Project Submittal

August 18, 2020

Operation, Maintenance & Inspection (OM&I)

Project Name:

ODOT Fort Washington Way Pump Station
Electrical Control Upgrade
ODOT 193002 – Replace Pump Station Electrical System

Owner:

Ohio Department of Transportation
District 8
505 South SR 741
Lebanon, Ohio 45036
Marvin Lennon, Project Engineer

General Contractor:

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Drawer D
Fremont, Ohio 43420
Nick Steyer, P.E., Project Manager

Sub-Contractors:

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Cincinnati, Ohio 45241
Tim Goudy, Project Manager

Quality Controls, Inc.
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Cincinnati, OH 45244

Operation, Maintenance & Inspection (OM&I)

Project Name:

ODOT Fort Washington Way Pump Station
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Fort Washington Way Pump Station

Operational Description

The Fort Washington Way Pump Station (FWWPS) collects all storm water runoff from the Fort Washington Way Roadway. The pump station is used to pump rainwater and general run-off from Fort Washington Way Roadway to the Ohio river. The FWWPS is designed to pump up to 47,000 gallons of water per minute.

Pump Station System Description

The pump station consists of three chambers described as the Wet Well Pumping Chamber, Discharge Chamber and the Control Room Chamber. All chambers are located below street level grade at the intersection of 2nd and Vine streets. **See Exhibit 1 for schematic and aerial view of the entrance locations.**

The chambers are accessible through a combination of double door and single door, flush framed, sidewalk mounted hatch openings. The chambers are OSHA Regulated Confined Spaces. Confined Space Entry (CSE) placards warn potential entrants that only those individuals trained for CSE may enter using appropriate entry safeguards. The Wet Well Chamber is monitored for Percent of Lower Explosive Limit (LEL) in the event of a roadway Fuel or Hazardous Cargo spill that may create an explosive atmosphere. The Control Room Chamber is monitored for Oxygen (O_2) percent and Carbon Monoxide (CO) parts per million (ppm) for safety of CSE occupants while working in the space. The monitoring system is a GasGuard XL manufactured by MSA. **A diagram of the pump station Ventilation Plan Schematic is attached in Exhibit 1. See Appendix A for complete information on the MSA GasGuard XL atmospheric monitoring system. The initial calibration records for the GasGuard XL are also found in Appendix A.**

The pump station power is normally supplied from the local electric utility using a three phase, 480-volt, 1200 FLA main disconnect located in the Control Room Chamber. Backup Emergency Backup power is supplied by a 750 kVA CAT Diesel Generator and Automatic Transfer Switch located on the north side entrance drive to the Underground Metro Bus Terminal, just North of Paul Brown Stadium. This location is approximately 4 city blocks west of the FWWPS. **Appendix B contains detailed information for the Emergency Backup Power System.**

The station operates automatically using an integrated control system combined with an electrically actuated discharge sluice gate. These control apparatuses combined with a total of 5 pumps are installed in the Wet-Well Chamber and the Control Room Chamber. The five pumps are described as:

- Sump Pump (2 HP) - used during dry weather run-off pumping
- #1 Low Flow Pump (20 HP) - used for wet weather and dry weather, Ohio River flooding and non-river flooding run-off pumping.

- #2,3 & 4 High Flow Pumps (174 HP) – used during Ohio River flooding run-off pumping. These pumps are High Volume Low Head pumps.

The pumps are accessible for maintenance through flush mounted, precast concrete sidewalk covers. A crane must be utilized to remove the precast concrete covers. Details of the FWWPS automation and controls are described below.

Pump Station Operating Conditions

There are two operating conditions described as **Normal Operating Condition (NOC) or Ohio River Flood Stage Condition (ORFSC).** The station operates automatically under NOC unless Ohio River elevations require the station to be switched to ORFSC. During ORFSC, personnel are required to ensure safe operation and sequence of the automated controls. Ohio River Stage (ORS) conditions affect the operating condition of the FWWPS. Normal river pool level at this location is 26.4' ORS. The station operates under NOC between 26.4'- 54.9' ORS. FWWPS must be placed in ORFSC mode by 55.0' of ORS. ORFSC mode commences by fully closing the sluice gate in preparation of pumping runoff & stormwater.

FWWPS is regulated between NOC and ORFSC using an electrically operated sluice gate equipped with manual operator override. The sluice gate is equipped with an electric actuator with a 4-20 mA position signal. The sluice gate position signal is communicated to a display mounted on the dead front control panel door located in the Control Room Chamber. The display will read the gate position between 100%-0% of open/close respectively allowing operators to see the movement of the gate when travelling. Programable relay outputs will allow the control relays to lock out various functions between NOC and ORFSC and allow permissible operator adjustment. The sluice gate actuator also has limit switch outputs used to report fully open or closed gate position on the display.

The sluice gate is normally open during NOC and must be closed to operate the station under ORFSC. During NOC runoff travels through a trough into the Wet-Well area through the opening controlled by the sluice gate emptying into the Discharge Chamber. On the River side of the sluice gate opening, the discharge chamber empties into two 36" pipes leading to the Ohio River outfall. At 55.0' Ohio River Stage (ORS) FWW must be placed in ORFSC mode by fully closing the sluice gate in preparation of pumping runoff & stormwater.

The Control Room Chamber contains the FWWPS control system with which operates the entire pump station automatically or with qualified operator involvement. The Sump Pump utilizes an across the line (ACL) motor starter only, the remaining pumps (#1-4) utilize solid state starters (SSS) with bypass contactors enabling selectable switching between SSS/ACL starting capability. The ACL feature will enable a qualified operator to override the SSS in the event of a failure. This feature is designed for emergency use only to operate pumps during a flood event. The SSS should be utilized unless it becomes disabled to allow for the pumps to ramp start which reduces inrush current. The SSS will also allow the pumps to soften severe loads on bearings and seals and reduce utility peak demand charges. The SSS play an important role if required to start the pumps using the backup

generator should utility power be unavailable. Pump starting time delays are integrated in the automatic control system purposely to avoid pump starting of the large motors at the same time. Attempting to start all motors at the same time creates stress loads on the power system and may stall the generator if in use during a power outage. Each timer is adjustable from 0-seconds to 10 minutes. The minimum delay is 30 seconds between each motor initial start. This delay occurs on the initial power up sequence and does not continue once the station is operational continuously. Once the initial starting sequence begins, the pump motors will start automatically without time delay as demanded by the Primary Level Control and the alternation sequence. A high-level alarm will initiate the back up float control in the event the Primary Level Control System fails. **Appendix C contains complete information for the FWW PS Automated Control System. The information includes Control Panel BOM, Single Line Wiring Schematic, SSS O&M Manual, & Manufacturers Component Information.**

Pump & Motor Maintenance Considerations

Care should be taken when "Bumping" submersible pump motors with SSS starters. "Dry Running" the hydraulic end can damage mechanical seals. Drying running should be limited to under 30 seconds when "Bumping" motors for maintenance. Experience has shown a Submersible pump left in storage (inactive) for 24 months requires a bearing change before placing in service. The bearings are pre-loaded on the shaft. Microscopic brinelling may occur if the bearing remains static on the motor shaft for 24 months. The solution is to move the rotating element even a small amount by hand causing shifting of the bearing to shaft contact points. At a minimum quarterly calendar turning of the shafts is required to prevent brinelling. The same is true for the Sluice Gate Actuator. Periodically, the gate should be run full closed then back open. Check for deposits of grit in the gate frame and remove them before cycling the gate

Normal Operating Condition (NOC)

During NOC the Sump maintains the pumping of any dry weather run-off from the roadway. The Sump Pump is situated in an independent sump at a lower elevation than the main Wet-Well floor elevation allowing the pumps #1-4 to sit on a dry floor during dry weather roadway run-off conditions. The Sump Pump controls are independent of all other pumps controls and use an Opti-Float Fiber Optic system to control Start/Stop sequence in Auto. During wet weather conditions the #1 Low Flow Pump may be called automatically to operate and help maintain the wet well level along with the Sump Pump. The #1 Low Flow Pump operates automatically using a liquid level transducer controlled by the Primary Level Control System. The level of the wet well is displayed in feet on a digital display panel in the Pump Station Control Room. Should the Transducer fail, a backup mechanical float system will engage using Opti-Float fiber optic floats. **The Sump Pump and #1 Low Flow Pumps are permitted to automatically operate under NOC with the sluice gate in the open position.**

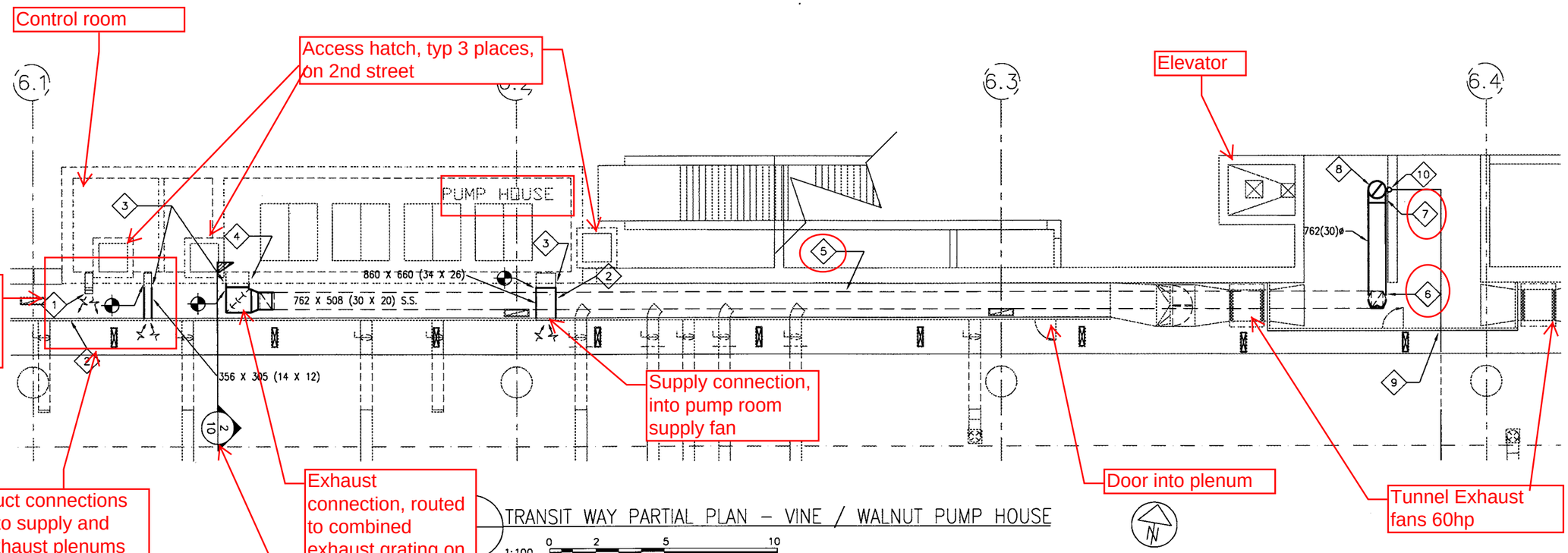
ORFSC Operating Condition

During ORFSC ODOT must be notified of the FWWPS going online. The notification process will begin at ORS 52.0'. The contact information for notification is found in Appendix C.

This condition requires the sluice gate to be fully closed in order to operate the # 1 Low Flow Pump and #2, 3, & 4 High Flow Pumps in automatic mode using the Primary Level Control. The operator will close the sluice gate and confirm the gate is closed by checking the display status. The pumps #1-4 are then placed in Auto mode. The operator will remain on site to assure proper operation. The #1 Low Flow Pump will remain operable using the Primary Level Control. The #1 Low Flow Pump will operate during ORFSC to maintain the wet well level for dry weather run-off conditions. Wet weather run-off conditions during ORFSC will call for the #2, 3, & 4 High Flow pumps to operate automatically as demand increases using the Primary Level Control. The High Flow Pumps will alternate sequence start/run from demand of the Primary Level Control. An alternator cycles the pumps lead, lag & lag lag sequencing then rotate positions automatically if everything is normal. The alternator has a switch to allow operator defined control. For example, #2 pump has an issue, select 1,3,2 as sequence so pumps #1 & #3 operate first. Turn #2 off so it will not operate if called for. Turning a pump to off with Alternator in Auto merely delays a pump start to the next operating level. At the end of a flood event open the Sluice Gate use #1 pump to pump down as much as possible then let the Sump Pump take over. Inspect Wet-Well floor for debris pickup and clean as needed remove all plastic bottles, jugs and floatables to avoid damaging Sump Pump. Occasionally a Vactor Truck may be needed if the Flood period was for an extended period.

Exhibit 1

FWW Tunnel Schematic



Control room

Access hatch, typ 3 places, on 2nd street

Elevator

This elevation view not shown for control room duct connections

Supply connection, into pump room supply fan

Duct connections into supply and exhaust plenums

Exhaust connection, routed to combined exhaust grating on 2nd street.

Door into plenum

Tunnel Exhaust fans 60hp

TRANSIT WAY PARTIAL PLAN – VINE / WALNUT PUMP HOUSE

1:100 0 2 5 10

Section view on page 3

KEYED NOTES THIS SHEET ONLY

1. PUMP HOUSE CONTROL ROOM SUPPLY DUCT BY OTHERS.
2. EXTEND SUPPLY AIR DUCT FROM FLOOD WALL PENETRATION THROUGH EXHAUST AIR CHASE, PENETRATING PLENUM ZONE BARRIER WALL AND TERMINATING INTO SUPPLY AIR CHASE.
3. DISCONNECT EXISTING SHEET METAL HOOD.
4. CONNECT TO EXISTING 1015 X 508 (40 X 20) PUMP ROOM EXHAUST, ELBOW, TRANSITION TO A 762 X 508 (30 X 20) AND ELBOW DOWN THROUGH MECHANICAL AIR CHASE FLOOR SLAB AS ILLUSTRATED ABOVE.
5. ALL WELDED 762 X 508 (30 X 20) STAINLESS STEEL EXHAUST AIR DUCT TIGHT TO BOTTOM OF MECHANICAL AIR CHASE FLOOR SLAB. LOCATE DUCT TIGHT TO NORTH FLOOD WALL COORDINATING WITH STRUCTURAL SUPPORTS FOR MECHANICAL FLOOR SLAB. CONTRACTOR SHALL COORDINATE WITH SPRINKLER PIPING, LIGHTING, ARCHITECTURAL CEILING AND CEILING HANGERS.
6. 762 X 508 (30 X 20) PUMP ROOM EXHAUST DUCT PENETRATION THROUGH MECHANICAL AIR CHASE FLOOR SLAB.
7. 762(30)ø WELDED STAINLESS STEEL PUMP HOUSE EXHAUST DUCT UP. ALIGN WITH AND CONNECT TO EXHAUST DISCHARGE STACK, SEE ARCHITECTURAL.
8. PROVIDE LOW POINT DUCT DRAIN, TRAP AS REQUIRED, AND ROUTE TO EXHAUST DISCHARGE PLENUM DRAIN. INSTALL NECESSARY PIPE SUPPORTS AS PER SPECIFICATIONS.
9. PROVIDE PIPE SEEVE THROUGH EXHAUST PLENUM WALL. SEAL AIR TIGHT.
10. ALIGHN 102 (4) VENT PIPING WITH 762 (30) ø STAINLESS STEEL PUMP HOUSE EXHAUST DUCT. TERMINATE AT A MINIMUM ELEVATION OF 3048 (120) ABOVE GRADE. PROVIDE TURN DOWN ELBOW TO PREVENT RAIN WATER PENETRATION (NOTE: ALL VENT PIPING, INCLUDING RISER THROUGH EXHAUST SHAFT. SHALL BE INCLUDED IN LUMP SUM COST FOR PUMP STATION).

ALL DUCTWORK/PIPING/EQUIPMENT SHALL BE INSTALLED PER THE OHIO VERSION OF THE 1996 BOCA CODE. THE FT. WASHINGTON WAY BUSWAY TUNNEL IS CLASSIFIED AS AN A3 OCCUPANCY THAT MUST COMPLY WITH SEISMIC HAZARD EXPOSURE GROUP II CRITERIA.

KEYED PLAN

DESIGN AGENCY
PARSONS BRINCKERHOFF, INC.
312 ELM STREET, STE. 2500
CINCINNATI, OH 45202-2720

DATE REVISED 2/22/00
STRUCTURE FILE NUMBER 3103420

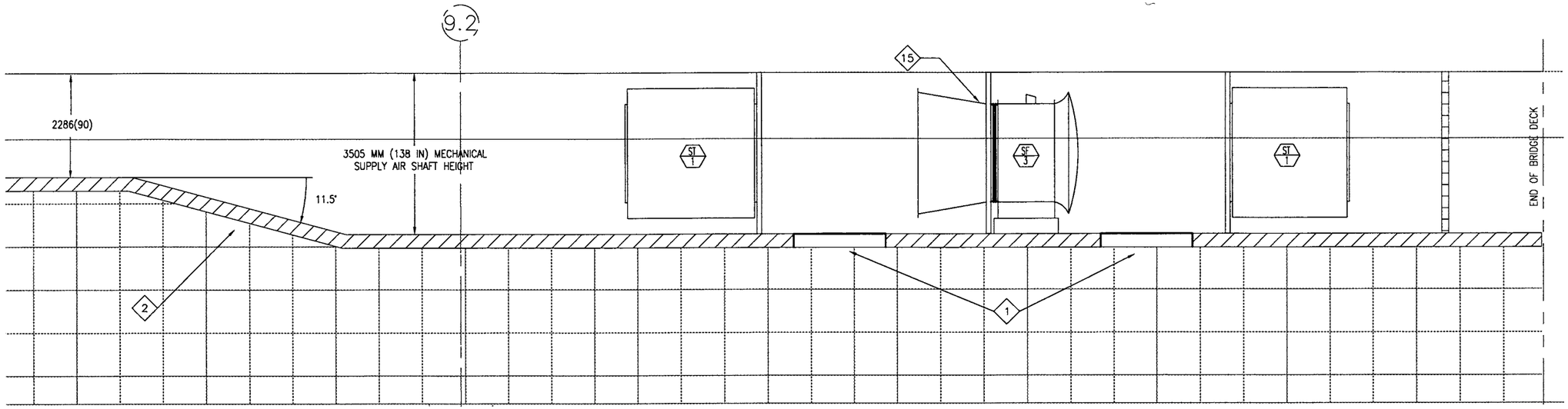
DRAWN SLV REVIEWED JDC
PREPARED KET CHECKED KET

Fort Washington Way
TRANSIT WAY MECHANICAL PARTIAL PLAN, ELEVATION & DETAIL
VINE / WALNUT PUMP HOUSE

CITY OF CINCINNATI
CONTRACT NO.75X5753

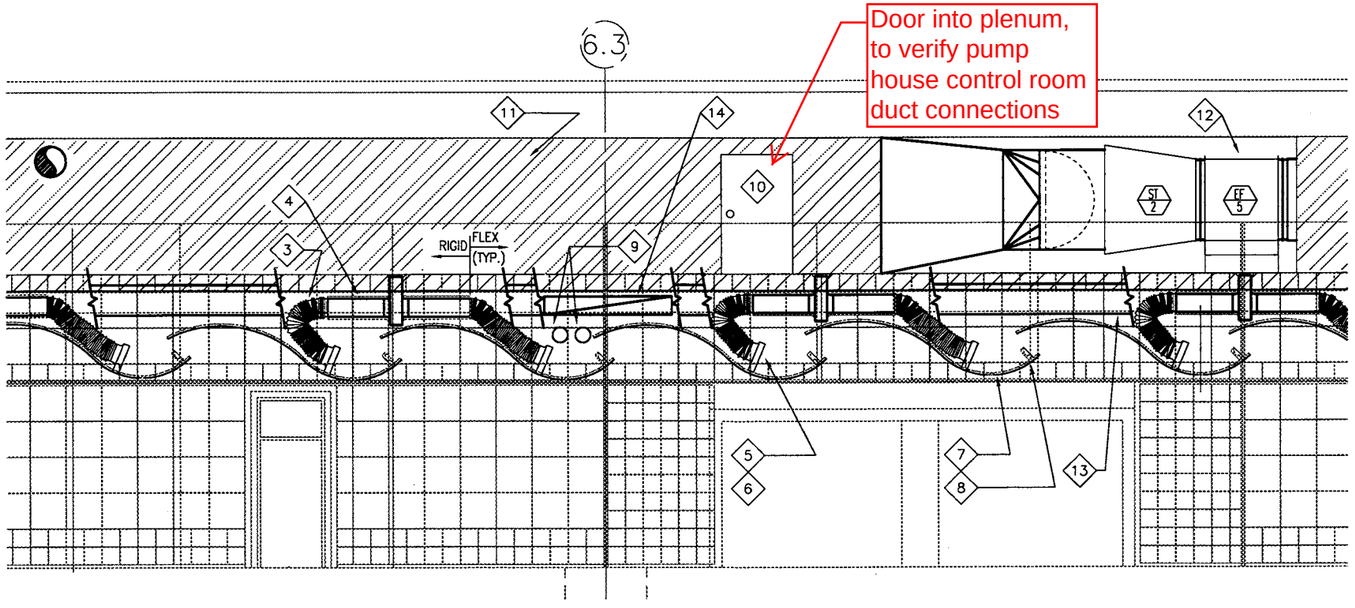
7/11

190/249



1/8 ELEVATION – SUPPLY FAN DECK – 3 AND 4 (1 AND 2 MIRROR IMAGE)

1:50 0 .5 1 2 5



2/8 NORTH ELEVATION – VINE / WALNUT STREET DUCTED WITH ARCHITECTURAL CEILING (TYP. BLOCKS #3 & #4)

1:50 0 .5 1 2 5

GENERAL NOTES

1. SUPPLY FAN ELEVATION TYPICAL FOR BOTH NORTH/SOUTH AND EAST/WEST.
2. DUCTED CEILING DIFFUSERS AS SHOWN ON NORTH ELEVATION ARE TYPICAL FOR SOUTH. ARCHITECTURAL CEILING OCCURS IN BLOCKS #2 AND #3 ONLY.

KEYED NOTES THIS SHEET ONLY

1. PROVIDE 2032 X 1524 (80 X 60) ACCESS HATCH THROUGH MECHANICAL FAN DECK FLOOR AS SHOWN.
2. CONTRACTOR SHALL COORDINATE DURING INSTALLATION OF FLOOR SLAB TO ENSURE PROPER TRANSITION, AS INDICATED ABOVE, FROM SUPPLY TO EXHAUST FAN DECK ELEVATIONS.
3. 305(12)ø INSULATED FLEXIBLE DUCTWORK.
4. 305(12)ø RIGID ROUND DUCTWORK. PROVIDE INSULATION BY WRAPPING DUCTWORK WITH SECTION OF INSULATED FLEXIBLE DUCTWORK. SEAL BOTH ENDS TO MAINTAIN VAPOR BARRIER.
5. FIELD FABRICATED SUPPLY AIR GRILL PLENUM BOX. FABRICATE AND INSTALL ONE PLENUM BOX PER GRILL. PLENUM BOX SHALL BE 508 X 1219 X 102 (20 X 48 X 4, H X W X D) WITH A 305(12)ø BELL-MOUTH INLET CONNECTION TO ACCOMODATE A 1219 X 102 (48 X 4) REGISTER WITH A FACTORY SUPPLIED OPPOSED BLADE DAMPER.
6. INSTALL TWO SUPPLY AIR PLENUM BOXES WITH GRILLS PER ARCHITECTURAL CEILING SECTION. COORDINATE INSTALLATION WITH CEILING INSTALLING CONTRACTOR.
7. CEILING SYSTEM. SEE ARCHITECTURAL DRAWINGS.
8. INDIRECT LIGHTING SYSTEM.
9. TYPICAL ELEVATION FOR SPRINKLER MAINS. COORDINATE ALL DUCTWORK WITH RESPECT TO PIPE LOCATIONS.
10. 915 X 2134 (36 X 84) MAN DOOR FROM SUPPLY AIR PLENUM INTO EXHAUST AIR PLENUM. INSTALL DOOR TO SWING AGAINST PRESSURE.
11. EXHAUST AIR PLENUM LOCATED BEYOND PLENUM WALL. SUPPLY AIR PLENUM LOCATED IN FOREGROUND.
12. EXHAUST AIR FAN AND COMPONENTS LOCATED WITHIN SUPPLY AIR PLENUM.
13. WELDED 508 X 1015 (20 X 40) STAINLESS STEEL EXHAUST DUCT.
14. 2133 X 305 (84 X 12) COLUMN EXHAUST DUCT.
15. OUTLET CONE WEIGHT OF 635 KG (1400 LBS) SHALL BE INDEPENDENTLY SUPPORTED FROM THE VIBRATIONALLY ISOLATED FAN.

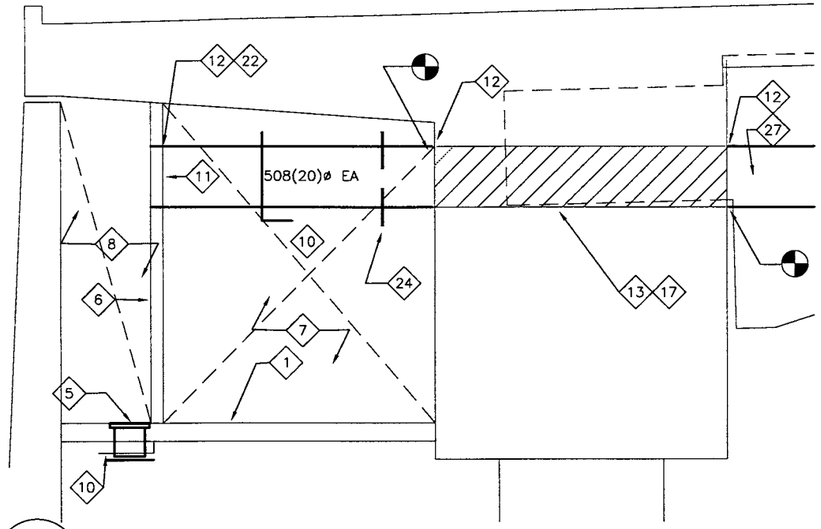
ALL DUCTWORK/PIPING/EQUIPMENT SHALL BE INSTALLED PER THE OHIO VERSION OF THE 1996 BOCA CODE. THE FT. WASHINGTON WAY BUSWAY TUNNEL IS CLASSIFIED AS AN A3 OCCUPANCY THAT MUST COMPLY WITH SEISMIC HAZARD EXPOSURE GROUP II CRITERIA.

DESIGN AGENCY
PARSONS BRINCKERHOFF, INC.
312 WALNUT STREET, SUITE 2500
CINCINNATI, OH 45202-2720

PREPARED	DRAWN	REVISED	DATE
SLV	SLV		2/22/00
CHECKED	REVIEWED		STRUCTURE FILE NUMBER
KET	JDC		3103420

Fort Washington Way
TRANSIT WAY MECHANICAL ELEVATIONS

CITY OF CINCINNATI
CONTRACT NO.75X5753

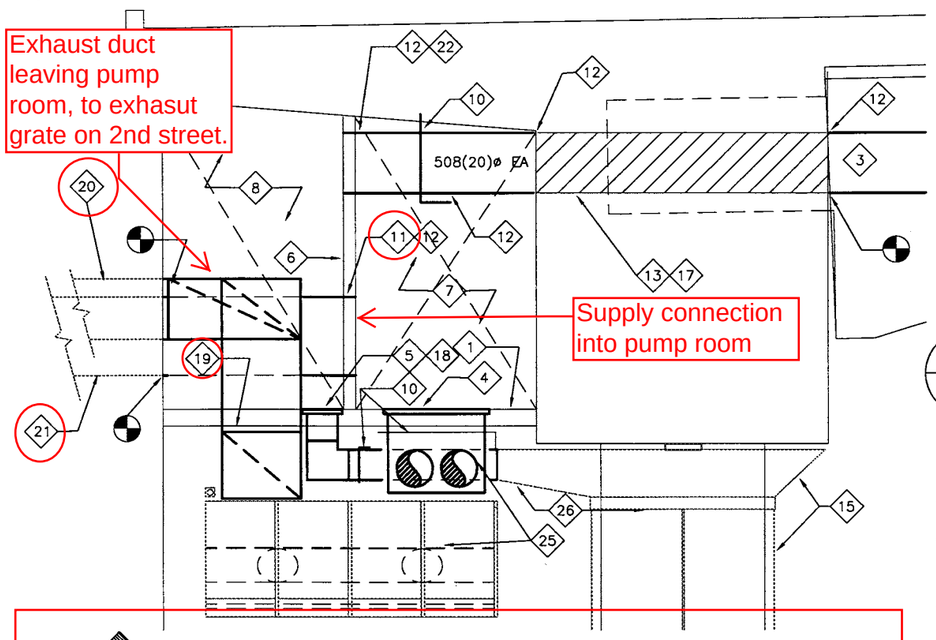


1/10 TYPICAL RETURN AIR – WITHOUT ARCHITECTURAL CEILING

1:25 0 .25 .5 1.0 2.5

Exhaust duct leaving pump room, to exhasut grate on 2nd street.

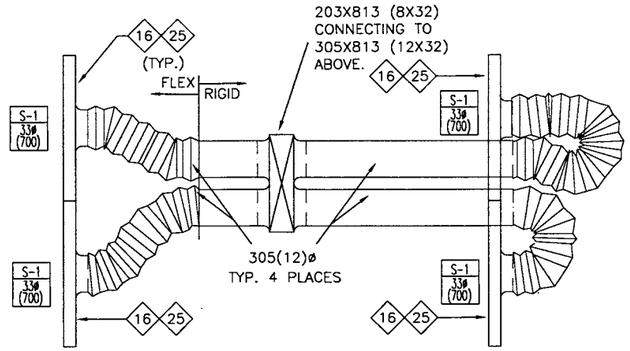
Supply connection into pump room



2/10 SECTION – NORTH CEILING WITH ARCHITECTURAL CEILING AND PUMP HOUSE EXHAUST DUCT

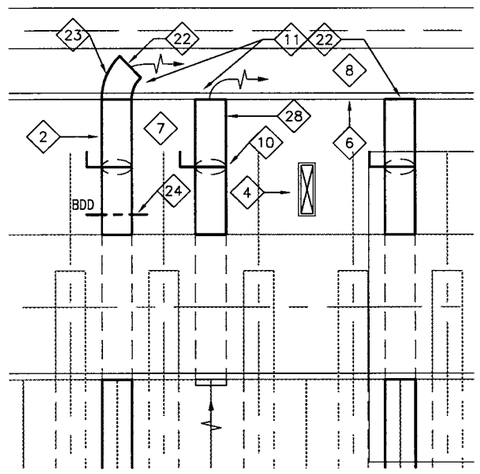
1:25 0 .25 .5 1.0 2.5

ALL DUCTWORK/PIPING/EQUIPMENT SHALL BE INSTALLED PER THE OHIO VERSION OF THE 1996 BOCA CODE. THE FT. WASHINGTON WAY BUSWAY TUNNEL IS CLASSIFIED AS AN A3 OCCUPANCY THAT MUST COMPLY WITH SEISMIC HAZARD EXPOSURE GROUP II CRITERIA.



3/10 TYPICAL SUPPLY AIR DETAIL

1:25 0 .25 .5 1.0 2.5

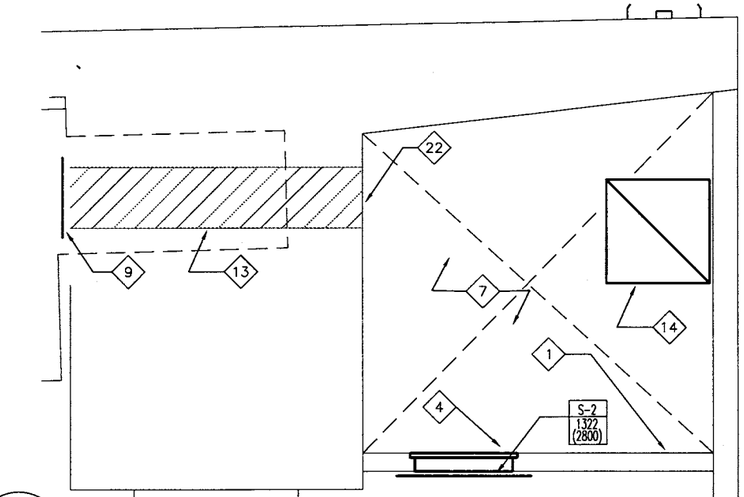


4/10 EXHAUST AIR PLENUM CONNECTION DETAIL

1:50 0 .5 1 2 5

KEYED NOTES THIS SHEET ONLY

1. MECHANICAL FLOOR SLAB, SEE STRUCTURAL.
2. 508(20)ø EXHAUST AIR TRANSFER DUCT. SLOPE DUCT AS REQUIRED TO ACCOMODATE ROADWAY STRUCTURE. ALL DUCTWORK SHALL REMAIN ABOVE THE BOTTOM OF THE ROADWAY BEAM.
3. HIGH CENTER EXHAUST CONNECTED TO 508(20)ø TRANSFER DUCT. ATTACH DUCT TO STRUCTURE WITH DRY POWDER CONCRETE ANCHORS.
4. SUPPLY AIR FLOOR GRATE SIZE AND CONFIGURATION EQUAL TO DUCTED CONFIGURATION, SEE SHEET #9.
5. EXHAUST AIR FLOOR GRATE SIZE AND CONFIGURATION EQUAL TO DUCTED CONFIGURATION, SEE SHEET #9.
6. SUPPLY/EXHAUST AIR ZONE BARRIER WALL.
7. SUPPLY AIR PLENUM
8. EXHAUST AIR PLENUM
9. SHEET METAL BLANK-OFF CONNECTED TO 508(20)ø METAL AIR SLEEVE. PROVIDE WELDED STEEL ANGLE IRON FRAME. ATTACH TO STRUCTURE WITH DRY POWDER CONCRETE ANCHORS.



5/10 TYPICAL SUPPLY AIR – WITHOUT ARCHITECTURAL CEILING

1:25 0 .25 .5 1.0 2.5

KEYED NOTES CONTINUED THIS SHEET ONLY

10. PROVIDE AND INSTALL MANUAL BALANCING DAMPERS FOR ALL DUCTS AS INDICATED ON PLANS, SEE SHEETS #2 THRU #5.
11. CONTRACTOR SHALL COORDINATE ZONE BARRIER WALL PENETRATIONS WITH ZONE BARRIER WALL MANUFACTURER.
12. PROVIDE FLANGED DUCT CONNECTION FOR ATTACHMENT TO STRUCTURE AND / OR ZONE BARRIER WALL. ATTACH TO BRIDGE STRUCTURE WITH POWDER DRIVEN STUDS. PROVIDE FLANGED CONNECTION AT ZONE BARRIER WALL. SEAL AIR TIGHT AT BOTH CONNECITONS.
13. STRUCTURAL AIR SLEEVE PROVIDED BY OTHERS.
14. 864 X 864 (34 X 34) SOUTH TUNNEL EXHAUST.
15. COLUMN SLEEVE AND CAP TO BE PROVIDED BY OTHERS.
16. PLENUM BOX AND DIFFUSER COMBINATION SHALL BE MOUNTED THROUGH ARCHITECTURAL CEILING SYSTEM. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION TO ENSURE PROPER INSTALLATION.
17. CONTRACTOR SHALL PROVIDE SOUND TEST RESULTS ON THE STRUCTURAL AIR SLEEVES. TESTS RESULTS SHALL BE PROVIDED FOR EACH AIRFLOW PASSING THROUGH THE TUBES AS INDICATED WITHIN THIS DESIGN PACKAGE. RESULTS SHALL BE PROVIDED IN dB FOR EACH OF THE FOLLOWING OCTAVE BAND CENTER FREQUENCIES (8 Hz, 16 Hz, 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 8000 Hz).
18. LOCATE EXHAUST AIR FLOOR GRATE TO SOUTH SIDE OF EXHAUST AIR PLENUM PROVIDING CLEARANCE FOR PUMP HOUSE EXHAUST DUCT.
19. ALL WELDED 661 X 559 (26 X 22) STAINLESS STEEL PUMP HOUSE EXHAUST DUCTWORK. LOCATE DUCT TIGHT TO BOTTOM OF MECHANICAL FLOOR DECK.
20. EXISTING 1015 X 508 (40 X 20) PUMP HOUSE EXHAUST
21. EXISTING 860 X 660 (34 X 26) PUMP HOUSE SUPPLY
22. SHOP FABRICATE TRANSFER AIR GRILL FROM 13(.5) BIRD SCREEN WELDED TO STEEL ANGLE IRON FRAME. ATTTACH TO BRIDGE STRUCTURE WITH POWDER DRIVEN STUDS OR FASTEN TO ZONE BARRIER WALL IN COMPLIANCE WITH ZONE BARRIER WALL MANUFACTURER.
23. PROVIDE AND INSTALL 45°, R=1.5, ELBOW FOR ALL EXHAUST TRANSFER AIR DUCTS, TOTAL OF 12 PER BLOCK (48 TOTAL).
24. PROVIDE AND INSTALL BACKDRAFT DAMPER FOR ALL EXHAUST TRANSFER AIR DUCTS, TOTAL OF 12 PER BLOCK (48 TOTAL).
25. PROVIDE FLEX DUCTWORK FROM SUPPLY AIR DUCT TO SUPPLY AIR DIFFUSER CONNECTION. SEE THIS SHEET AND SHEET #11 FOR TYPICAL SUPPLY AIR DUCTWORK DETAILS.
26. COLUMN EXHAUST BEYOND
27. EXHAUST TRANSFER DUCT
28. 508(20)ø BUSWAY EXHAUST DUCT

DESIGN AGENCY
PARSONS BRINCKERHOFF, INC.
312 ELM STREET, SUITE 2500
CINCINNATI, OH 45202-2720

PREPARED	DRAWN	REVISED	DATE
SLV	GGD		2/22/00
CHECKED	REVIEWED	STRUCTURE FILE NUMBER	
KET	JDC	3103420	

Fort Washington Way
TRANSIT WAY MECHANICAL PARTIAL PLANS, SECTIONS, AND DETAILS

CITY OF CINCINNATI
CONTRACT NO.75X5753


usbank
GREAT AMERICAN
INSURANCE GROUP
Control room access hatch
Discharge Chamber, Do Not Enter
Pump room access hatch
Park in this hatched area
Google Earth


Elevator, East of Vine street
Pump room exhaust duct, up through exhaust shaft.
Exhaust grating for Tunnel exhaust
INSURANCE GROU
A


Vine St
EAST SOUTH NORTH NORTH
Pump room
exhaust duct
Access Hatches
Elevator
Exhaust shaft
louvered grating
Vine St & Second St E

Appendix A

MSA GasGuard XL Information

CALIBRATION REPORT

Company Name; Allied Technical Services INC. FWW Flood PS							Copy of calibration report to; Doug Sayre	
Worked with; Doug Sayer							Date Calibration Performed; 03-13-20	Calibrated By; Kevin Raitz
Sensor Type	MFG Date	Location	As Found		As Left		Comments	
			Zero	Span	Zero	Span		
LEL	20	LEL#1	0	48	0	50	Alarms set at A1 15 LEL, A2 25 LEL	
LEL	20	LEL #2	0	49	0	50	Alarms set at A1 15 LEL, A2 25 LEL	
O2	20	Oxygen	0	21.0	0	20.8	Alarms set at A1 19.5 %, A2 25. 0%	
CO	20	CO	7	63	0	60	Alarms set at A1 15 ppm, Alarm 2 25 ppm	

Precision Sales & Instrumentation INC,
Ph: 513-282-8737
Fax: 513-725-2420
www.psireps.com
kevin.raitz@psireps.com

Kevin Raitz

GasGard® XL
Wall Mount Controller

Operating Manual

In North America, to contact your nearest stocking location, dial toll-free 1-800-MSA-INST
To contact MSA International, dial 1-412-967-3354

This manual is available on the internet at www.msanet.com

Manufactured by

MSA NORTH AMERICA

P.O. Box 427, Pittsburgh, Pennsylvania 15230

(L) Y Rev 0 **10091922**

⚠ WARNING

THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR USING OR SERVICING THE PRODUCT. Like any piece of complex equipment, this instrument will perform as designed only if it is used and serviced in accordance with the manufacturer's instructions. OTHERWISE, IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUSTAIN SEVERE PERSONAL INJURY OR DEATH.

The warranties made by Mine Safety Appliances Company with respect to the product are voided if the product is not used and serviced in accordance with the instructions in this manual. Please protect yourself and others by following them. We encourage our customers to write or call regarding this equipment prior to use or for any additional information relative to use or repairs.

MSA Permanent Instrument Warranty

1. **Warranty-** Seller warrants that this product will be free from mechanical defect or faulty workmanship for a period of 18 months from date of shipment, or one year from installation, whichever occurs first, provided it is maintained and used in accordance with Seller's instructions and/or recommendations. This warranty does not apply to expendable or consumable parts whose normal life expectancy is less than one year such as, but not limited to, non-rechargeable batteries, filament units, filter, lamps, fuses etc. The Seller shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning the goods sold under this contract. Seller makes no warranty concerning components or accessories not manufactured by the Seller, but will pass on to the Purchaser all warranties of manufacturers of such components.
   THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANT ABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.
2. **Exclusive Remedy-** It is expressly agreed that Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of Seller, or for any other cause of action, shall be the repair and/or replacement at Seller's option, of any equipment or parts thereof, which after examination by Seller is proven to be defective. Replacement equipment and/or parts will be provided at no cost to Purchaser, F.O.B. Seller's Plant. Failure of Seller to successfully repair any non-conforming product shall not cause the remedy established hereby to fail of its essential purpose.
3. **Exclusion of Consequential Damage-** Purchaser specifically understands and agrees that under no circumstances will seller be liable to purchaser for economic, special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of non-operation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

Table of Contents

Chapter 1,
Product Introduction

Correct Use

The GasGard XL Wall Mount Controller is a compact control unit that:

- connects with up to eight active combustible, toxic and/or oxygen sensors
- is used to monitor indoor industrial locations for the presence of combustible, explosive, toxic gases or air/vapor mixtures and oxygen content
- provides power to the sensors, signal conditioning and display of measured gas concentrations, alarm thresholds, outputs for alarm devices and self monitoring diagnostics
- is suitable for many applications and industrial areas
- provides simple installation, easy editing and copying functions
- is ideal for smaller, independent gas warning systems.

The user must carefully read and observe:

- this operating manual, particularly, the safety, use and operating instructions
- the national regulations applicable in the user's country, including requirements specific to explosive risk approval.

Use or alterations outside these instructions is considered as non-compliance.

⚠ WARNING

This product is supporting life and health. Incorrect use, maintenance or servicing can affect its function and seriously compromise the user's life. When turned ON for the first time, the controller performs a self-check. Do Not use the monitor if it fails the self-check, which is indicated by a failure light. Do Not use the monitor if it is damaged, improper servicing/maintenance has been performed, or if genuine MSA spare parts have not been used.

Chapter 2, Description

General Overview

The general-purpose control system enables:

- Combustible gas monitoring
  - for protecting operational plants and workers by monitoring atmospheres for potentially explosive gases/vapors in air before they reach the lower explosion limit and by activating alarms and initiating risk aversion measures.
- Oxygen monitoring
  - for protecting individuals by monitoring the atmosphere for oxygen deficiency or oxygen enrichment.
- Toxic gas monitoring
  - for protecting individuals by continuously monitoring the atmosphere for toxic gas concentrations.

NOTE: An alarm activates if set limit values are reached (e.g. minimum/ maximum concentration in the atmosphere).

Typical applications are:

- Chemical and petrochemical industry
- Paint and solvent industry
- Gas-processing industry
- Municipal areas.

Control Unit

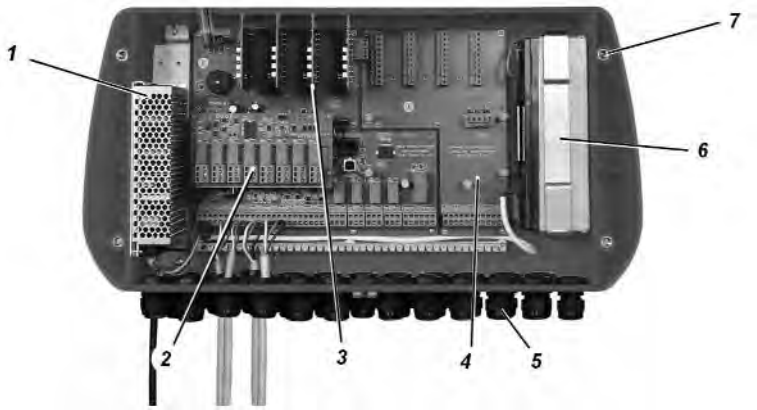


Figure 2-1. Enclosure

1	Power Supply	5	Cable entries
2	Channel Relay Board	6	Backup Battery
3	Channel Board	7	Enclosure with mounting holes
4	Sensor Extension Board		

Wall Mount Enclosure

The Control Unit:

- is housed in an ABS enclosure in accordance with IP 56 and NEMA 4X
- dimensions are 515 mm x 277 mm x 129 mm (20 x 11 x 5 inches)
- cable entry points are not provided, but are are predesigned on the bottom of the enclosure (0.75" or M20)
- front panel is molded with predesigned holes for fully equipped configuration (eight channels)
- is mounted by four screws (1/4 - 20 or M6).

Power Supply

- The 100 W power supply accepts main AC and DC power.
- In case of loss of main power, the power supply automatically switches to backup battery.
- Power source for detector is 24 VDC.

Backup Battery

Two batteries in series (12 VDC/2.2 Ah lead acid) can be used in the Control Unit as an option. The batteries supply 20 minutes of backup for eight catalytic combustible sensors.

To activate battery backup, the pc software must be configured. Go to Settings, Service Function, Device Settings. Check the Battery Backup box to activate, save and then download settings to the Control Unit.

Do not use primary non-rechargeable batteries.

Operation under back-up power is indicated by the Power LED blinking on the front panel.

Main Board

The Main board microcontroller includes:

- watchdog
- internal buzzer (85 dB)
- standard common outputs
- battery charger circuit.

All necessary information is stored on the Main board.

The following communications are possible:

- 1 Ethernet configurable for ModBus TCP/IP (galvanically isolated)
- 1 RS485 configurable for ModBus RTU (galvanically isolated)
- 1 USB configurable for ModBus RTU.

  NOTE: Communication doesn’t interfere with operation of the Control Unit.

- For SCADA visualization software, all three interfaces can be used.
- For service access, as a safety precaution, only the two ModBus RTU communications can be used.

Standard common outputs are incorporated:

- two SPDT (Single Pole Double Throw) relays common alarm (ALARM 1 and ALARM 2)
- one DPDT (Double Pole Double Throw) relay common fault
- two addressable common horn relays.

Display Board

The Display board, located on the back side of the lid, includes:

- microcontroller
- watchdog
- push buttons
- graphic display (128x64).

Sensor Extension Board

The sensor extension board is used to:

- attach channel boards
- connect internal communication.

NOTE: See Chapter 3, "Sensor Connection".

Channel Board

The channel boards are set to communicate with 4-20 mA transmitters.

Every board:

- includes four LEDs (A1, A2, Status, Power)
- attaches to the Channel connectors (four on the Main board, four on the Sensor Extension board).

Sensor power and connection is designed as "fail-safe" (wrong connection/configuration does not damage the remote sensor).

Channel Relay Board

Every Channel Relay board:

- provides eight output relays
- is connected to the Main board or Sensor Extension board (one by one) via connectors.

Relays are fully user-configurable from the front panel or connected PC via configuration software.

Two optional SPDT (Single Pole Double Throw) relays per channel (eight relays per four channels) are configurable for individual alarms:

- Normally open/closed
- Normally energized/de-energized
- Latching/non latching
- Increasing/decreasing
- N out of m voting
- Grouping

  NOTE: Contacts are resistive load.

Front Panel

The Front Panel enables communication with the Control Unit and is used to:

- monitor the status of all connected field sensors
- determine system settings
- configure all settings.

Figure 2-2. Front Panel

1	Common LEDs	4	Alarm Acknowledgement
2	Alarm Reset	5	Graphic Display
3	Control Push Buttons	6	Channel Status Info LEDs

Graphic Display

The Control Unit has a large, 128 x 64 pixel graphic display which shows information for all channels. See Chapter 4 for symbol explanation.

Figure 2-3.Graphic Display

Control Push Buttons

Using the control push buttons, the user can operate the menu prompt as shown below. For more information, see Chapter 4.

Right button [↵]

Up Button [↑]

Left button [ESC]

Down button [↓]

Alarm Acknowledgement

Alarm Reset

Channel Status Info LEDs

Each of the eight Control Channels has four LEDs for monitoring unit operating status.

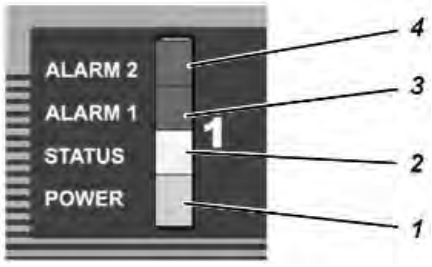


Figure 2-4. Channel Status Info LEDs

1. The green Power LED:
   Channel is powered and enabled by the system.
2. The yellow Status LED:
   Channel is in a fault condition.
   - Blinking LED (0.5 Hz):
     Channel is disabled.
3. The red Alarm 1 LED:
   First alarm level is reached. It further indicates the specific status:
   - 4 Hz blinking:
     First alarm level is reached, but not yet acknowledged
   - Steady:
     First alarm level is acknowledged, but still inside alarm range
   - 0.5 Hz blinking:
     First alarm is configured as latching. Measured value is out of alarm level and not yet reset.
4. The red Alarm 2 LED:
   Second alarm level is reached. It further indicates specific status:
   - 4 Hz blinking:
     Second alarm level is reached, but not yet acknowledged
   - Steady:
     Second alarm is acknowledged, but still inside alarm range
   - 0.5 Hz blinking:
     Second alarm is configured as latching. Measured value is out of alarm level and not yet reset.

