switch Setting	
Extend Pressure					Pressure Relief Valve Setting	
Retract Pressure					Oil Level As Left:	

Extend Time					¼	½	¾	Full
Retract Time								

Lines marked as " --- " are not applicable to this project

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8 SYSTEM OPERATION		Reference	Status	Note Recorded
Peripheral Equipment				
8.01	Verify flow meter signal with varying flow rates			
8.02	---	Section 10		
8.03	---			
8.04	Verify inlet gate operation			
8.05	Verify outlet gate/weir gate operation	Section 9		
Plant Signals				
8.06	Verify SCADA signals and data at plant interface	Controls Philosophy		
8.07	Verify digital and analog signals at plant interface	Controls Philosophy		
8.08	Verify customer Site Acceptance Testing (SAT) if required	Specifications		
Dose Pacing				
8.09	Simulate & verify dose pacing with worst case values	Record in Table G		
8.10	Set 'Use Theoretical' UVI setting to ALWAYS			
Training				
8.11	Conduct operation and maintenance training. Ensure training records are signed by all attendees	Operator Training Guideline		
Completion				
8.12	Effluent testing has been completed with low flows	Layout Drawing		
8.13	Effluent testing has been completed with high flows	Layout Drawing		
8.14	As built changes have been recorded on drawings/schematics			
8.15	PLC program upload saved to laptop with all settings and any program changes as left onsite			
8.16	Controls Philosophy changes documented	Controls Philosophy		
8.17	All cabinet covers are installed and doors closed			
8.18	Start-up and commissioning documents signed	System Start-up Certificate		
8.19	Document all spare parts onsite and any outstanding parts owed to site	Project Description		
8.20	Apply all safety warnings to the system			

Lines marked as " --- " are not applicable to this project

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G. DOSE PACE TESTING

Design Values entered in Controller

Dose Setpoint (mJ/cm^2)	UVT Value	Lamp Hours	Flow Rate	
30	65	15,000	27 (per Channel)	MGD(US)
Set to design dose value	*Use design value if manual UVT or record online value*	*Set all banks to EOL value*	*Set to peak design flow rate*	

Results

Calculated System RED (mJ/cm^2):	

Calculated Dose should be equal to or slightly above the dose setpoint.

Record the bank power level, Bank RED, UVI Filtered, and UVI Deviation for each bank from the bank details screen in table below. **This test verifies the dose pacing of the system with real world conditions.**

Bank	Bank Power Level (%)	Bank RED (mJ/cm^2)	UVI Filtered (mW/cm^2)	UVI Deviation (%)