Unit Status Info LEDs

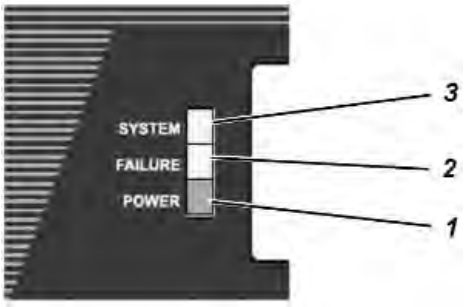


Figure 2-5. Unit Status Info LEDs

1. Green Power LED:
   Control Unit is powered.
   - Blinking LED:
     battery power supply.
2. Yellow Failure LED:
   Sensor is in fault condition.
3. Yellow System LED:
   Control Unit has a system fault.

Chapter 3, Installation

NOTE: Reference shipping documents and carton label to check that delivered components are correct before installation.

- The installation location for the Control Unit must be outside the potentially explosive area and free of corrosive gases.
- Sensors for use in the potentially explosive area must have the appropriate approval and be installed in accordance with all relevant local and national regulations.
- The gas warning system must be installed by qualified personnel after reading the supplied documentation.
- All relevant local and national regulations and instructions must be observed.

Mechanical Installation

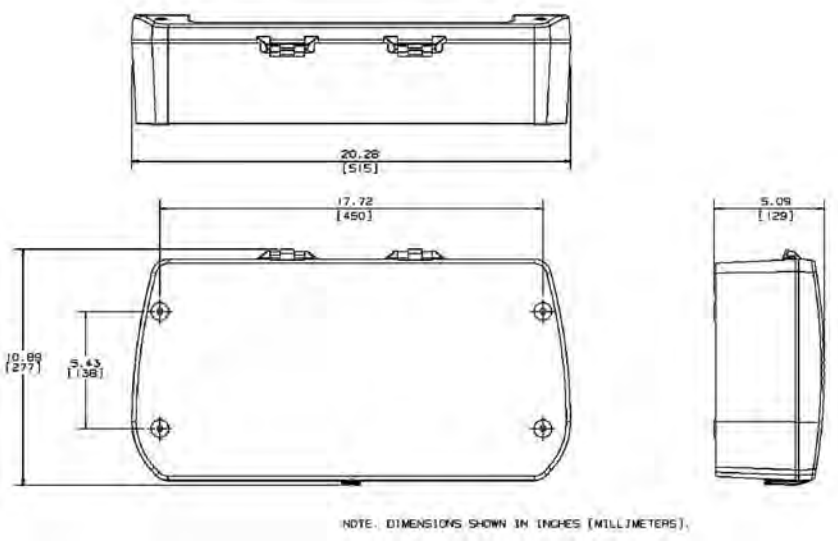


Figure 3-1. Mounting Drawing [dimensions in inches (mm)]

Mount the Control Unit as follows:

1. Mark holes for the four fixing screws as shown in FIGURE 3-1.
2. Drill four holes of appropriate diameter for the wall plugs.
3. Lift the front panel from the enclosure.
4. Attach the unit to the wall with the appropriate screws.
5. Return the lid to the resting position.

Electrical Installation

⚠ CAUTION

The control system must be installed in compliance with applicable regulations; otherwise, an unsafe condition may exist.

During installation, use the internal earth connection to ground the instruments.

If an external earth connection is permitted or demanded by the local authorities, it serves merely as additional earthing.

- Select an installation location that complies with the environmental conditions indicated in the technical data.
- When installing the Control Unit, the following conditions must be met to comply with the European EMC Directive
  - A fault-free ground or fault-free potential bonding conductor must be provided when connecting devices to the main power supply.
  - Ensure an appropriate supply voltage in accordance with EMC directives.
  - If the devices are supplied from a direct voltage (DC) source, the supply cable must be shielded.
  - All sensor and control cables must be shielded.
    - Shielded cables must have at least 80% coverage.
  - Control and sensor cables must be installed physically separate from power supply cables.
  - Shielded cables must be laid in a group. If cable lengths are to be extended using terminal boxes, the boxes must be shielded and internal connections must be kept as short as possible.
  - The control system can be simultaneously connected to AC voltage and 24 VDC (to enable an automatic power switch to 24 VDC voltage if the AC main supply fails).

Power Supply

- Standard power supply 110-230 VAC/24 VDC (100 W) is used to power internal circuits and attached sensors.
- A switch or circuit-breaker shall be included in the building installation in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.
- Main voltage is connected to terminal L (Line), N (Neutral), and ground.

Figure 3-2. Connecting the Main Supply

Sensor Connection

- The sensor must be connected to the terminals on the Main board or Sensor Extension board (See Appendices C and D for details).

⚠ CAUTION

Follow the instructions for components subject to damage from static electricity!

- Incorrect connection of the sensors will not damage the Control Unit or the sensor.
- The wiring diagrams for different sensors are shown in Appendix B. The sensors must be connected to the terminals using shielded cables.
- For the number of wires and the maximum cable length for each sensor type, refer to the specific sensor operating manual.

Chapter 4, Operation

The integrated operation/display unit:

- is the control system user interface
- displays alarms, warnings, and system parameters.
    - Connecting the operating unit to a PC enables a user-friendly operator interface.
    - Input fields are set up as selection fields as much as possible, with all known inputs displayed. Selection is cursor-controlled for easy display unit use.

Basic Screen

The basic screen displays information about active channel status (active, inhibit, and in service) including information about the system (system date and time).

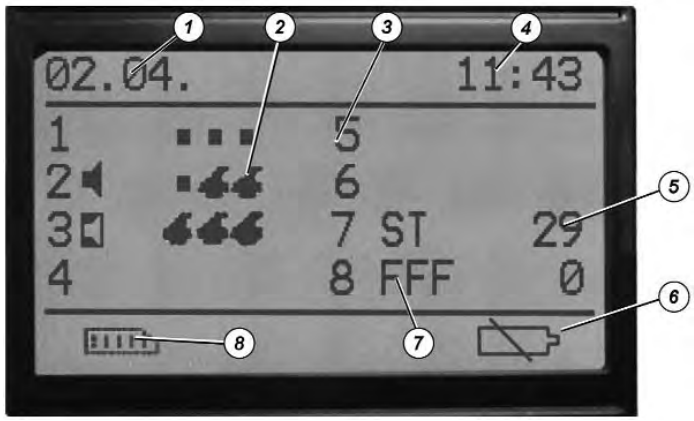


Figure 4-1. Basic Screen

1	System Date	5	Actual Value
2	FlameGard Status	6	Battery Status
3	Channel Number	7	Status Information
4	System Time	8	Events Archive

- **System Date and Time:**
  Actual preset values for events archive (default is DD/MM)
- **Channel Number:**
  Position of the channel board [counted from left to the right on the Main board (1 … 4) and the Sensor Extension board (5 … 8)].
- **Status Information:**
  Information about channel status (alarm, fault, in service, etc.; see symbols)
- **Actual Value:**
  Measured value of gas concentration.
- **Events Archive:**
  Last 700 events (alarms, alarm acknowledgement and reset, faults, calibrations, etc.) are stored in memory and can be user-restored.

Status Info Symbols

Alarm 1:
Displays if alarm level is reached

Alarm 2:
Displays if alarm level is reached

Overrange:
Displays if channel signal is above the range (more than 105 % of full scale).

Underrange:
Displays if channel signal is below the range (less than -5 % of full scale)

Sensor Fault:
Displays if a sensor connection is broken or shorted or if signal falls below -10% of full scale

Internal Channel Fault:
Displays if Channel board has a system fault

In Service:
Displays if channel is in service mode (calibration)

Inhibit:
Displays if channel is inhibited

STEL Alarm:
Displays if STEL alarm is reached

TWA Alarm:
Displays if TWA alarm is reached

Battery included and fully charged

Battery included but discharged
(Symbol starts blinking if battery cable disconnected)

Battery not included

- If FlameGard is connected to the mA Channel board, the basic screen contains additional symbols for FlameGard status:

FlameGard Detector is connected – No Flame

Warning - FlameGard Detector is in the first alarm condition

Alarm - FlameGard Detector is in second alarm condition

- The channel where an alarm condition is reached first is identified by blinking value.

Controls

Located on the front panel are four control push buttons for Control Unit operation and configuration.

SYMBOL		PRESS BUTTON TO CAUSE UNIT TO:
	**ENTER:**	enter a lower menu or accept the change
	**UP:**	change values/options
	**DOWN:**	advance the cursor to the next position
	**ESCAPE:**	exit the upper menu or cancel the change
	**ACKNOWLEDGEMENT:**	disable the audible signal when alarm occurs
	**RESET:**	reset alarm relays to normal operating conditions when a measured value drops below the latching alarm level

Using the Hotkeys

Pressing some of the front panel control push buttons for a longer period accesses some additional basic screen features.

UP:
Pressing button for five seconds changes the language from English to one of 10 local languages and back

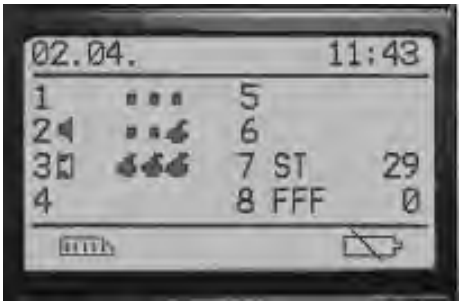
ESCAPE:
Pressing button for five seconds starts the GasGard XL Selftest Process, testing the:

- LCD display
- LEDs
- internal buzzer.

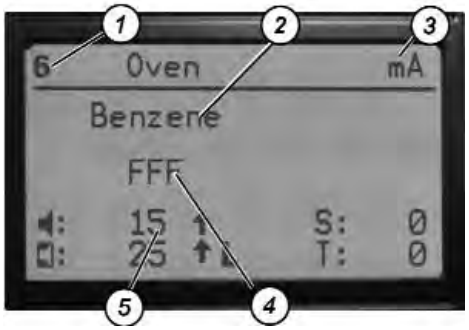
After the selftest, the firmware version of all assigned boards displays:

- C1 …C8 - Channel boards
- R1 … R2 - Relay boards
- D- Display board
- M – Main board.

Viewing Channel Information



1. Viewing the Basic Screen, press [ENTER].
2. Select the channel by pressing [DOWN]
3. Press [ENTER] to confirm.



The next screen (above) shows channel information as:	
1 - Channel number	4 - Measured gas value and unit or channel state
2 - Measured gas	5 - Preset alarm levels
3 - Active Channel Symbol	

NOTE: To change gas type, unit of measure or alarm levels, see the Quick Startup Guide (P/N 10095757) or Chapter 6.

Viewing Events Archive

1. Viewing the Basic Screen, press [ENTER].
2. Select the Event Archive button by pressing [DOWN]
3. Press [ENTER] to confirm.

The next screen (above) shows channel information as:

1 - Event Date	3 - Channel Identification
2 -Event Time	4 - Event Description

4. Scroll the Events Archive by pressing [DOWN] or [UP].

List of Assigned Events

00	Device Turned On	27	Master Calibration Saved
01	Communication OFF	28	New Calibration Saved
02	Communication ON	29	Coil Relay 1 FAULT
03	Board Reset	30	Coil Relay 2 FAULT
04	Alarm1 ON	31	Coil Relay 3 FAULT
05	Alarm1 OFF	32	Coil Relay 4 FAULT
06	Alarm1 Acknowledgement	33	Coil Relay 5 FAULT
07	Alarm1 Reset	34	Coil Relay 6 FAULT
08	Alarm2 ON	35	Coil Relay 7 FAULT
09	Alarm2 OFF	36	Coil Relay 8 FAULT
10	Alarm2 Acknowledgement	37	Main Power Supply OFF
11	Alarm2 Reset	38	Main Power Supply N
12	UnderRange	39	Low Battery
13	OverRange	40	Battery FAULT
14	STEL alarm ON	41	Common Coil Relay Horn2 FAULT
15	STEL alarm OFF	42	Common Coil Relay Horn1 FAULT
16	STEL alarm Acknowledgement	43	Common Coil Relay Alarm2 FAULT
17	TWA alarm ON	44	Common Coil Relay Alarm1 FAULT
18	TWA alarm OFF	45	Common Coil Relay Fault FAULT
19	TWA alarm Acknowledgement	46	RAM Check FAULT
20	Sensor FAULT	47	ROM Check FAULT
21	System FAULT	48	System Password entered
22	Start of Calibration	49	Calibration Password entered
23	ZG accepted	50	Read FAULT
24	SG accepted	51	Write FAULT
25	FAULT of ZG result		
26	FAULT of SG result		

Chapter 5, Configuration

All GasGard XL Control Unit parameters can be configured by using:

- front panel control push buttons
- configuration software tool (see Chapter 6).

Two menus allow the user to change unit parameters:

(1) System Menu

The System menu:

- enables the user to change any parameter needed for application requirements
- is accessible only by an access password.

From the System menu, the user can enter additional Control Unit set-up menus:

- Relay Setting menu (to set up individual relay parameters)
- Calibration menu (to calibrate all channels)
- General Setting menu (to set up general unit parameters).

(2) Calibration Menu

The channel boards are configured to accept 4-20 mA input signals from two-wire or three-wire remote transmitters. The controller does not require any calibration.

NOTE: There are different passwords for the System menu and Calibration menu. Passwords can be set in the General Setting menu.

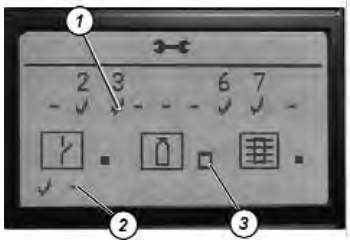
System Menu

The System menu allows full unit configuration:

- Modifying channel parameters
- Setting output relays (Relays Setting menu)
- Calibration (Calibration menu)
- General settings (General setting menu).

1. Simultaneously Press [ENTER] and [ESCAPE] and hold for one second.
   - User is prompted to enter the password.

   - Access Password is any number from 1 to 9999.
   - The factory password preset value is 123.
2. Use [UP]; [DOWN] and [ENTER] to enter the password.
3. Press [ENTER] to confirm the password.
   - If password is valid, the System menu screen appears.



The System menu screen (above) displays:

1 - Channel Board Identification Mark
2 - Relay Board Identification Mark
3 - Setting Icons

1. Channel Number

If selected, the Channel Number allows user to set channel parameters.

NOTE: The Channel board Identification Mark must be selected by user to confirm that a channel board is inserted in the slot.

2. Relay Board Identification Mark

The Relay board Identification Mark must be selected by the user to confirm that a channel relay board is inserted in the slot:

- Left mark is for the first board (connected to the Main board), counting from the left
- Right mark is for the second board (connected to the Sensor Extension board), counting from the left).

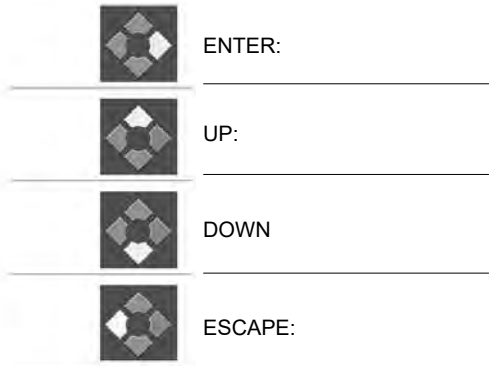
3. Setting Icons

Marking icons enable the user to enter an additional submenu:


Relays setting menu (individual relays modification menu; see Chapter 5, "Modifying Channel Parameters").


Calibration menu (channel calibration; see Chapter 5, "Calibration")


General setting menu (general parameters setting; see Chapter 5, "General Setting Menu")



1. Use control push buttons to select an item to set.
2. Press [ENTER] to confirm the selected item.

   NOTE: A selected setting item is inverse and non-blinking.

   NOTE: Pressing [ESCAPE] exits the System menu.

3. Use control push buttons to:

 - Accept changes and leave menu

 - Do not accept changes and leave menu

 - Return to the System menu.

Description of Channel Parameters

1. Enter the System menu (see Chapter 5, "System menu").
2. Use the control push buttons to select a channel number to modify.
3. Press [ENTER] to confirm.
   - The first of two configuration screens appears:

Inhibit: Marking inhibits the channel

ATEX: Marking presets alarm and relay conditions according to ATEX 94/9 requirements

Range: Defines measuring range and units

Sensor: Specifies sensor head to be connected

MG: Defines measuring gas

 Alarm 1 value threshold and

Alarm 2 value threshold
(Default value in ATEX version)

 Rising value will activate alarm

 Falling value will activate alarm

 Alarm is automatically deactivated

 Alarm is latched until acknowledgement by [RESET].

NOTE: Use [DOWN] to toggle between the two screens.

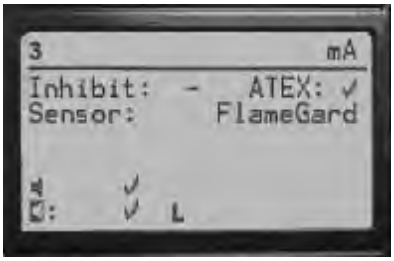
- The second screen displays:

Delay: Time delay for alarm activating (0 – 180 seconds); In ATEX version default value is “0”.

Hysteresis: Defines Alarm 1 and Alarm 2 hysteresis (from 0 to ±2.0 % full scale).

Dead Band: Defines zero baseline (from 0 to ±5.0 % full scale). Default is ±2.0 %.

- If FlameGard is selected from the sensor list, the setting menu changes to the following screen. (The second screen contains only the "Delay" parameter.)



4. Use the control push buttons the set the following:

- Accept changes and leave menu
- Do not accept changes and leave menu
- Return to the System menu.

Modifying Channel Parameters

1. Enter into System menu (see Chapter 5, "System Menu").
2. Use control push buttons to select a channel number to modify and press [ENTER] to confirm.
   - First of configuration screens appear (left figure).

   NOTE: Use [DOWN] to toggle between the two screens:

3. Use control push buttons to select required parameter.


Right (ENTER) button [↵]


Up Button [↑]


Left button [ESC]


Down button [↓]

4. Press [ENTER] to confirm the selected parameter.

5. Use the control push buttons to change parameter value.
6. Press [ENTER] to accept the changes.

   NOTE: Pressing [ESCAPE] toggles to the upper menu.

- If FlameGard is selected from the sensor list, the Setting menu changes to the following single screen:

7. Use the control push buttons to set:

   - Accept changes and leave menu

   - Do not accept changes and leave menu

   - Return to the System menu.

Relay Setting Menu

The Relay Setting menu enables the user to configure each relay in relation to each channel.

Description of Relay Parameters

1. Enter into the System menu.
2. In the System menu, select the item for “Relay Setting Menu” and press [ENTER] to confirm (see Chapter 5, "System Menu").

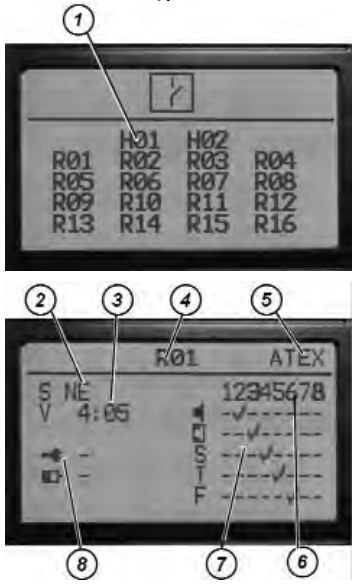
Right (ENTER) button [↵]

Up Button [↑]

Left button [ESC]

Down button [↓]

- The first of two configuration screens appears:



(1) Horn Relay Number (H01-H02):
Position of the horn relay on the Main board

(2) Relay Status:
Defines contacts position in de-energized status
NE - normally energized
ND - normally de-energized

(3) Relays Voting (V):
Allows user to set the voting of the selected relays

(4) Relay Number (R01-R16):
1 - 8 (Channel Relay board No. 1)
9 - 16 (Channel Relay board No. 2)

(5) ATEX Status:
Defines the selected relay is related to the channel being configured according to ATEX regulation. ATEX channels are displayed in bold numbers on the screen. Some relay parameters are limited [e.g., user can only set the normally energized (S: NE) selection]

(6) Channel Number:
Relates the relay to the selected channel
(bold number indicates channel is configured according to ATEX regulation)

(7) Configuration Grid:
Setting the following items to the grid defines the status on the selected channel that activates the selected relay:

 - Alarm 1 is set

 - Alarm 2 is set

 - STEL alarm 2 is set

 - TWA alarm 2 is set

 - Fault is set

(8) Battery/Power Relay Control:
Sets the relay that is energized when:

 - Main power is OFF and Control Unit is battery powered

 - Low battery voltage

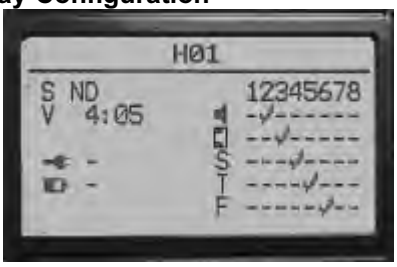
Relay is set using these symbols:

 - Not selected

 - Selected

NOTE: Use [DOWN] to toggle between the two screens.

Example of Relay Configuration

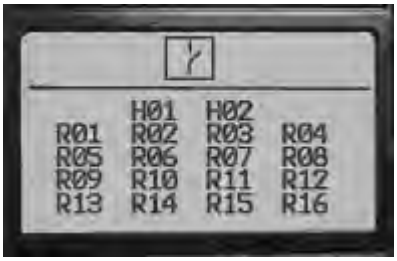


Relay HORN no. 1:

- is configured as normally de-energized (ND).
- is not activated if power is OFF or battery is depleted
- is voted if four out of five conditions are met and
- is energized if at least four of these conditions are met:
  - Channel 2 goes into alarm 1
  - Channel 3 goes into alarm 2
  - Channel 4 goes into STEL alarm
  - Channel 5 goes into TWA alarm
  - Channel 6 goes into FAULT.

Modifying Output Relays

1. Enter into the System menu.
2. From here, select "Relay Setting Menu" and press [ENTER] to confirm (see Chapter 5, "System Menu").
   - The first of the configuration screens appears.



NOTE: Use [DOWN] to toggle between the two screens.

3. Use control push buttons to select and change required parameter.


Right (ENTER) button [↵]


Up Button [↑]


Left button [ESC]


Down button [↓]

4. Press [ENTER] to accept the parameter changes.

   NOTE: Pressing [ESCAPE] returns unit to the upper menu.

5. Use control push buttons to:

    - Accept changes and leave menu

    - Do not accept changes and leave menu

    - Return to the System menu.

   NOTE: Common relays are not configurable. Their condition is set to the following fixed settings:

Fixed Setting for Common Relays

- Alarm 1 on any channel de-energizes common Alarm 1 relay on the Main board.
- Alarm 2 on any channel de-energizes common Alarm 2 relay on the Main board.
- Fault on any channel de-energizes Fault relay on the Main board.
- System fault de-energizes Fault relay on the Main board.

General Setting Menu

The General Setting menu allows the user to:

- configure access passwords for the system and Calibration menu
- set parameters.

1. Enter the System menu (see Chapter 5, "System Menu").
2. Use the control push buttons to select "General Setting Menu"; press [ENTER] to confirm.

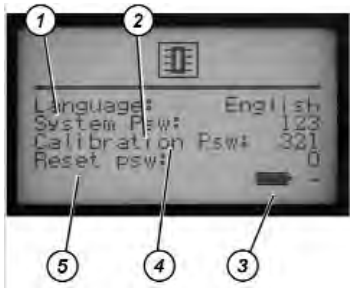
Right (ENTER) button [↵]

Up Button [↑]

Left button [ESC]

Down button [↓]

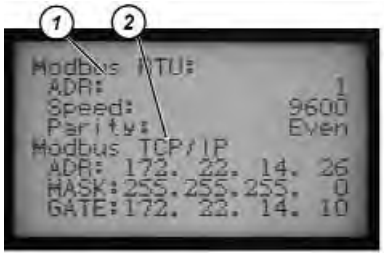
- The first configuration screen appears:



1 - Language:	Setting required language
2 - System Psw:	Setting system password (factory preset password is: 123)
3 - Battery Back Up:	Select if battery backup is used
4 - Calibration Psw:	Setting calibration password (factory preset password is: 321)
5 - RESET Psw:	Setting alarm reset password (factory preset password is: 0)

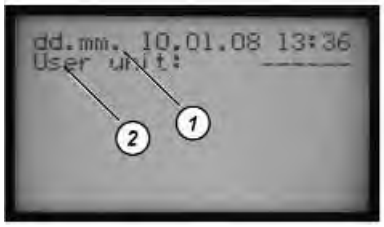
NOTE: Setting any above password to 0 disables the password.

NOTE: Use [DOWN] to toggle to the second screen.



1 -	**Modbus RTU:** Defines the RS 485 / USB communication parameters ADR – unit address Speed – communication speed Parity – setting the parity (Even/Odd)
2 -	**Modbus TCP / IP:** Defines the Ethernet communications parameters ADR – unit IP address MASK - subnetwork mask GATE - gateway

NOTE: Use [DOWN] to toggle to the second screen.



1 - Time/Date:	Define time or date format (dd.mm. or mm.dd) can be selected
2 - User Unit:	Define measuring units

3. Use control push buttons to select and change required parameter.
4. Press [ENTER] to accept the parameter changes.

   NOTE: Pressing [ESCAPE] toggles to the upper menu.

Right (ENTER) button [↵]

Up Button [↑]

Left button [ESC]

Down button [↓]

5. Use control push buttons to:

 - Accept changes and leave menu

 - Do not accept changes and leave menu

 - Return to the System menu.

Calibration

Calibration (4 - 20 mA)

Channel boards are configured to accept 4 - 20 mA input signals from two-wire or three-wire remote transmitters. The controller does not require any calibration.

During calibration of MSA's Ultima X Gas Monitors, the GasGard XL unit shows the following:

- For combustibles and toxics, if cal enable is ON, the 3.75 mA signal does not show a fault or underrange state on the GasGard XL unit. The display may show 0 or some negative value, depending on the Dead Band Around Zero setting.
- For oxygen, if cal enable is ON, the 21 mA signal causes the GasGard XL to go into an overrange status. As soon as the signal drops below 20.4 mA, the user must clear this state by pressing the RESET button.

Chapter 6,
Configuration Software

Installation and Start up

For software installation, copy the [GASGARD XL] folder from the installation disc into the user's own directory.

NOTE: To run this software, Java module must be installed on the user's computer.

To launch the application, run the file "run.bat" from the user's directory.

NOTE: For easy access, create a shortcut on the computer desktop.

Hardware Requirements:	PC, 512 MB RAM, CPU 1.5 GHz or higher
System Requirements:	Windows 2000, Windows XP
Software Requirements:	Java 6 SE or higher

Application

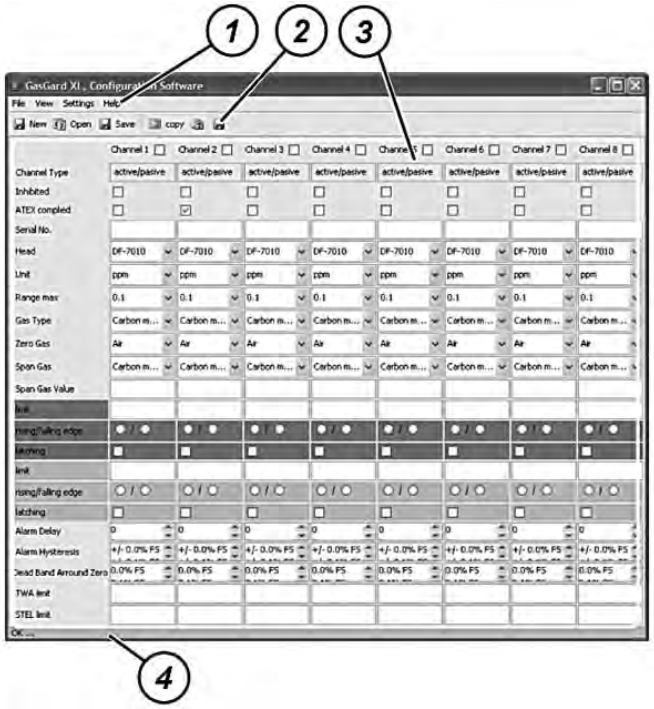


Figure 6-1. Main Applications Screen

The main Application screen contains four basic parts:	
1 - Menu Bar	3 - Main Screen
2 - Toolbar	4 - Status Bar

Menu Bar

The menu bar has four pull down menus for application functions:

- File
- View
- Settings
- Help.

File
From the File menu, the user can:
- send or receive a configuration to the device unit
- load or save a configuration to or from a file
- print
- exit the application

View
From the View menu, the user can switch between four basic screens and show or hide the toolbar and status bar.

NOTE: For easy access click on the toolbar icon to show a particular screen.

The user can select from the following options:
- Channels
- Outputs
- Calibration
- Logs

Settings
From the Settings menu, the user can select from:
- Connection Type option
- Service Function option.

This application allows communication with devices via serial or USB port. The user must select one port to use for communication.

The Service Function option enables the user to set:
- language
- device address
- IP address
- mask.

The window also shows firmware version information.

Help
The Help menu assists the operator in using the application.

Multilingual System

The Configuration software is multilingual; for individual languages, use the "lang.properties" configuration file.

For additional local language configuration software, contact MSA or an MSA representative.

Setting Up Channels

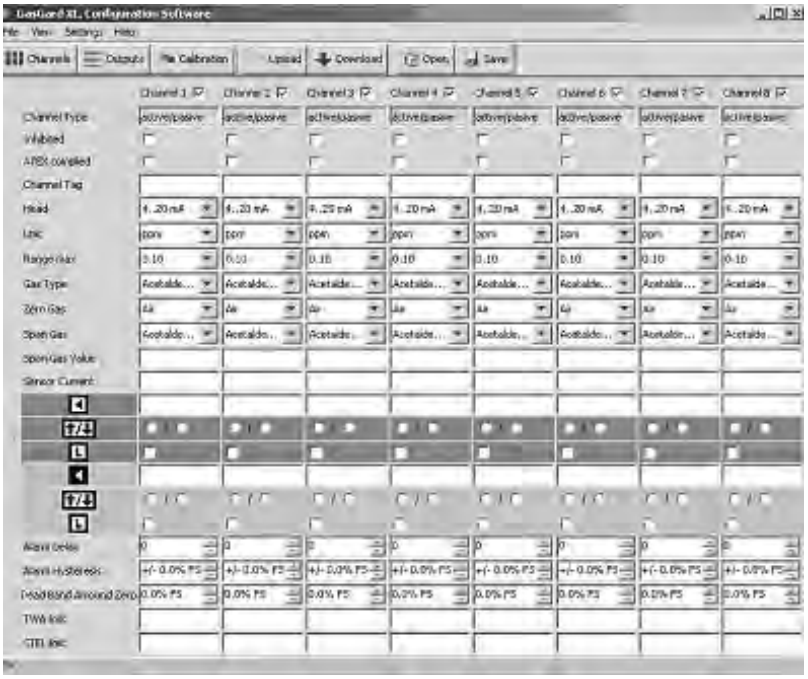


Figure 6-2. Setting up Channels

The window displays the status of all eight channels and allows configuration.

UPLOAD button:	Allows user to upload configuration from the GasGard XL unit
DOWNLOAD button:	Allows user to download configuration to the GasGard XL unit
OPEN Button:	Opens the GasGard XL configuration saved on the hard drive
SAVE button:	Saves the GasGard XL configuration to the hard drive

Setting Up Output Relays

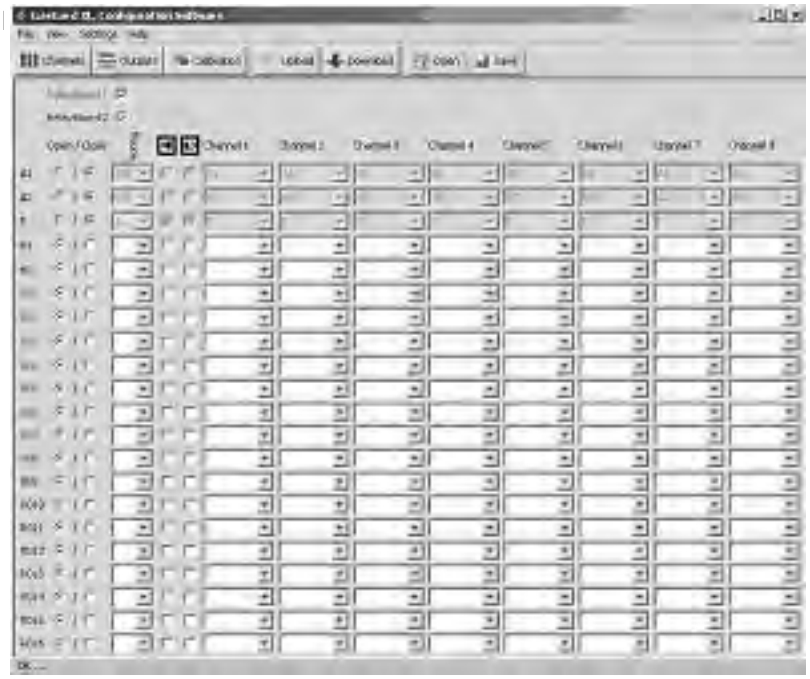


Figure 6-3. Setting up Output Relays

The window shows the outputs for the connected devices.

For each channel and each output relay, the user can select:

- Alarm 1
- Alarm 2
- STEL
- TWA or
- Fault.

For each selected channel, the drop-down menu enables voting selection. Voting can be set from 1:1 up to 42:42.

Chapter 7, Maintenance

- The Control Unit requires no special maintenance or cleaning, apart from verifying that it responds appropriately when performing sensor calibration checks.
- For SIL 2 (Safety Integrity Level) sensor applications, the calibration intervals must be reduced appropriately.
- Check the calibration of sensor(s) connected to the Control Unit according to your company's safety manager.

Table 7-1. Accessories and Spare Parts

DESCRIPTION	PART NO.
Sensor Extension Board (for channels 5 - 8)	10081676
Channel Relay Board	10081677
Channel Board 4 - 20 mA	10081674
GasGard XL, manual	10091922
EMC Filter (to be used with external. 24 VDC supply)	10081680
Back-up battery (2.2 Ah Kit)	10089924
Back-up battery	10093414
Display Board	10081679
Lid for housing with touch pad and gasket (w/o screws)	10081774
Flat ribbon cable (Main Board to Display Board)	10081775
Set of Lid fixing screws	10081909
Spare battery for Main Board	10031402
Main Board (channel 1 – 4)	10085436
Fuse 250 V	10089808
Spacers for relay channel board [set of 6]	10089913
Screw for Sensor Extension Board (need qty. 13)	10095004

Chapter 8, Technical Specifications and Certifications

Table 8-1. Technical Specifications

Power Supply	100 VAC - 240 VAC 50/60 Hz 2.5 A 100 W 24 VDC 4 A Main supply voltage fluctuations are not to exceed 10% of the nominal supply voltage
Sensor Power Supply	24 VDC
Connection Modes	2, 3 wires
Terminal Board	for copper wires up to 2.5 mm^2
Input Signals	4 – 20 mA
Output: Relay Contacts	5/6 A 240 VDC resistive
Alarm Thresholds	ALARM 1 (Warning) adjustable from 5 to 100% full scale (80% LEL for ATEX version) ALARM 2 (Alarm) adjustable from 5 to 100% full scale (80% LEL for ATEX version)
Electronic Speed of Response	< 1 sec to reach 100 % full scale
Span/Zero Drift	< ±0.5 % full scale ±1 digit/month
Accuracy/Repeatability	< ±1 % full scale ±1 digit
Operating Temperature	-10 to +50°C (14 to 122°F)
Storage Temperature	-20 to +75 °C (-4 to 167°F)
Ambient Humidity	0 to 90%, non condensing
Ingress Protection	IP 56, NEMA 4X
Dimensions (W x H x D)	515 x 277 x 129 mm (20 x 11 x 5 inches)
Weight	5 kg (7 kg with battery) [11 lbs. (15 lbs. with battery)]
Pollution Degree	2
Altitude	2000 m (6561 ft)
Installation Category	II

The GasGard XL Controller is for indoor use only.

Approvals

cCSAus Certification Mark

Ordinary Location to UL/CSA 61010-1

with performance to the controller portions of

CSA 22.2 No. 152 and ISA 12.13 standards.

Appendix A,
Sensor List

Table A-1.GasGard XL-compatible Sensors

4 – 20 mA TRANSMITTERS
FlameGard
SafEye
Standard 4-20 mA transmitter
ULTIMA X (2-wire)
ULTIMA X (3-wire)
ULTIMA X IR

Appendix B,
Wiring Diagrams

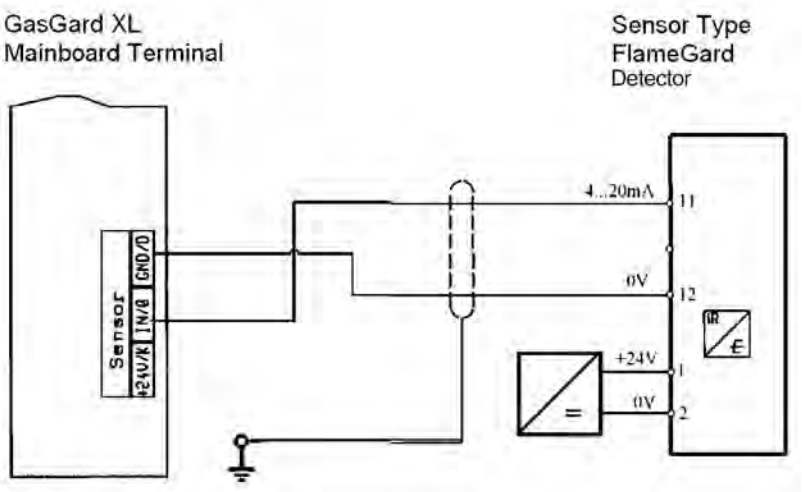


Figure B-1. Flamegard® Flame Detector

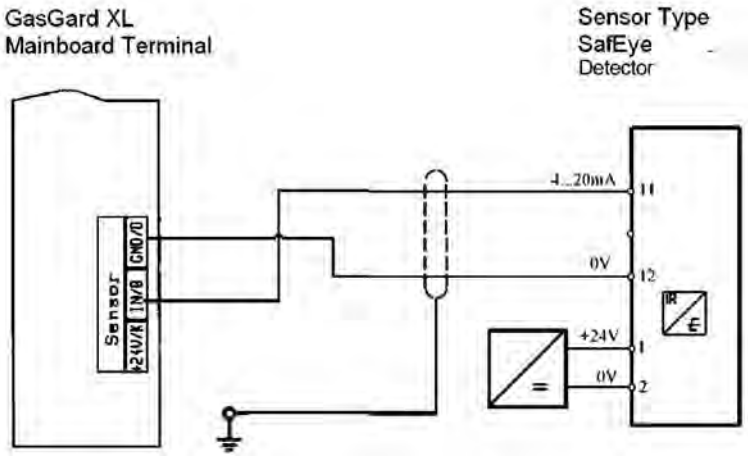


Figure B-2. SafEye® Open Path Gas Detector

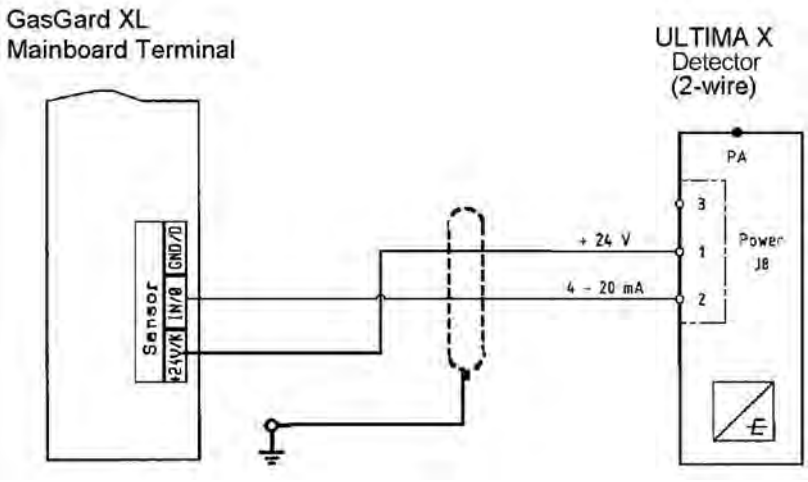


Figure B-3. Ultima® X (Two-wire)

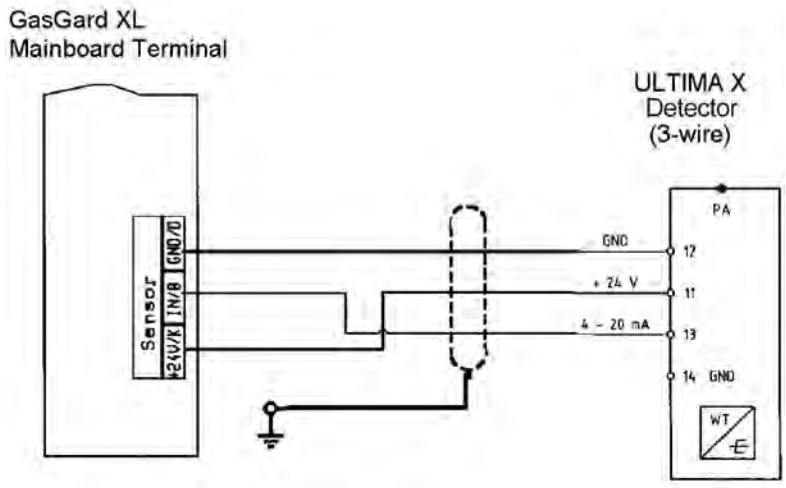


Figure B-4. Ultima X® (Three-wire)

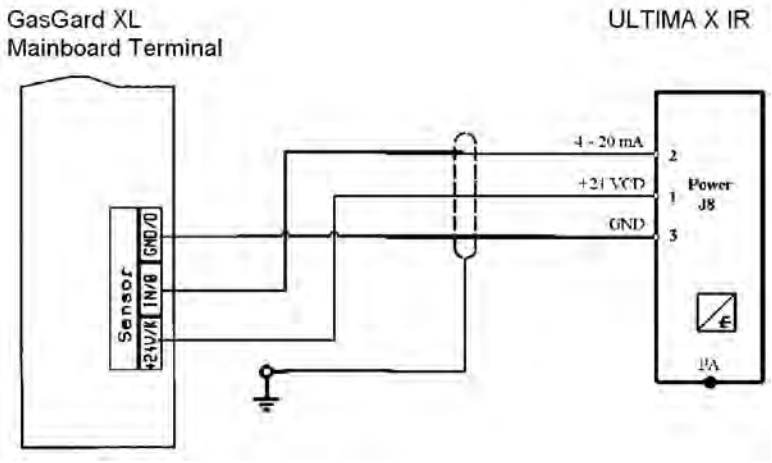


Figure B-5. Ultima® X IR Sensor

Appendix C,
Individual Relay Connections

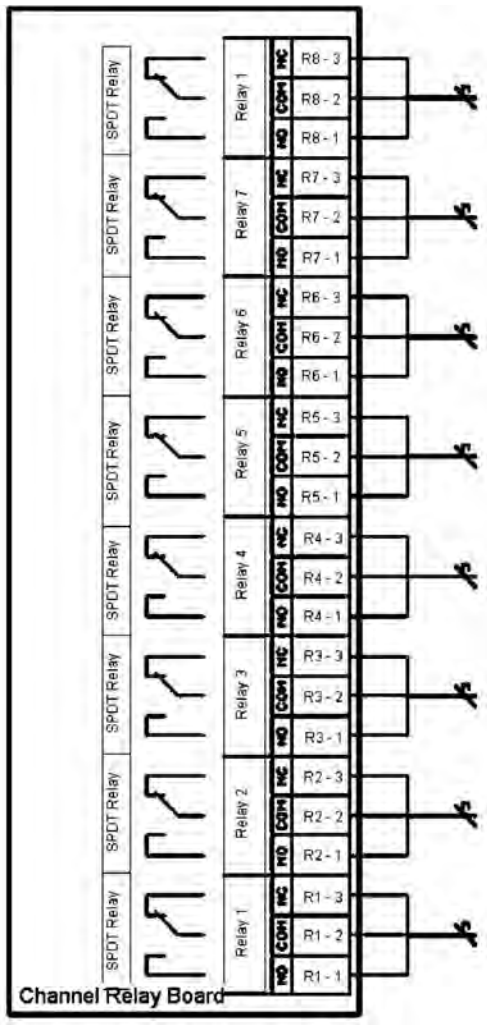


Figure C-1. Individual Relay Connections

Appendix D,
Terminal Connectors

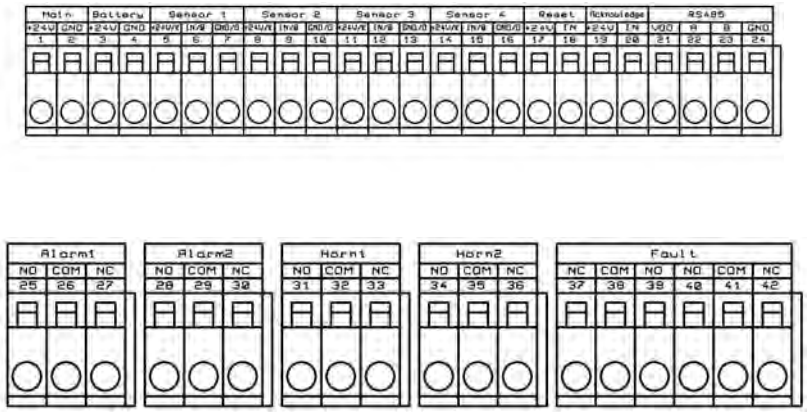


Figure D-1. Main Board

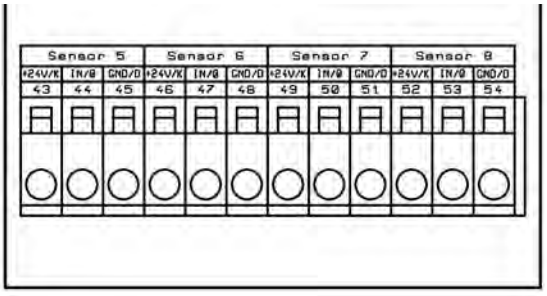


Figure D-2. Sensor Extension Board

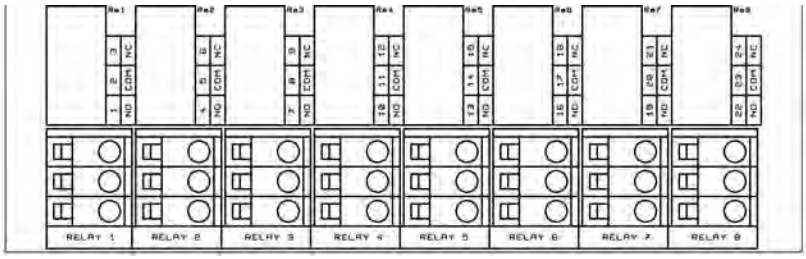


Figure D-3. Channel Relay Board

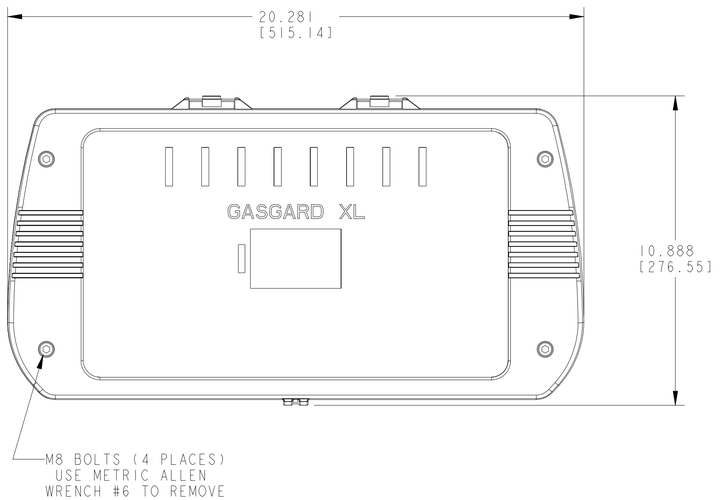
A - GASGARDXL - 1 - 2 - 3 - 4

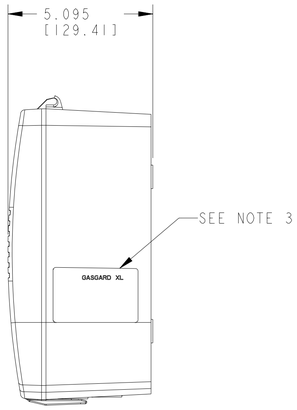
1 — Number of Channels
0 - 8 Channels

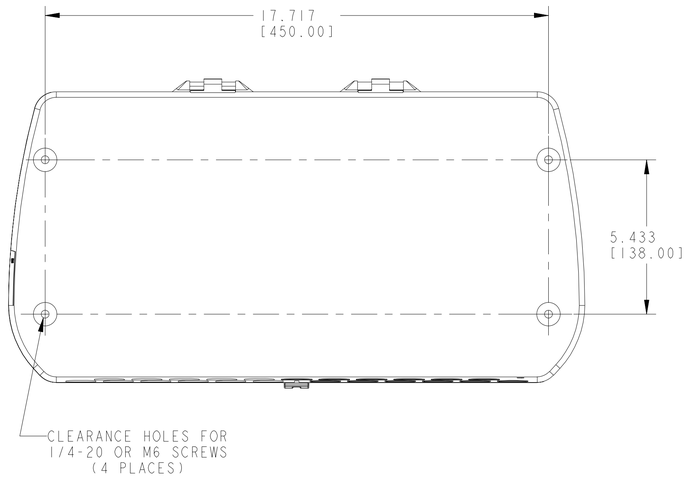
2 — Channel Relay Cards
0 = None
1 = 1 Relay PCBA
2 = 2 Relay PCBA

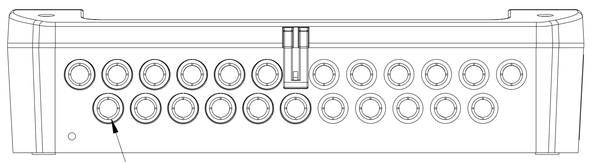
3 — Battery Backup
0 = No
1 = Yes

4 — Options
0 = None
C = Custom









NOTE:

1. DIMENSIONS SHOWN IN INCHES [MILLIMETERS].
2. INSTRUMENT HOUSING IS MADE OF ABS PLASTIC.
3. CHECK TAG FOR AREA CLASSIFICATION.
4. - - - - - INDICATES FIELD CONNECTIONS BY OTHERS.

(CONTINUED ON SHEET 2)

CUSTOMER _____
P.O. NO. _____
MSA NO. _____
LOCATION _____
TAG NO. _____
TOTAL NO. OF UNITS _____

REVISIONS

1	10-22-2008	INITIAL RELEASE FlameGard was SharpEye on SHEET 4 NOTE 11 and VIEW GJT JD

OCT 29 2008

AUTHORIZED COUNTRY

MSA — MINE SAFETY APPLIANCES CO. PITTSBURGH, PA 15230, USA
MSA STANDARD SHOP PRACTICES APPLY

DO NOT SCALE DWG.

CODE SYMBOLS
CRITICAL ⚠1
MAJOR A ⚠2 (MINOR (NO MARK))
MAJOR B ⚠3
100 % INSPECTION ⚠4

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL ± 1/64
2 PL DEC. ± 0.01
3 PL DEC. ± 0.005
ANGULAR ± 1 deg.
SEE MSA STANDARD SHOP PRACTICES FOR DRILLED HOLE TOLERANCES

JOB NO. 30009741 PH0703
APPROVAL AGENCY CODE: YES | NIOSH ATTR. DOC.: .

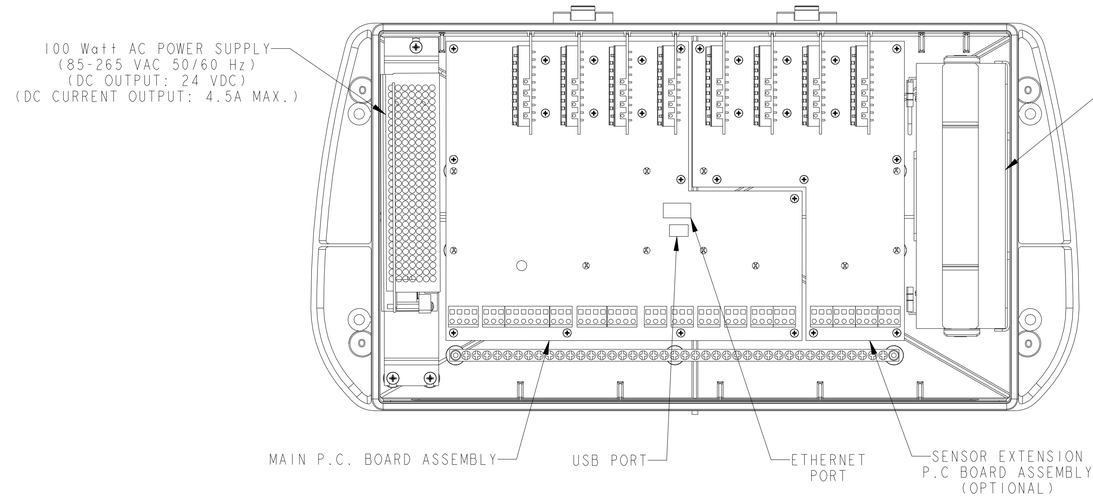
DRAWN BY / DATE	GT 10-2-2008
CHECKED BY	J.DiLEO 10-28-08
PROJ. ENGR.	S.TURNER 10-28-08
QUALITY ASSURANCE	J.DANNHARDT 10-28-08
MANUFACTURING	A.POLOCHAK 10-28-08

INSTALLATION OUTLINE, GASGARD XL

CADD REF: SK3015-1021 | SCALE: 1.000

D. SK3015-1021 SHEET 1 OF 4

REVISIONS
REV. 1
OCT 29 2008



GROUND
NEUTRAL
LINE

L N ⏚ -V -V +V +V
(AC)

100 WATT POWER SUPPLY

MAIN P.C. BOARD ASSEMBLY

Main		Battery		Sensor 1			Sensor 2			Sensor 3			Sensor 4			Reset		Acknowledge		RS485			
+24v	GND	+24V	GND	+24V-K	IN-0	GND/D	+24V-K	IN-0	GND/D	+24V-K	IN-0	GND/D	+24V-K	IN-0	GND/D	+24V	IN	+24V	IN	VDD	A	B	GND
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Alarm1		
NO	COM	NC
25	26	27

Alarm2		
NO	COM	NC
28	29	30

Horn1		
NO	COM	NC
31	32	33

Horn2		
NO	COM	NC
34	35	36

Fault					
NC	COM	NO	NO	COM	NC
37	38	39	40	41	42

SENSOR EXTENSION P.C. BOARD ASSEMBLY

Sensor 5			Sensor 6			Sensor 7			Sensor 8		
+24V-K	IN-0	GND/D	+24V-K	IN-0	GND/D	+24V-K	IN-0	GND/D	+24V-K	IN-0	GND/D
43	44	45	46	47	48	49	50	51	52	53	54

FERRITE FILTER

(GND) GROUND
(IN) 4-20mA
(+24V) +24 VDC

(TYPICAL)
FOR ALL SENSORS
SEE SHEET 4

NORMALLY CLOSED
COMMON
NORMALLY OPEN

(TYPICAL)
ALARM AND HORN RELAYS
(SEE NOTE 7)

(GND) GROUND OR COMMON
(B) DATA (T-/R-)
(A) DATA (T+/R+)
(VDD) (+) (POWER)

(SEE NOTE 6)

(SEE NOTE 6)

NORMALLY CLOSED
COMMON
NORMALLY OPEN
NORMALLY OPEN
COMMON
NORMALLY CLOSED

(SEE NOTE 8)

BACKUP BATTERY + RED
BACKUP BATTERY - BLACK

(SEE NOTE 5)

THESE TWO WIRES SUPPLIED WITH BATTERY AND INSTALLED BY CUSTOMER

NOTE: (CONTINUED FROM SHEET 1)

5. BATTERY IS SHIPPED DISCONNECTED. CONNECT DURING INSTALLATION OF THE GASGARD XL. UNIT MUST BE CONFIGURED FOR BATTERY BACKUP THROUGH THE PC SOFTWARE. (SEE MANUAL FOR DETAILS)
6. CUSTOMER INSTALLED (NO) NORMALLY OPEN PUSH BUTTON SWITCH.
7. RELAY IS (SPDT) SINGLE POLE DOUBLE THROW.
   CONTACT RATING: 5A@240VAC RESISTIVE or 5A@30VDC RESISTIVE
8. RELAY IS (DPDT) DOUBLE POLE DOUBLE THROW.
   CONTACT RATING: 5A@240VAC RESISTIVE or 5A@30VDC RESISTIVE

(CONTINUED ON SHEET 3)

AUTHORIZED COUNTRY

MSA — MINE SAFETY APPLIANCES CO. PITTSBURGH, PA 15230, USA

MSA STANDARD SHOP PRACTICES APPLY

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MAJOR B ③
MINOR (NO MARK)
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2 PL DEC. ± 0.01
3 PL DEC. ± 0.005
ANGULAR ± 1 deg.
SEE MSA STANDARD SHOP PRACTICES FOR DRILLED HOLE TOLERANCES

JOB NO. 30009741 PH0703
APPROVAL AGENCY CODE: YES | NIOSH ATTR. DOC.: .

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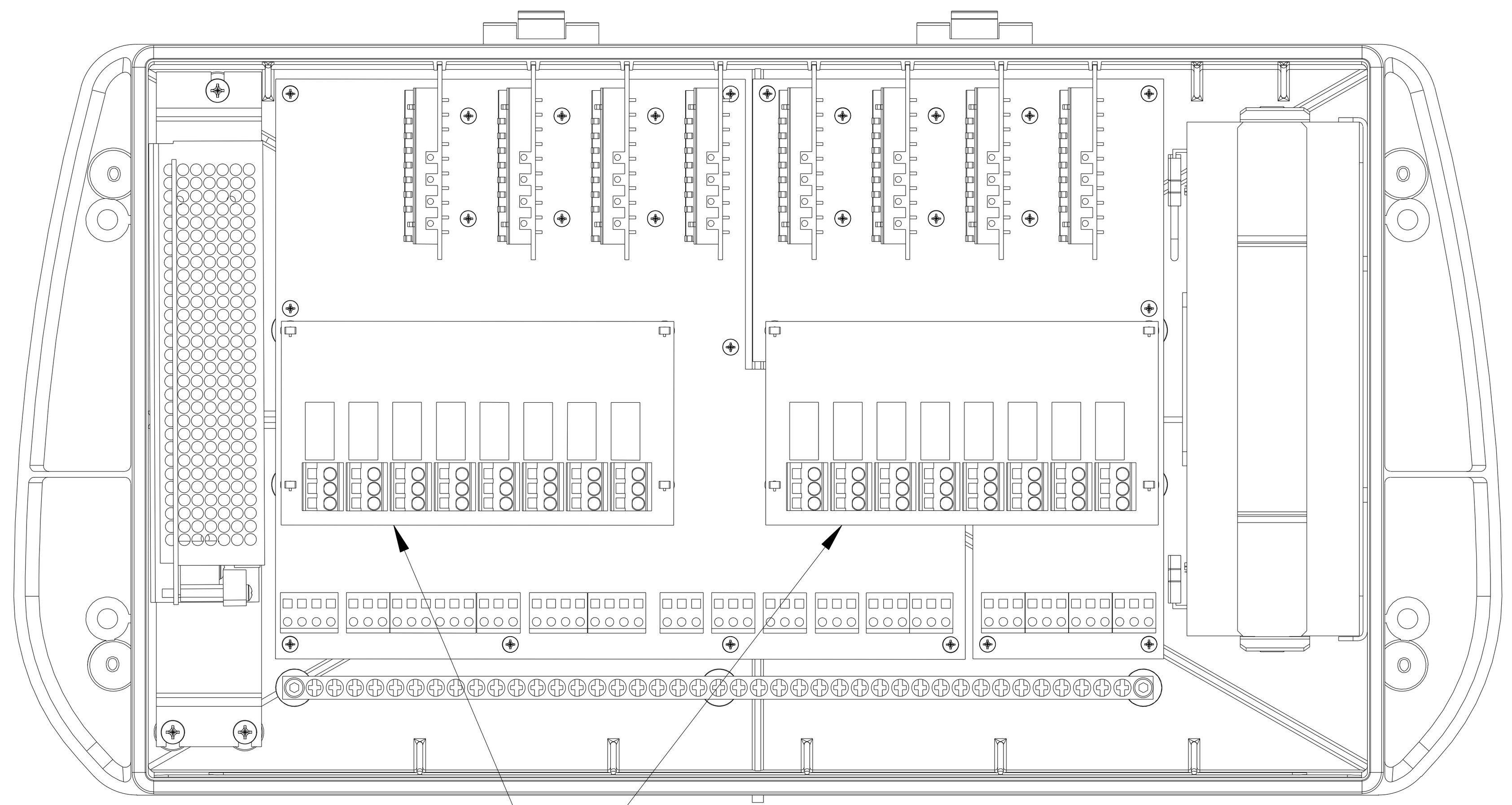
QUALITY ASSURANCE	J.DANNHARDT	10-28-08
MANUFACTURING	A.POLOCHAK	10-28-08

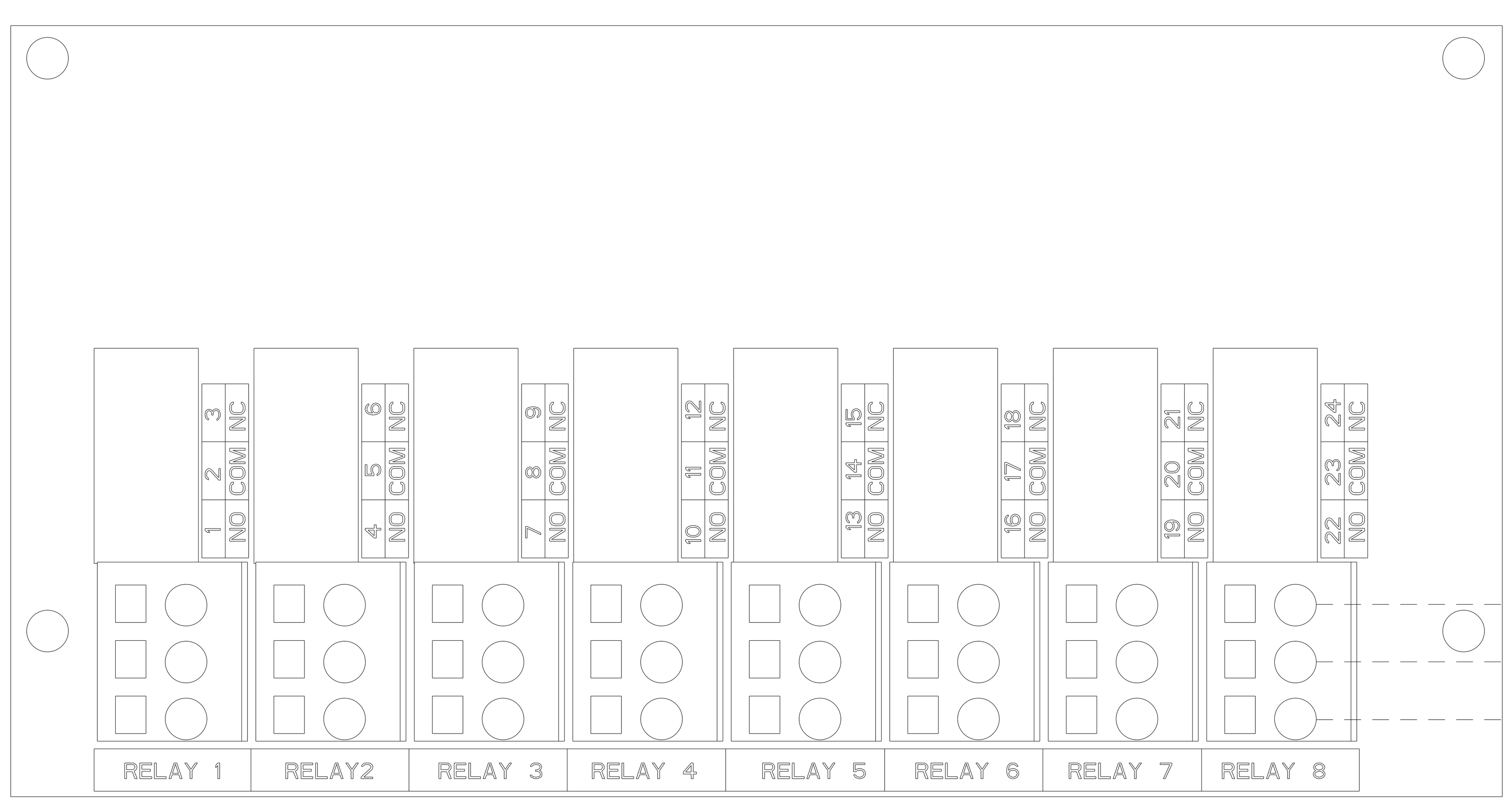
INSTALLATION OUTLINE, GASGARD XL

CADD REF: SK3015-1021 | SCALE: 1.000

D. SK3015-1021 | SHEET 2 OF 4

REVISIONS
REV. 1
OCT 29 2008





NOTE: (CONTINUED FROM SHEET 2)

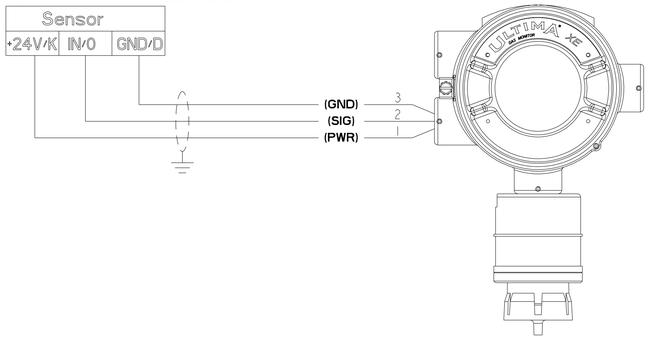
9. RELAYS ARE (SPDT) SINGLE POLE DOUBLE THROW.
   CONTACT RATING: 5A@240VAC RESISTIVE or 5A@30VDC RESISTIVE

(CONTINUED ON SHEET 4)

AUTHORIZED COUNTRY	MSA — MINE SAFETY APPLIANCES CO. PITTSBURGH, PA 15230, USA MSA STANDARD SHOP PRACTICES APPLY	THIS DRAWING IS THE PROPERTY OF MSA AND IS MADE AVAILABLE TO YOU IN CONFIDENCE AND SUBJECT TO THE FOLLOWING: NO PERMISSION IS GRANTED TO PUBLISH, USE, REPRODUCE, TRANSMIT OR DISCLOSE THIS DRAWING, OR ANY INFORMATION CONTAINED THEREIN TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF MSA EXCEPT FOR THE MANUFACTURE OF ARTICLES FOR MSA. SCHUTZVERMERK NACH DIN 34 BEACHTEN. MSA AUER GmbH.	DO NOT SCALE DWG.

CODE SYMBOLS	JOB NO. 30009741 PH0703	APPROVAL AGENCY CODE: YES	NIOSH ATTR. DOC.: .
CRITICAL (+)	DRAWN BY DATE GT 10-2-2008	INSTALLATION OUTLINE, GASGARD XL	
MAJOR A (A) MINOR (NO MARK)	CHECKED BY J.DiLEO 10-28-08		
MAJOR B (B)	PROJ. ENGR. S.TURNER 10-28-08		
100 % INSPECTION (C)	QUALITY ASSURANCE J.DANNHARDT 10-28-08		
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONAL ± 1/64 2 PL DEC. ± 0.01 3 PL DEC. ± 0.005 ANGULAR ± 1 deg. SEE MSA STANDARD SHOP PRACTICES FOR DRILLED HOLE TOLERANCES	MANUFACTURING A.POLOCHAK 10-28-08	CADD REF: SK3015-1021	SCALE: 1.000
	D.	SK3015-1021	SHEET 3 OF 4

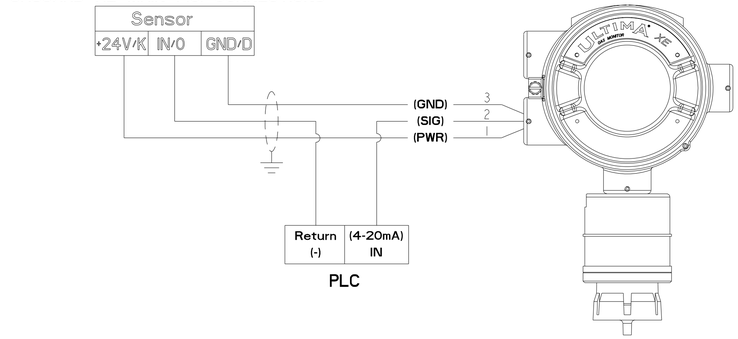
GASGARD XL MAIN P.C. CONNECTIONS



ULTIMA XE or XIR (3 WIRE)

(SEE NOTE 10)

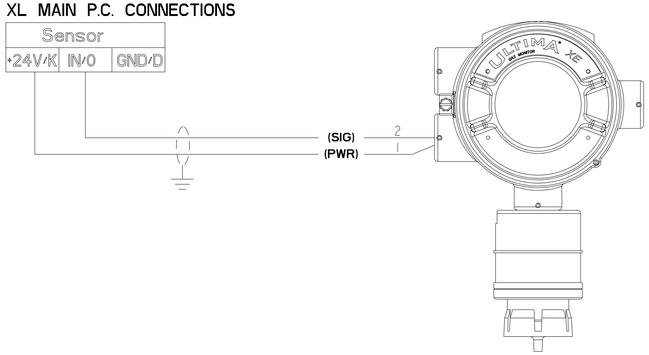
GASGARD XL MAIN P.C. CONNECTIONS



CONNECTIONS TO PLC (3 WIRE)

(SEE NOTE 13)

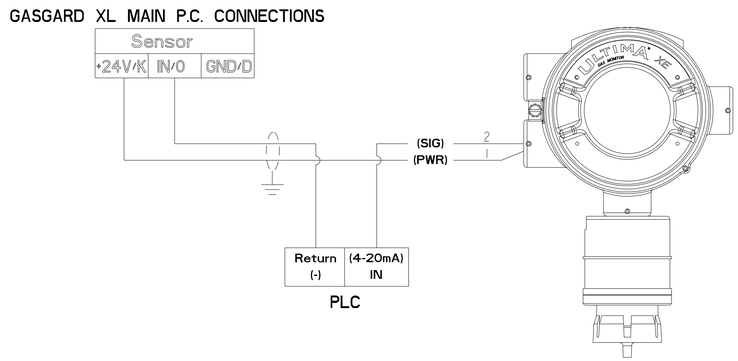
GASGARD XL MAIN P.C. CONNECTIONS



ULTIMA XE (2 WIRE)

(SEE NOTE 10)

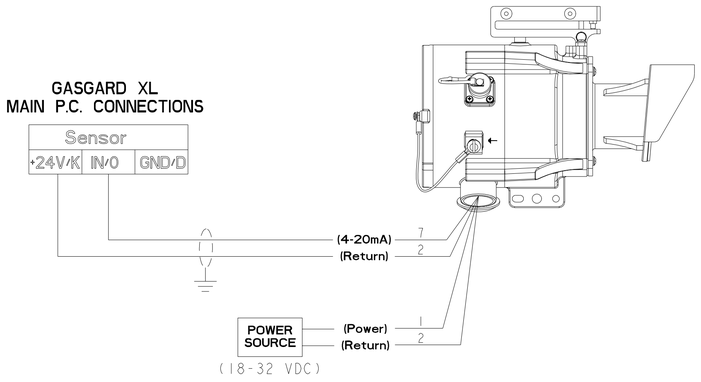
GASGARD XL MAIN P.C. CONNECTIONS



CONNECTIONS TO PLC (2 WIRE)

(SEE NOTE 13)

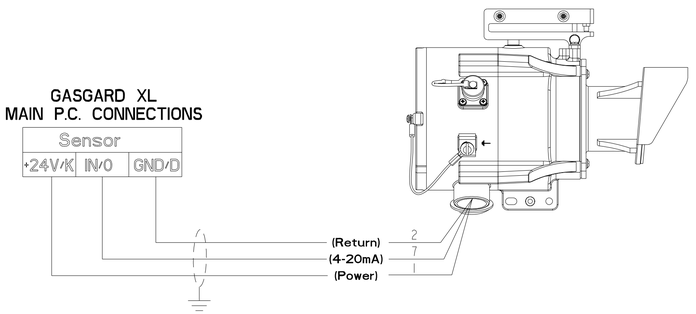
GASGARD XL MAIN P.C. CONNECTIONS



SafEye

(SEE NOTE 12)

GASGARD XL MAIN P.C. CONNECTIONS



FlameGard ⓘ

(SEE NOTE 11)

NOTE: (CONTINUED FROM SHEET 3)

10. SEE ULTIMA X MANUAL and INSTALLATION OUTLINE DRAWINGS FOR MORE DETAILS.
ⓘ 11. SEE FlameGard MANUAL FOR MORE DETAILS.
12. SEE SafEye MANUAL FOR MORE DETAILS.
13. MAX. LOOP RESISTANCE WITH PLC and GASGARD XL NOT TO EXCEED 600 Ohms. THE PLC 4-20mA INPUT MUST BE ISOLATED FROM GROUND.

REVISIONS

REV. 1

OCT 29 2008

AUTHORIZED COUNTRY

MSA

MINE SAFETY APPLIANCES CO.
PITTSBURGH, PA 15230, USA

MSA STANDARD SHOP PRACTICES APPLY

DO NOT SCALE DWG.

CODE SYMBOLS
CRITICAL ⚠
MAJOR A ⚠ MINOR (NO MARK)
MAJOR B ⚠
100 % INSPECTION ⚠

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL ± 1/64
2 PL DEC. ± 0.01
3 PL DEC. ± 0.005
ANGULAR ± 1 deg.
SEE MSA STANDARD SHOP PRACTICES FOR DRILLED HOLE TOLERANCES

JOB NO. 30009741 PH0703
APPROVAL AGENCY CODE: YES | NIOSH ATTR. DOC.: .

	DRAWN BY	DATE
	GT	10-2-2008
CHECKED BY	J.DiLEO	10-28-08
PROJ. ENGR.	S.TURNER	10-28-08
QUALITY ASSURANCE	J.DANNHARDT	10-28-08
MANUFACTURING	A.POLOCHAK	10-28-08

INSTALLATION OUTLINE, GASGARD XL

CADD REF: SK3015-1021

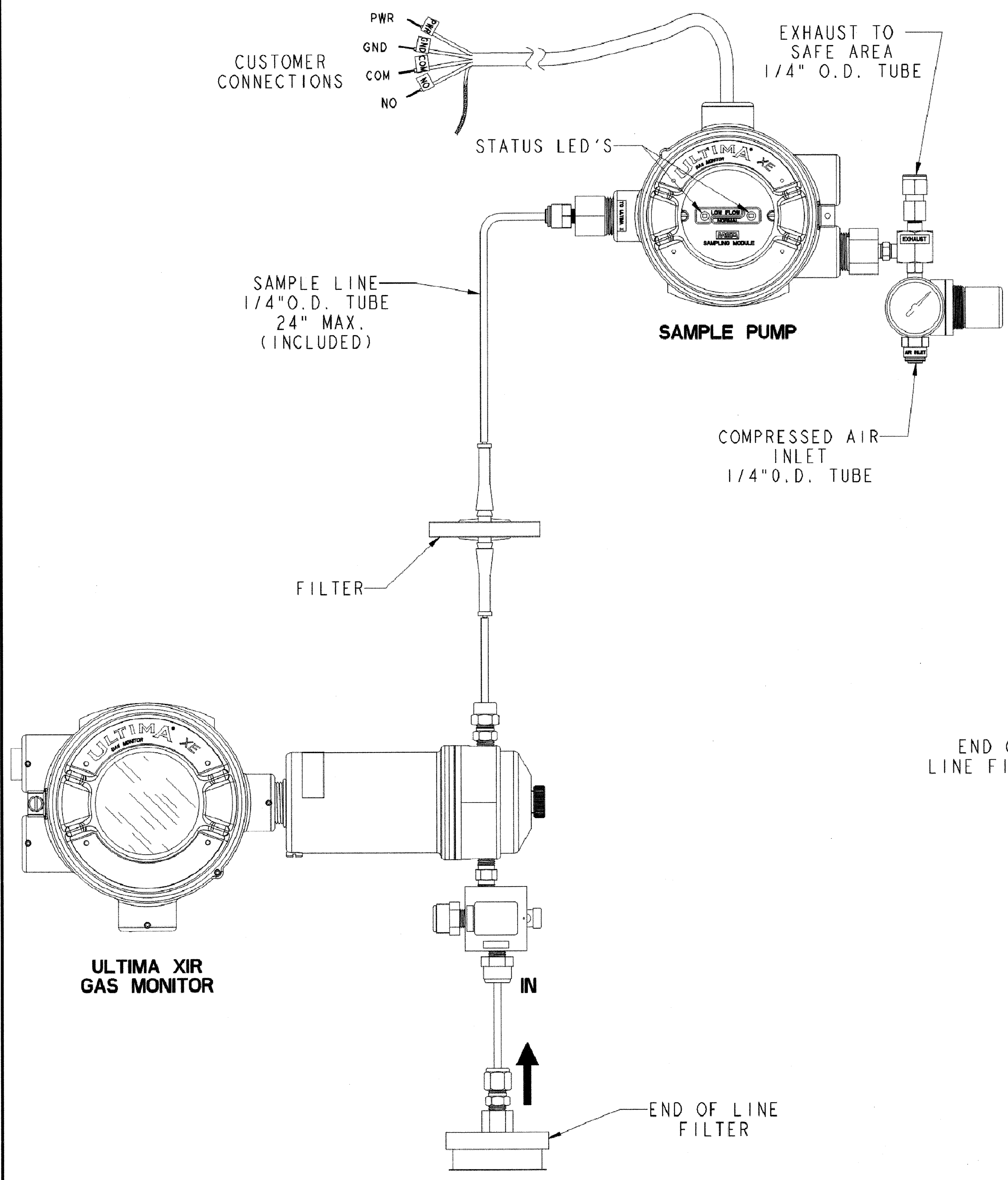
SCALE: 1.000

D.

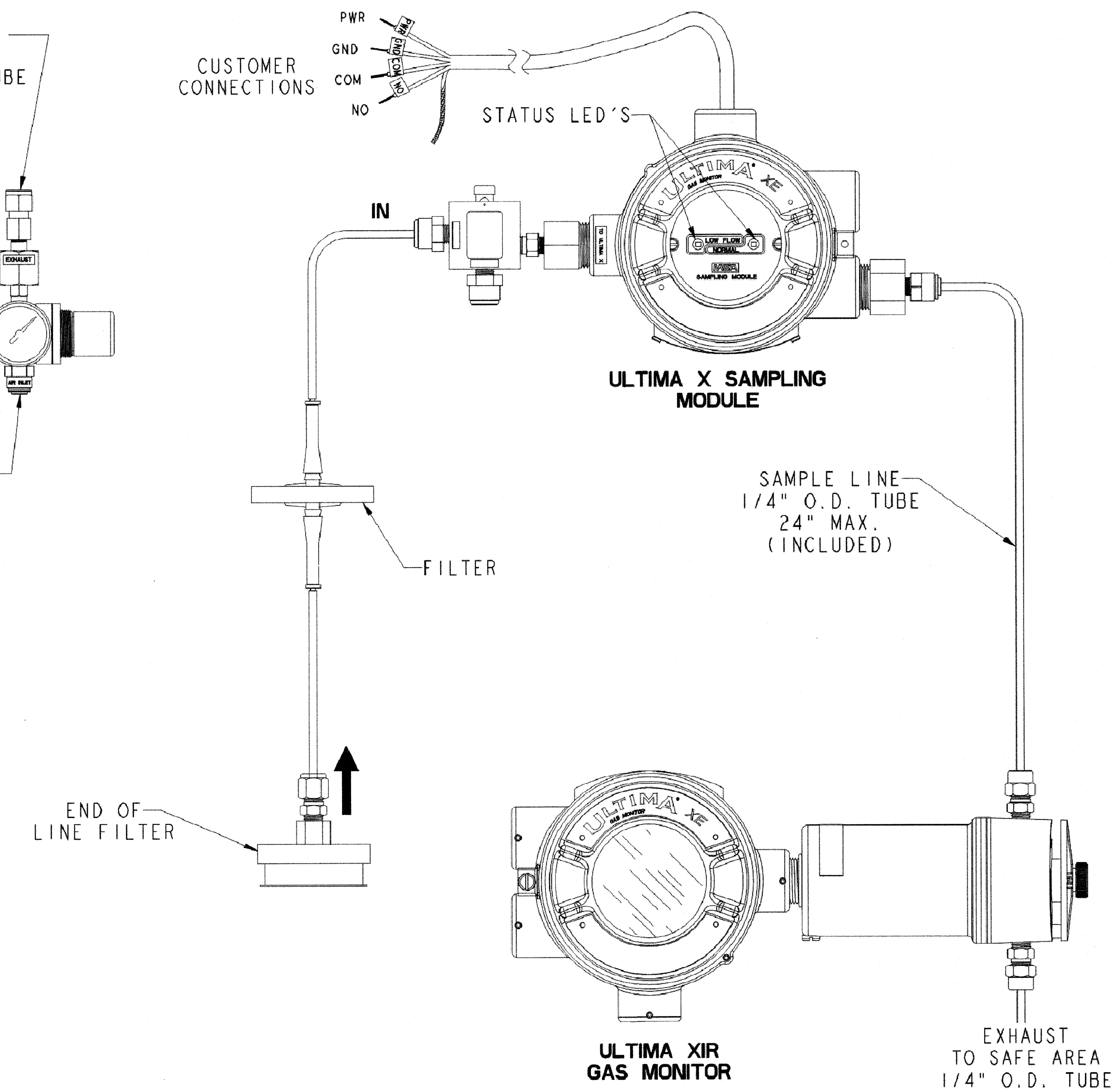
SK3015-1021

SHEET 4 OF 4

REVISIONS
REV. 2
MAY 03 2011
REV. 3



ULTIMA XIR and a ASPIRATED SAMPLING MODULE



ULTIMA XIR and a DC POWERED SAMPLING MODULE

LIFECYCLE STATE: Production			REVISION: 2
AUTHORIZED COUNTRY	MSA — MINE SAFETY APPLIANCES CO. PITTSBURGH, PA 15230, USA. MSA STANDARD SHOP PRACTICES APPLY	THIS DRAWING IS THE PROPERTY OF MSA AND IS MADE AVAILABLE TO YOU IN CONFIDENCE AND SUBJECT TO THE FOLLOWING: NO PERMISSION IS GRANTED TO PUBLISH, USE, REPRODUCE, TRANSMIT OR DISCLOSE THIS DRAWING, OR ANY INFORMATION CONTAINED THEREIN TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF MSA EXCEPT FOR THE MANUFACTURE OF ARTICLES FOR MSA. SCHUTZVERMERK NACH DIN 34 BEACHTEN. MSA AUER GmbH.	DO NOT SCALE DWG.
CODE SYMBOLS: CRITICAL, MAJOR A, MAJOR B, MINOR (NO MARK), 100 % INSPECTION	JOB NO. 30002141 PH0730	APPROVAL AGENCY CODE: NO	NIOSH ATTR. DOC.: .
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ± 1/64; 2 PL DEC. ± 0.01; 3 PL DEC. ± 0.005; ANGULAR ± 1 deg. SEE MSA STANDARD SHOP PRACTICES FOR DRILLED HOLE TOLERANCES	DRAWN BY LCR DATE 12/12/02; CHECKED BY E.ADIWINATA 3-23-11; PROJ. ENGR. E.ADIWINATA 3-23-11; QUALITY ASSURANCE J.DANNHARDT 4-15-11; MANUFACTURING A.POLOCHAK 3-29-11	INSTALLATION OUTLINE, ULTIMA XE SAMPLING MODULE	
	D SK	CADD REF: 10000015617 — DOCUMENT NO. 10000015617	SCALE: 1.000 — SHEET 3 OF 3

GAS DETECTION DETAILS

EXPANSION AREA 2A - WASTEWATER SYSTEM IMPROVEMENTS
CONTRACT 1 - PUMP STATION
LEXINGTON FAYETTE URBAN COUNTY GOVERNMENT

STATE OF KENTUCKY — PHILLIP B. JUETT 23706 — LICENSED PROFESSIONAL ENGINEER

GRW PROJECT NO. 3809
CLIENT PROJECT NO.

GRW — ENGINEERS - ARCHITECTS - PLANNERS — www.grwinc.com

DESIGNED: PBJ
DRAWN: TEW
REVIEWED: PBJ
APPROVED: PBJ

NO.	DESCRIPTION	DATE	BY
	REVISIONS		
	BID DOCUMENT SET		

THIS MARK SHOULD MEASURE EXACTLY 1" WHEN PLOTTED
SCALE CHECK

DATE: MAY 2012
SCALE: AS NOTED
SHEET NO. E-1-508

PRINTED: 5/30/2012 @ 10:14AM
FILE NAME: U:\3809-LFUCG Exp 2A Swr\Working Drawings\Design Drawings\Contract 1\3809-E-1-508.dwg

Ultima® X Sampling Module, DC Pump Model

Instruction Manual

⚠ WARNING

THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR USING OR SERVICING THE PRODUCT. Like any piece of complex equipment, this device will perform as designed only if it is used and serviced in accordance with the manufacturer's instructions. OTHERWISE, IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUSTAIN SEVERE PERSONAL INJURY OR DEATH.

The warranties made by Mine Safety Appliances Company with respect to the product are voided if the product is not used and serviced in accordance with the instructions in this manual. Please protect yourself and others by following them. We encourage our customers to write or call regarding this equipment prior to use or for any additional information relative to use or service.

In the U.S., to contact your nearest stocking location, dial toll-free 1-800-MSA-INST
To contact MSA International, dial 724-776-8626.

This manual is available on the internet at www.msanet.com

Manufactured by
MSA NORTH AMERICA
1000 Cranberry Woods Drive, Cranberry Township, PA 16066

(L) Rev 1 **10103804**

MSA Permanent Instrument Warranty

1. **Warranty-** Seller warrants that this product will be free from mechanical defect or faulty workmanship for a period of eighteen (18) months from date of shipment or one (1) year from installation, whichever occurs first, provided it is maintained and used in accordance with Seller's instructions and/or recommendations. This warranty does not apply to expendable or consumable parts whose normal life expectancy is less than one (1) year such as, but not limited to, non-rechargeable batteries, sensor elements, filter, lamps, fuses etc. The Seller shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning the goods sold under this contract. Seller makes no warranty concerning components or accessories not manufactured by the Seller, but will pass onto the Purchaser all warranties of manufacturers of such components. **THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.**
2. **Exclusive Remedy-** It is expressly agreed that Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of Seller, or for any other cause of action, shall be the repair and/or replacement at Seller's option, of any equipment or parts thereof, which after examination by Seller is proven to be defective. Replacement equipment and/or parts will be provided at no cost to Purchaser, F.O.B. Seller's Plant. Failure of Seller to successfully repair any nonconforming product shall not cause the remedy established hereby to fail of its essential purpose.
3. **Exclusion of Consequential Damage-** Purchaser specifically understands and agrees that under no circumstances will seller be liable to purchaser for economic, special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of non-operation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

General Warnings and Cautions

⚠ WARNING

1. The Ultima X Sampling Module - DC Pump Model described in this manual must be installed, operated, and maintained in strict accordance with the labels, cautions, warnings, instructions, and within the limitations stated.
2. An Ultima X Sampling Module - DC Pump Model is designed to sample gases or vapors in air. It cannot sample the concentration of gases or vapors in steam or condensing streams or inert or oxygen deficient atmospheres.
3. The unit must not be painted. If painting in an area where this unit is located, ensure that paint is not deposited on the module inlet fitting. Such paint deposits interfere with the sampling process and can result in improper readings.
4. Sensors are sealed units containing a corrosive electrolyte. Should a sensor develop leakage, immediately remove it from service; then, remove it from its housing assembly and discard it properly. Ensure that the electrolyte does not contact skin, eyes, clothing or circuitry; otherwise, personal injury (burns) and/or equipment damage may result.
5. Use only genuine MSA replacement parts when performing any maintenance procedures provided in this manual. Failure to do so may seriously impair instrument performance. Repair or alteration of the Ultima X Sampling Module - DC Pump Model, beyond the scope of these maintenance instructions or by anyone other than an authorized MSA service person, could cause the product to fail to perform as designed, and persons who rely on this product for their safety could sustain severe personal injury or death.
6. Properly vent the exhaust of this unit to a safe area. Improper venting of the exhaust can cause personal injury or death.
7. Extremely high concentrations of combustible gas or vapor between the lower explosive limit (LEL) and the upper explosive limit (UEL) will cause the indication on the Ultima X Gas Monitor to indicate full scale or above full scale. If the concentration level is further increased and exceeds the UEL, the display will continue to show an above scale indication. Gas or vapor concentrations above the UEL are extremely dangerous since the instrument cannot measure them accurately, and when reduced by the addition of air to a level below the UEL, they again constitute a

violently explosive mixture. Therefore, every alarm causing condition or situation must be investigated to determine that the

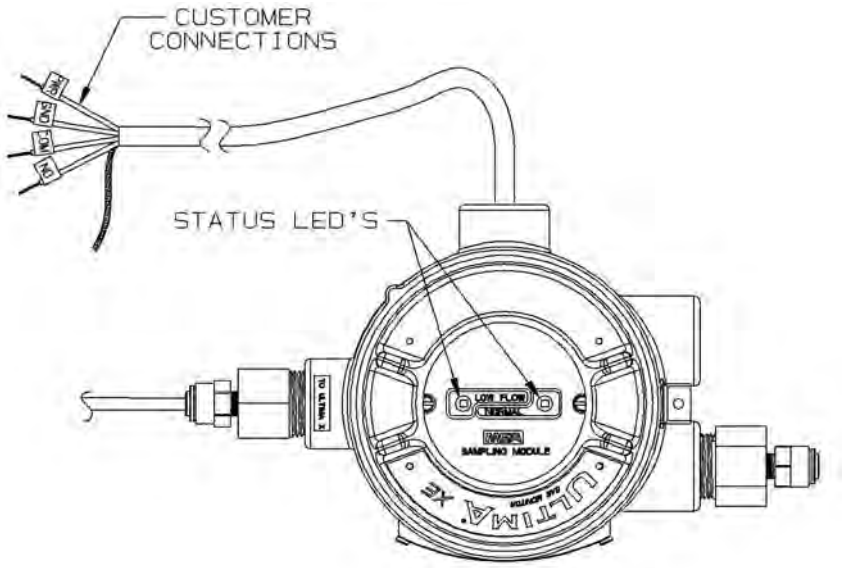
area being monitored does not contain a gas or vapor in air mixture that exceeds the LEL or UEL.

FAILURE TO FOLLOW THE ABOVE WARNING CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

⚠ CAUTION

1. Perform periodic leak check on all of this unit's flow System components and fittings. Ensure the flow is within specifications.
2. As with all sensors, high levels of, or long exposure to, certain compounds in the tested atmosphere contaminate the sensors. In atmospheres where an Ultima X Sampling module - DC Pump Model may be exposed to such materials, calibration should be performed frequently to ensure that channel operation is dependable and display indications are accurate. Ensure the flow is checked to be within specifications.
3. The only absolute method to ensure the proper overall operation of this unit is to check the associated sensor (s) with a known concentration of the gas for which it has been calibrated. Consequently, calibration checks must be included as part of the routine inspection of the system along with ensuring flow to be within specifications.

FAILURE TO FOLLOW THE ABOVE CAUTION CAN RESULT IN INJURY, PRODUCT DAMAGE, AND/OR AN UNSAFE CONDITION.



Ultima X Sampling Module, DC Pump Model (P/N 10043264)

Table of Contents

Chapter 1,
General Information

Introduction

The Ultima X Sampling Module - Pump Model:

- must be used with an Ultima X Gas Monitor (available separately)
- draws a gas sample from the monitored area, through a sample line (available separately) to the Ultima X Gas Monitor sensor
- samples areas that are remote, inaccessible, too hot or too cold for direct sensor monitoring, such as:
    - ducts carrying combustible or toxic gas
    - wet wells, water vapor in the sampling must not condense (RH must be less than 95%)
    - printing drying ovens
    - blanking or inerting operations
- comes equipped with necessary flow components (excluding gas sample line) to properly deliver gas samples to the Ultima X Gas Monitor
- must be used with a special flow cap for use on the Ultima X Monitor to ensure proper sensor sampling (available separately)

A properly-installed unit for a single Ultima X Gas Monitor is shown in FIGURE 1-1. It is also possible for one Pump Sampling Module to supply sample gas for up to three Ultima X Gas Monitors. This procedure:

- is useful when monitoring up to three different gases
- requires additional Ultima X Gas Monitors with individual flow caps
- is further detailed in Section 2, "Installation."

When using Ultima XIR Gas Monitor(s). locate the Ultima XIR sensor on the exhaust side of the sample module (FIGURE 1-2) to ensure the most accurate readings (the three-way valve from the XIR flow cap must be installed on the inlet side of the pump).

Unpacking Unit

Carefully unpack your Pump Sampling Module (and Ultima X Gas Monitor, if also newly purchased) from shipping carton(s). Compare enclosed items with the packing list to ensure all parts ordered were received; contact shipper or carrier if discrepancies exist.

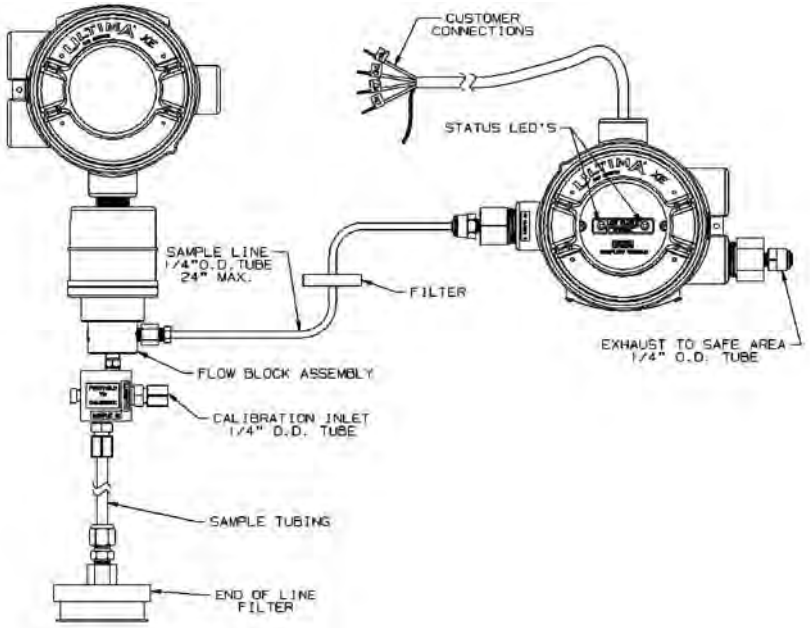


Figure 1-1. Sampling Module Installation with Ultima X Oxygen, Toxic, and Catalytic Combustible Sensors

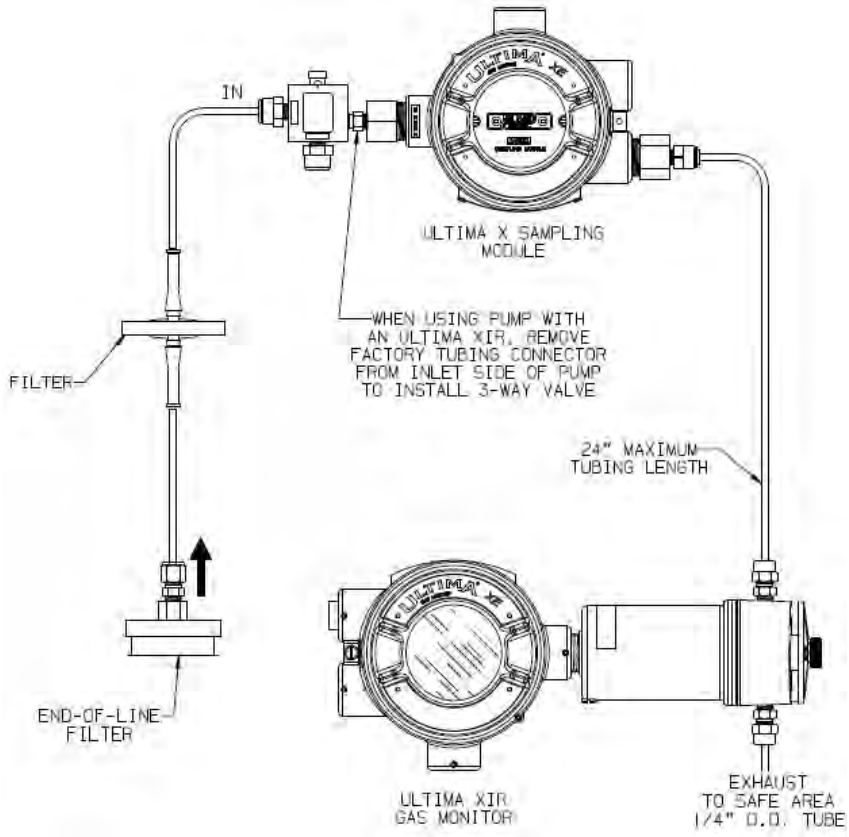


Figure 1-2. Sampling Module Installation with Ultima XIR Sensors

Each Pump Sampling Module package contains:

- Pump Sampling Module
- Flow cap for one Ultima X Gas Monitor
- Tubing and in-line Filter
- End-of-line Filter
- Instruction Manual

Unit Identification

There is one possible pump Sampling Module configuration:

- Explosion-proof (P/N 10043264) unit.

Reference the identification label located on the side of the unit (FIGURE 1-3). See TABLE 1-1 for unit specifications.

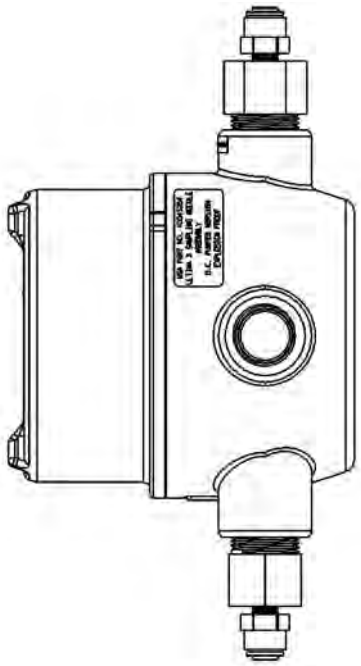


Figure 1-3. Identification Label

Table 1-1.
Performance Specifications
for Ultima X Sampling Module - Pump Model

MAXIMUM POWER CONSUMPTION	8.5 watts at 9 to 30 VDC
CABLE REQUIREMENTS	Four conductor, shielded, 18 AWG (typical)
SAMPLE TRANSPORT TIME	30 seconds at 0.5 LPM with 50 feet (15.25 meters) of .180 (4.57 mm) ID sample tubing
NOMINAL SAMPLE FLOW RATE	2 CFH (1 LPM)
MINIMUM SAMPLE FLOW RATE	1 CFH (.500 LPM)
MAXIMUM SAMPLE TUBING LENGTH	100 feet (30 meters)
MAXIMUM EXHAUST TUBING LENGTH	20 feet (6 meters)
INLET FITTINGS	1/4" (6.35 mm) OD Tube Fitting
EXHAUST FITTING	1/4" (6.35 mm) OD Tube Fitting
CALIBRATION FITTING	1/4" (6.35 mm) OD Barbed Fitting
OVERALL DIMENSIONS	9" x 6" x 5" (228.5 cm x 152.4 cm x 127 cm)
WEIGHT	4.5 lbs. (2 kg)
RATING	Explosion-proof enclosure, Class I, Groups A, B, C and D, Division 1, Hazardous Locations
ELECTRICAL ENTRY	3/4-14 NPT
FLOW FAILURE RELAY	SPDT at 0.6 Amps, 125 Volts AC or 110 Volts DC at 2.0 Amps, 30 Volts DC
TEMPERATURE RANGE	-20° to 55°C (-4 to 122°F)
HUMIDITY	15 to 95% RH, Non-condensing

Terminology

ELECTRO-CHEMICAL SENSOR -
Sensor employing the reactions of chemicals generating electric currents to detect certain gases.

EXHAUST GAS -
Gas after it has passed through the sensor.

FLOW RATE -
The volume-per-minute of gas in the sample line.

SPAN -
Full scale or up-scale reading on the meter display.

SPAN GAS VALUE -
Gas concentration which gives the instrument an up scale or full scale value. This value is usually printed on the gas cylinder containing the gas.

SPANNING -
Process of placing a full scale or up scale meter reading on the display by using calibration span gas cylinders.

ZERO -
A zero (0) indication on the meter display usually indicates ambient air present or no hazardous gases present.

ZEROING -
Processes for placing a zero indication on meter display.

Chapter 2, Installation

General

Install the sample module in the correct area classified in your facility.

- The explosion-proof model hazardous area classification is Class I, Division 1, Groups A, B, C and D. It is important that all local and national codes be followed when installing this model in a classified area.

Double check the area classification of the sampling module.

Refer to FIGURE 1-3 to find the area classification label on your unit. Ensure that the Ultima X Gas Monitor is rated properly by referring to Ultima X Gas Monitor instruction manual (P/N 10036101) for details.

⚠ WARNING

Do not mix units with different area classifications. All units used in a classified area must have the proper area classification. Otherwise, an explosion hazard will exist, resulting in a possible explosion, injury or death.

The sampling module for a general-purpose (GP) monitor can be a source of ignition. Install, locate and operate only in a non-hazardous area and in accordance with applicable codes.

If sampling from or exhausting into a separate location, the installation requires flashback arrestors at the inlet from a hazardous location and at the outlet to a hazardous location, to prevent the propagation of ignition of hazardous gases. Routinely check for pump system leaks that could create an explosive environment inside the enclosure.

Read and follow all instructions, warnings and cautions pertaining to this gas monitor.

FAILURE TO FOLLOW THIS WARNING CAN CAUSE IGNITION OF EXPLOSIVE ENVIRONMENTS RESULTING IN SERIOUS PERSONAL INJURY OR DEATH.

Mounting the Pump Sampling Module Unit (All Models)

1. Locate the Pump Sampling Module and the Ultima X Gas Monitor(s) in a clean, accessible location.
   - Since the unit enclosure is non-corrosive, it can be mounted to the outside of a building or in other wet environments. Note the temperature and RH requirements.
   - Use of Teflon tape or non-hardening thread sealant for environmental reasons is acceptable.
   - When installing multiple Ultima X Gas Monitors, locate all monitors within 18 inches (45 cm) of each other.

⚠ CAUTION

Ensure that Pump Sampling Module or the Ultima X Gas Monitor unit front covers are not blocked or obscured. A blocked front cover will obscure the gas reading indication and sampling module indications. The unit must be mounted with the electrical input facing down and the label clearly readable.

2. Mount the Pump Sampling Module and Ultima X Gas Monitor to a wall:
   - From the electrical condulet or
   - By using optional mounting strap (P/N 10047561) and the four holes in the rear of the units.
3. Mount Ultima X Gas Monitor SENSOR INLET facing downward
4. Mount Pump Sample Module EXHAUST tubing so that the end of the tubing is facing downward and is the lowest point of the tubing (see FIGURE 1-1).

⚠ CAUTION

The Ultima X Gas Monitor must be mounted with its sensor at the bottom of the case and the sensor inlet fitting pointed downward; otherwise, the unit may become inoperative.

Sample Line Placement between Pump Sampling Module and Ultima X Gas Monitor

1. Remove all protective packaging plugs and/or caps from Pump Sampling Module gas INLET and EXHAUST ports.
2. On new installations, skip to Step 4.
   On existing installations of the Ultima X Gas Monitor, remove the Ultima X Gas Monitor(s) red plastic sensor cap and any gaskets remaining on the sensor. Do not remove the sensor element.
3. Install the flow block(s) on the Ultima X Gas Monitor(s) where the red plastic sensor cap was removed in the previous step.
   See FIGURE 1-1 and FIGURE 2-1.
   - Additional flow blocks are available for additional Ultima X Gas monitors.
   - Refer to TABLE 2-1 for a description and part number for additional flow blocks.

Table 2-1. Parts List

ITEM	PART NO.
XE Flow Block	10041866
XIR Flow Block	10042600

4. Attach the supplied tubing to the Pump Sampling Module port labeled "TO ULTIMA".
5. Attach the other end of the supplied tubing to the side of the flow block (FIGURE 1-1).
   - Tubing can be trimmed to ensure that there are no kinks.
   - In-line filter (P/N 10051406) must be used somewhere along the tubing length. Ensure that the arrow on the in line filter is pointing towards the Pump Sampling Module.

⚠ CAUTION

The in-line filter must be used before the pump module to prevent water entry from damaging unit.

- If installing additional Ultima X Gas Monitors, install tubing between units as shown in FIGURE 2-1. Use tubing compatible with the gas being sampled.
- MSA tubing is available (P/N 600771).

Sample Line Placement

The pump Sampling Module draws a gas sample to the internally-mounted Ultima X Gas Monitor sensor.

- The Pump Sampling Module can be mounted up to 100 feet (30 meters) away from the monitored area.
- It uses 1/4-inch (6.35 mm) OD tubing to connect the Pump Sampling Module sample inlet to the end of the sample line in the monitored area.
- Tubing must be compatible with the sampled gas.
- It takes a maximum of 30 seconds for the sample gas to reach the Pump Sampling Module when 50 feet (15.25 meters) of tubing is used:
    - To decrease this time, shorten the sample line length.
    - It is generally good practice to make the sample line as short as possible.
- Depending on the gas characteristics, the end of the sampling tubing and the sample inlet should be mounted to best optimize sampling of that particular gas. Consult your architect, facility manager or safety engineer for guidance in proper placement of the sampling tube inlet.
- Testing for ventilation patterns is useful in establishing sample inlet location. Smoke tubes (P/N 458481) are useful in measuring the direction and rate of air flow to determine which areas to monitor.
- The particulate filter provided should be used at the sample end of the sample line to help prevent dirt and dust from clogging the sample line. This filter must be compatible with the gas being sampled.

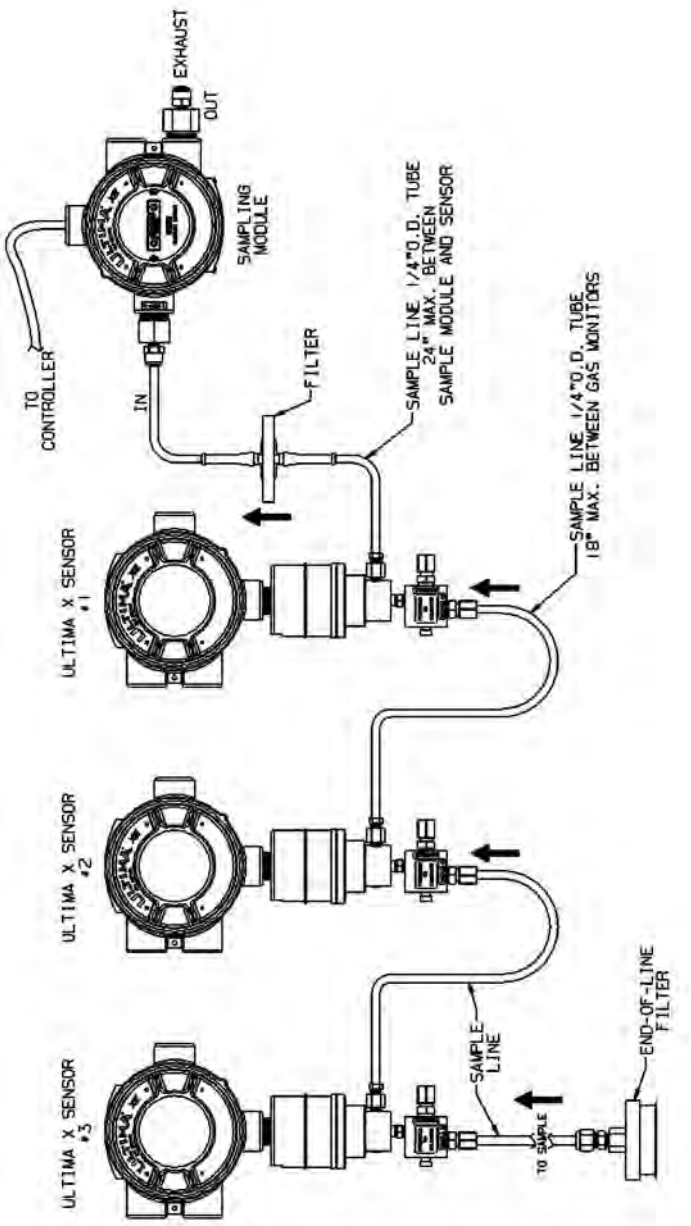


Figure 2-1. Three Ultima X Monitors & a Sampling Module

- It is recommended that a stainless steel or Teflon* sample line be used for monitoring gases that are highly reactive such as:
  - Nitrogen Dioxide
  - Sulfur Dioxide
  - Chlorine
  - Chlorine Dioxide
  - Hydrogen Chloride
  - Ammonia
  - Fluorine
  - Bromine.
- With the above gases, use Filter (P/N 637921). The filter and sample line should be inspected periodically and replaced if dirty.

⚠ CAUTION

Do not attempt to clean the sample line by applying compressed air.

All Ultima X Gas Monitors must be mounted in ambient, interference-free air; otherwise erroneous readings may result.

1. Remove all protective packaging plugs and/or caps from the Pump Sampling Module:
   - gas inlet
   - exhaust ports.
2. Attach a 1/4-inch (6.35 mm) OD sample tubing to the flow block sample inlet fitting on the Ultima X Gas monitor (FIGURE 1-1). Ensure tubing is compatible with the sampled gas.
3. Route the sample tubing to the area to be monitored.

   NOTE: Do not run the sample tubing in water or across areas of vibration, doorways, man ways or access ways; otherwise, a sample tubing leak or tripping hazard may result.

4. Using suitable hardware (not supplied):
   - fasten the sample tubing to supports
   - fasten the end of the sample tubing and sample inlet in the monitoring area.
     - The sample inlet should be pointed downward to prevent dirt and water from entering the sample tubing line.

5. Install the provided end-of-line filter at the end of the sampling tubing, if applicable.
6. Check for leaks along the entire length of the sample tubing line. Any leak will dilute the gas sample from the area of interest and give a lower than actual gas reading.
7. The in-line filter will trap water and block the flow.

Exhaust Line Placement

1. Attach a ¼-inch (6.35 mm) OD sample tubing to the exhaust outlet fitting on the Pump Sampling Module Unit.
2. Route the exhaust tubing into a safe area where the gas sample can be vented. Avoid any sharp bends or elbows. Route the tubing to allow any collected water to drain.
   - The maximum exhaust tubing length is 20 feet (6 meters).

   NOTE: Do not run the exhaust tubing in water or across areas of vibration or across doorways, man ways or access ways; otherwise, a leak in the exhaust tubing or a tripping hazard may result.
3. Fasten the exhaust tubing to supports using suitable hardware (not supplied).
4. Fasten the end of the exhaust tubing in the area of interest by using suitable hardware (not supplied)

   NOTE: Exhaust inlet should be pointed downward to prevent dirt and water from entering the exhaust tubing line.
5. Check for leaks along entire length of the exhaust tubing line.

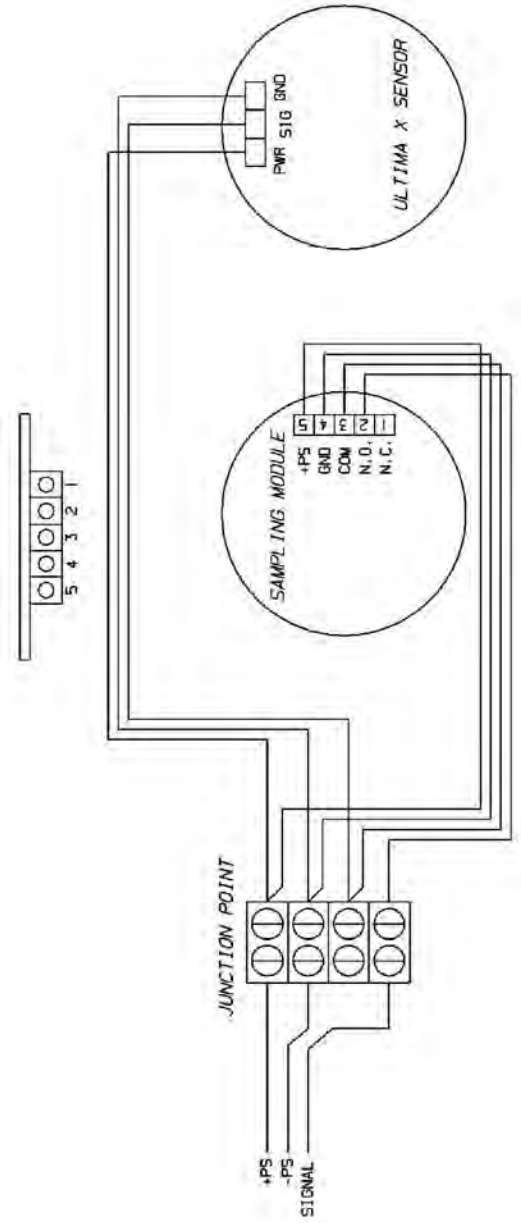


Figure 2-2. Typical Wiring

Electrical Connection

A flow detector within the Pump Sampling Module activates a relay when sufficient flow exists for proper gas detection. Generally, the Ultima X Gas Monitor output signal is routed through this relay. When the flow is insufficient, the relay opens and the 4-20 mA signal is interrupted. Equipment monitoring this signal can be configured to sound an alarm when signal is interrupted. See FIGURE 2-2 for a typical wiring schematic of the Sampling Module and Ultima X Gas Monitor.

Other devices that alert when the flow loss relay activates can be connected to relay contact with the Pump Sampling Module.

NOTE: The Pump Sampling Module requires a four-conductor wire. Use shielded wire if installing the system where portable two-way radio, welding or large machinery are located. The shield of any wire must not be grounded at the Sampling Module or the Ultima X Gas Monitor. The shield must be grounded at one point only, usually at the controlling instrument.

Electrical Connection Procedure

1. Turn power OFF from the receiving instrument or power supply for the system.

⚠ CAUTION

Failure to remove power from instrument may damage Pump Sampling Module and/or Ultima X Gas Monitor during wiring.

2. If connecting the field wires to the wiring harness, observe the identity of the conductors within the wiring harness. Connect field wires to the appropriate harness conductors.
3. If not using the attached wiring harness:
   a. Remove the top cover of the Sampling Module by rotating the cover counter-clockwise.
   b. Unscrew and remove the two top-cover screws.
   c. Lift top cover to expose the wiring terminal strip on the bottom side of the cover.
   d. Loosen terminal strip screws and remove the wiring harness.

- If not using the attached wire harness:
    - remove and discard the wiring harness
    - install a conduit seal into the enclosure.
    - Use of Teflon tape or non-hardening thread sealant for environmental reasons is acceptable.

e. Route a cable (not supplied) through the electrical entry of the Pump Sampling Module.

f. Connect the conductors to the wiring terminal strip noting the identity of the wires. See FIGURE 2-1 and TABLE 2-2.

g. Replace top cover and tighten with the two screws.

h. Replace lid and tighten in place.

⚠ WARNING

Do not allow lid to remain off of the explosion-proof Pump Sampling Module. Flammable or combustible gas in the atmosphere may ignite a spark; that, in turn, may cause an explosion and result in injury or death.

Table 2-2. Wiring Identification

POSITION	DESCRIPTION
1	Normally closed contact of the flow loss relay
2	Normally open contact of the flow loss relay
3	Common position of the flow loss relay
4	Ground or negative of the power supply
5	Positive or supply position of the power supply

4. Wire the other end of the wiring cable to your read-out instrument and power supply, ensuring the cable from the Pump Sampling Module is wired to the proper connections on the instrument. Consult the instrument instruction manual for more wiring details.

Initial Start-Up

Before starting up the Pump Sampling Module:

1. Check wiring connections; see FIGURE 2-1 and TABLE 2-2.
2. Ensure that power supplied to the controlling instrument is the proper voltage with sufficient current capacity to operate the instrument. Refer to the instrument instruction manual for proper power set-up.
3. Apply power to the instrument through a remote circuit breaker.

⚠ CAUTION

If relays in the controlling instrument are wired to external devices (e.g. horns, exhaust fans, and fire suppression systems), these devices may activate while adjustments are performed during the following procedures. Consult equipment instruction manual for further details. All instruments must be returned to normal operation when Pump Sampling Module and Ultima X Gas Monitor adjustments are completed.

4. Ensure the exhaust is not restricted.
5. The front-panel low flow indication, red LED, should NOT be ON.
    - If front panel low flow indication is ON, see Section 4, "Troubleshooting Guidelines."

Chapter 3,
Calibration and Operation

Introduction

Pump Sampling Module and Ultima X Gas Monitoring System use the Ultima X Gas Monitor calibration procedure. Refer to the Ultima X Gas Monitor instruction manual and follow the procedure below:

Perform the calibration procedure regularly and maintain a log of calibration adjustments. Increase the frequency of calibration when any calibration shows as much as 10% difference from the test gas concentration. More frequent calibrations may be required when the Pump Sampling Module is new or when the sensor is approaching its end of life. Also, perform the calibration procedure when installing or changing the power source, sensor, or control instrumentation.

The necessary frequency of calibration depends on the operating time and chemical exposures of the sensors. Newly installed units should be checked for flow and new sensors should be calibrated more often until the calibration records prove sensor stability. The calibration frequency can then be reduced to the schedule set by the safety officer or facility manager.

If this calibration procedure cannot be performed at any step, consult Section 4, "Troubleshooting Guidelines," localize the problem and replace the inoperative component.

MSA offers periodic service that is available on a contract basis; for more information, please call MSA at 1-800-MSA-INST.

Calibration Procedures

Place the instrument receiving the signal from the Ultima X Gas Monitor into CALIBRATION mode, if applicable.

⚠ WARNING

It is necessary to put the receiving instrument in CALIBRATION mode. If the instrument is not in CALIBRATION mode, any alarm relays may energize and activate any safety devices which are connected to the alarm relays of the instruments.

Equipment Needed:

- Calibration Kit #42
- Appropriate ZERO and SPAN Gas Cylinders (refer to the Ultima X Instruction Manual (P/N 10036101).
- Ultima X Controller (P/N 809086) or an Ultima X Calibrator (P/N 809997)

NOTE: If unsure of which SPAN gas to use or of the SPAN gas value, consult your safety engineer or office or facility manager.

1. Locate the ZERO gas cylinder and the appropriate regulator and tubing. Screw the regulator into the cylinder and connect the tubing to the regulator outlet. Ensure that tubing is compatible with the gas within the cylinder.
2. Before initiating the calibration procedures on the Ultima X Gas Monitor, connect the tubing from the ZERO gas cylinder to the Calibration Inlet (See FIGURE 1-1).

Zeroing with the Ultima X Sampling Module

3. Initiate the calibration procedure on the Ultima X Gas Monitor; refer to the Ultima X Gas Monitor instruction manual.
4. When the Ultima X Gas Monitor displays "APPLY ZERO GAS", press and hold the button by the calibration inlet. Turn the knob on the regulator to permit the ZERO gas to flow. Simultaneously, the Ultima X Gas Monitor will make all corrections to the zero signal; there are no adjustments necessary.
5. When the Ultima X Gas Monitor is done zeroing, close the cylinder valve, release the button by the calibration inlet, and quickly remove the ZERO gas cylinder. Do not remove the tubing from the flow controller.
6. Locate and screw regulator into the cylinder.

   NOTE: If unsure of which SPAN gas to use or of the SPAN gas value, consult your safety engineer or officer or facility manager.

Spanning with the Ultima X Sampling Module

7. When calibrating, the SPAN immediately follows the ZERO; refer to Ultima X Calibrator or Controller instruction manual.
8. When the Ultima X Gas Monitor displays "APPLY SPAN GAS", press and hold the button by the calibration inlet. Turn the regulator knob to permit the SPAN gas to flow. The Ultima X Gas Monitor will make all the corrections to its calibration; there are no adjustments necessary.
9. When the Ultima X Gas Monitor calibration is complete, release the button by the calibration inlet, close the cylinder valve and remove the SPAN gas cylinder.
10. Unscrew the regulator from the gas cylinder and replace all calibration components in the kit.
11. Return instrument receiving the signal from the Ultima X Gas Monitor to NORMAL run mode operation.

Operation

There are only two indicators on the front cover of the Pump Sampling Module which affect the operation of the unit.

- The NORMAL indicator, the green LED, shows that there is power to the unit and the flow is greater than .5 LPM.
- The LOW FLOW indicator, the red LED, indicates that the flow detector has insufficient gas flow for proper monitoring. Refer to Section 4, "Troubleshooting Guidelines" for corrective action.

⚠ WARNING

The pressure switch can fail and the orifice can clog if water enters the system. Always use the proper in-line filter (P/N 10051406).

Chapter 4,
Maintenance and Troubleshooting Guidelines

Maintenance

The Sampling Module requires minimal maintenance. However, the filters need routine inspection and possible replacement. It is good practice to have on hand replacement filters to minimize any down time of your unit (see TABLE 4-2)

Filter Maintenance

Filter maintenance consists of visual inspection of the two filters, end of line filter and the in line filter. When new, filters are white or slightly yellowed; when loaded with dust or dirt, they normally turn dark in color. Visually inspect the two filters periodically. The frequency of this inspection depends on the environment; if your environment is extremely dirty or dusty, this inspection should be done often.The in-line filter is hydrophobic and will not pass liquids.

End-of-line filters must be located so that they are not exposed to liquids or steam. If liquids become entrapped within a filter, replace the filter as it will interfere with proper operation of the unit.

Troubleshooting Guidelines

Table 4-1. Troubleshooting Guidelines

SYMPTOM	POSSIBLE CAUSE	PROBABLE SOLUTION
Low Flow indicator is ON	Sample line clogged	Check and replace or clean sample line
	A leak internal to the Ultima X Sampling Module	Check tubing inside the Ultima X Sampling Module, especially the fittings
	Inoperative flow switch	Replace flow switch
	The sample line is under a vacuum	Remove vacuum from sample line inlet
	Dirty end-of-line or in-line filter	Replace dirty end-of-line or in-line filter
	Exhaust clogged	Clean or replace exhaust tubing
No sensor output or low output	Sensor is approaching its end-of-life	Replace sensor
	The ambient is too cold or too hot for the sensor	Place Ultima X Sampling Module in a warmer or cooler ambient environment
	A leak in the sample line	Check/repair any leaks in the sample line
	Inoperative sensor pre-amp electronics	Replace sensor printed circuit board
	Exhaust clogged or restricted	Unclogged or remove the restriction on the exhaust
	Dirty or wet sample filter	Replace sample filter
	Inoperative flow switch	Replace the flow switch
	Sensor wiring plug loose	Reconnect sensor wiring plug
	Bad wiring connection between instrument and Ultima X Sampling Module	Check wiring and replace or repair any inoperative wiring or connections
	No power to the unit	Turn control instrument ON
	Improper voltage selection at the control instrument	Select proper voltage at the control instrument
	Inoperative relay	Replace printed circuit board assembly

Replacement Parts

Table 4-2. Parts List

DESCRIPTION	PART NO.
PC Board Assembly (requires new label - listed below)	10052349
Label, Ultima X Sampling Module	10051804
Pressure Switch	10050076
Pump and Drive	815395
Filter, In-line	10051406
Filter, End-of-Line, Includes Cartridge (High Humidity)	637920
Filter, End-of Line, (Reactive Gases)	637921
Filter Cartridge for End-of-Line Filter (General Purpose)	95302
Flashback Arrestor for Explosion-proof Models Only	813159
Valve, Push-button	635729
Gasket, Flow Block, Explosion-proof	10051112
Sample Line Tubing	600771
O-ring, Ultima XIR flow Block	10042428

NOTE: It is the user's responsibility to follow all applicable regulations and to ensure continued compliance with the certification, as marked on the label.

A - X5000 - ⬭ - ⬭ - ⬭ - ⬭ - ⬭ - ⬭ - ⬭ - ⬭

Material
0 = Stainless Steel - 3/4" NPT
2 = Stainless Steel - M25

Approvals
F = FM/CSA
A = ATEX/IEC

Bluetooth
0 = Yes
1 = No

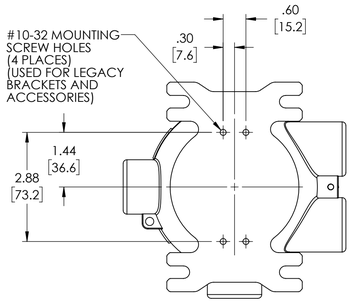
Outputs
0 = Analog/HART
1 = Analog/HART/Relays

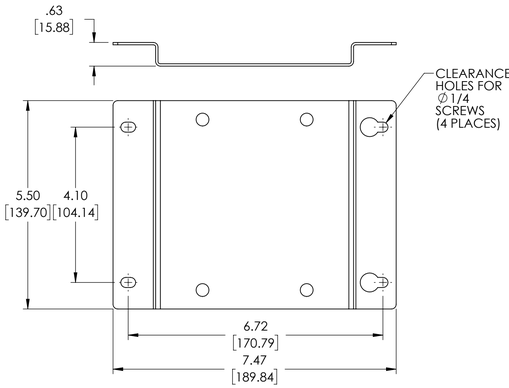
Place Holder
0 = Future Use

Sensor #1
Check Sensor Label
See Read First

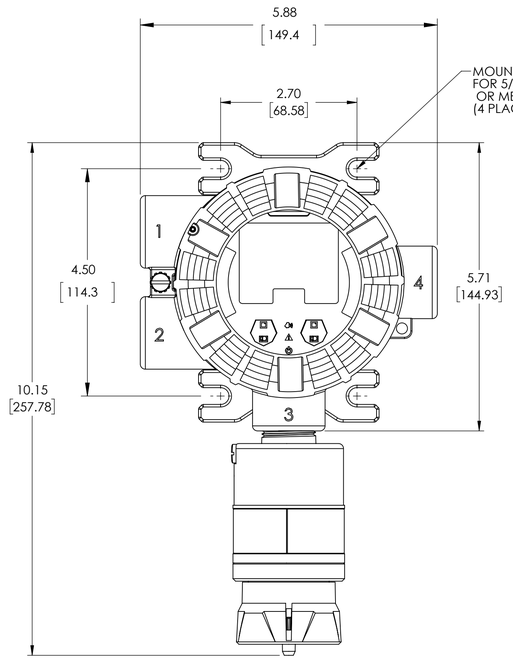
Sensor #2
Check Sensor Label
See Read First

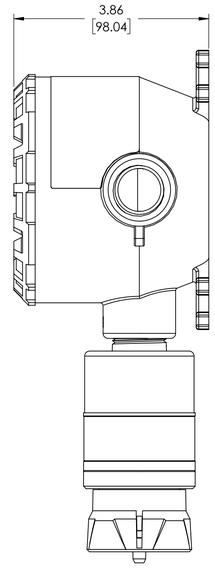
Tag
0 = None
T = Stainless Steel affixed tag



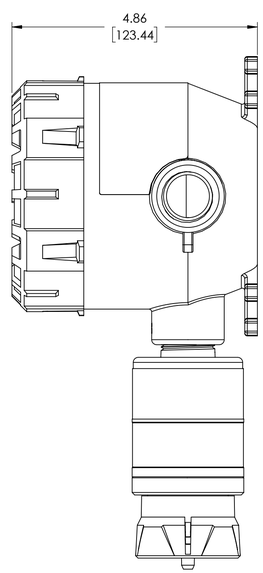


MOUNTING BRACKET
(REQUIRED FOR XIR PLUS SENSORS)
(PART NUMBER 10179361)

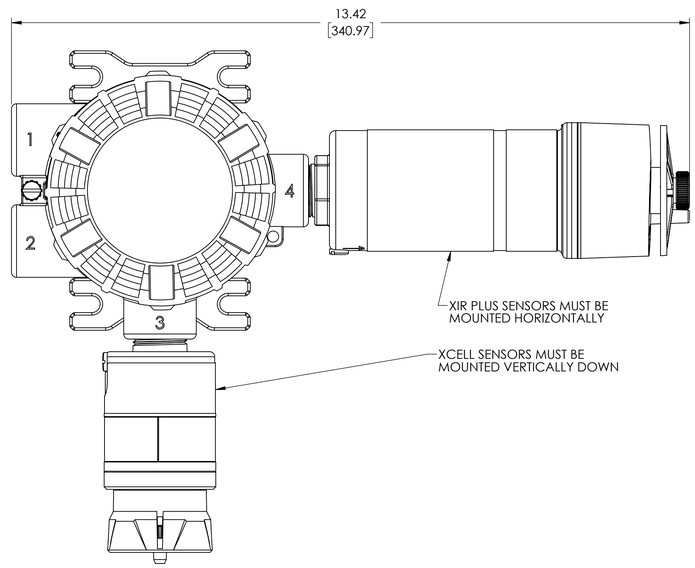


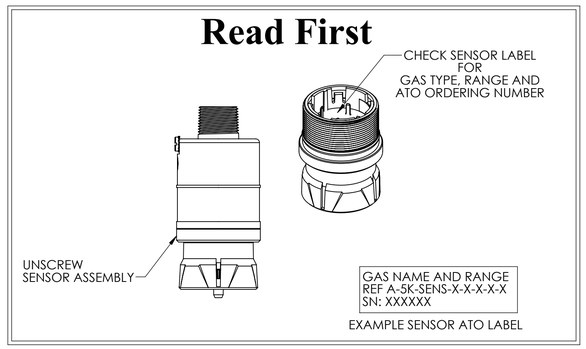


SHORT LID
(USED FOR MAIN BOARD WITHOUT RELAYS OR JUNCTION BOX BOARD)



DEEP LID
(USED FOR MAIN BOARD WITH RELAYS)





CUSTOMER _____
P.O. NO. _____
MSA NO. _____
LOCATION _____
TAG NO. _____
TOTAL NO. OF UNITS _____

NOTES:
1. DIMENSIONS SHOWN ARE IN INCHES [MILLIMETERS]
2. MAIN HOUSING AND REMOTE JUNCTION BOX HAVE THE SAME DIMENSIONS.

REVISIONS

①	9-4-2017
ADDED SHT FOR REVISED WIRE LENGTH TABLES & PICTORIALS CR#800000021543	
LRB	JD
②	01-04-2018
ADDED GROUNDING SHEETS & INFO. & ALL ASSOC. NOTES CR#800000023657	
LRB	JD
③	01-23-2018
SHEET 3: ADDED RETROFIT NOTES CR#800000024223	
LRB	MK

LIFECYCLE STATE: Production
REVISION: 3

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MSA STANDARD SHOP PRACTICES APPLY

THIRD-ANGLE PROJECTION
DO NOT SCALE DWG.

JOB NO. 30012996 PH0705
APPROVAL AGENCY CODE:
NIOSH ATTR. DOC.:

	DRAWN BY	DATE
	WJE	9-29-2016
CHECKED BY	C.STARTA	3-28-2017
PROJECT ENGR.	N.CICCONE	3-28-2017
QUALITY ASSURANCE	J.DANNHARDT	3-28-2017
MANUFACTURING	M.ZIRNSAK	3-28-2017

INSTALLATION OUTLINE, ULTIMA X5000

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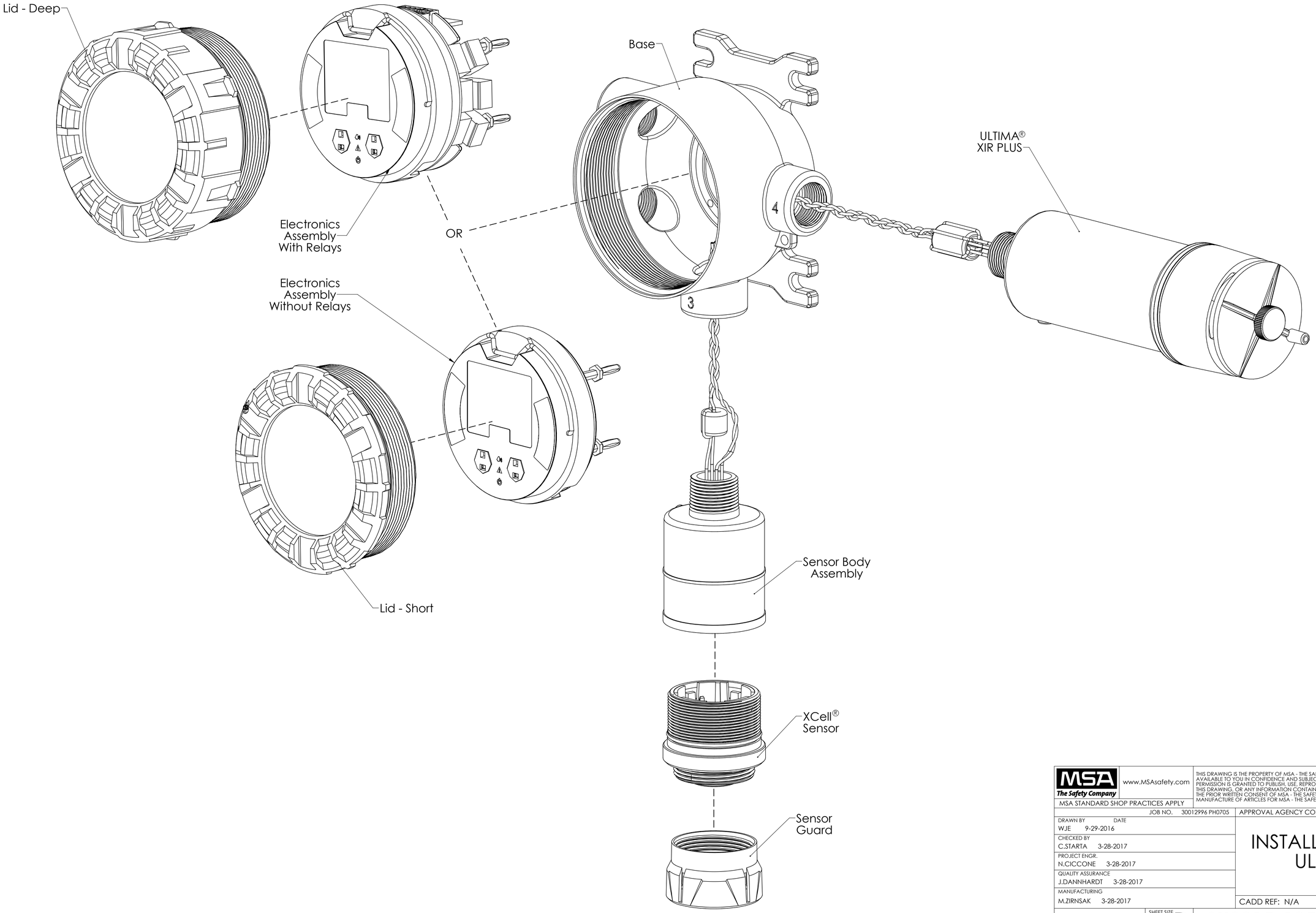
SCALE: 1:2
SHEET SIZE: D
SK3015-1051
SHEET 1 OF 6

REVISIONS
REV. 3



LIFECYCLE STATE	REVISION
Production	3

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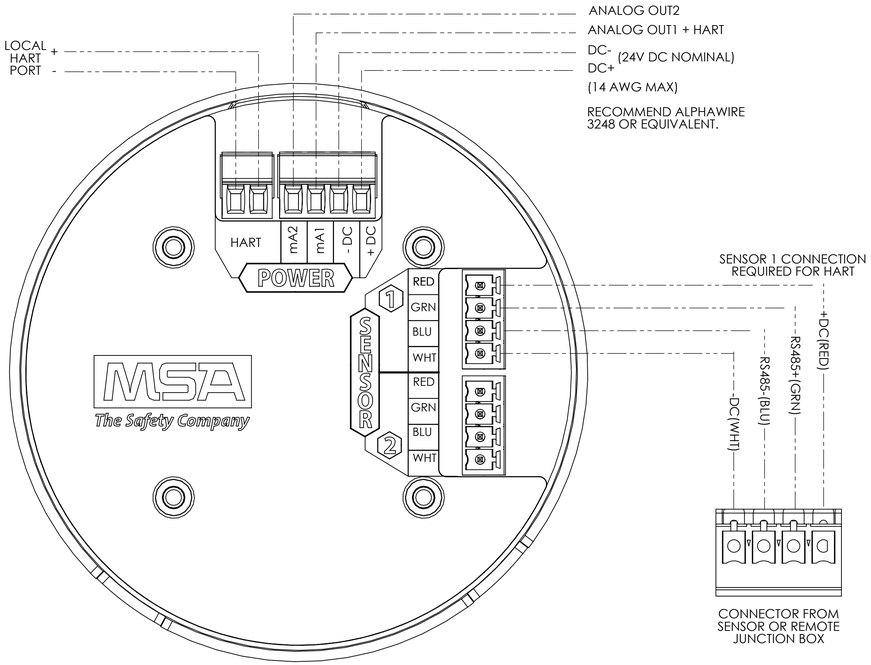
INSTALLATION OUTLINE, ULTIMA X5000

CADD REF: N/A

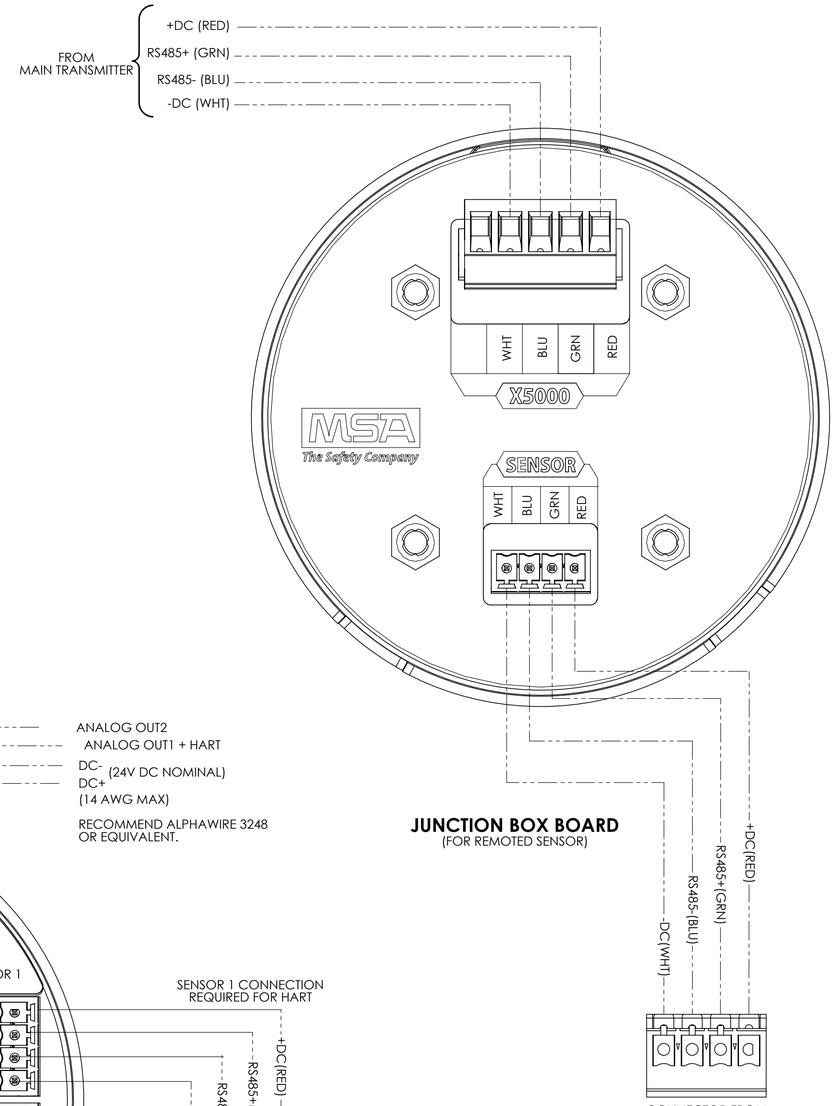
SCALE: 1:2

SHEET SIZE D

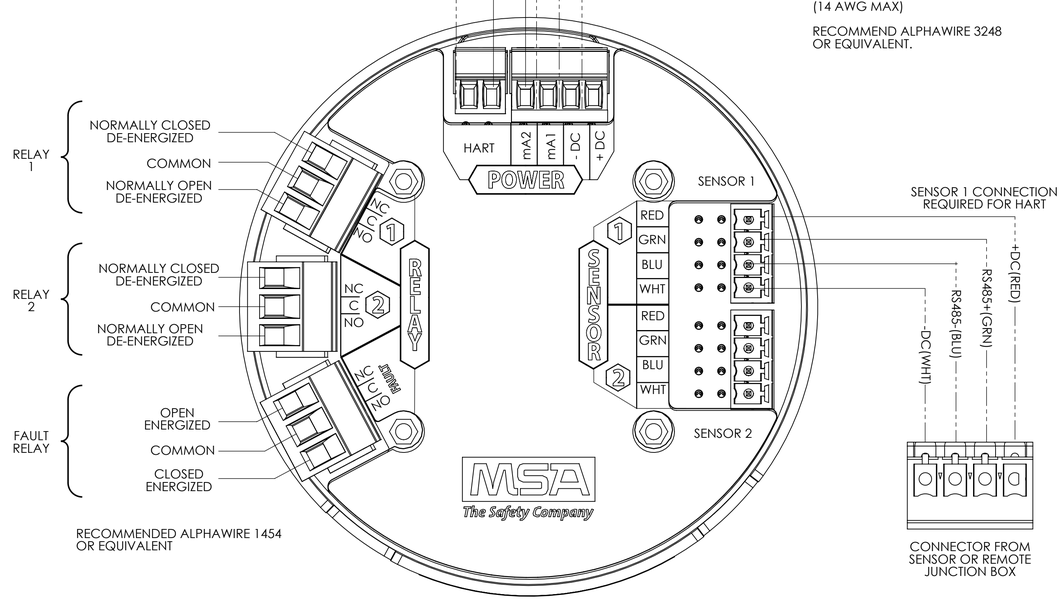
SK3015-1051



MAIN BOARD WITHOUT RELAYS



JUNCTION BOX BOARD
(FOR REMOTED SENSOR)



RECOMMENDED ALPHAWIRE 1454 OR EQUIVALENT

MAIN BOARD WITH RELAY OPTION

③

RETROFIT APPLICATION NOTES:

WHEN REPLACING AN EXISTING ULTIMA X WITH THE EQUIVALENT X5000 SENSOR TECHNOLOGY, THE FOLLOWING ITEMS NEED TO BE CHECKED IN ORDER FOR THE X5000 TO OPERATE:

1. WIRE GAUGE NEEDS TO BE 18-14 AWG TO THE X5000
2. SUFFICIENT POWER MUST BE SUPPLIED TO THE X5000 IN ACCORDANCE WITH THE MAXIMUM WIRE LENGTHS. SEE TABLES 1-3

IF THESE REQUIREMENTS ARE MET, PERFORMANCE OF THE X5000 SHOULD MEET THE NOISE IMMUNITY STANDARD EQUIVALENT OF THE ULTIMA X USING THE EXISTING WIRING; HOWEVER, THE INSTALLATION MAY NOT MEET THE LATEST EMC EN50270 NOISE IMMUNITY STANDARD THAT THE X5000 MEETS WITH THE GROUNDING AND WIRING SCHEME AS INDICATED IN THIS I/O DRAWING.

READ THE X5000 MANUAL CAREFULLY BEFORE INSTALLING OR USING THIS DEVICE. THE DEVICE WILL PERFORM AS DESIGNED ONLY IF IT IS USED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

REVISIONS
REV. 3

MSA The Safety Company	www.MSAsafety.com	LIFECYCLE STATE: Production	REVISION: 3
MSA STANDARD SHOP PRACTICES APPLY		THIRD-ANGLE PROJECTION	DO NOT SCALE DWG.
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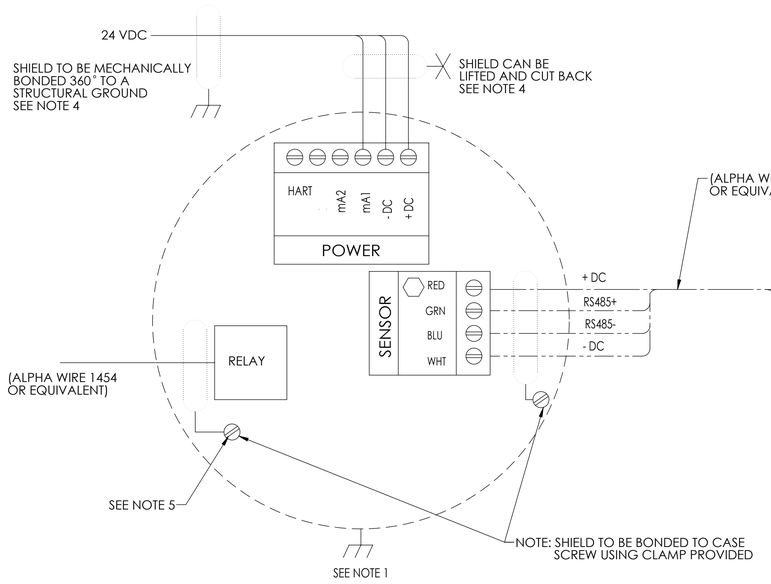
QUALITY ASSURANCE J.DANNHARDT 3-28-2017			
MANUFACTURING M.ZIRNSAK 3-28-2017			
CADD REF: SK3015-1051		SCALE: 1:2	
SHEET SIZE D	SK3015-1051	SHEET 3 OF 6	

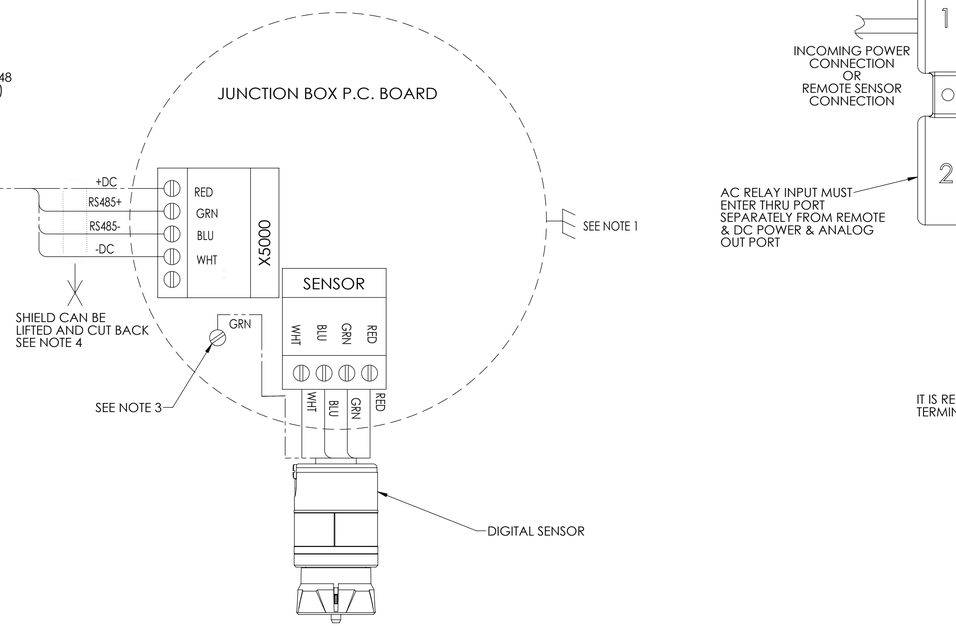
SINGLE SENSOR GROUNDING CONFIGURATION

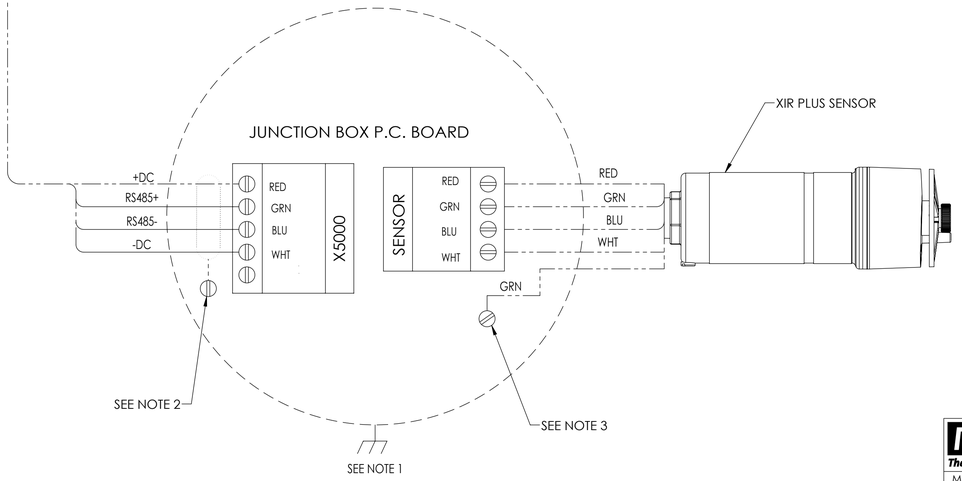


SINGLE SENSOR TRANSMITTER GROUNDING

OR

DIGITAL SENSOR GROUNDING

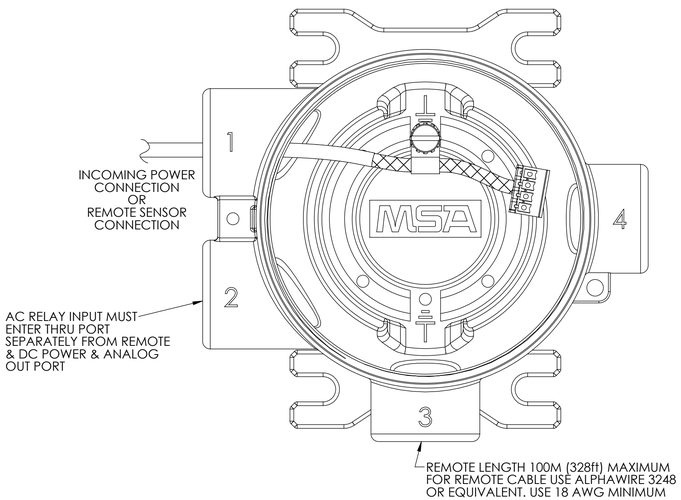




XIR PLUS SENSOR GROUNDING

**GENERAL BRAIDED SHIELD TERMINATION

IN MAIN TRANSMITTER



IT IS RECOMMENDED TO USE BRAIDED SHIELDED CABLE. THE SHIELD SHOULD BE TERMINATED 360° INTERNAL TO THE MAIN HOUSING AS SHOWN.

NOTES:

1. ENCLOSURE TO BE MECHANICALLY BOLTED TO STRUCTURAL GROUND.
2. SHIELD TO BE BONDED TO CASE SCREW REQUIRED WHEN REMOTING XIR PLUS SENSOR.
3. GREEN SENSOR WIRE TO BE BONDED TO ENCLOSURE CASE SCREW. KEEP WIRE AS SHORT AS POSSIBLE.
4. IF A LOW IMPEDANCE (360) SHIELD CONNECTION CANNOT BE MADE, BOND SHIELD TO INTERNAL CASE SCREW WITH CLAMP AND LEAVE SHIELD LIFTED AND CUTBACK AT 24VDC SOURCE.
5. WHEN INERFACING TO RELAYS, USE A BRAIDED SHIELD CABLE AND BOND TO CASE SCREW USING CLAMPS. USE ALPHA WIRE 1454 OR EQUIVALENT.

REVISIONS

REV. 3

LIFECYCLE STATE	REVISION
Production	3

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THIRD-ANGLE PROJECTION

DO NOT SCALE DWG.

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	DRAWN BY	DATE
	WJE	9-29-2016
	CHECKED BY	
	C.STARTA	3-28-2017
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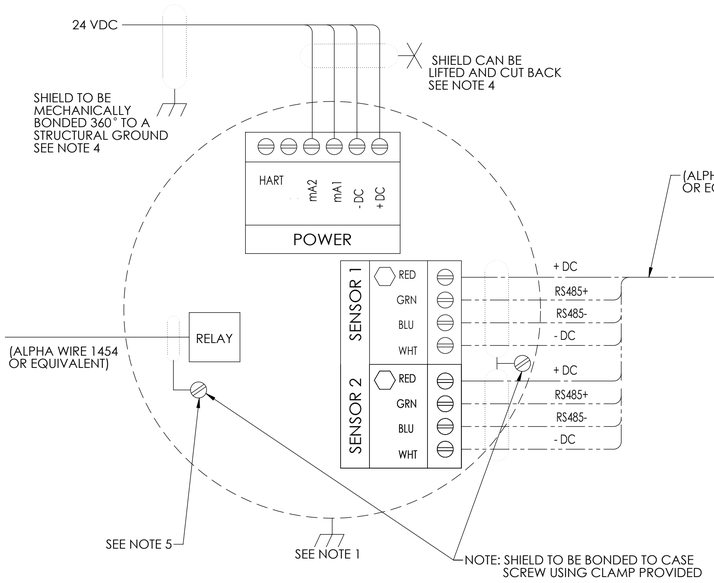
	QUALITY ASSURANCE	
	J.DANNHARDT	3-28-2017
	MANUFACTURING	
	M.ZIRNSAK	3-28-2017

INSTALLATION OUTLINE, ULTIMA X5000

CADD REF: SK3015-1051 | SCALE: 1:2

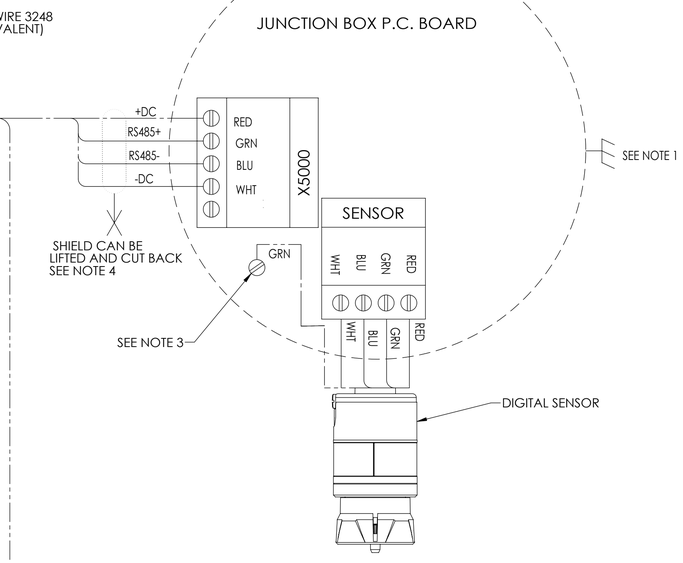
SHEET SIZE **D** | **SK3015-1051** | SHEET 4 OF 6

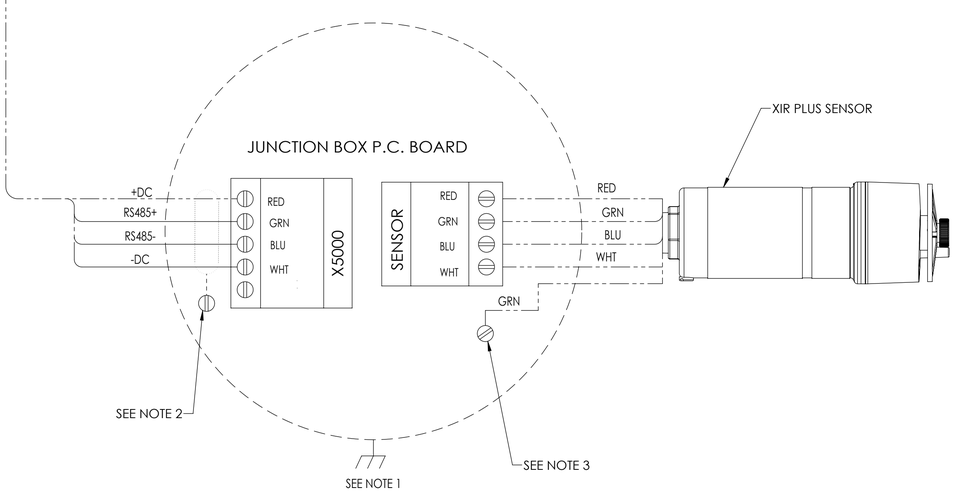
DUAL SENSOR GROUNDING CONFIGURATION



DUAL SENSOR TRANSMITTER GROUNDING

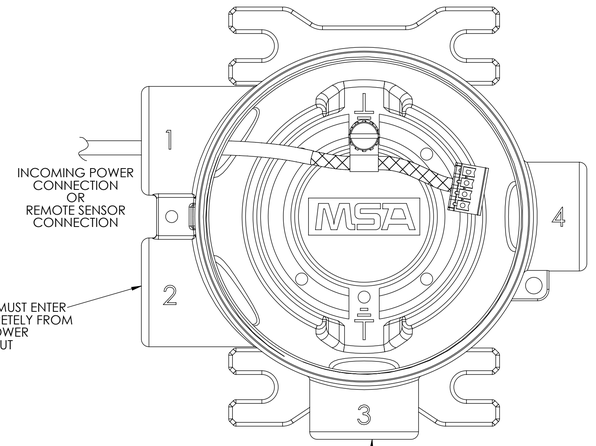
DIGITAL SENSOR GROUNDING





XIR PLUS SENSOR GROUNDING

**GENERAL BRAIDED SHIELD TERMINATION
IN MAIN TRANSMITTER



IT IS RECOMMENDED TO USE BRAIDED SHIELDED CABLE. THE SHIELD SHOULD BE TERMINATED 360° INTERNAL TO THE MAIN HOUSING AS SHOWN.

FOR DUAL REMOTED CONFIGURATIONS, TERMINATE THE BRAIDED SHIELD AT THE ADDITIONAL CLIPS IN THE MAIN HOUSING.

NOTES:

1. ENCLOSURE TO BE MECHANICALLY BOLTED TO STRUCTURAL GROUND.
2. SHIELD TO BE BONDED TO CASE SCREW REQUIRED WHEN REMOTING XIR PLUS SENSOR.
3. GREEN SENSOR WIRE TO BE BONDED TO ENCLOSURE CASE SCREW. KEEP WIRE AS SHORT AS POSSIBLE.
4. IF A LOW IMPEDANCE (360) SHIELD CONNECTION CANNOT BE MADE, BOND SHIELD TO INTERNAL CASE SCREW WITH CLAMP AND LEAVE SHIELD LIFTED AND CUTBACK AT 24VDC SOURCE.
5. WHEN INERFACING TO RELAYS, USE A BRAIDED SHIELD CABLE AND BOND TO CASE SCREW USING CLAMPS. USE ALPHA WIRE 1454 OR EQUIVALENT.

REVISIONS

REV. 3

LIFECYCLE STATE: Production | REVISION: 3

MSA The Safety Company | www.MSAsafety.com

MSA STANDARD SHOP PRACTICES APPLY

THIRD-ANGLE PROJECTION | DO NOT SCALE DWG.

JOB NO. 30012996 PH0705 | APPROVAL AGENCY CODE: | NIOSH ATTR. DOC.:

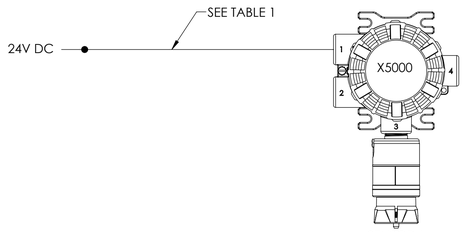
	DRAWN BY	DATE
	WJE	9-29-2016
CHECKED BY	C.STARTA	3-28-2017
PROJECT ENGR.	N.CICCONE	3-28-2017
QUALITY ASSURANCE	J.DANNHARDT	3-28-2017
MANUFACTURING	M.ZIRNSAK	3-28-2017

INSTALLATION OUTLINE, ULTIMA X5000

CADD REF: SK3015-1051 | SCALE: 1:2

SHEET SIZE D | SK3015-1051 | SHEET 5 OF 6

WIRING DISTANCES FROM POWER SUPPLY TO TRANSMITTER



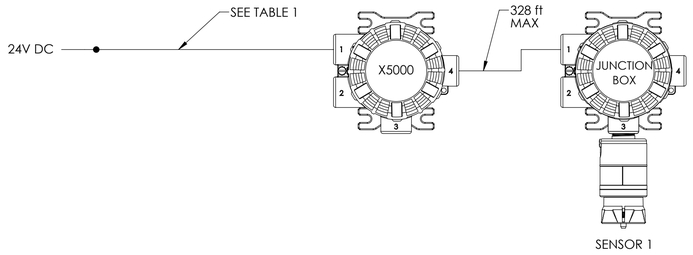
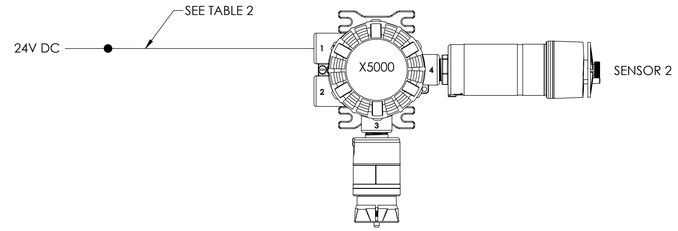


TABLE 1 - SINGLE SENSOR

Sensor Mounting	Sensor 1	Max Power (W)	Max Distance (FT) To Transmitter, 24 VDC Supply			
			18 AWG	16 AWG	14 AWG	12 AWG
MOUNTED ON TRANSMITTER	Echem	2.8	2211	3337	5314	8440
	Catalytic	5.5	1548	2335	3719	5907
	XIR Plus	6.7	1184	1787	2846	4520
REMOTE MOUNTED ON JUNCTION BOX (UP TO 328 ft)	Echem	2.8	2210	3335	5313	8439
	Catalytic	5.5	1504	2294	3679	5867
	XIR Plus	6.7	1090	1697	2759	4435



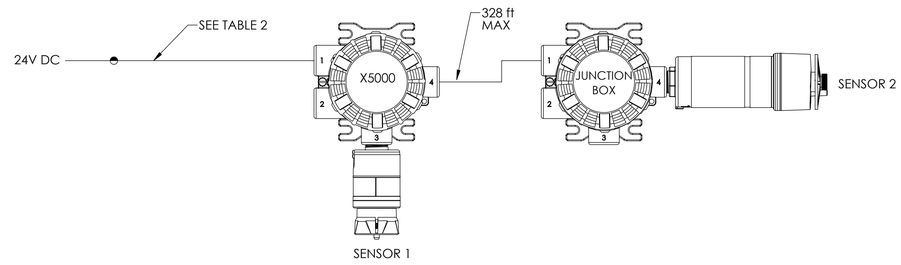


TABLE 2 - DUAL SENSORS

Sensor Mounting	Sensor 1	Sensor 2	Max Power (W)	Max Distance (FT) To Transmitter, 24 VDC Supply			
				18 AWG	16 AWG	14 AWG	12 AWG
TWO SENSORS Mounted on Transmitter	Echem	Echem	3.6	2078	3136	4994	7932
		Catalytic	5.3	1473	2223	3541	5623
		XIR Plus	7.0	1076	1623	2585	4106
	Catalytic	Echem	5.3	1473	2223	3541	5623
		Catalytic	10.6	1151	1736	2765	4392
		XIR Plus	10.9	893	1347	2146	3408
	XIR Plus	Echem	7.0	1076	1623	2585	4106
		Catalytic	10.9	893	1347	2146	3408
		XIR Plus	11.6	*One sensor must be remote mounted if using two XIR PLUS sensors*			
ONE SENSOR mounted on junction box (328 ft Max), ONE SENSOR on transmitter	Echem	Echem	3.6	2096	3154	5012	7952
		Catalytic	5.3	1441	2193	3512	5596
		XIR Plus	7.0	982	1536	2501	4024
	Catalytic	Echem	5.3	1441	2193	3512	5596
		Catalytic	10.6	1124	1711	2741	4368
		XIR Plus	10.9	763	1225	2029	3295
	XIR Plus	Echem	7.0	982	1536	2501	4024
		Catalytic	10.9	763	1225	2029	3295
		XIR Plus	11.6	731	1135	1843	2961

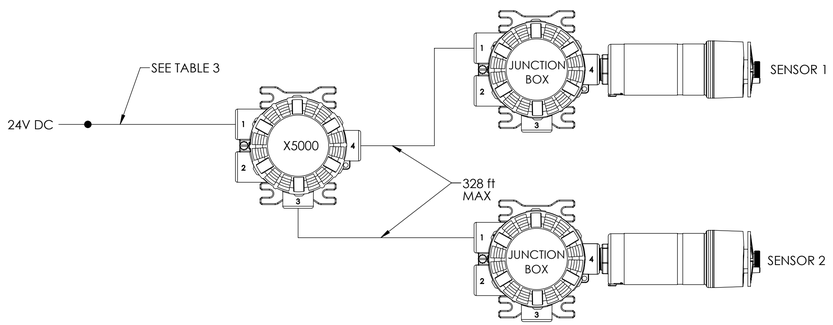


TABLE 3 - DUAL REMOTED SENSORS

Sensor Mounting	Sensor 1	Sensor 2	Max Power (W)	Max Distance (FT) To Transmitter, 24 VDC Supply			
				18 AWG	16 AWG	14 AWG	12 AWG
TWO SENSORS mounted on junction box up to 328ft for 24V	Echem	Echem	3.6	2079	3134	4992	7932
		Catalytic	5.3	1421	2173	3492	5576
		XIR Plus	7.0	962	1516	2481	4004
	Catalytic	Echem	5.3	1421	2173	3492	5576
		Catalytic	10.6	1104	1691	2721	4348
		XIR Plus	10.9	743	1205	2009	3275
	XIR Plus	Echem	7.0	962	1516	2481	4004
		Catalytic	10.9	743	1205	2009	3275
		XIR Plus	11.6	711	1115	1823	2941

NOTES:

1. WHEN SIZING A SYSTEM'S 24V SUPPLY, A 1 AMP INRUSH CURRENT WITH A 1ms DURATION SHOULD BE CONSIDERED FOR EACH ULTIMA X5000 ON THE POWER SUPPLY

REVISIONS

REV. 3

LIFECYCLE STATE: Production | REVISION: 3

MSA The Safety Company | www.MSAsafety.com

MSA STANDARD SHOP PRACTICES APPLY

THIRD-ANGLE PROJECTION | DO NOT SCALE DWG.

JOB NO. 30012996 PH0705 | APPROVAL AGENCY CODE: | NIOSH ATTR. DOC.:

DRAWN BY WJE DATE 9-29-2016

CHECKED BY C.STARTA 3-28-2017

PROJECT ENGR. N.CICCONE 3-28-2017

QUALITY ASSURANCE J.DANNHARDT 3-28-2017

MANUFACTURING M.ZIRNSAK 3-28-2017

INSTALLATION OUTLINE, ULTIMA X5000

CADD REF: N/A | SCALE: 1:1

SHEET SIZE D | SK3015-1051 | SHEET 6 OF 6

Appendix B

Emergency Backup Power System Information

GENERATOR DATA

AUGUST 01, 2019

For Help Desk Phone Numbers Click here

Selected Model

Engine: 3412	**Generator Frame:** 593	**Genset Rating (kW):** 600.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 9Y0448	**Genset Rating (kVA):** 750.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.8	**Rated Current:** 902.1
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version: 39094 /38915 /38261 /10347

Spec Information

Generator Specification

Frame: 593 **Type:** SR4B	**No. of Bearings:** 1
Winding Type: RANDOM WOUND	**Flywheel:** 18.0
Connection: SERIES STAR	**Housing:** 0
Phases: 3	**No. of Leads:** 12
Poles: 4	**Wires per Lead:** 2
Sync Speed: 1800	**Generator Pitch:** 0.7333

Generator Efficiency

Per Unit Load	kW	Efficiency %
0.25	150.0	91.2
0.5	300.0	94.1
0.75	450.0	94.6
1.0	600.0	94.4

Reactances	Per Unit	Ohms
SUBTRANSIENT - DIRECT AXIS X''_d	0.1458	0.0448
SUBTRANSIENT - QUADRATURE AXIS X''_q	0.1452	0.0446
TRANSIENT - SATURATED X'_d	0.2113	0.0649
SYNCHRONOUS - DIRECT AXIS X_d	2.8405	0.8726
SYNCHRONOUS - QUADRATURE AXIS X_q	1.4437	0.4435
NEGATIVE SEQUENCE X_2	0.1455	0.0447
ZERO SEQUENCE X_0	0.0420	0.0129

Time Constants	Seconds
OPEN CIRCUIT TRANSIENT - DIRECT AXIS T'_{d0}	2.6060
SHORT CIRCUIT TRANSIENT - DIRECT AXIS T'_d	0.1939
OPEN CIRCUIT SUBSTRANSIENT - DIRECT AXIS T''_{d0}	0.0093
SHORT CIRCUIT SUBSTRANSIENT - DIRECT AXIS T''_d	0.0068
OPEN CIRCUIT SUBSTRANSIENT - QUADRATURE AXIS T''_{q0}	0.0081
SHORT CIRCUIT SUBSTRANSIENT - QUADRATURE AXIS T''_q	0.0061
EXCITER TIME CONSTANT T_e	0.1400
ARMATURE SHORT CIRCUIT T_a	0.0254

Short Circuit Ratio: 0.5	Stator Resistance = 0.0087 Ohms	Field Resistance = 1.44 Ohms

Voltage Regulation

Voltage level adjustment: +/-	5.0%
Voltage regulation, steady state: +/-	0.5%
Voltage regulation with 3% speed change: +/-	0.5%
Waveform deviation line - line, no load: less than	5.0%
Telephone influence factor: less than	50

Generator Excitation

	No Load	Full Load, (rated) pf	
		Series	Parallel
Excitation voltage:	9.97 Volts	44.0 Volts	Volts
Excitation current	2.21 Amps	8.03 Amps	Amps

Selected Model

Engine: 3412	**Generator Frame:** 593	**Genset Rating (kW):** 600.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 9Y0448	**Genset Rating (kVA):** 750.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.8	**Rated Current:** 902.1
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version:
39094 /38915 /38261 /10347

Generator Mechanical Information

Center of Gravity

Dimension X	-746.0 mm	-29.4 IN.
Dimension Y	0.0 mm	0.0 IN.
Dimension Z	0.0 mm	0.0 IN.

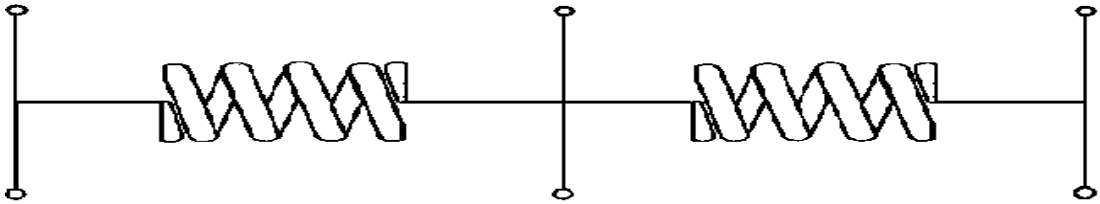
- "X" is measured from driven end of generator and parallel to rotor. Towards engine fan is positive. See General Information for details
- "Y" is measured vertically from rotor center line. Up is positive.
- "Z" is measured to left and right of rotor center line. To the right is positive.

Generator WT = 1707 kg	* Rotor WT = 540 kg	* Stator WT = 1167 kg
3,763 LB	1,190 LB	2,573 LB

Rotor Balance = 0.0508 mm deflection PTP

Overspeed Capacity = 150% of synchronous speed

Generator Torsional Data



J1 = Coupling and Fan | **J2 = Rotor** | **J3 = Exciter End**

TOTAL J = J1 + J2 + J3

K1 = Shaft Stiffness between J1 + J2 (Diameter 1)

K2 = Shaft Stiffness between J2 + J3 (Diameter 2)

J1	K1	Min Shaft Dia 1	J2	K2	Min Shaft Dia 2	J3
11.8 LB IN. s^2	75.2 MLB IN./rad	5.0 IN.	72.9 LB IN. s^2	9.7 MLB IN./rad	2.5 IN.	1.5 LB IN. s^2
1.336 N m s^2	8.5 MN m/rad	127.0 mm	8.238 N m s^2	1.1 MN m/rad	63.5 mm	0.171 N m s^2

Total J

86.3 LB IN. s^2

9.745 N m s^2

Selected Model

Engine: 3412	**Generator Frame:** 593	**Genset Rating (kW):** 600.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 9Y0448	**Genset Rating (kVA):** 750.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.8	**Rated Current:** 902.1
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version:
39094 /38915 /38261 /10347

Generator Cooling Requirements - Temperature - Insulation Data

Cooling Requirements:		**Temperature Data: (Ambient 40 ^{0}C)**	
Heat Dissipated:	35.6 kW	**Stator Rise:**	130.0 ^{0}C
Air Flow:	112.2 m^3/min	**Rotor Rise:**	130.0 ^{0}C

Insulation Class: H

Insulation Reg. as shipped: 100.0 MΩ minimum at 40 ^{0}C

Thermal Limits of Generator

Frequency:	60 Hz
Line to Line Voltage:	480 Volts
B BR 80/40	565.0 kVA
F BR -105/40	681.0 kVA
H BR - 125/40	750.0 kVA
F PR - 130/40	750.0 kVA

Selected Model

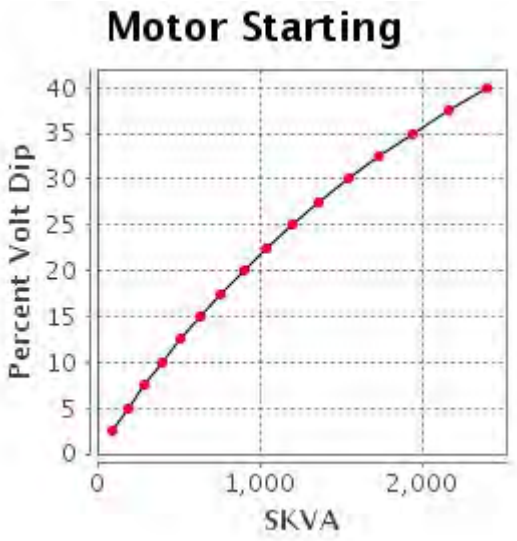
Engine: 3412	**Generator Frame:** 593	**Genset Rating (kW):** 600.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 9Y0448	**Genset Rating (kVA):** 750.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.8	**Rated Current:** 902.1
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version:
39094 /38915 /38261 /10347

Starting Capability & Current Decrement

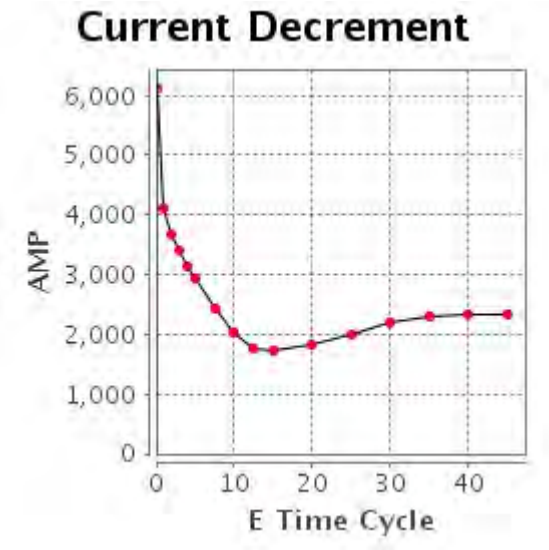
Motor Starting Capability (0.4 pf)

SKVA	Percent Volt Dip
92	2.5
189	5.0
292	7.5
400	10.0
514	12.5
635	15.0
763	17.5
900	20.0
1,045	22.5
1,199	25.0
1,365	27.5
1,542	30.0
1,733	32.5
1,938	35.0
2,159	37.5
2,399	40.0



Current Decrement Data

E Time Cycle	AMP
0.0	6,135
1.0	4,118
2.0	3,675
3.0	3,395
4.0	3,148
5.0	2,923
7.5	2,438
10.0	2,046
12.5	1,767
15.0	1,720
20.0	1,826
25.0	2,004
30.0	2,208
35.0	2,313
40.0	2,341
45.0	2,348



Instantaneous 3 Phase Fault Current: 6135 Amps **Instantaneous Line - Line Fault Current:** 5319 Amps
Instantaneous Line - Neutral Fault Current: 8056 Amps

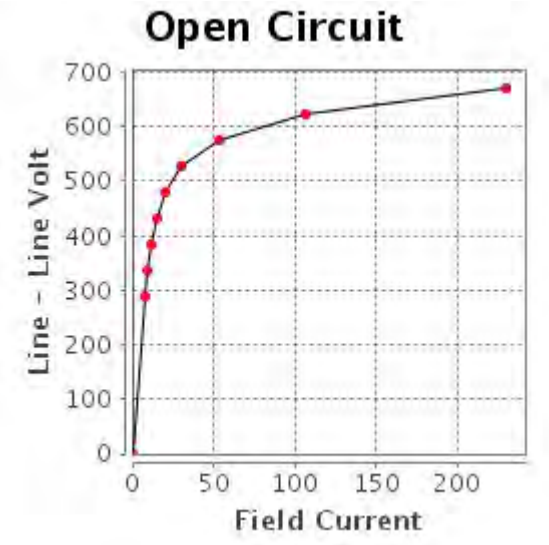
Selected Model

Engine: 3412	**Generator Frame:** 593	**Genset Rating (kW):** 600.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 9Y0448	**Genset Rating (kVA):** 750.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.8	**Rated Current:** 902.1
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version:
39094 /38915 /38261 /10347

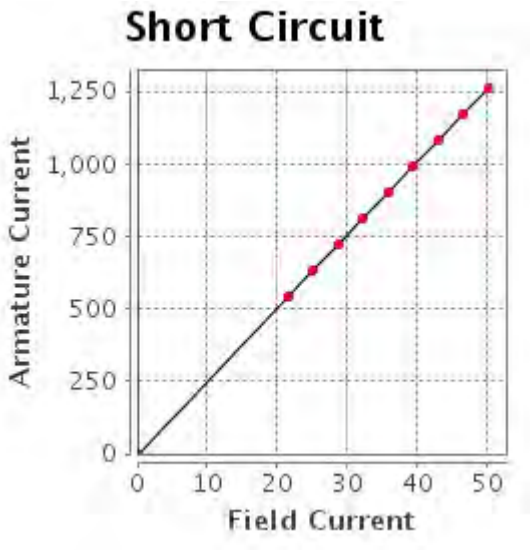
Generator Output Characteristic Curves
Open Circuit Curve

Field Current	Line - Line Volt
0.0	0
8.2	288
9.8	336
11.8	384
14.8	432
20.0	480
30.5	528
53.7	576
106.6	624
229.8	672



Short Circuit Curve

Field Current	Armature Current
0.0	0
21.5	541
25.1	631
28.7	722
32.3	812
35.9	902
39.4	992
43.0	1,083
46.6	1,173
50.2	1,263



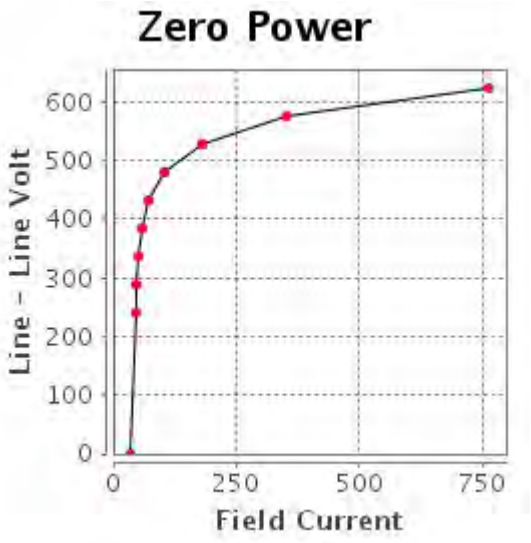
Selected Model

Engine: 3412	**Generator Frame:** 593	**Genset Rating (kW):** 600.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 9Y0448	**Genset Rating (kVA):** 750.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.8	**Rated Current:** 902.1
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version:
39094 /38915 /38261 /10347

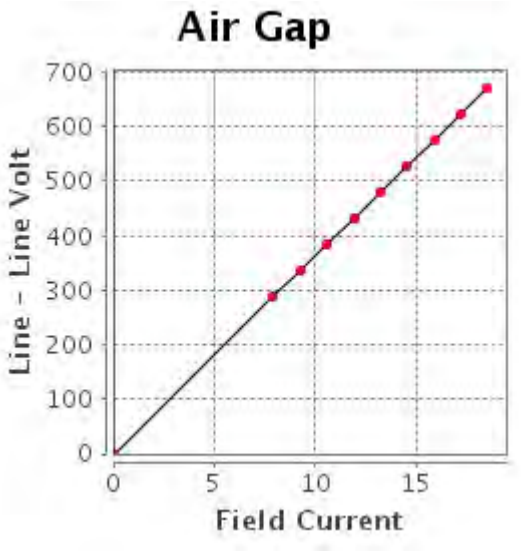
Generator Output Characteristic Curves
Zero Power Factor Curve

Field Current	Line - Line Volt
35.9	0
46.0	240
48.3	288
52.0	336
58.8	384
73.1	432
105.2	480
179.4	528
352.9	576
761.4	624



Air Gap Curve

Field Current	Line - Line Volt
0.0	0
7.9	288
9.3	336
10.6	384
11.9	432
13.2	480
14.5	528
15.9	576
17.2	624
18.5	672



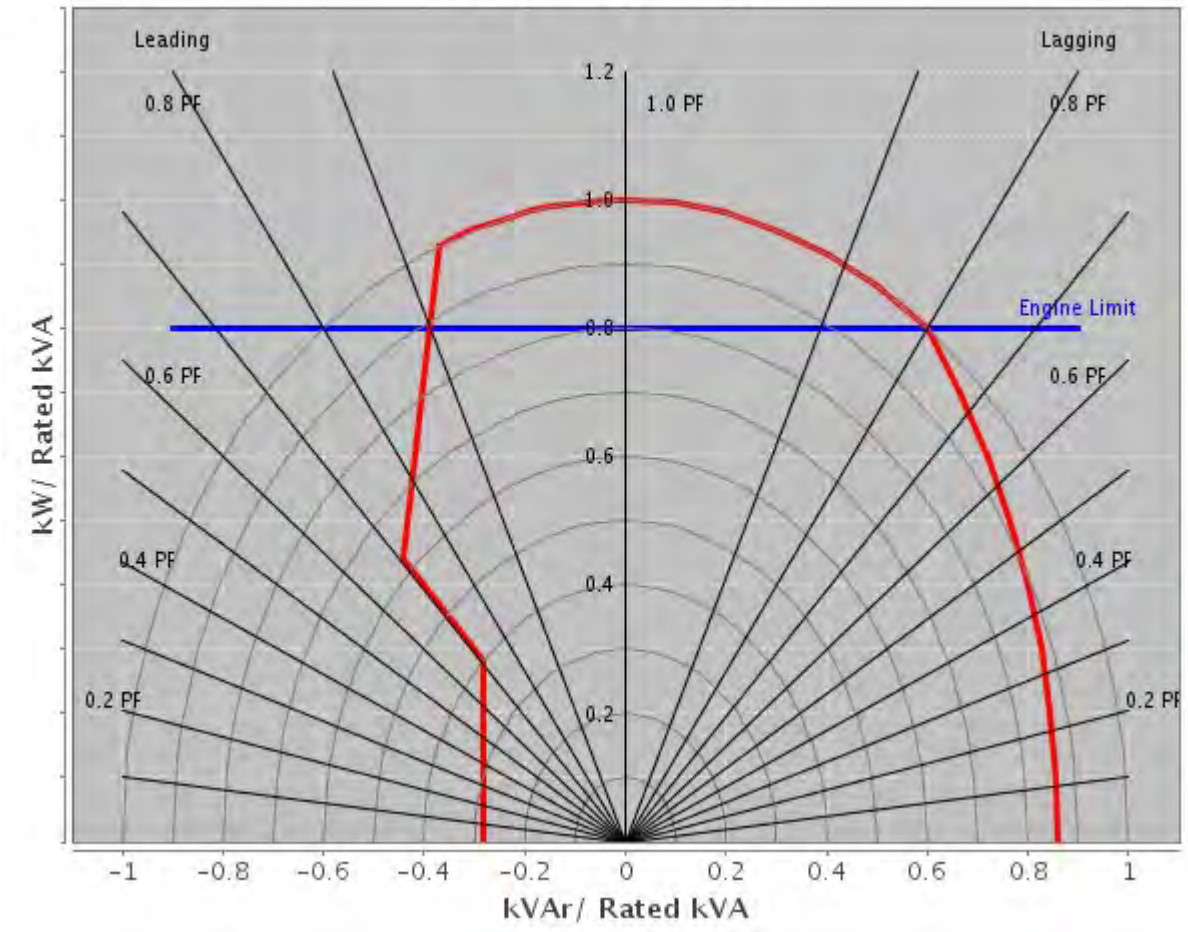
Selected Model

Engine: 3412	**Generator Frame:** 593	**Genset Rating (kW):** 600.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 9Y0448	**Genset Rating (kVA):** 750.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.8	**Rated Current:** 902.1
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version:
39094 /38915 /38261 /10347

Reactive Capability Curve

Operating Chart



Selected Model

Engine: 3412	**Generator Frame:** 593	**Genset Rating (kW):** 600.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 9Y0448	**Genset Rating (kVA):** 750.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.8	**Rated Current:** 902.1
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version:
39094 /38915 /38261 /10347

General Information

DM7802
GENERATOR GENERAL INFORMATION

I. GENERATOR MOTOR STARTING CAPABILITY CURVES
A. THE MOTOR STARTING CURVES ARE REPRESENTATIVE OF THE DATA OBTAINED BY THE FOLLOWING PROCEDURE:
1. THE CATERPILLAR GENERATOR IS DRIVEN BY A SYNCHRONOUS DRIVER.
2. VARIOUS SIZE THREE PHASE INDUCTION MOTORS (NEMA CODE F) ARE STARTED ACROSS THE LINE LEADS OF THE UNLOADED GENERATOR.
3. THE RESULTING VOLTAGE DIPS ARE RECORDED WITH AN OSCILLOSCOPE.
4. MOTOR HORSEPOWER HAS BEEN CONVERTED TO STARTING KILOVOLT AMPERES (SKVA).
5. RECORDED VOLTAGE DIPS HAVE BEEN EXPRESSED AS A OF GENERATOR RATED VOLTAGE.

II. USE OF THE MOTOR STARTING CAPABILITY CURVES.
A. CALCULATE THE SKVA REQUIRED BY THE MOTOR FOR FULL VOLTAGE STARTING ACROSS THE LINE IF THE VALUE IS NOT LISTED ON THE MOTOR DATA PLATE.
1. MOTORS CONFORMING TO NEMA STANDARDS
MULTIPLY THE MOTOR HORSEPOWER BY THE NEMA SKVA/HP FIGURE. FOR NEMA CODE F,USE 5.3 SKVA/HP; FOR NEMA CODE G, USE 6.0 SKVA/HP.
2. ALL OTHER MOTORS:
MULTIPLY THE RATED VOLTAGE BY THE LOCKED ROTOR AMPERE AND BY 0.001732. (IF THE LOCKED ROTOR AMPERES ARE NOT LISTED, MULTIPLY THE FULL LOAD (RUNNING) AMPERES BY
B. USE THE ABOVE SKVA WITH THE MOTOR STARTING TABLE.
1. ACROSS LINE STARTING:
READ ACROSS THE ROW OF "ACROSS THE LINE STARTING SKVA
IF THE DESIRED VALUE OF SKVA IS NOT GIVEN, CALCULATE THE DIP BY FINDING THE PROPER SKVA INTERVAL AND INTERPOLATING AS FOLLOWS:
SKVA1 IS THE SKVA TABLE ENTRY JUST SMALLER THAN THE DESIRED SKVA, DIP1 IS THE DIP FOR SKVA2, AND SKVA2 IS THE SKVA TABLE ENTRY JUST GREATER THAN THE DESIRED SKVA. THE DIP (IN PERCENT) AT THE DESIRED SKVA IS:
DIP = DIP1 + (SKVA - SKVA1) * 2.5 /
(SKVA2 - SKVA1)
NOTE:VOLTAGE DIPS GREATER THAN 35% MAY CAUSE MAGNETIC CONTACTORS TO DROP OUT.

2. REDUCED VOLTAGE STARTING:
REFER TO THE FOLLOWING TABLE. MULTIPLY THE CALCULATE ACROSS LINE SKVA BY THE MULTIPLIER LISTED FOR THE SPECIFIC STARTING METHOD. APPLY THE RESULT TO THE STARTING TABLE AS IN II A, TO CALCULATE THE EXPECTED VOLTAGE DIP:

TYPE OF REDUCED VOLTAGE STARTING	MULTIPLY LINE SKVA BY
80% TAP	.80
65% TAP	.65
50% TAP	.50
45% TAP	.45
Wye start,delta run	.33
AUTOTRANSFORMER	
80% TAP	.68
65% TAP	.46
50% TAP	.29

NOTE: REDUCE VOLTAGE STARTING LOWERS THE MAXIMUM
REQUIRED MOTOR skVA.
3. Part winding starting:
Most common is half-winding start, full-winding run.
Multiply the full motor, accross line starting skVA
by 0.6. Apply the result to the selected curve as
in ii. A above. Read the expected voltage dip, for
the required skVA.

III.DEFINITION:
A. GENERATOR TERMS
MODEL: Engine Sales model
ENG TYPE: DI = Direct Injection,
NA = Naturally aspirated, etc
HZ: Running frequency, hertz
RATING TYPE: PP, SB (prime power or standby)
KW: Base rating electrical kilowatts (ekW)
VOLTS: Rating terminal, line to line
GEN ARR: Cat generator arrangement part number
GEN FRAME: Generator frame size designation
CONN: Generator output connection
(star, wye, delta, ect.)
POLES: Number of pole pieces on rotor.
(eg. A 4 pole generator run at 1800)
RPM will produce 60 Hz alternating current. A 6 pole
generator run at 1200 RPM will produce 60 Hz alternating
current.)
B. GENERATOR TEMPERATURE RISE:
The indicated temperature rise indicated the NEMA limits
for standby or prime power applications. These rises are
used for calculating the losses and efficiencies and are
not necessarily indicative of the actual temperature rise
of a given machine.

C. CENTER OF GRAVITY
The specified center of gravity is for the generator only.
For single bearing, and two bearing close coupled generators, the cent
er of gravity is measured from the generator/engine flywheel housing i
nterface and from the centerline of the rotor shaft.

For two bearing, standalone generators, the center of gravity is measu
red from the end of the rotor shaft and from the centerline of the rot
or shaft.

For two bearing, standalone generators, the center of gravity is measu
red from the end of the rotor shaft and from the centerline of the rot
or shaft.

D. GENERATOR DECREMENT CURRENT CURVES

The generator decrement current curve gives the
symmetrical current supplied by the generator for a three
phase bolted fault at the generator terminals. Generators
equipped with the series boost attachment or generators
with PM excitation system will supply 300% of rated current
for at least 10 seconds.

E. GENERATOR EFFICIENCY CURVES
The efficiency curve is representative of the overall
generator efficiency over the normal range of the
electrical load and at the specified parameters. This is
not the overall engine generator set efficiency curve.

Appendix C

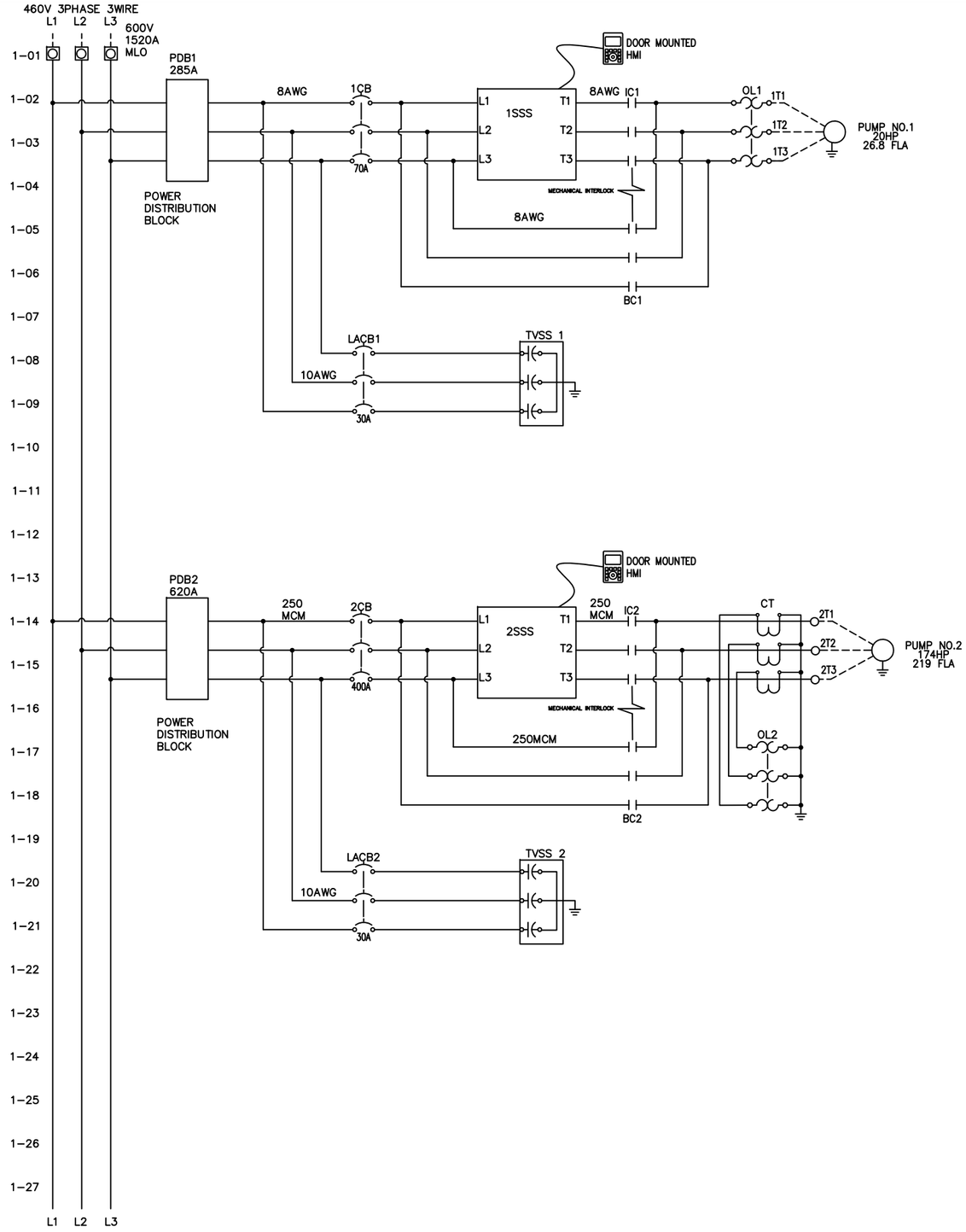
Pump Station Control Panel Information

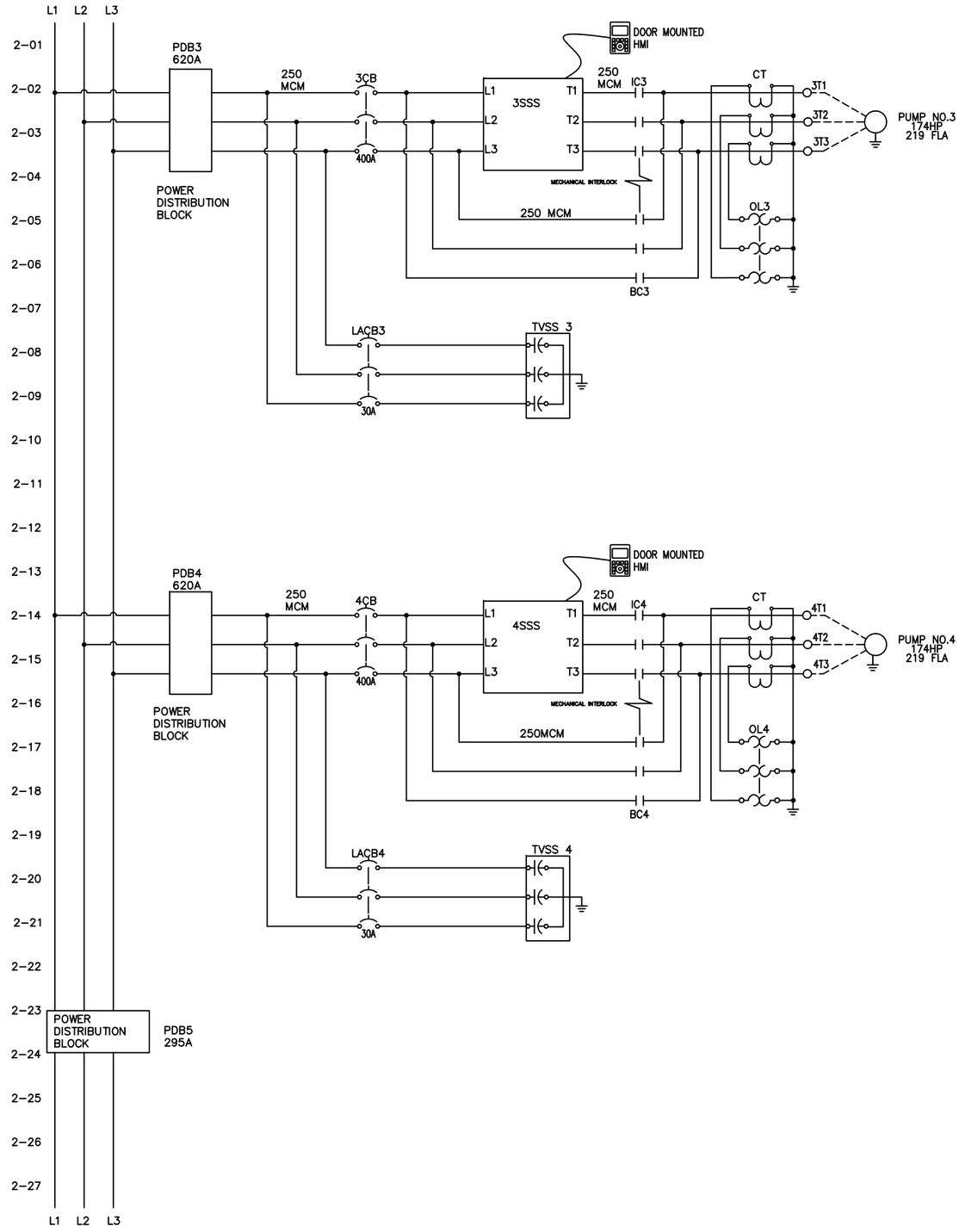
Fort Washington Way Pump Station
Control Panel Bill of Materials

DESCRIPTION	MANUFACTURER	PART NUMBER	QTY.
ENCLOSURE, NEMA 12 (86.12"H X 149.19"W X 14.12"D)	HOFFMANN	A-86M4E	1
CIRCUIT BREAKER, 3 POLE, PUMP NO. 1, 70 AMP	EATON-WESTINGHOUSE	HFD3070L	1
CIRCUIT BREAKER, 3 POLE, PUMPS 2,3, AND 4, 400 AMP	EATON-WESTINGHOUSE	HKD3400	3
CIRCUIT BREAKER, 3 POLE, ZAP TRAP, 30 AMP	EATON-WESTINGHOUSE	GHC3030	4
CIRCUIT BREAKER, 3 POLE, SUMP PUMP/FANS, 15 AMP	EATON-WESTINGHOUSE	HFD3015L	4
STARTER, NEMA SIZE 3	EATON-WESTINGHOUSE	AN16KNOA	1
CONTACTOR, NEMA SIZE 3	EATON-WESTINGHOUSE	CN15KN3A	1
CONTACTOR, NEMA SIZE 5	EATON-WESTINGHOUSE	CN15TN3A	6
OVERLOAD HEATER PACK	EATON-WESTINGHOUSE	H2020-3	1
OVERLOAD HEATER PACK	EATON-WESTINGHOUSE	H2006B-3	3
SOLID STATE STARTER, W/ SOFT STOP (SMC-PLUS)	EATON	S811+N66N3S	1
SOLID STATE STARTER, W/ SOFT STOP (SMC-PLUS)	EATON	S811+U42N3S	3
FUSE, 600V, 1/2 AMP	LITTLEFUSE	KLKD-1/2	8
FUSE, 500V, 1/8 AMP	LITTLEFUSE	FLQ-1/8	3
FUSE, 250V, 2 AMP	LITTLEFUSE	FLM-2	3
FUSE, 250V, 1 AMP	LITTLEFUSE	FLM-1	1
TRANSFORMER, 460/120 VOLT, 3 KVA	SIEMENS	1D1N003ST	1
TRANSFORMER, ISOLATION, 120/120 VOLT, 300 VA	MICRON	B300L15XK	1
POWER SUPPLY, 120VAC/24VDC	IDEC	PS5R-B24	1
LIGHTNING ARRESTOR	INNOVATIVE TECHNOLOGY	XT40-3Y201	4
PHASE MONITOR RELAY, ADJUSTABLE	SSAC	RLM 911	1
FLASHER, 2 AMP, 120 VOLT	SSAC	FS 127	1
ELAPSED TIME METER, 120 VOLT, NON-RESETTABLE	YOKOGAWA	240-711-AAAD	4
ELAPSED TIME METER, 120 VOLT, RESETTABLE	YOKOGAWA	240-712-AAAD	4
ALARM BEACON	INGRAM PRODUCTS	LRX-40	1
ALARM HORN	FLOYD BELL	MW-V09-201-S	1
CPU, SLC-5/03	ALLEN BRADLEY	1747-L532	1
TOUCH SCREEN, 5" (QUICK PANEL JR.)	TCP	QPJ2D100-L2P/SERIES A	1
INPUT MODULE, 16 PTS	ALLEN BRADLEY	1746-IA16	3
OUTPUT MODULE 16 PTS	ALLEN BRADLEY	1746-OW16	2
ANALOG INPUT MODULE, 4 CHANNEL	ALLEN BRADLEY	1746-N14	1
POWER SUPPLY	EATON	PSG960F24RM	1
I/O CHASSIS, 7 SLOT	ALLEN BRADLEY	1746-A7/SERIES A	1
COOLING PACKAGE, 560 CFM	HOFFMANN	A-PA10AXFN	2
INTRINSICALLY SAFE RELAY	P&F	Z787.H	1
RELAY, PLUG IN, DPDT	OMRON	LY2N	55
RELAY, PLUG IN, 4PDT, 120 VOLT	OMRON	LY4N-110/120VAC	15
TIMER, ON-DELAY, DPDT, 120 VOLT (1 SEC. - 10 MIN)	IDEC	RTE-P11-120V	10
STARTER, IEC	SQUARE D	LC1-D09G7	1
OVERLOAD RELAY	SQUARE D	LRD08	1
CIRCUIT BREAKER, 2 POLE, TRANSFER PRI, 15 AMP	EATON	FAZ-D15/2-NA	1
CIRCUIT BREAKER, 1 POLE, 30 AMP	CULTER-HAMMER	GC1030	1
CIRCUIT BREAKER, 1 POLE, 2 AMP	ABB	S271-K2	2
CIRCUIT BREAKER, 1 POLE, 4 AMP	ABB	S271-K4	1
TERMOSTAT, N.O.	VYNCKIER	VESNO	1

Fort Washington Way Pump Station
Control Panel Bill of Materials

GFI DUPLEX RECEPTACLE, 15 AMP	LEVITON	6599-I	1
RELAY, POWER, DPDT, 120 VOLT, 30 AMP	WW GRANGER	5X847	3
RELAY, TRIPLEX ALTERNATING	DIVERSIFIED	ARA-120-AFE	1
MOISTURE SENSOR RELAY	SSAC	LLC54AAS	2
MOTOR MEGGER	MSE	M603IND-120	4
INTRINSICALLY SAFE RELAY, 4 CHANNEL, 120 VOT	DIVERSIFIED	ISO-120-ACE	2
PRESSURE TRANSDUCER, SUBMERSIBLE	KELLER	700 SERIES	1
RELAY, LED, PLUG-IN, 4PDT, 24 VDC	OMRON	LYN4-24VDC	3
TRANSFORMER, ISOLATION, 120/120 VOLT, 100 VA	MICRON	B100L15XK	1
GFCI SWITCH, 20 AMP	PASS & SEYMOUR	2081-SI	1
ENCLOSURE, NEMA 12, PUSHBUTTON, 6-HOLES, 30.5MM	HOFFMANN	E-6PBY25	1
OVERLOAD RELAY, 3 POLE, 32 AMP	CULTER-HAMMER	C306DN3B	3
PUMP SAFE "A"	KSB		3
REMOTE KEYPADS	EATON	EMA69B	4
LEVEL METER	PRECISION DIGITAL	PD6000-6R7	1
PUSH TO TEST INDICATIOR LIGHTS (RED)	SQUARE D	9001KT38R	19
RED LENS	SQUARE D	9001R31	19
PUSH TO TEST INDICATIOR LIGHTS (AMBER)	SQUARE D	9001KT38LY	6
AMBER LENS	SQUARE D	9001A31	6
PUSH TO TEST INDICATIOR LIGHTS (GREEN)	SQUARE D	9001KT38LG	9
GREEN LENS	SQUARE D	9001G31	9





QUALITY CONTROLS,
INC. 3411 CHURCH
STREET
CINCINNATI,OHIO
45244 (513)
272–3900

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SQUARE D 9080GM6 TO 7–8 IN–LBS
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TO DE–ENERGIZE EQUIPMENT BEFORE SERVICING

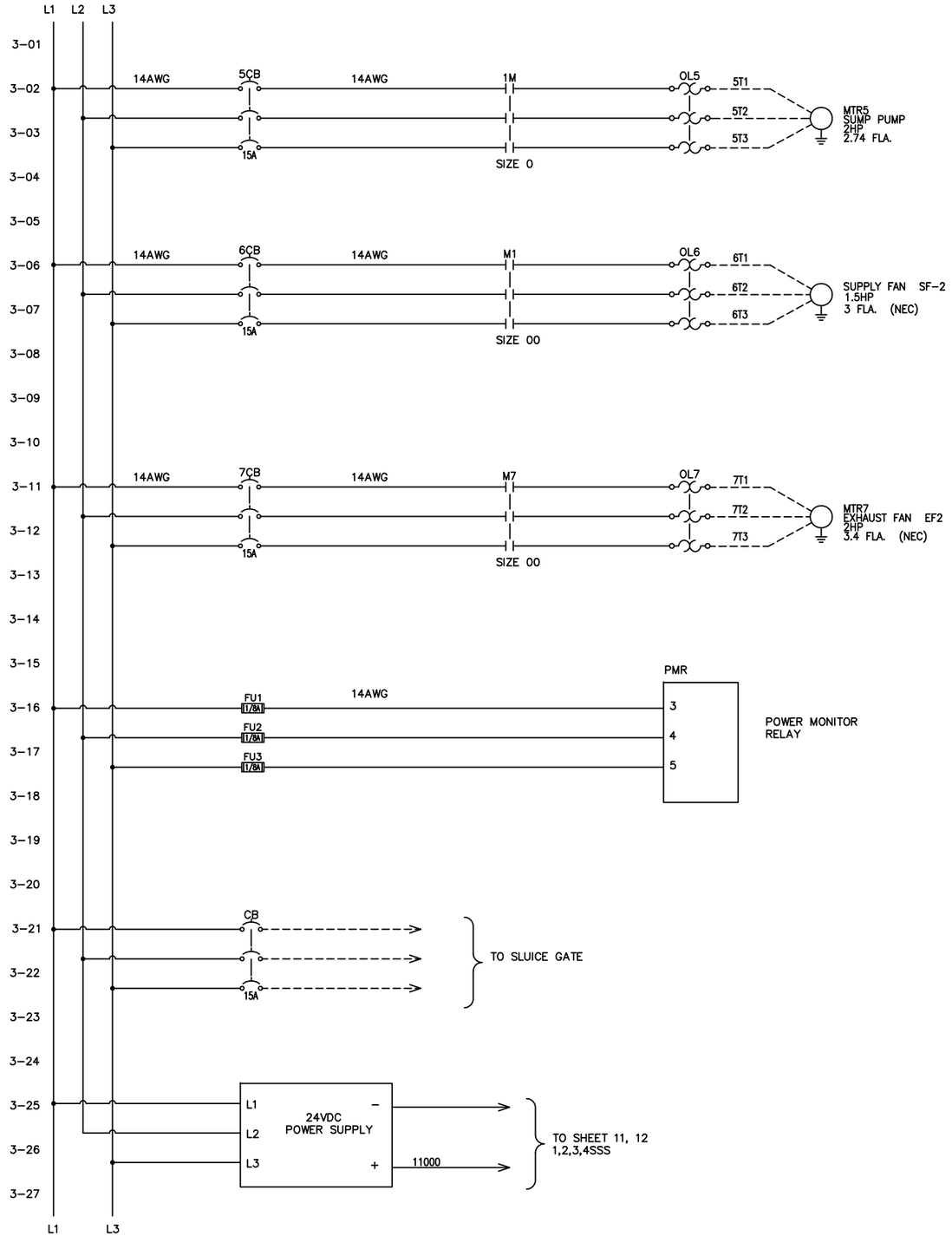
UL LISTED

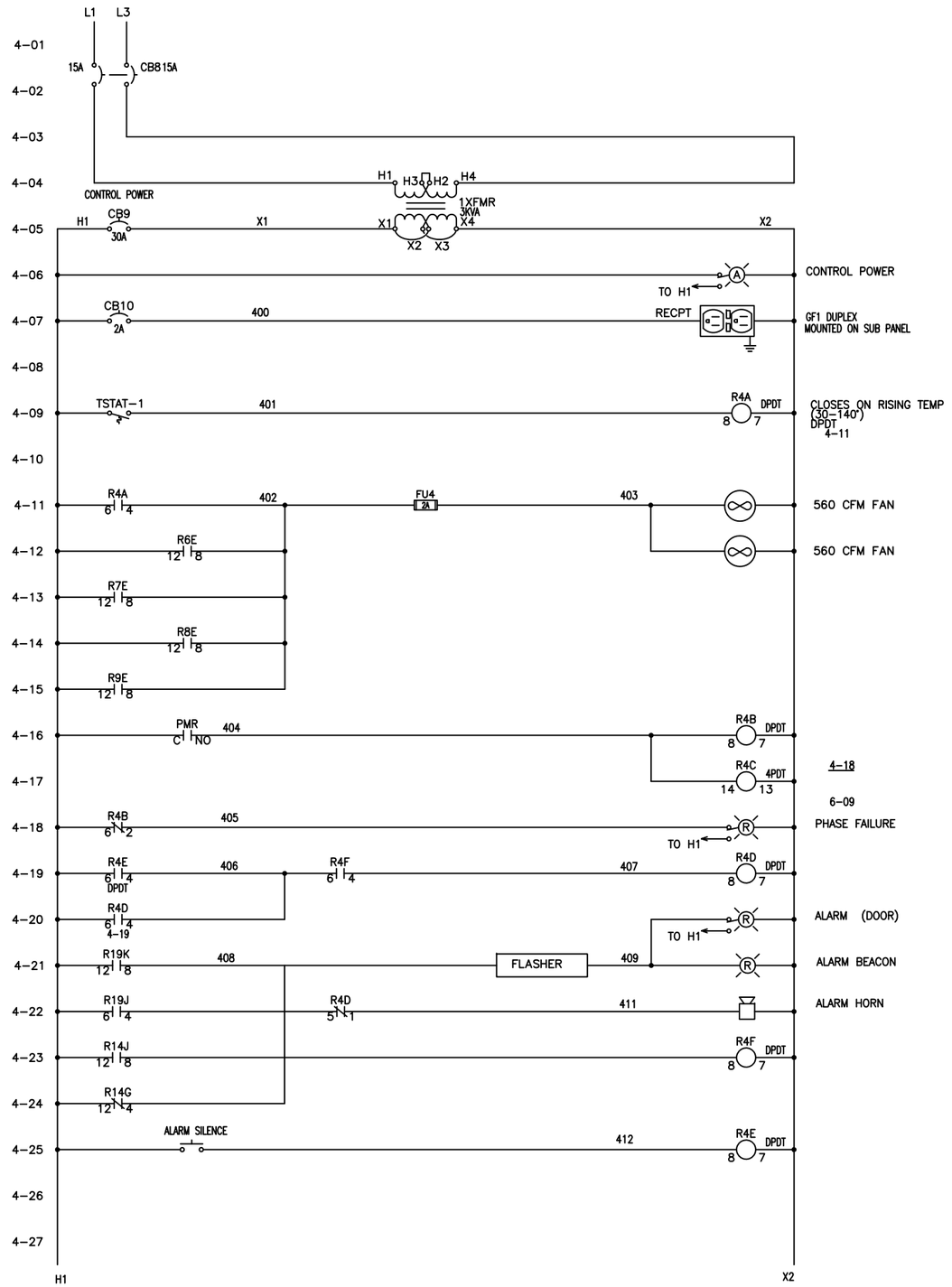
AS BUILT

PANEL TO BEAR
UL508A LABEL

FORT WASHINGTON WAY
CONTROL PANEL

VOLT: 460	PH:3	HZ:60	HP:168	FLA: 259	BY: BR	APP:	DATE: 04/01/2020
CUSTOMER: PETE DUTY					JOB# 19–899		DWG# E19899–1,2





QUALITY CONTROLS, INC. 3411 CHURCH STREET CINCINNATI,OHIO 45244 (513) 272-3900	TORQUE FIELD CONNECTIONS TO 20 IN-LBS SQUARE D 9080GR6 TO 18-20 IN-LBS SQUARE D 9080GM6 TO 7-8 IN-LBS CONNECTIONS MUST BE 600VAC 75°C COPPER WIRE POWER CIRCUITS & GROUNDS 14 AWG WARNING MORE THAN ONE DISCONNECT MAY BE REQUIRED TO DE-ENERGIZE EQUIPMENT BEFORE SERVICING	UL LISTED	AS BUILT	PANEL TO BEAR UL508A LABEL	FORT WASHINGTON WAY CONTROL PANEL							
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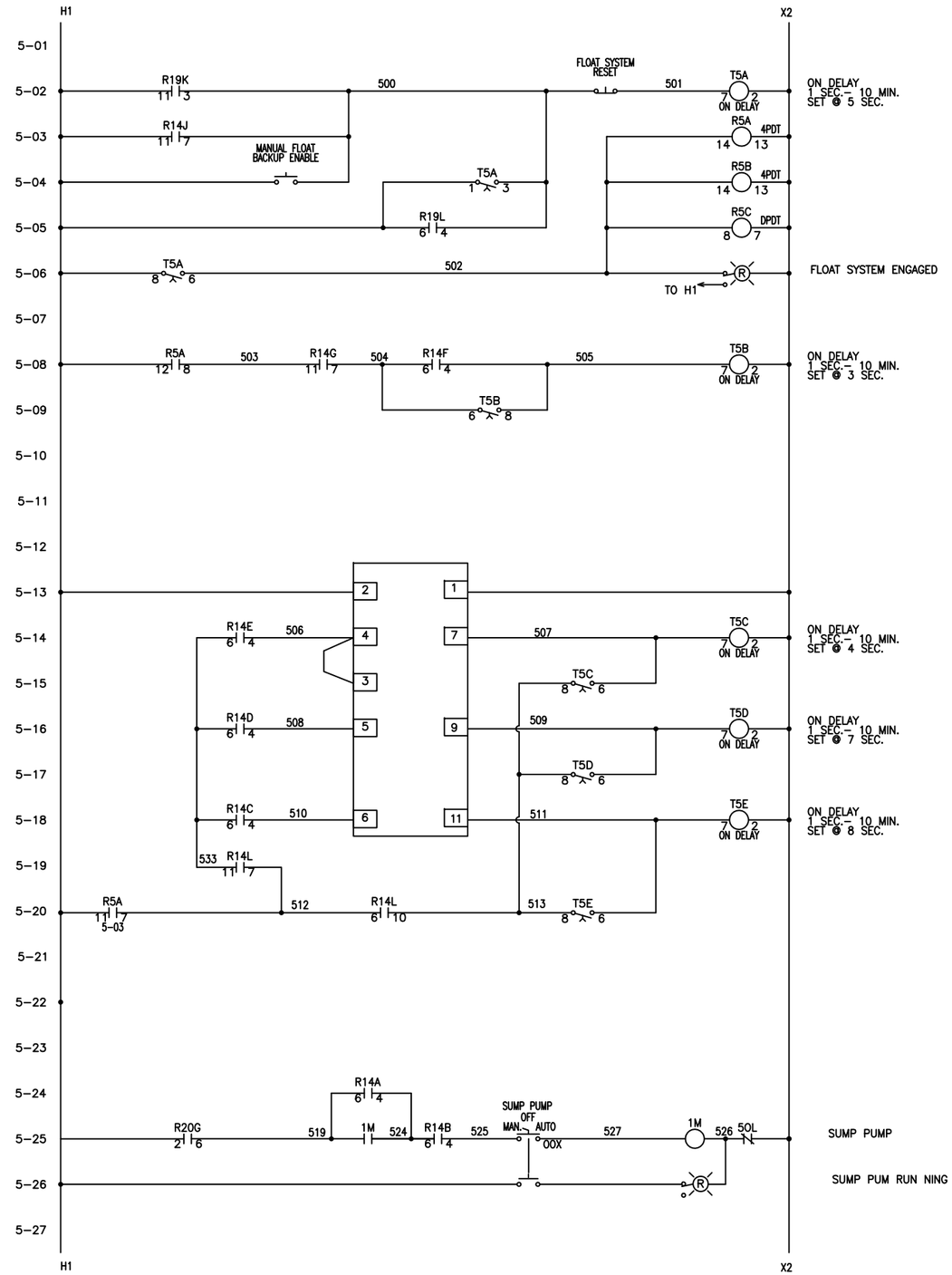
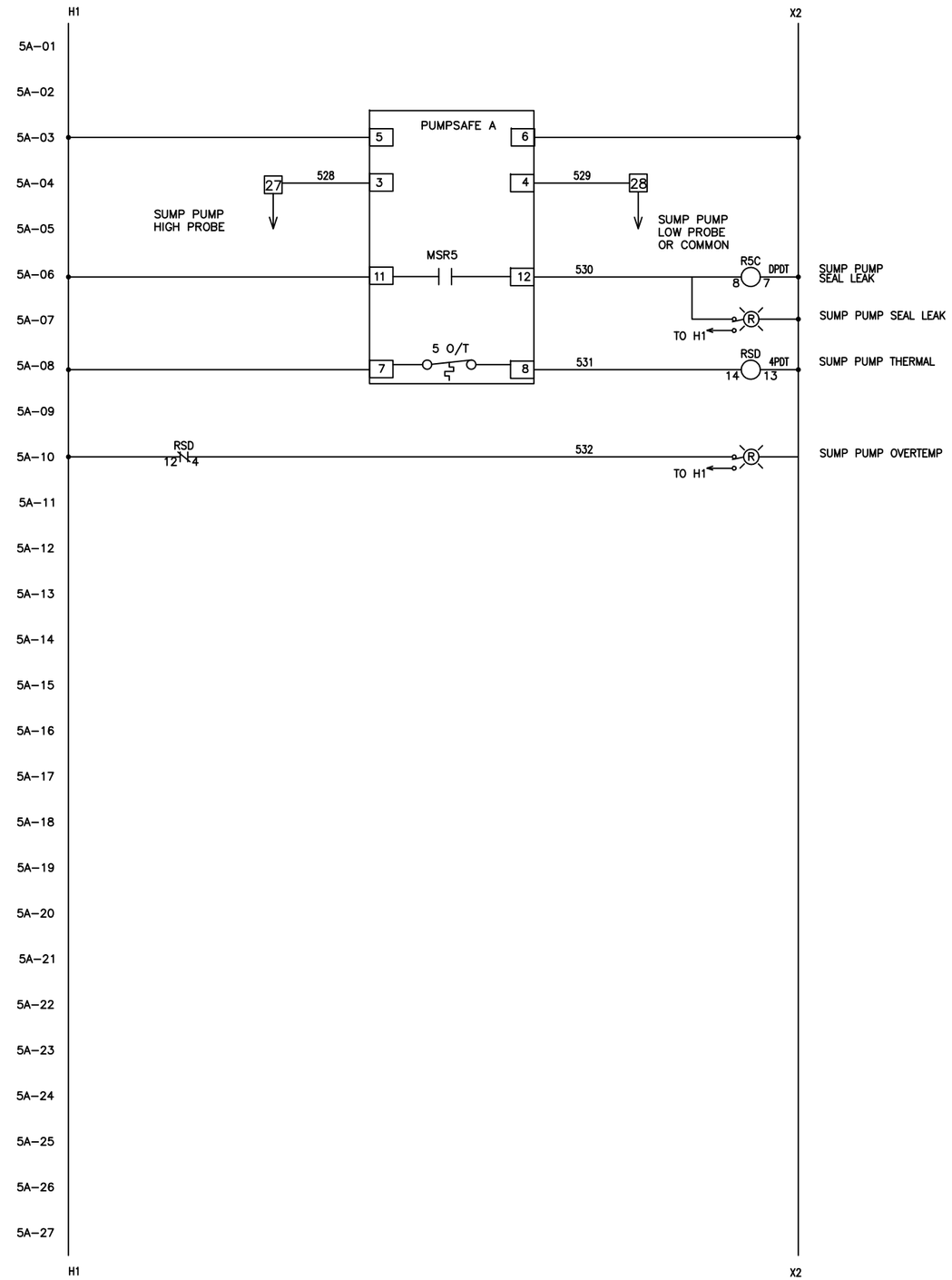
					CUSTOMER: PETE DUTY					JOB# 19-899		DWG# E19899-3,4





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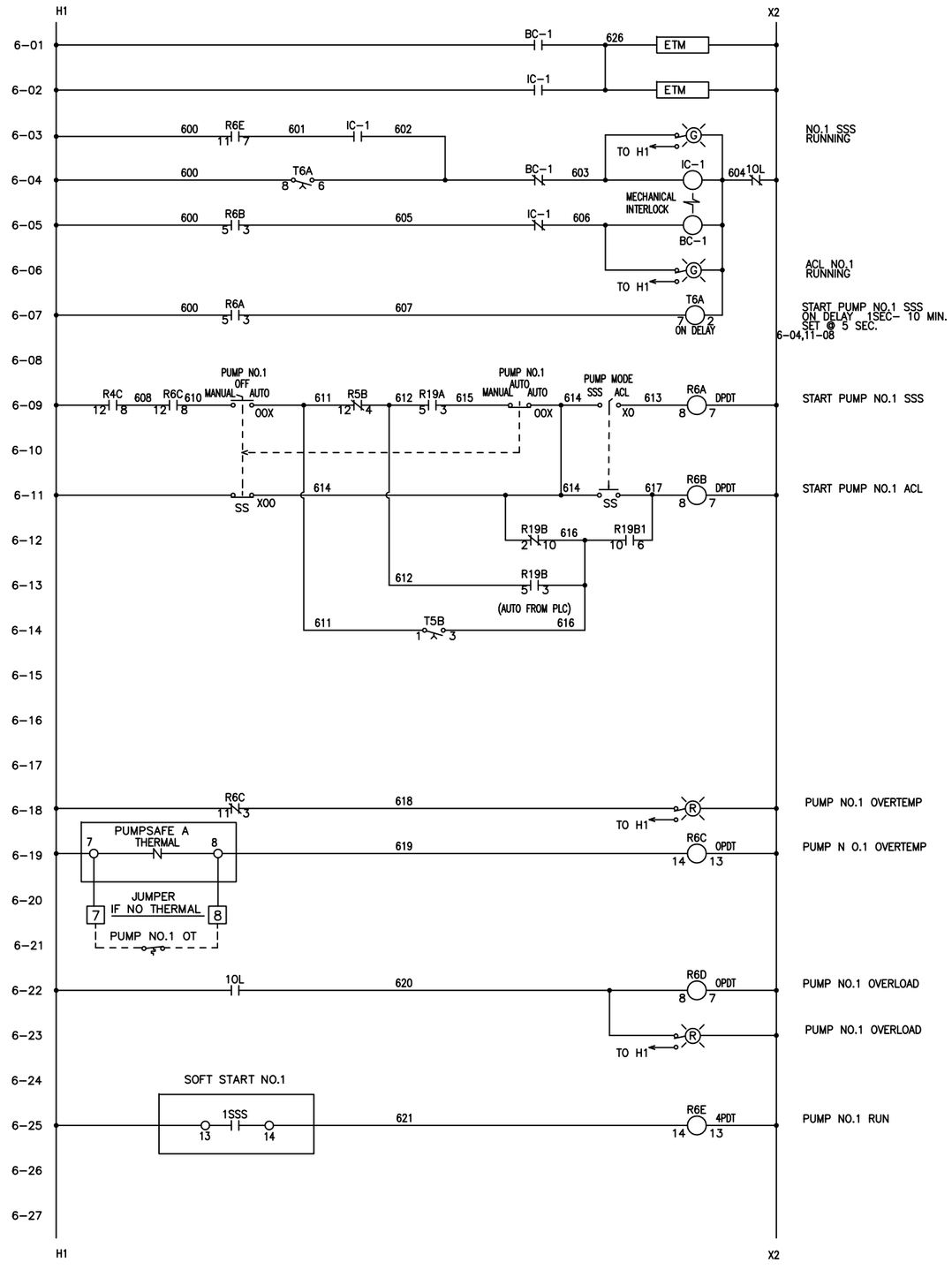
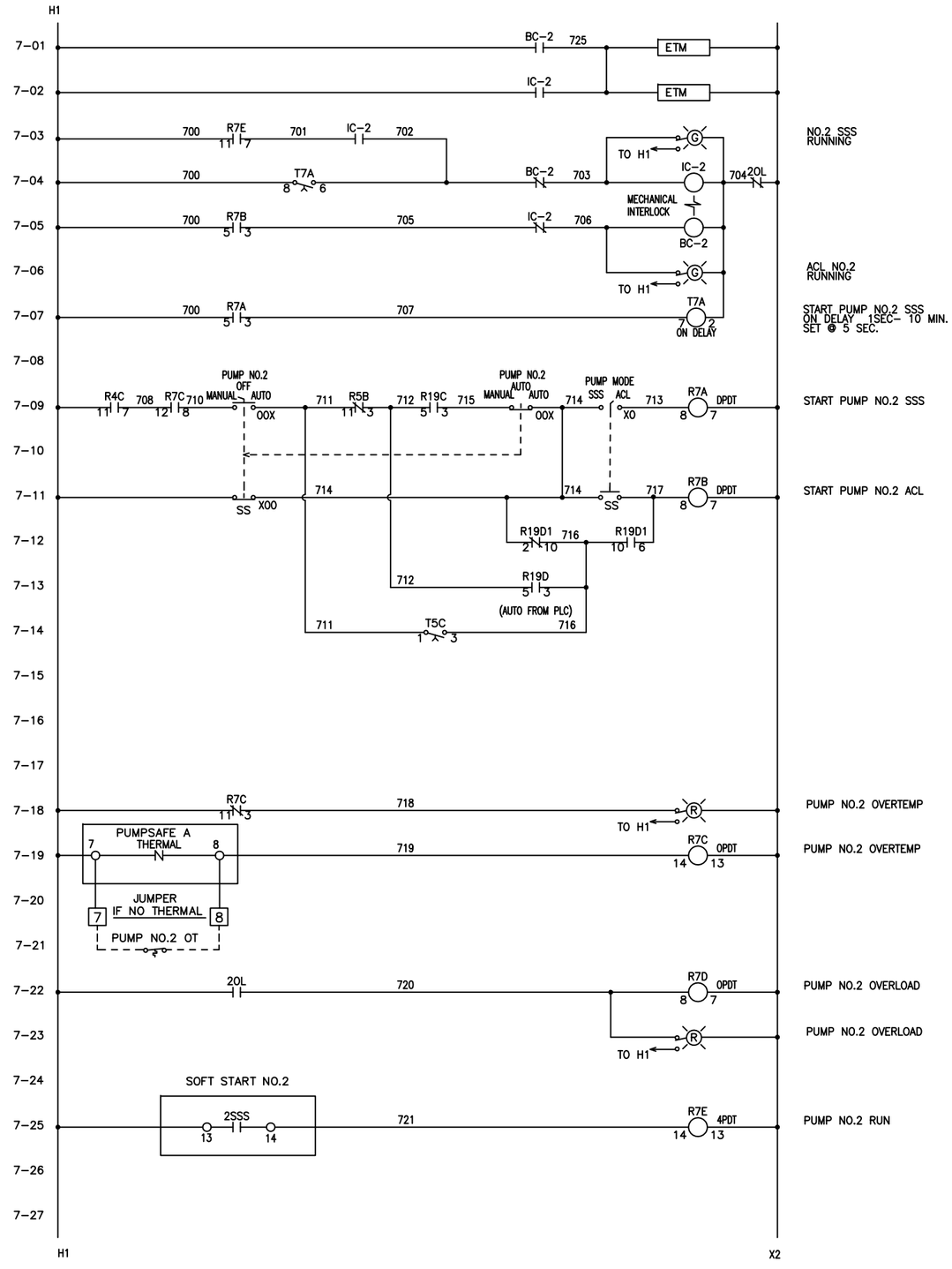
FORT WASHINGTON WAY CONTROL PANEL

VOLT: 460	PH:3	HZ:60	HP:168	FLA: 259	BY: BR	APP:	DATE: 08/21/2020
CUSTOMER: PETE DUTY					JOB# 19-899		DWG# E19899-5,5A





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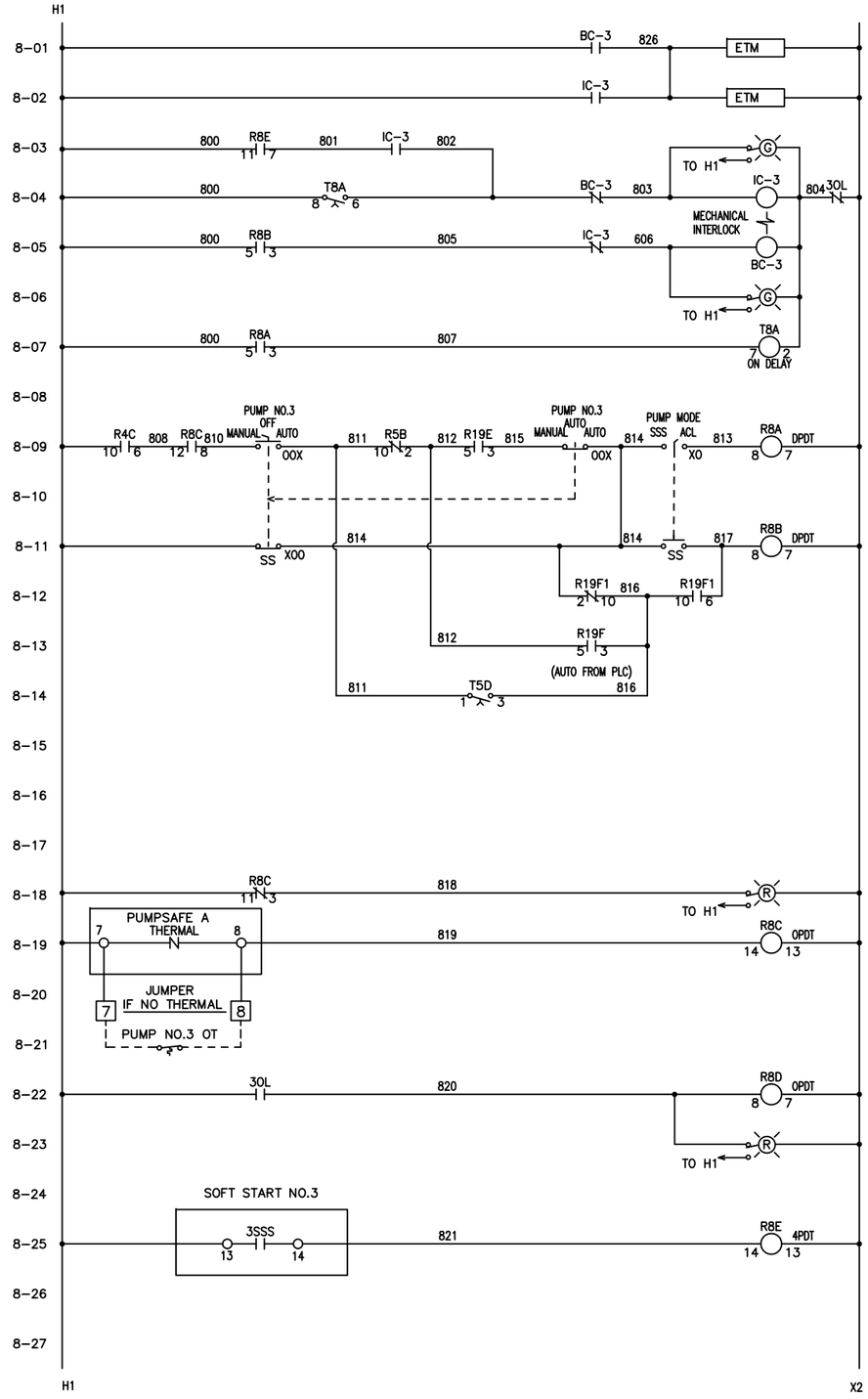

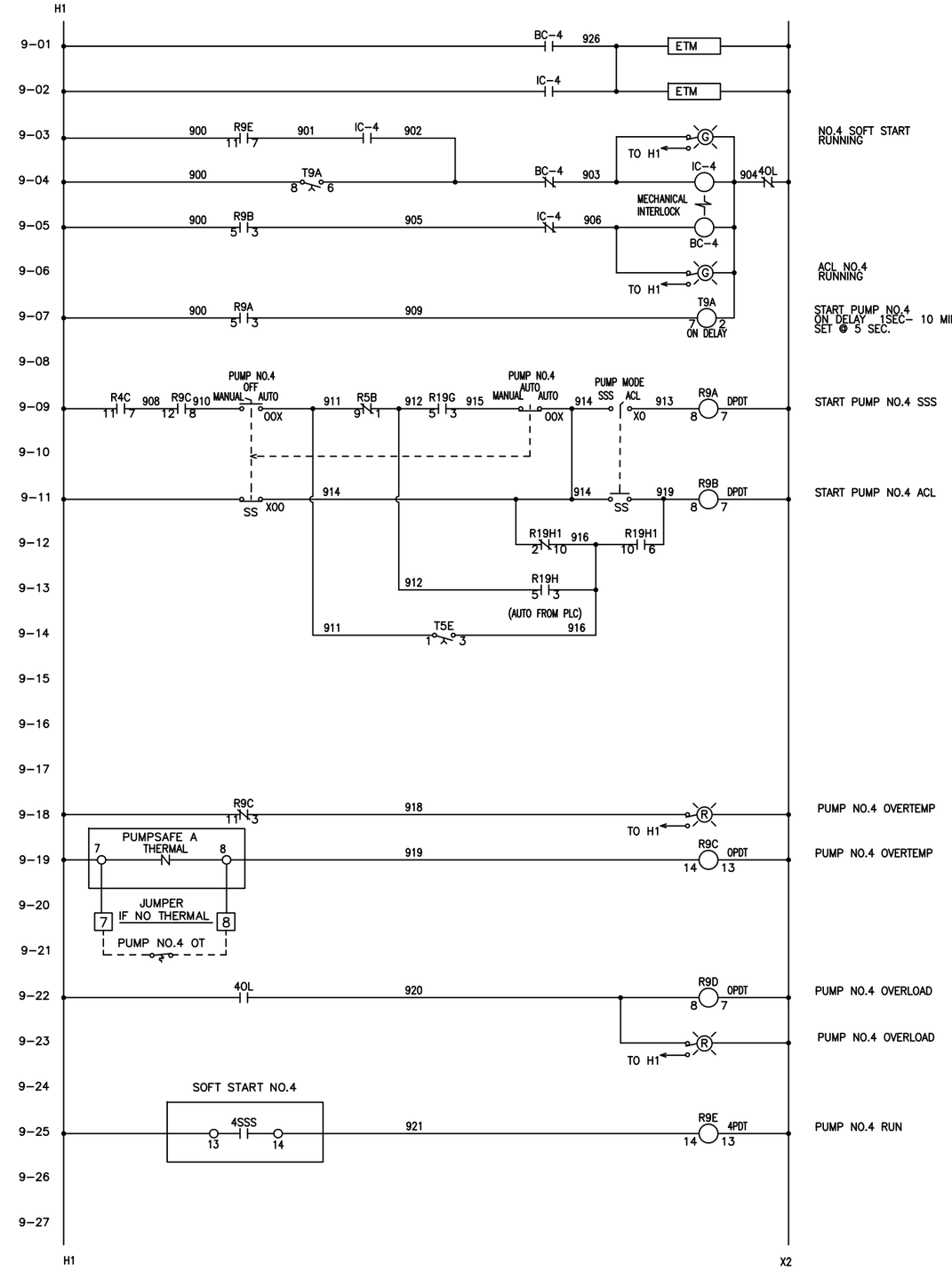

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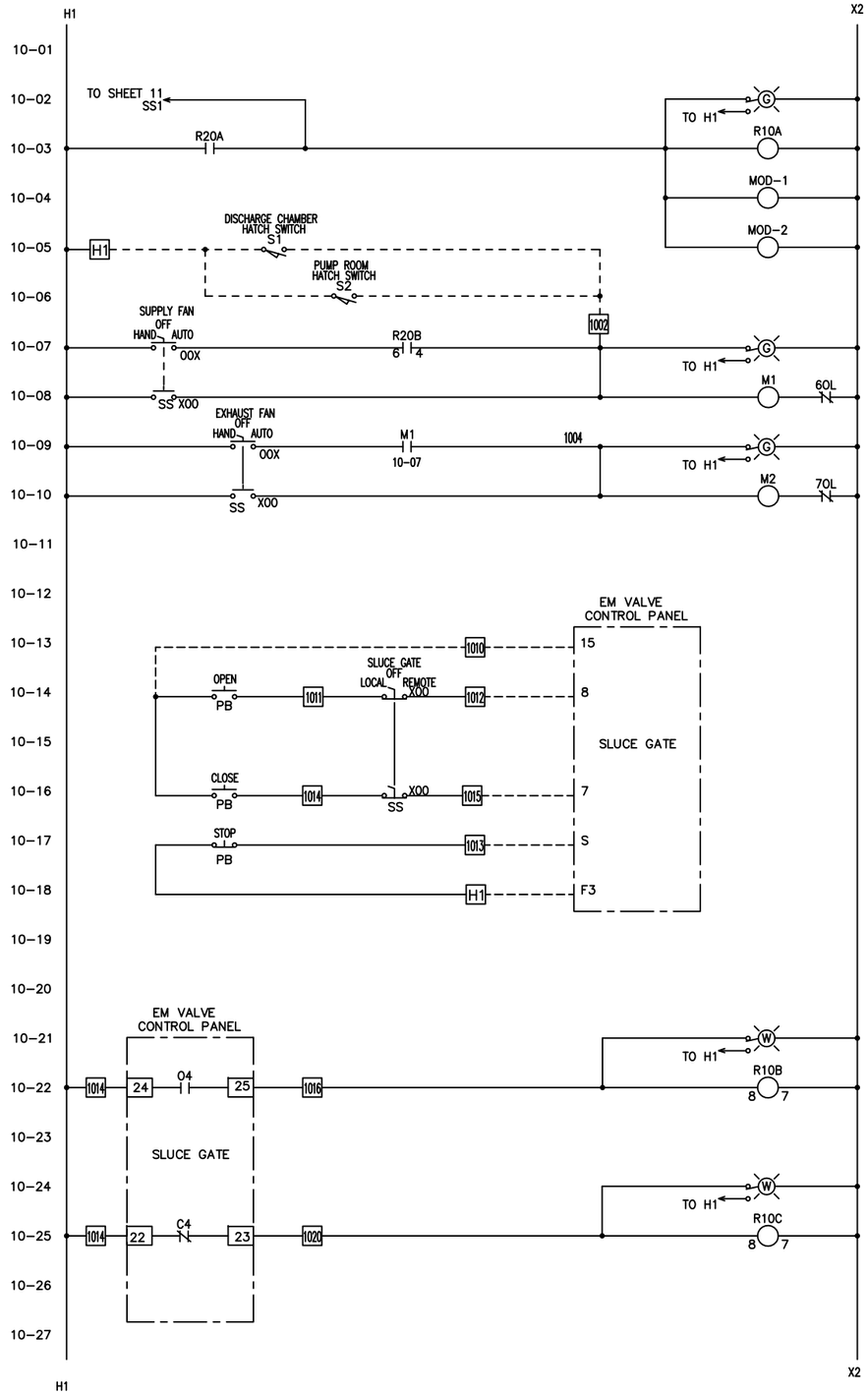

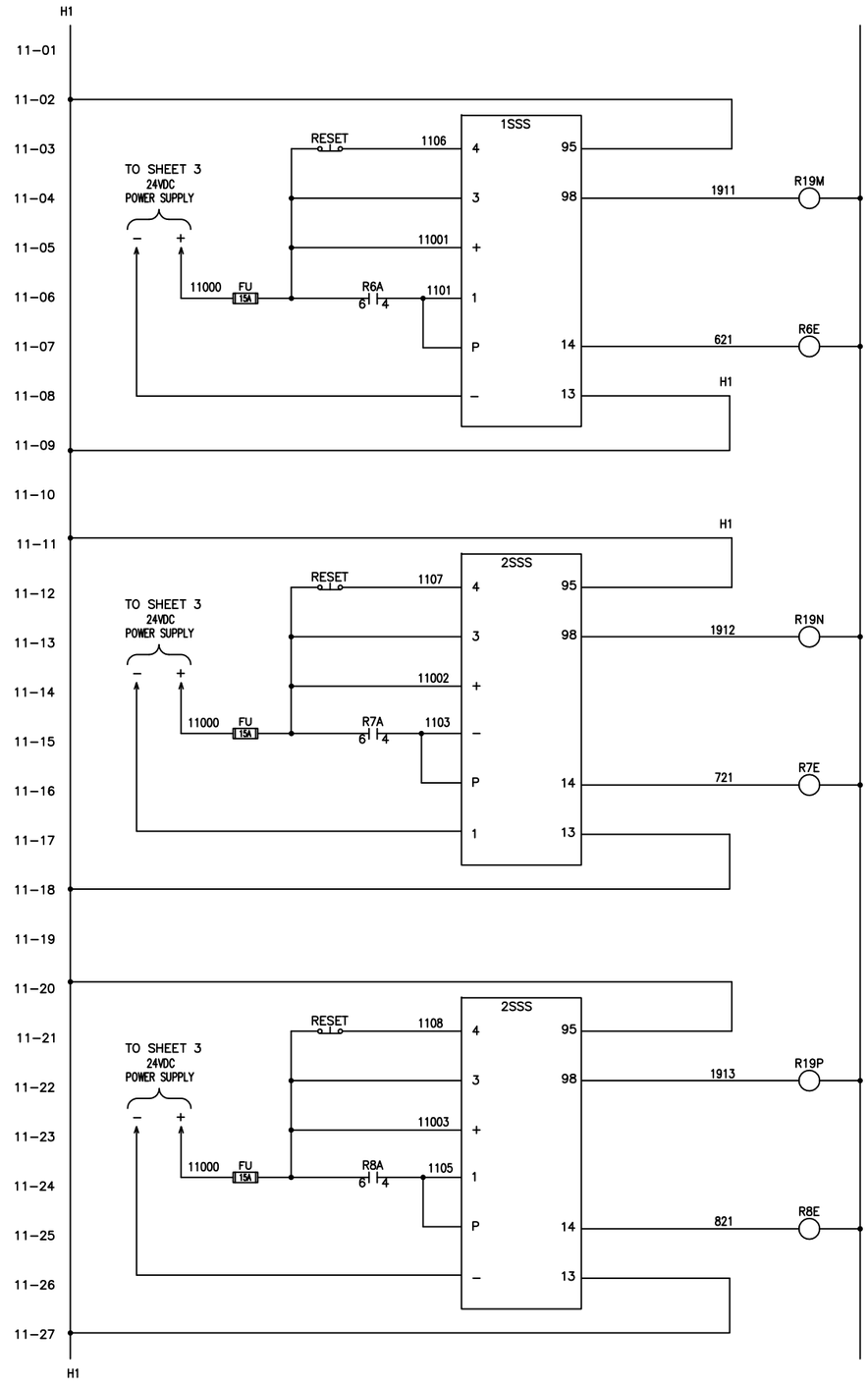

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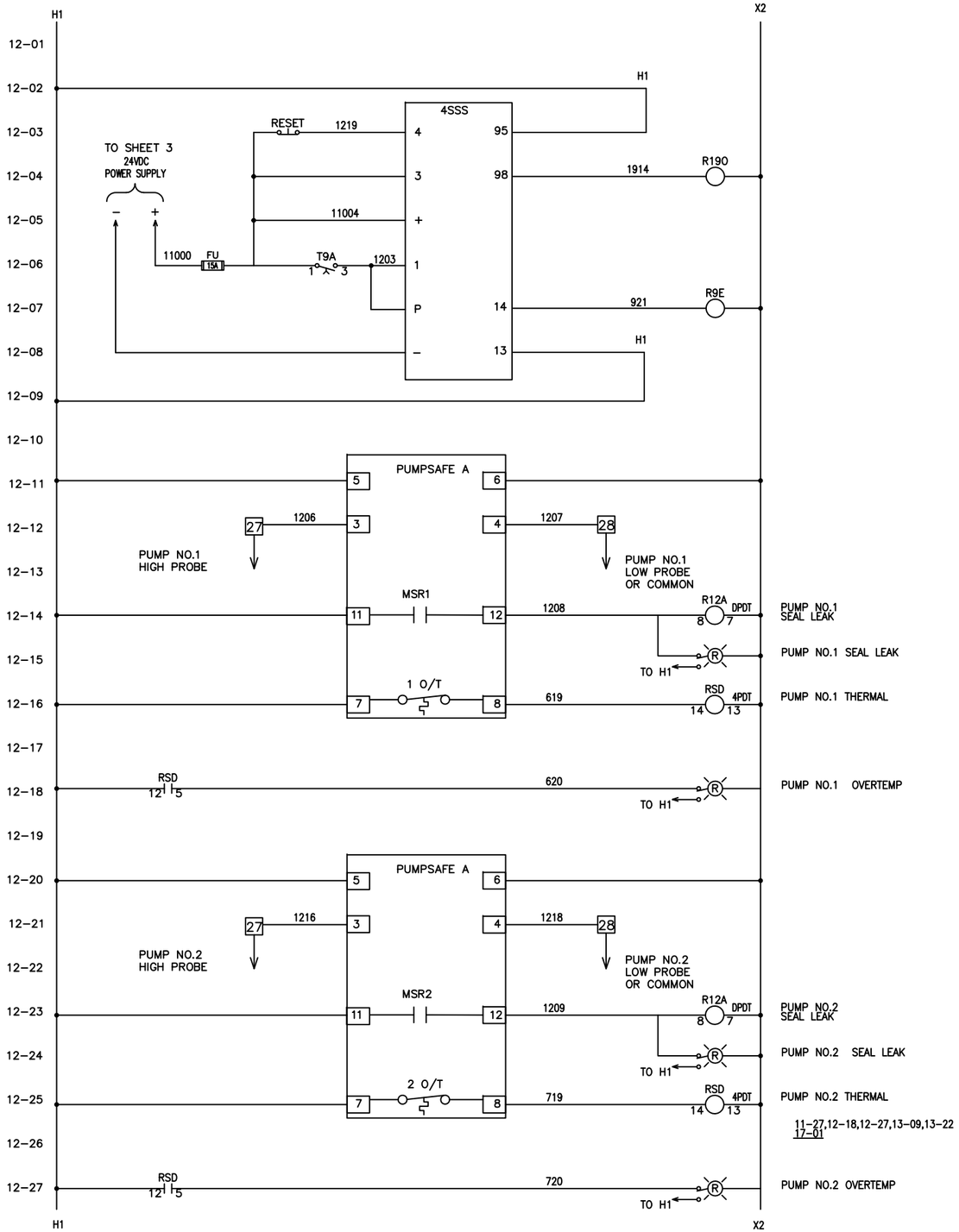

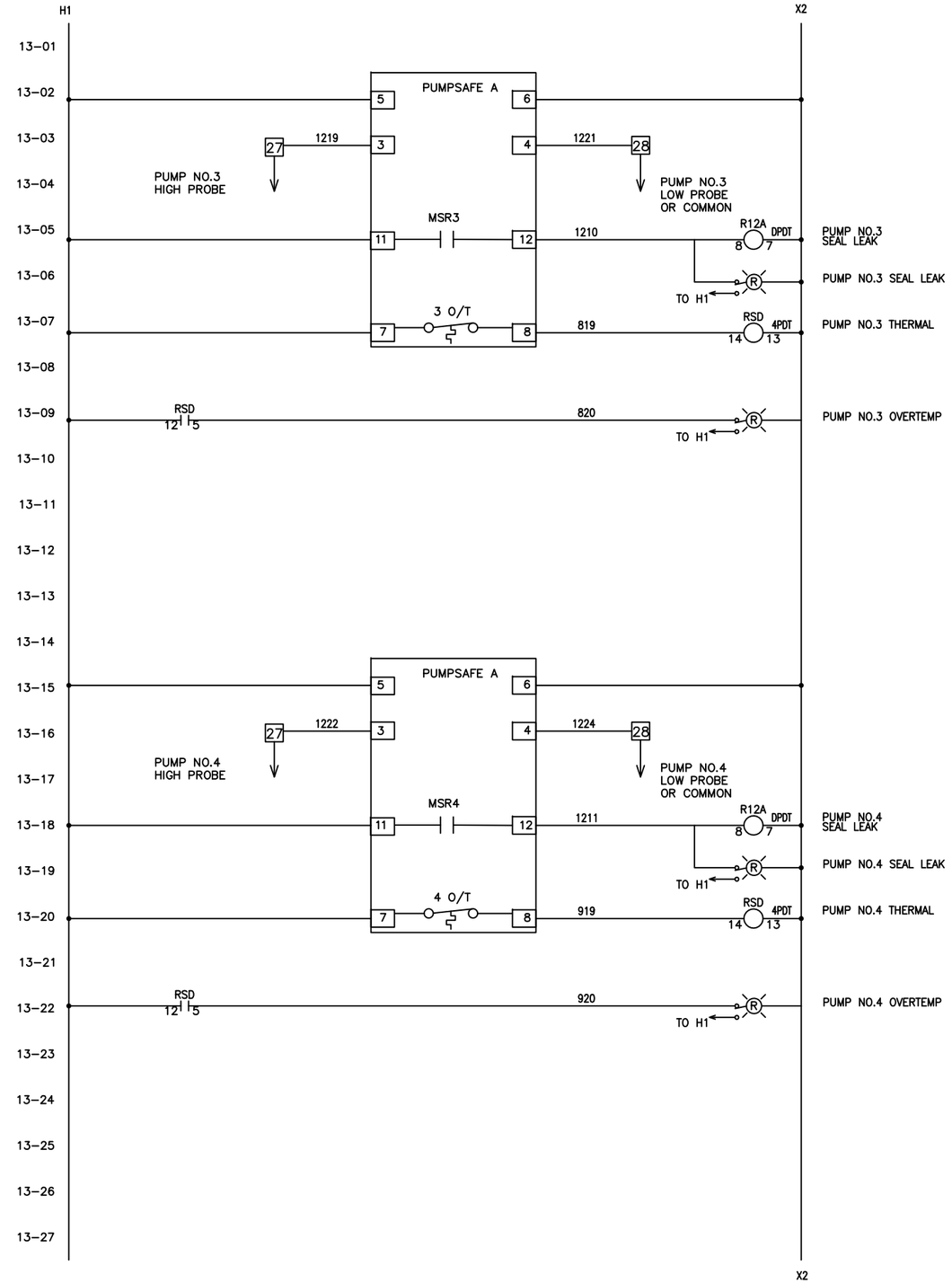

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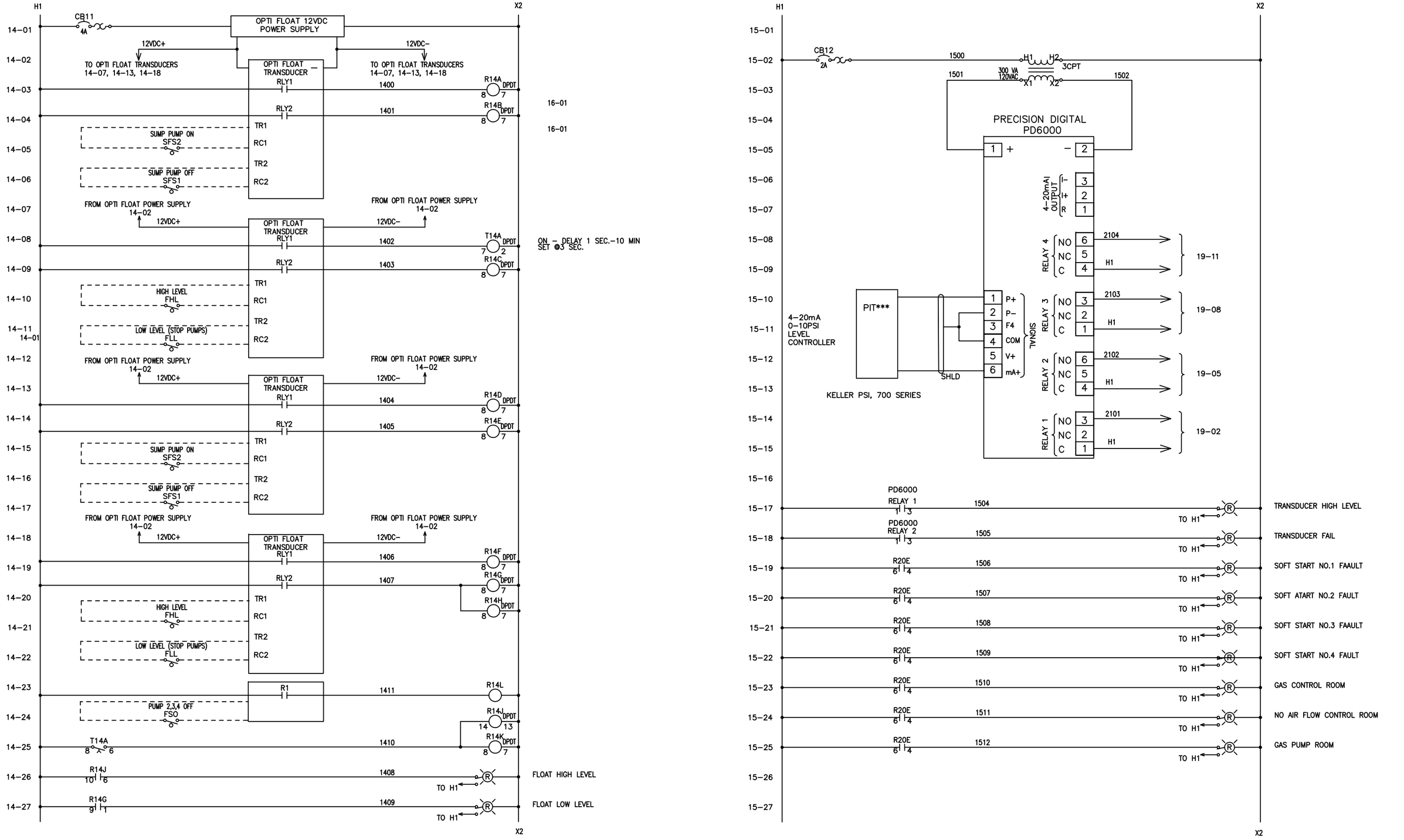
CUSTOMER: PETE DUTY					JOB# 19-899		DWG# E19899-12,13



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CUSTOMER: PETE DUTY					JOB# 19-899		DWG# E19899-14,15

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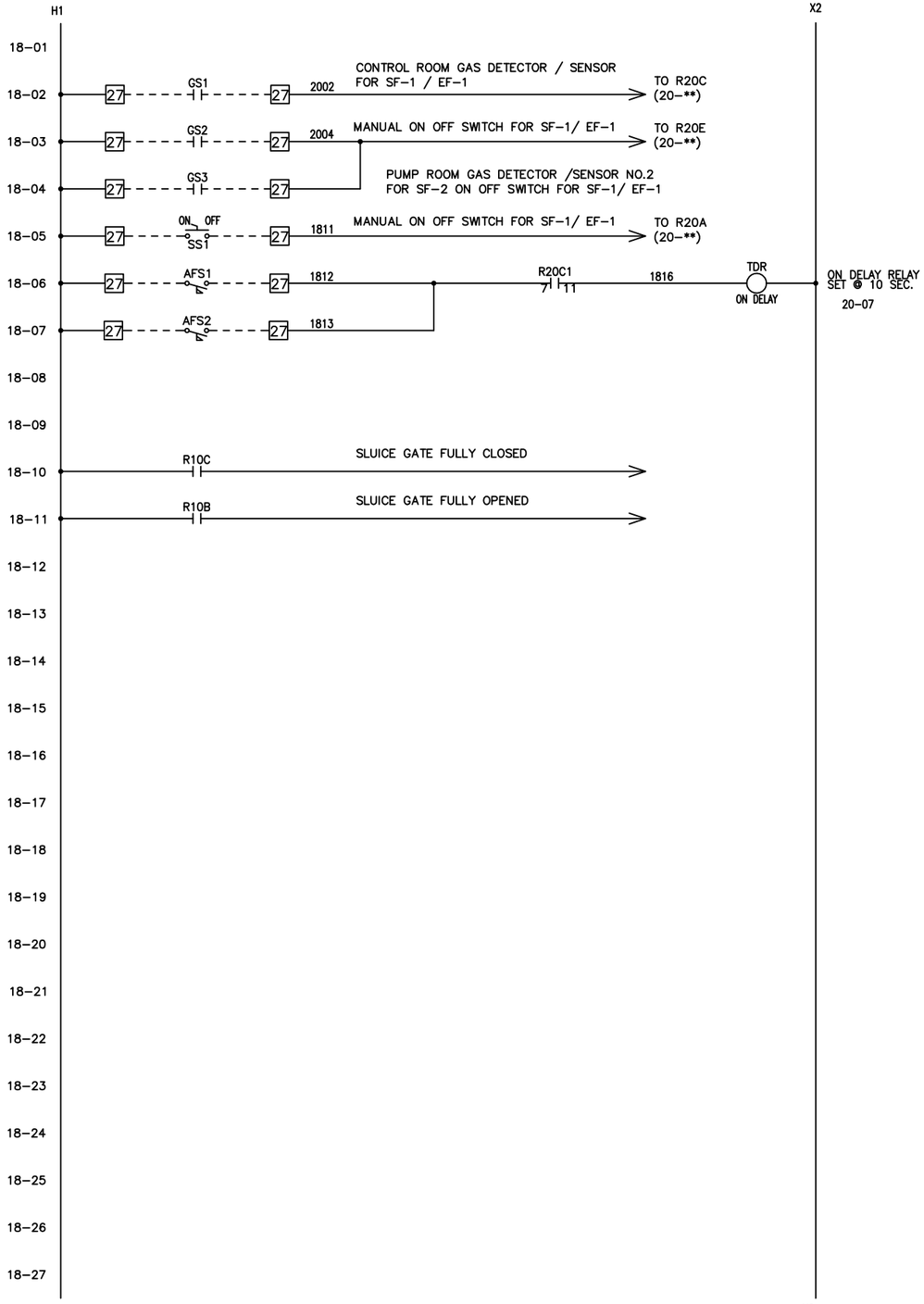

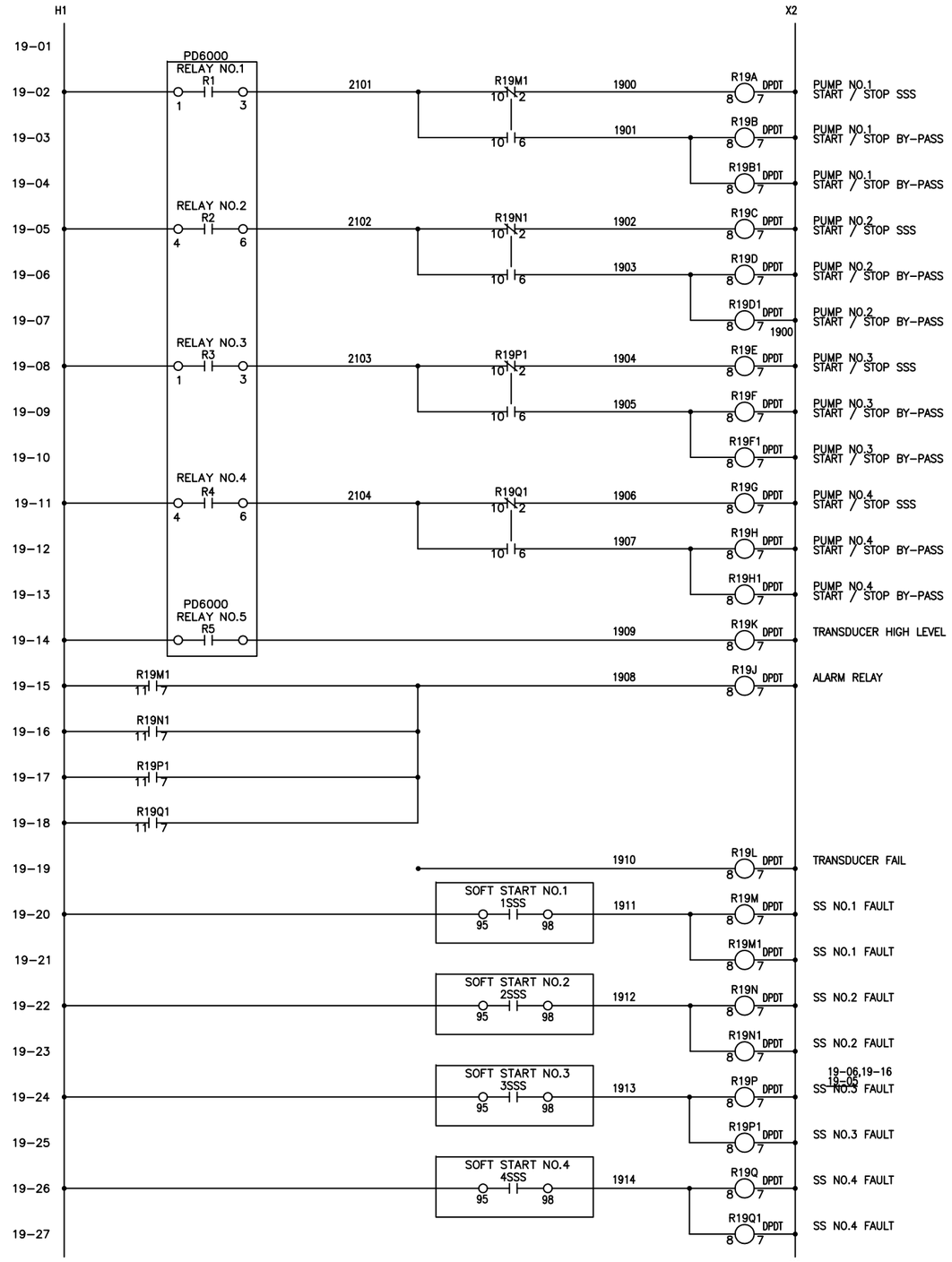

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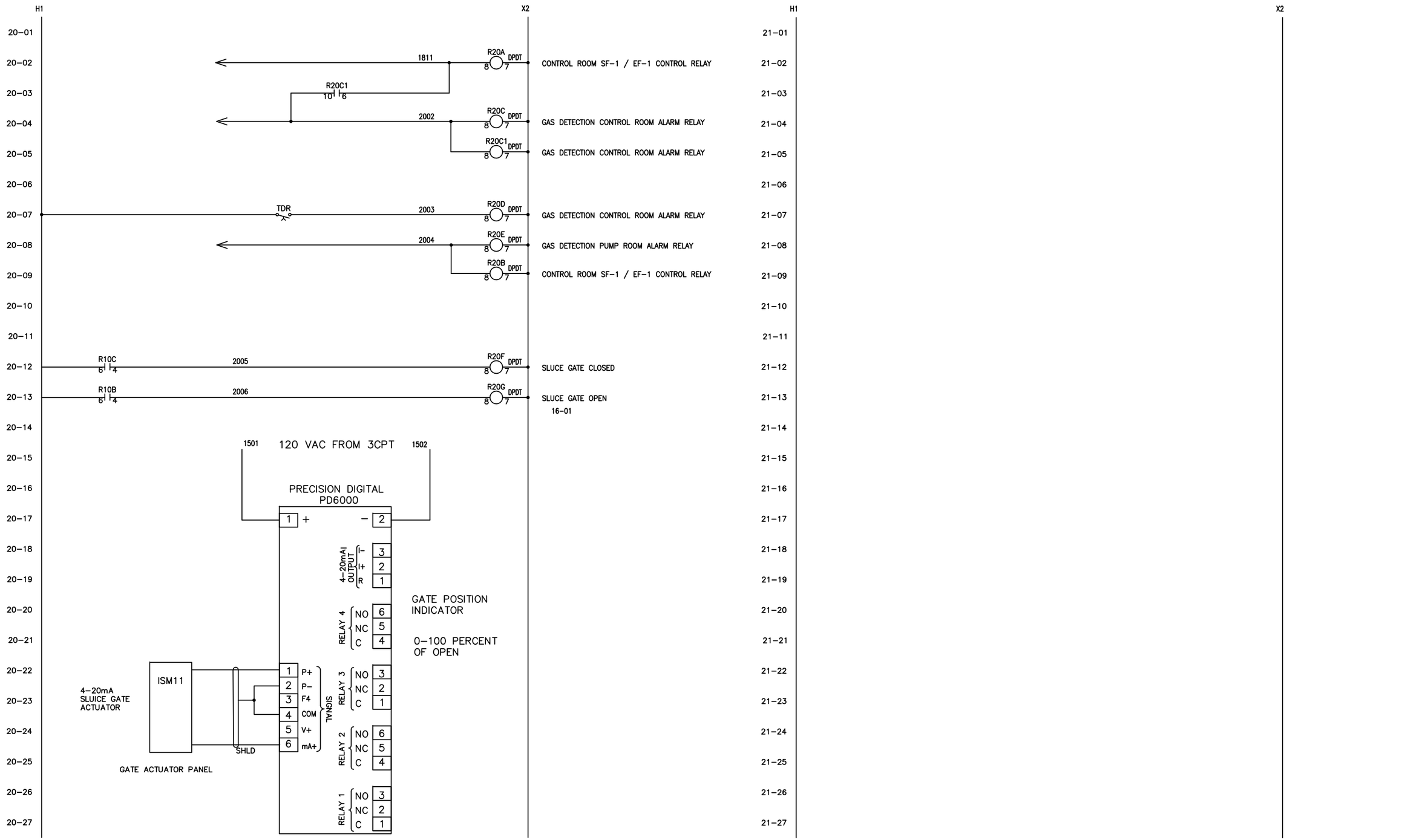

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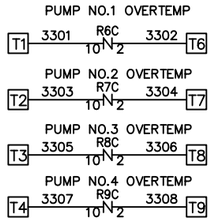
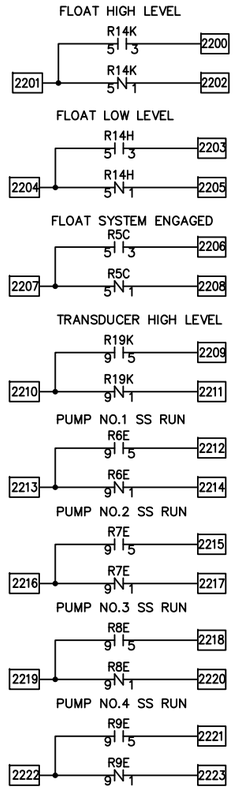
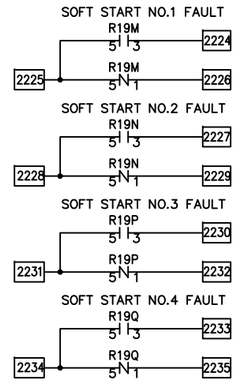
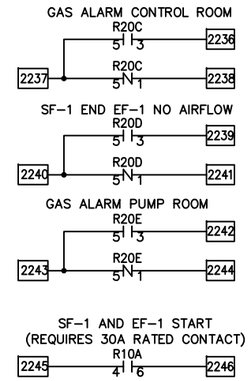
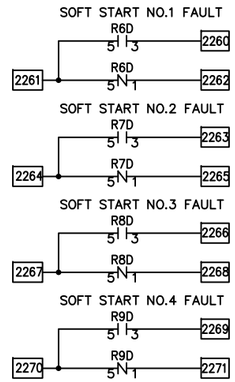










QUALITY CONTROLS,
INC. 3411 CHURCH
STREET
CINCINNATI,OHIO
45244 (513)
272-3900

TORQUE FIELD CONNECTIONS TO 20 IN-LBS
SQUARE D 9080GR6 TO 18-20 IN-LBS
SQUARE D 9080GM6 TO 7-8 IN-LBS
CONNECTIONS MUST BE 600VAC 75°C COPPER WIRE
POWER CIRCUITS & GROUNDS 14 AWG
WARNING MORE THAN ONE DISCONNECT MAY BE REQUIRED
TO DE-ENERGIZE EQUIPMENT BEFORE SERVICING

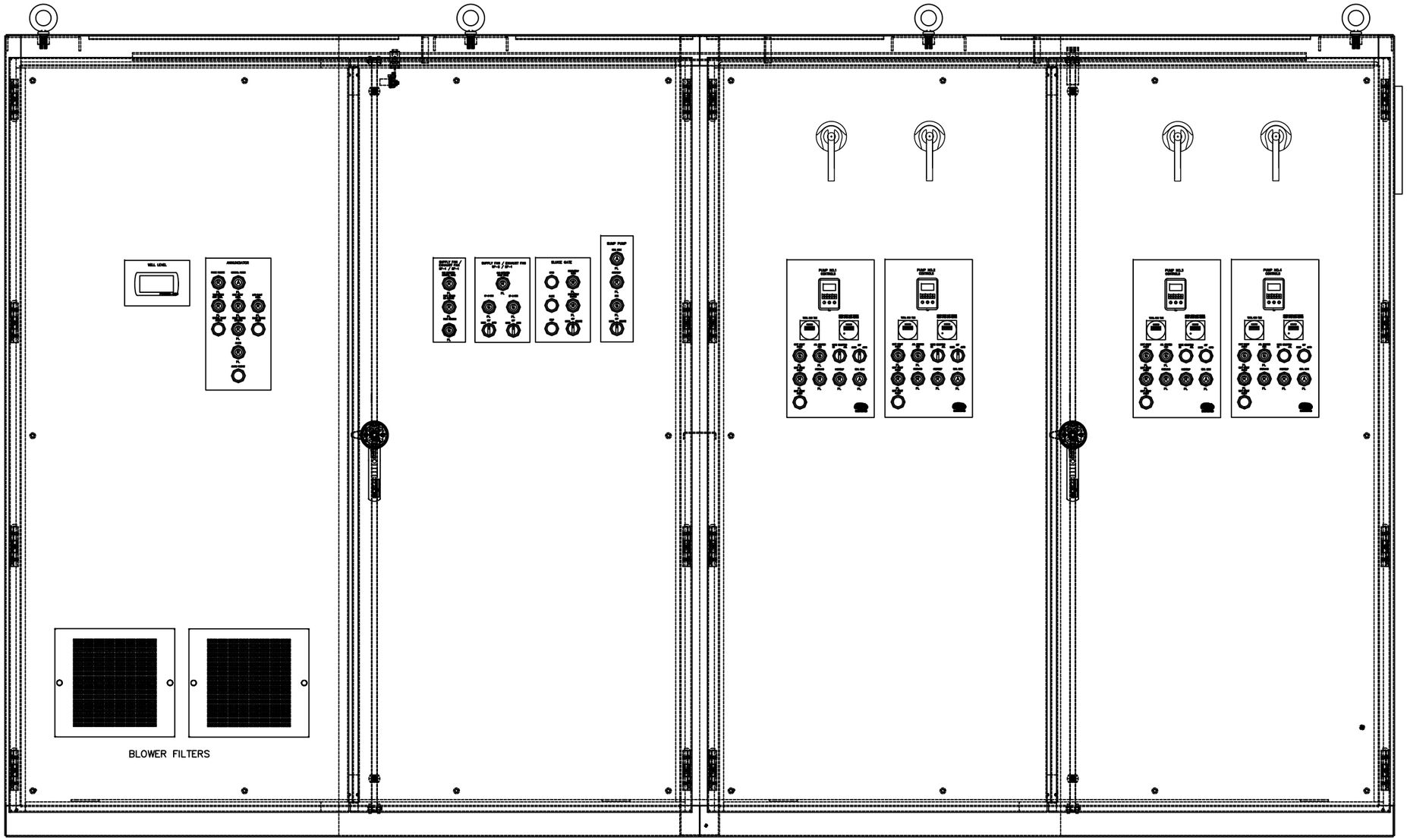
UL LISTED

AS BUILT

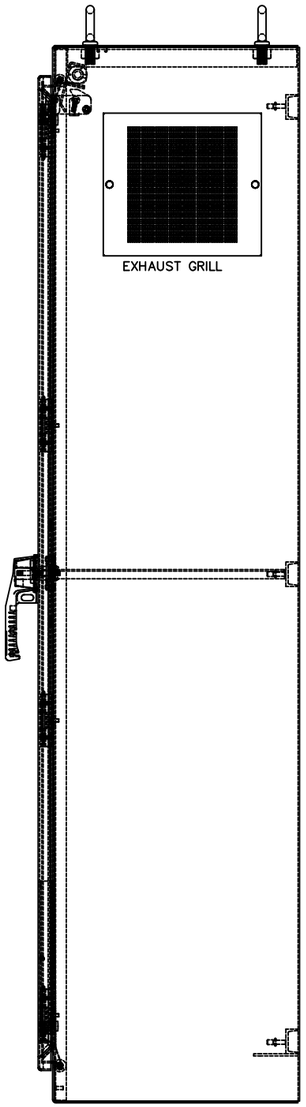
PANEL TO BEAR
UL508A LABEL

FORT WASHINGTON WAY
CONTROL PANEL

VOLT: 460	PH:3	HZ:60	HP:168	FLA: 259	BY:BR	APP:	DATE: 04/01/2020
CUSTOMER: PETE DUTY					JOB# 19-899		DWG# E19899-22



BLOWER FILTERS



EXHAUST GRILL

NEMA 12 ENCLOSURE
SEE DOOR DETAILS

QUALITY CONTROLS, INC. 3411 CHURCH STREET CINCINNATI,OHIO 45244 (513) 272-3900

TORQUE FIELD CONNECTIONS TO 20 IN-LBS
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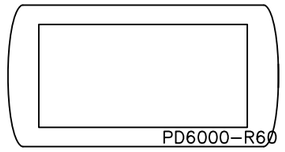
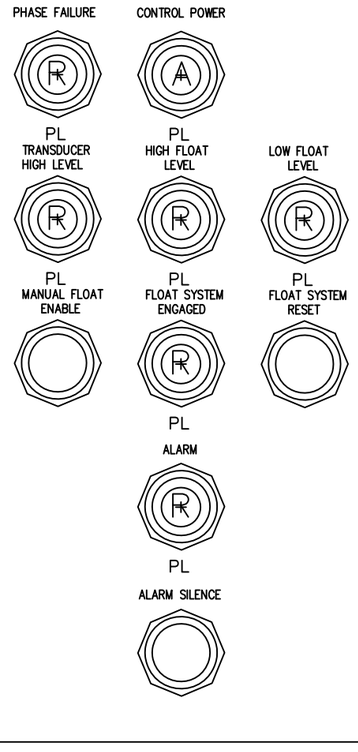
CUSTOMER: PETE DUTY					JOB# 19-899		DWG# E19899-23

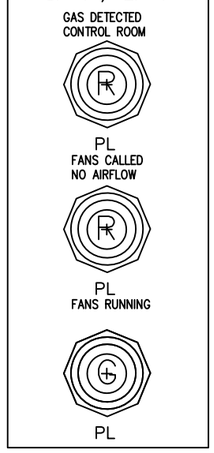
WELL LEVEL



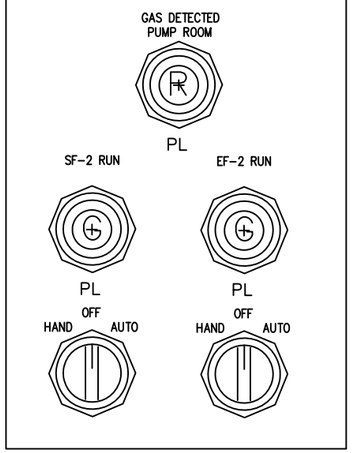
ANNUNCIATOR



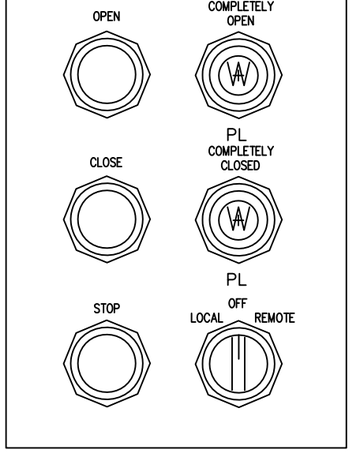
SUPPLY FAN / EXHAUST FAN SF-1 / EF-1



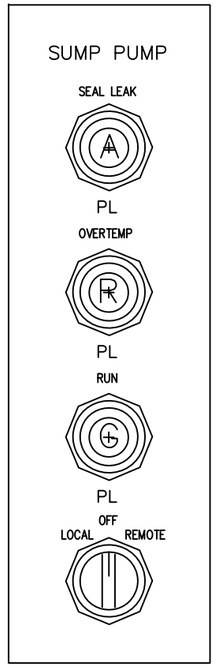
SUPPLY FAN / EXHAUST FAN SF-2 / EF-1



SLUICE GATE



SUMP PUMP



QUALITY CONTROLS, INC. 3411 CHURCH STREET CINCINNATI,OHIO 45244 (513) 272-3900

TORQUE FIELD CONNECTIONS TO 20 IN-LBS
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UL LISTED

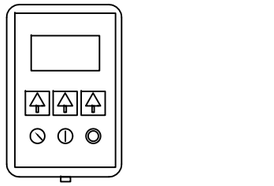
AS BUILT

PANEL TO BEAR UL508A LABEL

FORT WASHINGTON WAY CONTROL PANEL

VOLT: 460	PH:3	HZ:60	HP:168	FLA: 259	BY:BR	APP:	DATE: 04/01/2020
CUSTOMER: PETE DUTY					JOB# 19-899		DWG# E19899-24

PUMP NO.1
CONTROLS

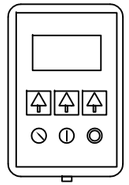


TOTAL RUN TIME
HOURS
000000

HOURS SINCE LAST SERVICE
RESET AFTER EACH SERVICE
HOURS
000000

SOFT START FAULT — PL
ACL STARTER RUN — PL
MODE SELECTION SS ACL — OFF HAND AUTO
SOFT START FAULT — PL
OVERLOAD — PL
OVERTEMP — PL
SEAL LEAK — PL
SOFT START RESET

PUMP NO.2
CONTROLS

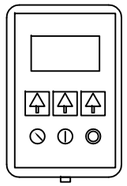


TOTAL RUN TIME
HOURS
000000

HOURS SINCE LAST SERVICE
RESET AFTER EACH SERVICE
HOURS
000000

SOFT START FAULT — PL
ACL STARTER RUN — PL
MODE SELECTION SS ACL — OFF HAND AUTO
SOFT START FAULT — PL
OVERLOAD — PL
OVERTEMP — PL
SEAL LEAK — PL
SOFT START RESET

PUMP NO.3
CONTROLS

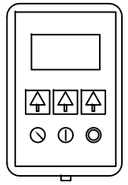


TOTAL RUN TIME
HOURS
000000

HOURS SINCE LAST SERVICE
RESET AFTER EACH SERVICE
HOURS
000000

SOFT START FAULT — PL
ACL STARTER RUN — PL
MODE SELECTION SS ACL — OFF HAND AUTO
SOFT START FAULT — PL
OVERLOAD — PL
OVERTEMP — PL
SEAL LEAK — PL
SOFT START RESET

PUMP NO.4
CONTROLS



TOTAL RUN TIME
HOURS
000000

HOURS SINCE LAST SERVICE
RESET AFTER EACH SERVICE
HOURS
000000

SOFT START FAULT — PL
ACL STARTER RUN — PL
MODE SELECTION SS ACL — OFF HAND AUTO
SOFT START FAULT — PL
OVERLOAD — PL
OVERTEMP — PL
SEAL LEAK — PL
SOFT START RESET

QUALITY CONTROLS, INC. 3411 CHURCH STREET CINCINNATI,OHIO 45244 (513) 272-3900

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FORT WASHINGTON WAY
CONTROL PANEL

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CUSTOMER: PETE DUTY					JOB# 19-899		DWG# E19899-25

Type S811+, Soft Starters with Digital Interface Module (DIM)

Contents

Type S811+, Soft Starters with DIM

Product Description

Eaton's S811+ offers all the popular features of the S801+ and adds new enhanced functionality with the new Digital Interface Module (DIM), communications, metering, monitoring and diagnostics capabilities.

Eaton's line of S811+ reduced voltage soft starters is very compact, multi-functional, easy to install and easy to set operating parameters. Designed to control the acceleration and deceleration of three-phase motors up to 690 V, the line is available from 11A to 1000A.

The S811+ is designed to be a complete package, combining the silicon controlled rectifiers (SCRs), bypass contactor and overload in one, very compact unit. The S811+ is available as a component for panel mounting, in motor control centers or in enclosed control (NEMA Type 1, 3R, 4, 4X, 7/9 and 12).

Application Description

Designed to control the acceleration and deceleration of three-phase motors, the S811+ soft starter uses SCRs to control the voltage to soft start and soft stop the motor. After the motor is started, internal run bypass contactors close, resulting in the motor running directly across-the-line. The built-in solid-state overload protects the motor from overload conditions with sophisticated algorithms that model true motor heating, resulting in better motor protection and fewer nuisance trips. Advanced protective and diagnostic features reduce downtime.

A voltage ramp start or current limit start is available. Kick start is available in either starting mode. The soft stop option allows for a ramp stop time that is longer than the coast to stop time. The pump control option in the S811+ Premium provides a smooth transition for starting and stopping a motor and eliminating the "water-hammer" effect that can damage pipes, valves and pumps.

The S811+ offers an impressive array of advanced protective features. Not only are the protective features selectable, but many offer variable settings and adjustable time delays to ride through system discrepancies. Protective features may also be set to Warning status to avoid nuisance trips.

The S811+ has an easy to use Digital Interface Module (DIM) that allows the user to configure the device and to read system parameters and monitor system values. The DIM includes an LCD display and keypad to scroll through the various menus. The DIM allows the user to modify control parameters, enable or disable protections, set communication variables, monitor system parameters such as line voltages and currents, and access the fault queue.

The DIM can be removed from the S811+ and be remote mounted. Kits are available to door mount the DIM, enabling users to safely configure, commission, monitor and troubleshoot the system at the electrical panel without opening the enclosure door. This will help eliminate the possibility of an arc flash incident.

Digital Interface Module (DIM)

1

Communications

The S811+ is equipped with native Modbus RTU communication capabilities and may be connected to a variety of networks, including DeviceNet, Modbus TCP, EtherNet/IP and PROFIBUS using the C441 series communication modules for easy integration into any PLC or DCS system.

The modules come standard with four inputs and two relay outputs. C441 communication modules can also be used independently for standalone I/O applications.

C441 Communication Card Options

Designed for use with soft starters …

Protocol	Catalog Number	Input Signal Type	S811+	General Purpose I/O ①	Mounting Options
Modbus RTU	**C441NS**	120 Vac	■	■	Standalone—DIN rail/panel mount
	C441PS	24 Vdc	■	■	Standalone—DIN rail/panel mount
DeviceNet	**C441KS**	120 Vac	■	■	Standalone—DIN rail/panel mount
	C441LS	24 Vdc	■	■	Standalone—DIN rail/panel mount
PROFIBUS	**C441SS**	120 Vac	■	■	Standalone—DIN rail/panel mount
	C441QS	24 Vdc	■	■	Standalone—DIN rail/panel mount
Modbus TCP, EtherNet/IP	**C441U**	120 Vac	■	■	Standalone—DIN rail/panel mount
	C441V	24 Vdc	■	■	Standalone—DIN rail/panel mount

Note: Refer to Volume 5—Motor Control and Protection, **CA08100006E**, tab 5.4 for additional details and **BR042002EN** brochure for C441 communication module accessories for overload relays and soft starters.

Recommended Power Supply	Catalog Number
85–264 Vac single-phase input, 24 Vdc output	**PSG240E24RM**
360–575 Vac three-phase input, 24 Vdc output	**PSG240F24RM**

Operation

Starting and Stopping Modes

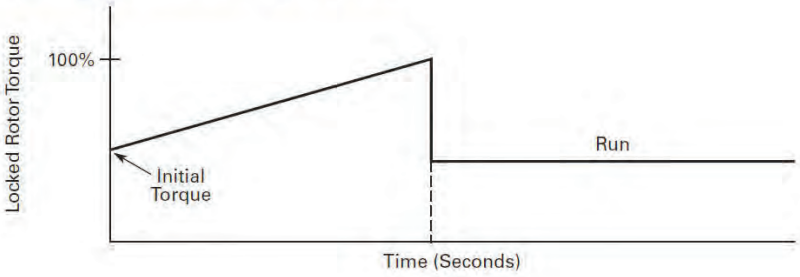
The S811+ has a variety of starting and stopping methods to provide superior performance in the most demanding applications. The motor can be started in either voltage ramp start or current limit start mode. Kick start and soft stop are available within both starting modes. The user has the option to configure two independent start ramp profiles to accommodate variations in starting requirements.

Voltage Ramp Start

Provides a voltage ramp to the motor resulting in a constant torque increase. The most commonly used form of soft start, this start mode allows you to set the initial torque value and the duration of the ramp to full voltage conditions. Bypass contactors close after ramp time.

- Adjustable initial torque 0–85% of locked rotor torque
- Adjustable ramp time 0.5–180 seconds (0.5–360 seconds with the S811+ Premium)

Starting Characteristics—Ramp Start



Note

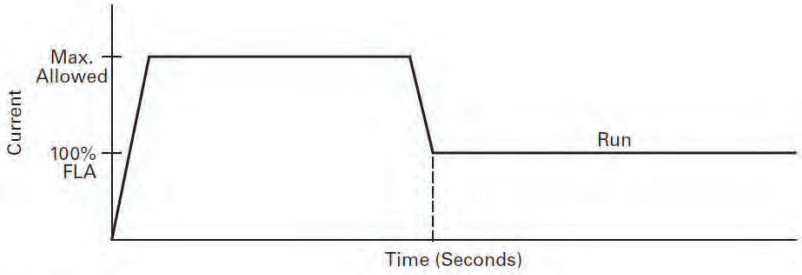
① C441 standalone communication modules can be used as general purpose I/O. This allows a customer to monitor the status of any non-communicating product over the selected protocol by wiring fault or auxiliary contacts from that product to the C441 communication module on-board I/O.

Current Limit Start

Limits the maximum current available to the motor during the start phase. This mode of soft starting is used when it becomes necessary to limit the maximum starting current due to long start times or to protect the motor. This start mode allows you to set the maximum starting current as a percentage of locked rotor current and the duration of the current limit. Bypass contactors close after current limit time.

- Maximum current of 0–85% locked rotor current
- Adjustable ramp time 0.5–180 seconds (0.5–360 seconds with the S811+ Premium)

Starting Characteristics—Current Limit Start



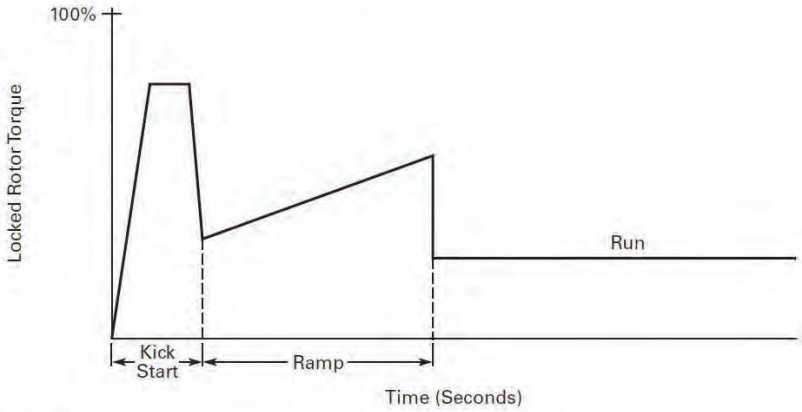
Kick Start

Selectable feature in both voltage ramp start and current limit start modes. Provides a current and torque "kick" for 0 to 2.0 seconds.

This provides greater initial current to develop additional torque to breakaway a high friction load.

- 0–85% of locked rotor torque
- 0–2.0 seconds duration

Starting Characteristics—Kick Start

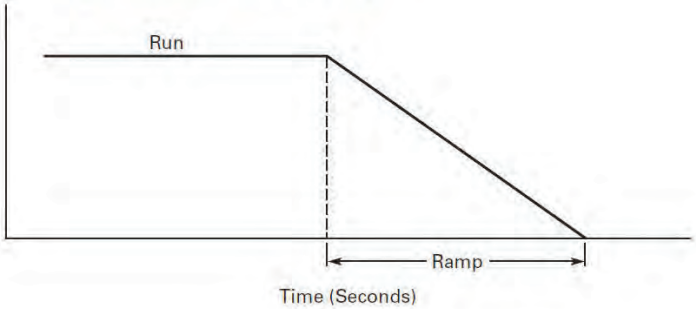


Soft Stop

Allows for a controlled stopping of a load. Used when a stop-time that is greater than the coast-to-stop time is desired. Often used with high friction loads where a sudden stop may cause system or load damage.

- Stop time = 0–60 seconds

Starting Characteristics—Soft Stop



1

Edge and Level Sensing Control

Edge Sensing

Edge sensing requires +24 Vdc power be momentarily applied to Control Terminal Block Pin 1 (with Terminal P at +24 Vdc) to initiate a start under all conditions. After a stop or fault occurs, the +24 Vdc must be removed, then reapplied to Terminal Pin 1 before another start can occur. This control configuration should be used when restarting of the motor after a fault or stop must be supervised manually or as a part of a control scheme. The cycling of +24 Vdc power to Terminal 1 Pin before starting is required regardless of the position of the auto reset switch on the DIM.

Level Sensing

Level sensing will enable a motor to restart after a fault is cleared without cycling +24 Vdc power to Terminal Pin 1 as long as:

- Terminal Pin P is supplied with +24 Vdc (to start from Control Terminal Block, Terminal Pin 3 must also be enabled)
- The auto reset switch on the DIM is set to enabled
- All faults have been reset

This control configuration should be used where it is desirable to restart a motor after a fault without additional manual or automatic control. An example of this condition would be on a remote pumping station where it is desirable to automatically restart a pump after a power outage without operator intervention.

Note: If the auto reset feature is used, CAUTION must be exercised to ensure that any restart occurs in a safe manner.

Features and Benefits

- Communication capabilities with various protocols
- The Digital Interface Module (DIM) provides an intuitive, easy-to-use human interface with powerful configuration capabilities to maximize system performance
- Door or device mounted DIM enables users to safely configure, commission, monitor and troubleshoot the system at the electrical panel without opening the enclosure door, eliminating the possibility of an arc flash incident
- System operating parameters can be monitored enterprise-wide through a communications network. Increase uptime by providing data for process management and preventive diagnostics
- Run internal bypass mode greatly reduces internal heating created by the greater power dissipation in the SCRs. Bypass contactor directly connects the motor to the line and improves system efficiency by reducing internal power losses
- Internal solid-state overload protection provides accurate current measurement and trip settings. Sophisticated algorithms solve a series of differential equations that model true motor heating and cooling, resulting in superior motor overload protection while minimizing nuisance trips. Advanced selectable protective features safeguard the motor and system against a variety of system faults
- Internal run bypass contactors and overload protection eliminate the need for additional devices, reducing enclosure sizes, minimizing installation and wiring time, and reducing overall assembly size and cost
- Wide range of overload FLA settings (31–100% of rated current) and a selectable trip class (5–30) offers users the flexibility to fine tune the starter to match specific application requirements
- Variable ramp times and torque control settings provide unlimited starting configurations, allowing for maximum application flexibility
- Kick-start feature enables soft starting of high friction loads
- Soft stop control for applications where an abrupt stop of the load is not acceptable
- The S811+ Premium with sophisticated pump control algorithms on both starting and stopping that minimize the pressure surges that cause water hammer. The pump control feature will maximize the life of the pump and piping systems while minimizing the downtime caused by system failure
- Six SCRs control all three motor phases, providing smooth acceleration and deceleration performance
- Soft acceleration and deceleration reduces wear on belts, gears, chains, clutches, shafts and bearings
- Reduce the peak inrush current's stress on the power system
- Manage peak starting torque to diminish mechanical system wear and damage
- 24 Vdc control voltage enhances personnel and equipment safety
- Removable, lockable control terminal block reduces maintenance costs. Also provides the opportunity for OEMs to reduce assembly and test costs by utilizing pre-assembled wire harnesses

Motor Wiring Configuration User Selectable Inline or Inside-the-Delta

Mains Motor Wiring Configuration is accomplished by simply selecting the required configuration from a menu. This feature allows adaptability from one configuration to another without any additional programming operations and reduces inventory levels by not having to stock both configurations.

Modbus Native Communications Protocol

Modbus RTU communications in now standard on all S811+ units. This allows users to quickly configure the unit for network communications using a common protocol. Adapters are available for users who prefer to use EtherNet/IP or Modbus TCP protocols.

Programmable Control Terminal Block Functionality

Four programmable terminals on the S811+ enable the user to expand functionality with options such as a second start ramp profile, externally triggered trip or warning functions, analog inputs, and others, in addition to the normal start, stop, reset, and so on, functions.

Second Start Ramp Profile Capability

A second start ramp profile may be configured for the soft starter. This profile is independent of the primary profile and retains all the parameter options such as start time and initial torques. With a signal at a terminal programmed for this feature, the second profile may be selected by a pushbutton station or a network.

Alarm-No-Trip Functionality

Some applications require the ability to effectively disable most protections with the intent of enabling the RVSS unit to control a motor under the most severe operating conditions characterized by current or voltage imbalances, high or low value deviations, or other fault conditions. This function causes the S811+ to ignore most fault trip conditions and continue operation of the application.

Digital Interface Module (DIM) Cloning

For OEMs or other users that desire to load identical parameter settings into multiple RVSS units, the DIM may be used to extract and duplicate parameter settings from one RVSS and loaded into other units, saving time, effort, and reducing chances for errors while programming.

1

Protective Features

All protective features can be configured, enabled or disabled with the DIM or through the communications network.

Motor Overload

The S811+ includes electronic overload protection as standard. The overload meets applicable requirements for a motor overload protective device. The overload protects the motor from over heat conditions with the use of sophisticated algorithms that model true motor heating, resulting in superior motor protection and fewer nuisance trips.

The S811+ calculates a thermal memory value based on the heat energy introduced into the motor during the start process. A 100% value represents the maximum safe internal temperature of the motor.

When the thermal memory value reaches 100%, an overload trip will occur removing power to the motor. Upon trip, the S811+ stores the calculated motor heating value and will not allow a motor re-start until the motor has a thermal memory value of less than 100%. This feature ensures the motor will not be damaged by repeated overload trip, reset and re-start cycles.

The thermal memory value can be monitored through the DIM or the communications network. The thermal memory value can be of great use in determining an impending overload trip condition.Alarms can be implemented in the process monitoring system warning of an impending trip before a trip occurs halting the process. Costly system downtime can be avoided.

The trip current is adjusted to match the specific application requirements by entering the motor nameplate full load current rating and trip class. The FLA parameter is adjustable from 32% to 100% of the unit's rated current. The overload trip class is adjustable from class 5 through class 30. The overload is ambient temperature compensated—meaning its trip characteristics will not vary with changes in ambient temperature. The overload protection can be enabled, disabled, or disabled on start.

Short Circuit

The use of a short-circuit protective device in coordination with the S811+ is required in branch motor circuits by most electrical codes. Short-circuit coordination ratings with both fuses and Eaton molded case circuit breakers are available providing customers with design flexibility. The S811+ has short-circuit coordination ratings as an open component, an enclosed starter, and in a motor control center.

External E-Stop

Emergency Stop functionality may be triggered from an external source. Removal of the 24 Vdc signal from a terminal configured for E-Stop will initiate an E-Stop action. The External E-Stop option is useful in applications where it is desirable to accomplish a motor shutdown in the event that an external condition(s) exist that will damage system components and/or product flows or operations.

External Trip

External Trip functionality may be triggered from an external source. Removal of the 24 Vdc signal from a terminal configured for External Trip will initiate an External Trip action. The External Trip option is useful in applications where it is desirable to accomplish a motor stop in the event that an external condition(s) exist that will damage system components and/or product flows or operations.

Fault Warning Functionality

Selected protection parameters may be assigned to provide a Fault Warning instead of a Fault Trip with user adjustable set points. When a Fault Warning condition is detected, the fault condition is reported via the DIM, network connection, or an auxiliary relay configured for this function. The soft starter remains in operation. At such time the fault condition no longer exists, the Fault Warning message will be extinguished.

External Warning

The S811+ will accept a Warning signal from an external source or device. In a fashion similar to the Fault Warning, the fault condition is reported via the DIM, network connection, or an auxiliary relay configured for this function. The soft starter remains in operation. At such time the fault condition no longer exists, the Fault Warning message will be extinguished.

Custom Fault/Warning Auxiliary Relays

Up to three fault and/or warning codes may be selected to operate an auxiliary relay configured to operate when any of these codes are detected. This option enables the user to provide external warnings or fault indications to increase monitoring effectiveness and to provide additional system control.

Motor Power

Motor Power can be not only be monitored, but trip levels can be adjusted to provide indications of system malfunctions or operating discrepancies. Both High and Low Power thresholds can be set to provide Fault Warning or Fault Trip functions. Additionally, fault delays times may be set to up to 60 seconds.

Analog Input

An input control terminal may be configured to accept a 0–20 mA DC signal with range scaling. This feature enables the S811+ to respond to an external device that may be monitoring a critical component or process and provides Fault Trip or Fault Warning capability to protect operating systems and processes.

Start Delay

Three start delay timers are available to enhance motor protection or to provide simple logic functions to coordinate motor control with other devices in the system. The timers will allow delays from 24 Vdc power up, receipt of a valid START command, or a delay in switch from one start ramp profile to another.

Jam

Excessive current and torque up to locked rotor levels can occur in a jam condition. The condition can result in stress and damage to the motor, load, mechanical system, and the electrical distribution system. Jam protection prevents the stress and damage from a jam during normal run. After the motor is in bypass, a current greater than 300% FLA setting will cause the starter to trip on a jam fault.

Stall

Excessive current and torque up to locked rotor levels can occur in a stall condition. The condition can lead to an overload trip and result in stress and damage to the motor, load, mechanical system, and the electrical distribution system. Stall protection prevents stress and damage to a motor that has not come up to speed during the soft start time. The S811+ will trip to protect the system in the event that the motor did not get to the rated speed in the defined soft start period. A current greater than 200% FLA at the end of the soft start period will cause the starter to trip on a stall fault.

Pole Over Temperature

High ambient temperatures, extended ramp times and high duty cycle conditions may cause the S811+ power pole conductors to reach a temperature that exceeds their thermal rating. The S811+ is equipped with sensors that monitor the temperature of the power poles. Over temperature protection occurs if the power pole's thermal capacity is exceeded. The soft starter will trip in over temperature conditions, preventing device failure.

Each power pole temperature value can be monitored through the DIM or the communications network. This feature can be of use in determining an impending over temperature trip condition.

When using a communications network, alarms can be implemented in the process monitoring system warning of an impending trip before the trip occurs, halting the process.

Phase Loss

Loss of a phase can cause a significant increase in the current drawn in the remaining two phases. Phase loss can lead to motor damage before an eventual overload trip occurs. Phase loss is typically an indication of a failure in the electrical distribution system. The S811+ will detect a phase loss and trip if any phase current drops below a preset value. The phase loss trip level is adjustable from 0% to 100% of the average of the other two phase levels with an adjustable trip delay of 0.1 to 60 seconds.

Phase Imbalance

Phase current or voltage imbalance can cause a significant increase in the current drawn in the remaining two phases. Phase imbalance can lead to motor damage before an eventual overload trip. Phase imbalance is typically an indication of a failure in the electrical distribution system or the motor. The S811+ will detect both current and voltage phase imbalances and trip if any phase becomes imbalanced as compared to the average of the other two phases.

The phase current imbalance trip level is adjustable from 0% to 100% of the average of the current in the other two phases with an adjustable trip delay of 0.1 to 60 seconds.

The phase voltage imbalance trip level is adjustable from 0% to 100% of the average of the voltage in the other two phases with an adjustable trip delay of 0.1 to 60 seconds.

Reset Mode

The S811+ can be set up for automatic or manual reset on trip. The manual reset mode requires the operator to physically press the RESET button located on the soft starter. The trip can be manually reset through the DIM or through the communications network. The trip can also be electrically reset by energizing a 24 Vdc input on the control terminal block.

The automatic reset mode allows the soft starter to be automatically reset as soon as the trip condition is no longer present. With the automatic reset mode, after the fault is no longer present, the motor will be restarted as soon as a valid start signal is present.

Phase Reversal

The S811+ can determine if the proper line phase sequence is present by default. The device will trip if the line phase sequence is something other than A-B-C. The S811+ can be configured to operate under reversed phase conditions (A-C-B).

Shorted SCR Detection

The S811+ monitors the operation of the power poles and will trip under a shorted SCR condition.

Open SCR Detection

The S811+ monitors the operation of the power poles and will trip under an open SCR condition.

Ground Fault Protection

The S811+ Premium and 690 V versions meet the IEC Ground Fault trip thresholds. Reference Application Note AP039007EN for more information.

Low Current

Low current conditions can be a result of a loss of load or a failure in the mechanical system. The S811+ has low current protection that will trip if the average rms current falls below a preset value. The low current protection can be programmed as a percent of motor FLA from 0% to 100%.

Low Voltage

Low voltage conditions can result from disturbances in the electrical power distribution system. Low voltage conditions can cause a malfunction and damage to electrical equipment. The S811+ has low voltage protection that will trip if the average rms voltage falls below a preset value. The low voltage protection can be programmed as a percent of nominal voltage from 1% to 99% with a trip delay of 0.1 to 60 seconds to accommodate short temporary voltage drops during the start process.

High Voltage

High voltage conditions can result from disturbances in the electrical power distribution system. High voltage conditions can cause malfunctions or failures of electrical equipment. The S811+ has high voltage protection that will trip if the average rms voltage is greater than a preset value. The high voltage protection can be programmed as a percent of nominal voltage from 101% to 120% with a trip delay of 0.1 to 60 seconds.

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Monitoring Capabilities

The S811+ has an impressive array of system monitoring capabilities that allows users to access real time process and diagnostic data. This data can be viewed at the device with the DIM or through a communications network. Data over a communications network can provide valuable insight into the condition of the equipment and processes. Maintenance and production personnel can monitor critical operational and maintenance data from a central control station that can be located far away from the production facility. Process data can be monitored to determine system anomalies that may indicate a need for preventive maintenance or an impeding failure. Adjustments made through the communications network can reduce costs by minimizing the time traveling to the location where the motor controls are located. When faults do occur, real time fault data can assist maintenance in troubleshooting and planning repair resources. Remote reset signals can be given to tripped devices without the need for manual intervention by maintenance personnel.

Average Line Current

Provides the average of the three-phase rms line currents in amps, accurate to within 2%. Current data can be used to indicate a need for maintenance. Increased currents in a fixed load application can indicate a reduction in system efficiencies and performance, signifying system maintenance is due.

Average Pole Current

Provides the average of the three-phase rms pole currents in amps, accurate to within 2%. The pole current is the current through the soft starter. The line and pole current will be identical in inline applications, and will differ in inside-the-delta applications.

Average Line Current as a % FLA

Provides the average rms line current as a percentage of the S811+ FLA setting.

Three-Phase Line Currents

Provides three rms phase line currents in amps, accurate to within 2%. Imbalances or changes in the relative phase current to one another can indicate anomalies in the motor or electrical distribution system.

Three-Phase Pole Currents

Provides three rms phase pole currents in amps, accurate to within 2%. The pole current is the current through the soft starter. The line and pole current will be identical in in-line applications, and will differ in inside-the-delta applications.

Three-Phase Line Voltages

Provides the individual rms three-phase line voltages. Imbalances or changes in the relative phase voltage to one another can indicate anomalies in the motor or electrical distribution system. Voltage can be used to monitor electrical distribution system performance. Warnings, alarms and system actions to low or high voltage conditions can be implemented.

Percent Thermal Memory

Provides the real time calculated thermal memory value. The S811+ calculates thermal memory value. A 100% value represents the maximum safe internal temperature of the motor. When the thermal memory value reaches 100%, an overload trip will occur, removing power to the motor.

The thermal memory value can be of great use in determining an impending overload trip condition. When using a communications network, alarms can be implemented in the process monitoring system warning of an impending trip before the trip occurs, halting the process. Costly system downtime can be avoided.

DC Control Voltage

Monitors level of the 24 Vdc control voltage. Fluctuations in control voltage can cause component malfunction and failure. System control voltage data can be used to implement warnings, alarms and system actions to low or high voltage conditions.

Pole Temperature

Increases in power pole temperature are caused by increases in ambient temperature, start/stop times and start duty cycles. Changes in pole temperatures represent a change in system operating conditions. Identifying unexpected operating conditions or changes can prompt maintenance and aid in process evaluation activities.

PCB Device Temperature

An increase in printed circuit board (PCB) device temperature is a strong indication of an increase in ambient temperature. High ambient temperature operation can be identified with the device temperature data. Device temperature increases can be due to undersized enclosures, failure of cooling fans or blocked venting. High operating temperatures will reduce the life of all electrical equipment in the enclosure.

Start Count

Start count data can be used to monitor system output, schedule preventative maintenance, identify system anomalies and identify changes in system operation.

Average Line Power

Provides the average of the three-phase line power in kilowatts, accurate to 5%. Power data may be used to monitor power transmitted to the load. Increased power demand may indicate degraded system components or connections. Additionally, such data is useful in determine power utilization in branch circuits consisting of multiple loads.

Power Factor

Provides the three-phase power factor value, accurate to 5%. The power factor of the circuit may be used to identify circuit conditions that may need to be corrected due to low power factor indications. Low circuit power factor can indicate improper or degraded components.

Diagnostics

Fault Queue

Current fault and a fault queue containing the last nine system faults can be read through the DIM or communications network. Fault identification can minimize troubleshooting time and cost, and prevent arc flash incidents. The fault queue can be remotely accessed through a communications network to assist in planning maintenance resources. Thirty (30) different faults can be identified by the S811+.

Control Status

The S811+ provides data that represents system conditions that can be read through the DIM or the communications network. This data identifies the status of the system and the control commands the system is requesting of the S811+. This can be used for advanced troubleshooting and system integration activities.

Breaker Status

The S811+ has provisions to read and display circuit breaker status. Eaton communicating cover control or other communicating protective device is required to take advantage of this feature.

Standards and Certifications

- IEC 60947-4-2
- EN 60947-4-2
- UL listed (NMFT-E202571) S811+N37... through S811+V85...
- UL recognized (NMFT2) S811+V10...
- CE marked
- CSA certified (3211 06)
- CSA elevator (2411 01)

Instructional Leaflets

- User manual MN03900001E
- Outline drawings:
  - S811+N...: 10-8574
  - S811+R...: 10-8575
  - S811+T...: 10-8576
  - S811+U...: 10-8857
  - S811+V...: 10-8577

Catalog Number Selection

S811+ Open Soft Starters ①

S 811+ T 30 N 3 S

S = Soft starter						**S** = Standard soft starter
811+ = Non-combination soft starter		**Frame Size** ② **N** = 65 mm **R** = 110 mm **T** = 200 mm **U** = 200 mm **V** = 290 mm		**Options** **N** = No options ④ **P** = Premium, 600 V rated ⑤⑧ **V** = Premium, 690 V rated (S811+ frame size T and V only) ⑥⑦⑧		**Number of Poles** **3** = Three-pole device
		Ampere Rating				
		37 = 37A **66** = 66A **10** = 105A **13** = 135A **18** = 180A	**24** = 240A **30** = 304A **36** = 360A **42** = 420A **50** = 500A ③	**65** = 650A **72** = 720A **85** = 850A **10** = 1000A		

Notes

① All units require a 24 Vdc power supply found on catalog **Page V6-T1-88**, or equivalent.
② S811+T..., S811+U... and S811+V... units require lug kits found on **Page V6-T1-88**.
③ S811+U50... unit does not have IEC certification.
④ Level/Edge Sense, Inline or Inside-the-Delta wiring configuration.
⑤ Level/Edge Sense, Inline or Inside-the-Delta wiring configuration, pump control and extended ramp.
⑥ Not available in S811+U....
⑦ Level/Edge Sense, Inline wiring configuration, pump control, extended ramp.
⑧ Ground fault protection included.

Severe Duty

Severe Duty Ratings

Starting Method	Ramp Current % of FLA	Ramp Time Seconds	Starts per Hour	Ambient Temperature
Soft start	450%	30 sec.	4	50°C
Full voltage	500%	10 sec.	10	50°C
Wye-delta	350%	65 sec.	3	50°C
80% RVAT	480%	25 sec.	4	50°C
65% RVAT	390%	40 sec.	4	50°C
50% RVAT	300%	60 sec.	4	50°C

Severe duty ratings are defined as any combination of parameters that exceed the standard duty ratings where the ramp time is over 30 seconds, and/or the number of starts per hour exceeds 4, and/or the current limit set is over 300%. *Example:* 35-second ramp, 5 starts per hour, 350% current limit at 40°C ambient.

S811+

Severe Duty—30 Second Ramp and/or 450% Current Limit at 50°C, Inline Connection

Rated Current	Three-Phase Motors kW Rating (50 Hz) 230 V	380–400 V	440 V	hp Rating (60 Hz) 200 V 1.0SF	200 V 1.15SF	230 V 1.0SF	230 V 1.15SF	460 V 1.0SF	460 V 1.15SF	575–690 V 1.0SF	575–690 V 1.15SF	Catalog Number ①
Frame Size N												
22	5.5	10	11	5	5	7-1/2	5	15	10	20	15	**S811+N37N3S**
42	11	18.5	22	10	10	15	10	30	25	40	30	**S811+N66N3S**
Frame Size R												
65	15	30	33	15	15	20	15	50	40	50	50	**S811+R10N3S**
80	22	40	45	25	20	30	25	60	50	75	60	**S811+R13N3S**
Frame Size T												
115	33	59	63	30	30	40	30	75	75	100	100	**S811+T18N3S**
150	45	80	90	50	40	50	50	100	100	150	125	**S811+T24N3S**
192	55	100	110	60	50	75	60	150	125	200	150	**S811+T30N3S**
Frame Size U												
240	75	110	147	75	60	75	75	200	150	200	200	**S811+U36N3S**
305	90	160	185	100	75	100	100	250	200	300	250	**S811+U42N3S**
365	110	185	220	125	100	150	125	300	250	350	300	**S811+U50N3S** ②
Frame Size V												
240	75	110	147	75	60	75	75	200	150	200	200	**S811+V36N3S**
305	90	160	185	100	75	100	100	250	200	300	250	**S811+V42N3S**
365	110	185	220	125	100	150	125	300	250	350	300	**S811+V50N3S**
420	129	220	257	150	125	150	150	350	300	450	350	**S811+V65N3S**
480	147	257	295	150	150	200	150	400	350	500	450	**S811+V72N3S**
525	160	280	335	150	150	200	150	450	350	500	450	**S811+V85N3S**
575	172	303	370	200	150	250	200	500	450	600	500	**S811+V10N3S**

Notes

① Replace N3S with P3S for premium/pump option.

② S811+U50… rating does not have IEC certification.

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Accessories

Lug Kits

S811+T..., S811U... and S811+V... soft starters each have different lug options based on your wiring needs. Each lug kit contains three lugs that can be mounted on either the load or line side.

Lug Kit

Lug Kits

S811+ Catalog Number	Description	Kits Required	Catalog Number
S811+T..., S811+U...	2 cable connections, 4 AWG to 1/0 cable	2	**EML22**
	1 cable connection, 4/0 to 500 kcmil cable		**EML23**
	2 cable connections, 4/0 to 500 kcmil cable		**EML24**
	1 cable connection, 2/0 to 300 kcmil cable		**EML25**
	2 cable connections, 2/0 to 300 kcmil cable		**EML26**
S811+V...	2 cable connections, 4/0 to 500 kcmil cable	2	**EML28**
	4 cable connections, 4/0 to 500 kcmil cable		**EML30**
	6 cable connections, 4/0 to 500 kcmil cable		**EML32**
	4 cable connections, 2/0 to 300 kcmil cable		**EML33**

Power Supplies

24 Vdc power supply that can be used with the S811+ SSRV or as a stand-alone device.

Power Supplies

Description	Catalog Number
85–264 Vac input 24 Vdc output	**PSG240E**
360–575 Vac input 24 Vdc output	**PSG240F**
600 Vac input 24 Vdc output	**PSS55D**

Lug Cover Kits

Replacement covers for the S811+T..., S811+U... and S811+V... soft starters are available in case of damage to the existing covers.

Lug Cover Kits

Description	Catalog Number
Lug cover S811+T..., S811+U...	**EML27**
Lug cover S811+V...	**EML34**

IP20 Kits

IP20 Kits

Description	Catalog Number
S811+N...	**SS-IP20-N**
S811+R...	**SS-IP20-R**
S811+T... and S811+U...	**SS-IP20-TU**
S811+V...	**SS-IP20-V**

Surge Suppressors

The surge suppressor can mount on either the line or load side of the soft starter. It is designed to clip the line voltage (or load side induced voltage).

Surge Suppressor

Surge Suppressors

Description	Catalog Number
600 V MOV for S811+... units	**EMS39**
690 V MOV for S811+... units ①	**EMS41**

Note

① S811+T... only.

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Technical Data and Specifications

Soft Starters—S811+

Description	S811+N37…	S811+N66…	S811+R10+…	S811+R13…
Max. current capacity	37	66	105	135
FLA range	11–37	20–66	32–105	42–135
General Information				
Bypass mechanical lifespan	10M	10M	10M	10M
Insulating voltage Ui	660 V	660 V	660 V	660 V
Ramp time range	0.5–180 seconds (0.5–360 seconds S811+ Premium)	0.5–180 seconds (0.5–360 seconds S811+ Premium)	0.5–180 seconds (0.5–360 seconds S811+ Premium)	0.5–180 seconds (0.5–360 seconds S811+ Premium)
Resistance to vibration	3g	3g	3g	3g
Resistance to shock	15g	15g	15g	15g
Electrical Information				
Operating voltage	200–600 V	200–600 V	200–600 V	200–600 V
Operating frequency	47–63 Hz	47–63 Hz	47–63 Hz	47–63 Hz
Overload setting	30–100%	30–100%	30–100%	30–100%
Trip class	5, 10, 20 and 30	5, 10, 20 and 30	5, 10, 20 and 30	5, 10, 20 and 30
Cabling Capacity (IEC 947)				
Number of conductors	1	1	1	1
Wire sizes	14–2	14–2	14–4/0	14–4/0
Type of connectors	Box lug	Box lug	Box lug	Box lug
Control Wiring (12-Pin)				
Wire sizes in AWG	22–14	22–14	22–14	22–14
Number of conductors (stranded)	2 (or one AWG 12)	2 (or one AWG 12)	2 (or one AWG 12)	2 (or one AWG 12)
Torque requirements in lb-in	3.5	3.5	3.5	3.5
Solid, stranded or flexible max. size in mm^2	3.31	3.31	3.31	3.31
Control Power Requirements				
Voltage range (24V ±10%)	21.6–26.4	21.6–26.4	21.6–26.4	21.6–26.4
Steady-state current amps	1.0	1.0	1.0	1.0
Inrush current amps	10	10	10	10
Ripple	1%	1%	1%	1%
Relays (1) Class A and C				
Voltage AC—maximum	240	240	240	240
Voltage DC—maximum	120	120	120	120
Amps—maximum	3	3	3	3
Environment				
Temperature—operating	–30° to 50°C (no derating) consult factory for operation >50°C	–30° to 50°C (no derating) consult factory for operation >50°C	–30° to 50°C (no derating) consult factory for operation >50°C	–30° to 50°C (no derating) consult factory for operation >50°C
Temperature—storage	–50° to 70°C	–50° to 70°C	–50° to 70°C	–50° to 70°C
Altitude	<2000m—consult factory for operation >2000m	<2000m—consult factory for operation >2000m	<2000m—consult factory for operation >2000m	<2000m—consult factory for operation >2000m
Humidity	<95% noncondensing	<95% noncondensing	<95% noncondensing	<95% noncondensing
Operating position	Any	Any	Any	Any
Pollution degree IEC947-1	3	3	3	3
Impulse withstand voltage IEC947-4-1	6000 V	6000 V	6000 V	6000 V

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Soft Starters—S811+, continued

Description	S811+U42…	S811+U50… ①	S811+V36…	S811+V42…
Max. current capacity	420	500	360	420
FLA range	131–420	156–500	112–360	131–420
General Information				
Bypass mechanical lifespan	10M	10M	10M	10M
Insulating voltage Ui	660 V	660 V	660 V	660 V
Ramp time range	0.5–180 seconds (0.5–360 seconds S811+ Premium)	0.5–180 seconds (0.5–360 seconds S811+ Premium)	0.5–180 seconds (0.5–360 seconds S811+ Premium)	0.5–180 seconds (0.5–360 seconds S811+ Premium)
Resistance to vibration	3g	3g	3g	3g
Resistance to shock	15g	15g	15g	15g
Electrical Information				
Operating voltage	200–600 V	200–600 V	200–600 V	200–600 V
Operating frequency	47–63 Hz	47–63 Hz	47–63 Hz	47–63 Hz
Overload setting	30–100%	30–100%	30–100%	30–100%
Trip class	5, 10, 20 and 30	5, 10, 20 and 30	5, 10, 20 and 30	5, 10, 20 and 30
Cabling Capacity (IEC 947)				
Number of conductors	1 or 2	1 or 2	2, 4 or 6	2, 4 or 6
Wire sizes	4 AWG to 500 kcmil	4 AWG to 500 kcmil	2/0 to 500 kcmil	2/0 to 500 kcmil
Type of connectors	Add-on lug kit	Add-on lug kit	Add-on lug kit	Add-on lug kit
Control Wiring (12-Pin)				
Wire sizes in AWG	22–14	22–14	22–14	22–14
Number of conductors (stranded)	2 (or one AWG 12)	2 (or one AWG 12)	2 (or one AWG 12)	2 (or one AWG 12)
Torque requirements in lb-in	3.5	3.5	3.5	3.5
Solid, stranded or flexible max. size in mm^2	3.31	3.31	3.31	3.31
Control Power Requirements				
Voltage range (24V ±10%)	21.6–26.4	21.6–26.4	21.6–26.4	21.6–26.4
Steady-state current amps	1.0	1.0	1.4	1.4
Inrush current amps	10	10	10	10
Ripple	1%	1%	1%	1%
Relays (1) Class A and C				
Voltage AC—maximum	240	240	240	240
Voltage DC—maximum	120	120	120	120
Amps—maximum	3	3	3	3
Environment				
Temperature—operating	–30° to 50°C (no derating) consult factory for operation >50°C	–30° to 50°C (no derating) consult factory for operation >50°C	–30° to 50°C (no derating) consult factory for operation >50°C	–30° to 50°C (no derating) consult factory for operation >50°C
Temperature—storage	–50° to 70°C	–50° to 70°C	–50° to 70°C	–50° to 70°C
Altitude	<2000m—consult factory for operation >2000m	<2000m—consult factory for operation >2000m	<2000m—consult factory for operation >2000m	<2000m—consult factory for operation >2000m
Humidity	<95% noncondensing	<95% noncondensing	<95% noncondensing	<95% noncondensing
Operating position	Any	Any	Any	Any
Pollution degree IEC947-1	3	3	3	3
Impulse withstand voltage IEC947-4-1	6000 V	6000 V	6000 V	6000 V

Note

① S811+U50… unit does not have IEC certification.

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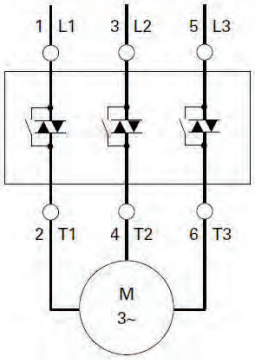
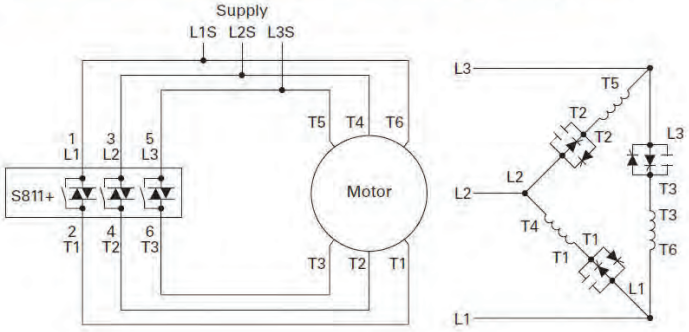
Wiring Diagrams

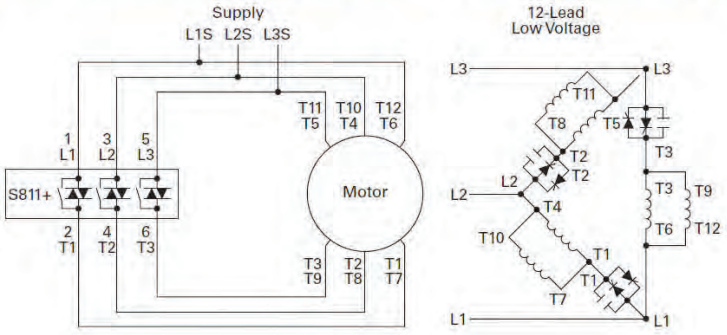
Line Connected Soft Starter



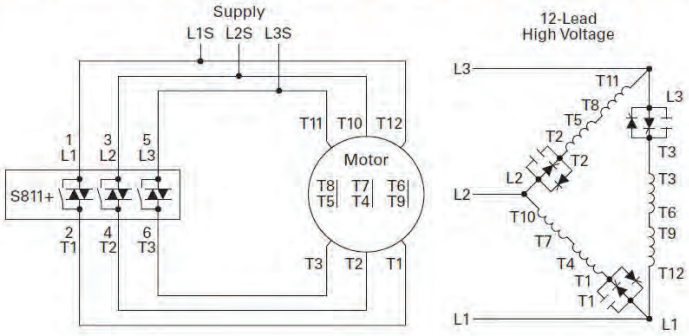
Inside-the-Delta Connected Soft Starter for a 6-Lead Motor



Inside-the-Delta Connected Soft Starter for a 12-Lead Low Voltage Motor



Inside-the-Delta Connected Soft Starter for a 12-Lead High Voltage Motor



Dimensions

Approximate Dimensions in Inches (mm)

Soft Starters—S811+

Catalog Number ①	W	H	D	Weight in Lbs (kg)
S811+N37N3S	2.66 (67.6)	7.37 (187.2)	6.45 (163.9)	5.8 (2.6)
S811+N66N3S	2.66 (67.6)	7.37 (187.2)	6.45 (163.9)	5.8 (2.6)
S811+R10N3S	4.38 (111.3)	7.92 (201.1)	6.64 (168.6)	10.5 (4.8)
S811+R13N3S	4.38 (111.3)	7.92 (201.1)	6.64 (168.6)	10.5 (4.8)
S811+T18N3S	7.65 (194.4)	12.71 (322.9)	6.47 (164.4)	48 (21.8) with lugs 41 (18.6) without lugs
S811+T24N3S	7.65 (194.4)	12.71 (322.9)	6.47 (164.4)	48 (21.8) with lugs 41 (18.6) without lugs
S811+T30N3S	7.65 (194.4)	12.71 (322.9)	6.47 (164.4)	48 (21.8) with lugs 41 (18.6) without lugs
S811+U36N3S	7.73 (196.3)	12.72 (323.1)	7.16 (181.8)	48 (21.8) with lugs 41 (18.6) without lugs
S811+U42N3S	7.73 (196.3)	12.72 (323.1)	7.16 (181.8)	48 (21.8) with lugs 41 (18.6) without lugs
S811+U50N3S	7.73 (196.3)	12.72 (323.1)	7.16 (181.8)	48 (21.8) with lugs 41 (18.6) without lugs
S811+V36N3S	11.05 (280.6)	16.57 (420.8)	7.39 (187.8)	103 (46.8) with lugs 91 (41.4) without lugs
S811+V42N3S	11.05 (280.6)	16.57 (420.8)	7.39 (187.8)	103 (46.8) with lugs 91 (41.4) without lugs
S811+V50N3S	11.05 (280.6)	16.57 (420.8)	7.39 (187.8)	103 (46.8) with lugs 91 (41.4) without lugs
S811+V65N3S	11.05 (280.6)	16.57 (420.8)	7.39 (187.8)	103 (46.8) with lugs 91 (41.4) without lugs
S811+V72N3S	11.05 (280.6)	16.57 (420.8)	7.39 (187.8)	103 (46.8) with lugs 91 (41.4) without lugs
S811+V85N3S	11.05 (280.6)	16.57 (420.8)	7.39 (187.8)	103 (46.8) with lugs 91 (41.4) without lugs
S811+V10N3S	11.05 (280.6)	16.57 (420.8)	7.39 (187.8)	103 (46.8) with lugs 91 (41.4) without lugs

Also refer to dimension drawings on **Pages V6-T1-96** through **V6-T1-98.**

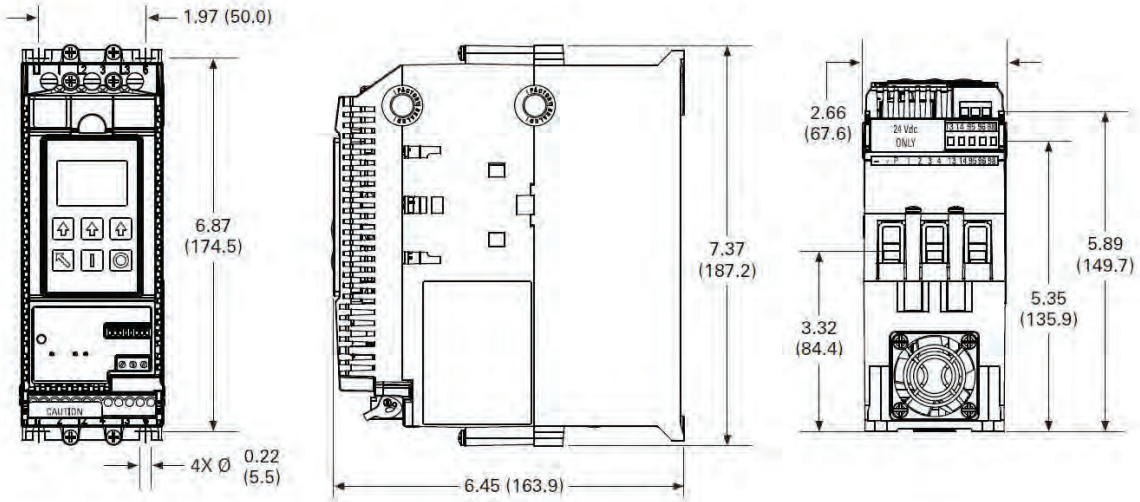
Note

① Dimensions of the frames stay consistent between the N3S, P3S, and V3S options.

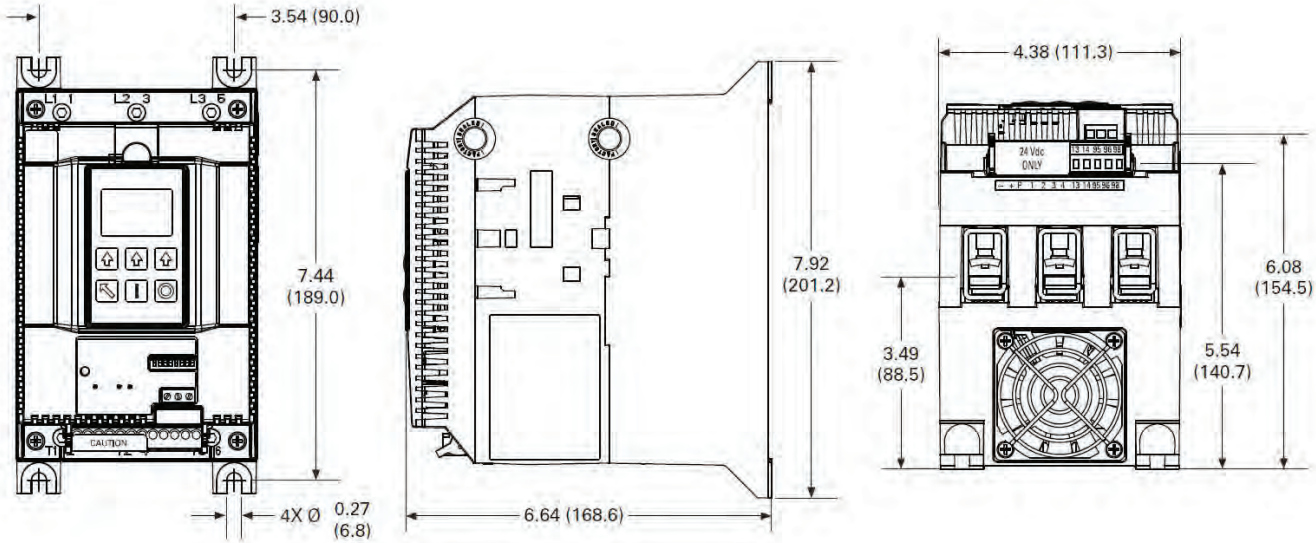
1

Approximate Dimensions in Inches (mm)

S811+N...

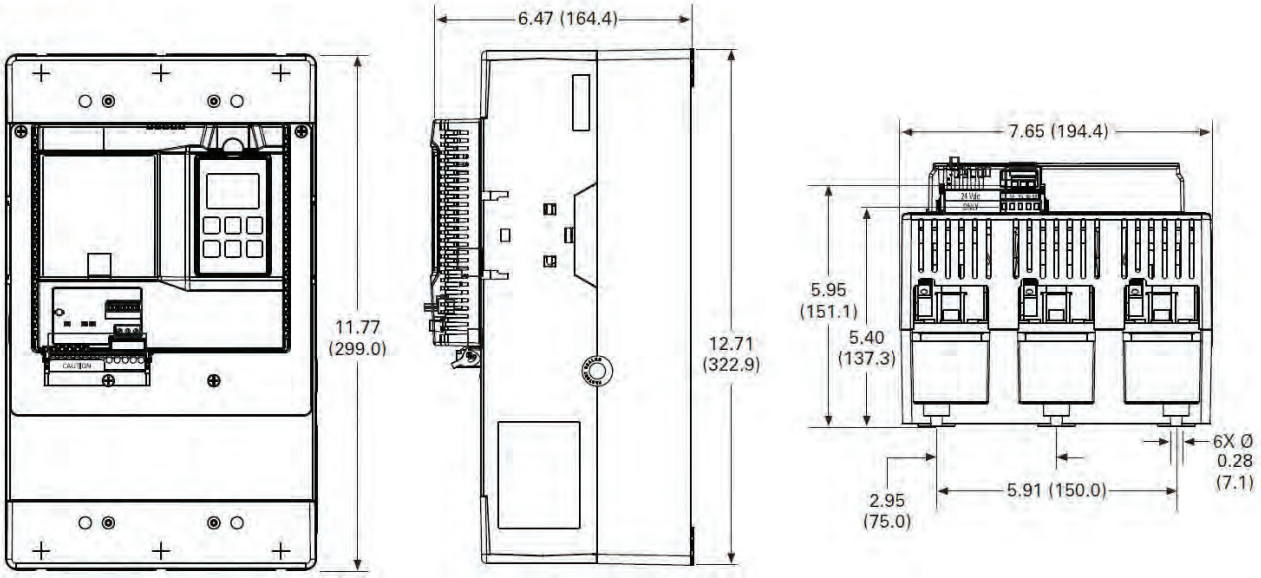


S811+R...

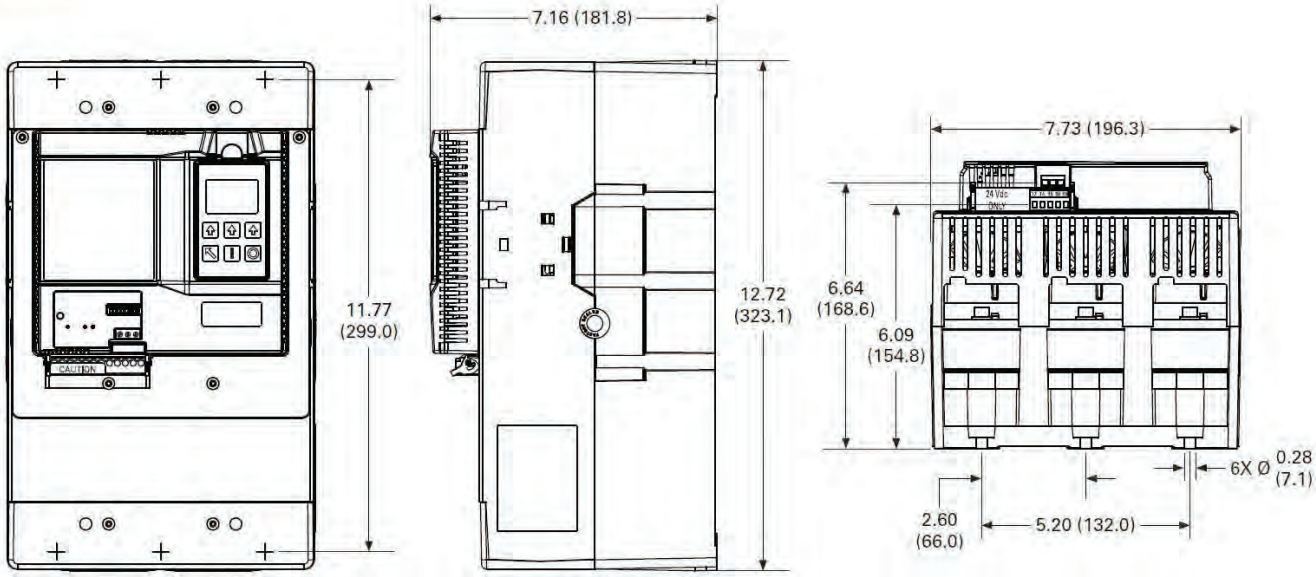


Approximate Dimensions in Inches (mm)

S811+T...



S811+U...



DUAL-LINE 6-DIGIT PROCESS METER

ProVu Series

c UL us LISTED

CE

ProVu • Model PD6000

- 0-20 mA, 4-20 mA, 0-5 V, 1-5 V, and ±10 V Inputs
- NEMA 4X, IP65 Front
- Universal 85-265 VAC or 12/24 VDC Input Power
- Large Dual-Line 6-Digit Display, 0.60" & 0.46"
- Isolated 24 VDC @ 200 mA Transmitter Power Supply
- Math Functions for Flow & Round Horizontal Tanks
- Programmable Displays & Function Keys
- Sunlight Readable Display
- 32-Point, Square Root, or Exponential Linearization
- Multi-Pump Alternation Control
- 2 or 4 Relays + Isolated 4-20 mA Output Options
- External 4-Relay & Digital I/O Expansion Modules
- RS-232, RS-422/485 Serial Communication Options
- -40 to 65°C Operating Temperature Range

PROVU • MODEL PD6000 PROCESS METER

(Actual Size)

FEATURE RICH AND FLEXIBLE

The **PROVU** meter boasts speci cations and functionality that clearly makes it one of the most advanced process meters available. Its dual-line 6-digit display (999,999), advanced math functions, function keys, and optional expansion modules are only a few of the features you wi **PROVU**.

FRONT PANEL DISPLAY

Precise, Accurate, and More Informative

PROVU's large 0.6" main display will provide you with a highly accurate and precise 6-digit view of your process. Its 24-bit A/D is accurate to ±0.03% of calibrated span ±1 count.

Configurable

The main display can be programmed to indicate PV, maximum (peak), minimum (valley), alternating maximum/ minimum, or one of eight alarm set points. The secondary display can also be con gured to display engineering units, setpoints, user de ned legends, or simply turned off.

Function Keys

There are three function keys available to the user. These keys can be programmed to trigger certain events (i.e. acknowledge alarms, reset max and/or min, disable/enable output relays, or hold current relay states), provide direct menu access points, and more.

Environmentally Tough

UV Resistant
Sunlight Readable

NEMA 4X Rated

Rugged

A unique front panel design makes the **PROVU** nearly impenetrable in typical applications. Here, the **PROVU** easily survives a direct hit on the display from a heavy 2" solid stainless steel ball dropped from eight feet.

Easy to Use

The user friendly dual-line display makes the **PROVU** easy to set up & program. No jumpers to set for input selection. All setup & programming is done via the front panel. Three levels of password protection help maintain the reliability of the programming.

FIELD EXPANSION MODULES

Add functionality to the **ProVu** in th eld with easy-to-install external expansion modules. Add RS-232 or RS-422/485 communications, I/O modules (up to 2), or 4-relay expansion module. The menu items for these modules do not appear until the module is connected, simplifying the basic menu. Relay and digital I/O modules are shown below with optional DIN rail mounting kit, P/N PDA1002.

I/O Expansion Module

Four digital inputs and four digital outputs are available per expansion module. The **ProVu** meter will accept two of these modules. External digital inputs can function similarly to the front panel function keys. They can be con gured to trigger certain events (i.e. acknowledge/reset alarms, reset max and/or min values, disable/enable all output relays, and hold current relay states), provide direct menu access point, or mimic front panel keys.

Digital outputs can be used to remotely monitor **ProVu**'s alarm relay output states, or the states of a variety of actions and functions executed by the meter.

Relay Expansion Module

An external module containing four 3 amp Form A (SPST) relays can be added to the **ProVu** at anytime. Removable screw terminal blocks accept 12 to 22 AWG wire.

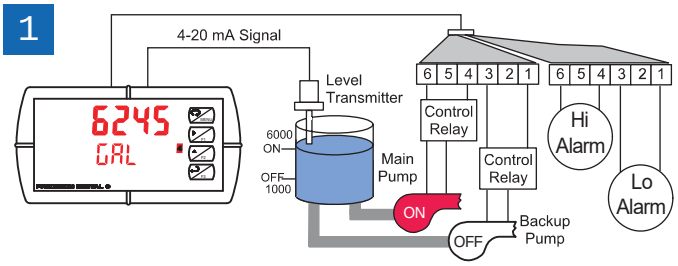
Communications Module

Serial communications on the **ProVu** can be added anytime with external RS-232 or RS-422/485 communication adapters.

MULTI-PUMP ALTERNATION

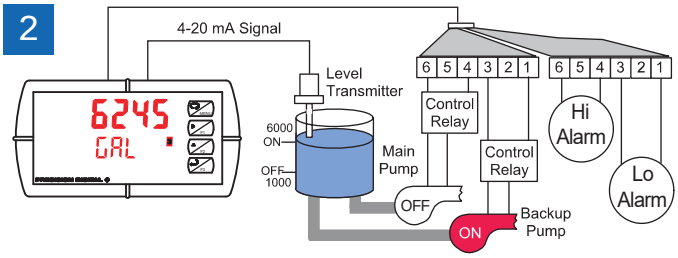
Up to 8 pumps can be alternated/sequenced.

1



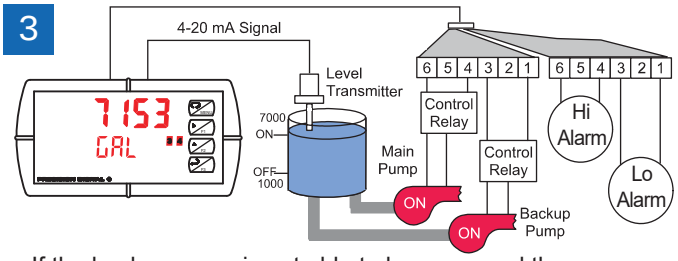
Relay #4 turns the main pump on at 6000 gallons and turns it off at 1000 gallons.

2



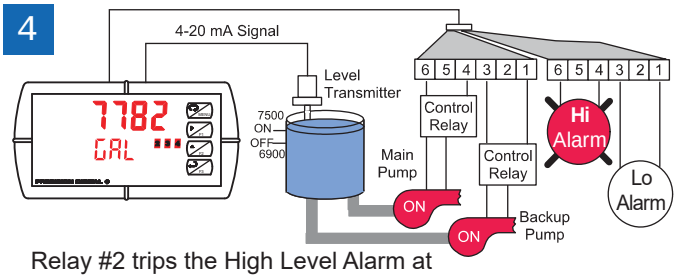
With the Pump Alternation feature activated, the next time the level reaches 6000 gallons, relay #3 transfers and starts the backup pump.

3



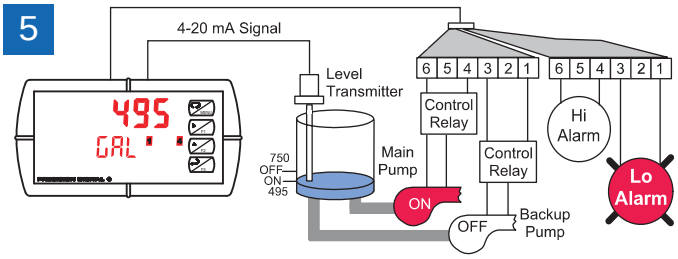
If the backup pump is not able to keep up, and the level reaches 7000 gallons, relay #4 transfers and starts the main pump as well.

4



Relay #2 trips the High Level Alarm at 7500 gallons and resets at 6900 gallons.

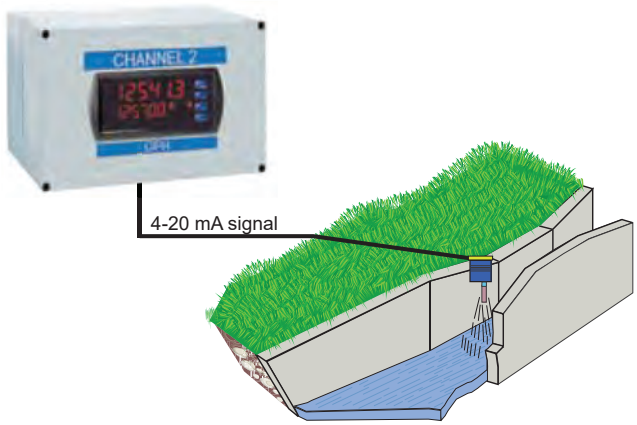
5



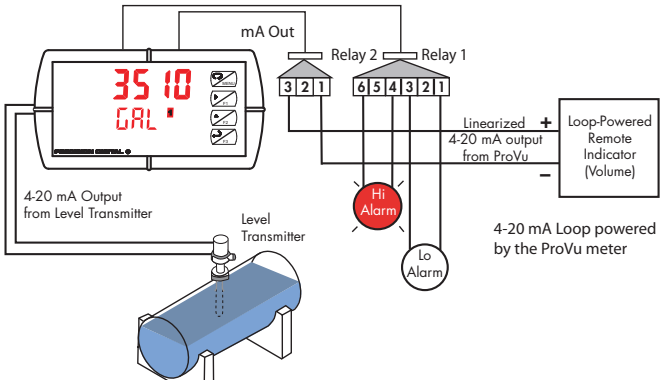
Relay #1 trips the Low Level Alarm at 495 gallons and resets at 750 gallons.

MATH FUNCTIONS

Non-Linear input signals can be linearized with the **PROVU's** simple to use built-in math functions, such as: square-root extractor, weir umes exponential linearizer, horizontal round tank linearizer, or the **PROVU**'s powerful general purpose 32-point linearizer (free linearization utility available at www.predig.com).



Weirs and Flumes Math Function

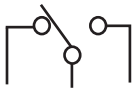


Round Horizontal Tank Math Function

METER COPY

The Copy feature is used to copy (or clone) all the settings from one **PROVU** to other **PROVU** meters in about 20 seconds! The Copy function is a standard feature on all meters. It does not require a communications adapter, only an optional cable assembly, P/N PDA1200. See the ordering information for complete details.

OUTPUTS



Relay Outputs

The **PROVU** has up to four 3 A Form C relays (SPDT), giving you more fail-safe options upon power loss. Relay action can also be con gured for input loop break protection. Set ON and OFF delay times when needed. Up to eight front panel indicators show alarm and/or relay state. Can be con gured for 0-100% deadband.

Relay Operation/Configuration

There are powerful relay functions that can be con gured in the **PROVU** meter, including:

- Automatic reset only (non-latching)
- Automatic + manual reset at any time (non-latching)
- Latching (manual reset only)
- Latching with clear (manual reset only after alarm condition has cleared)
- Pump alternation control (automatic reset only)
- Sampling (activated for a user-speci ed time)
- User selectable fail-safe operation
- Relay action for loss (break) of 4-20 mA input signal
- Time delay (on and off), independent for each relay
- Manual control mode

Analog Output

The isolated analog retransmission signal can be con gured to represent the process variable (PV), maximum (peak) value, minimum (valley) value, or the value for any of the eight relay set points. While the output is nominally 4-20 mA, the signal will accurately accommodate under- and over-ranges from 1 to 23 mA.

Auto/Manual Control

Take control of any output with this feature. All relays can be forced ON or OFF, and the 4-20 mA output signal can be set to any value within its range.

Isolated Transmitter Power Supplies

A powerful 24 V @ 200 mA power supply is a standard feature on the **PROVU** meter. It can be con gured for 5, 10, or 24 V (default) by means of a simple internal jumper (see manual). An additional power supply (24 V @ 40 mA) is standard with the 4-20 mA output option.

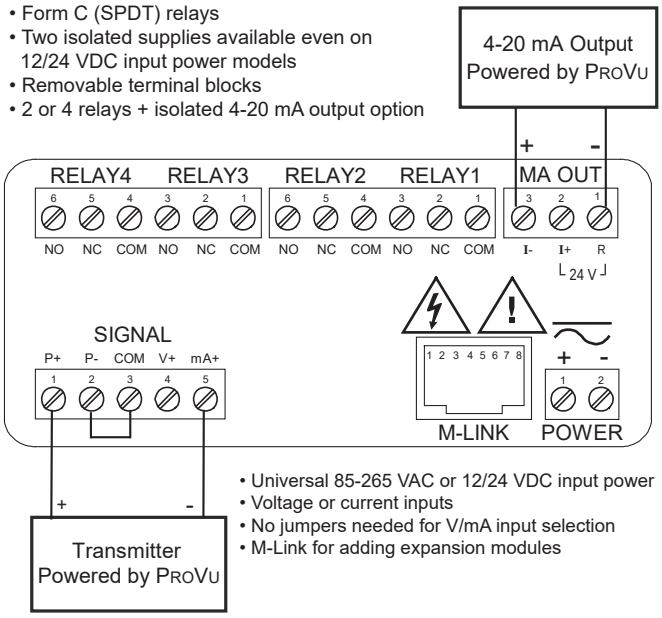
NEMA 4 & 4X FIELD ENCLOSURES

Plastic, stainless steel, and painted steel NEMA 4 enclosures for up to 10 **PROVU** meters.

See our complete offering at www.predig.com

CONNECTIONS

- Form C (SPDT) relays
- Two isolated supplies available even on 12/24 VDC input power models
- Removable terminal blocks
- 2 or 4 relays + isolated 4-20 mA output option



- Universal 85-265 VAC or 12/24 VDC input power
- Voltage or current inputs
- No jumpers needed for V/mA input selection
- M-Link for adding expansion modules

SPECIFICATIONS

Except where noted all specifications apply to operation at +25°C.

General

Display: Main display: 0.60" (15 mm) high, second display: 0.46" (12 mm) high. Both displays are 6 digits (-99999 to 999999), red LEDs with leading zero blanking.

Display Intensity: Eight intensity levels

Display Update Rate: 5/second (200 ms)

Overrange: Display flashes 999999

Underrange: Display flashes -99999

Front Panel: NEMA 4X, IP65

Programming Methods: Four front panel buttons, PC based linearization utility, cloning using Copy function, or via digital inputs.

Noise filter: Programmable from 2 to 199 (0 will disable filter)

Filter Bypass: Programmable from 0.1 to 99.9% of calibrated span

Recalibration: Calibrated at the factory. Recalibration is recommended at least every 12 months.

Max/Min Display: Max (Peak) / min (Valley) readings reached by the process are stored until reset by the user or until power to the meter is turned off.

Password: Three programmable passwords restrict modification of programmed settings. Pass 1: Allows use of the F1–F3 function keys. Pass 2: Allows use of the F1–F3 function keys and changing the set/reset points. Pass 3: Restricts all programming and F1–F3 keys. *Note: Digital inputs are not password protected.*

Non-Volatile Memory: All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.

Power Options: 85-265 VAC 50/60 Hz, 90-265 VDC 20 W max, or jumper selectable 12/24 VDC ±10%, 15 W max.

Fuse: Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 meters may share one 5 A fuse.

Isolated Transmitter Power Supply: 5, 10, or 24 VDC selectable by internal jumper. 24 VDC ± 10% supply rated @ 200 mA max (100 mA max for 12/24 VDC powered models). The 5 or 10 VDC supplies rated @ 50 mA max.

Normal Mode Rejection: Greater than 60 dB at 50/60 Hz

Isolation: 4 kV input/output-to-power line. 500 V input-to-output or output-to-P+ supply.

Environmental: Operating temperature range: -40 to 65°C. Storage temperature range: -40 to 85°C. Relative humidity: 0 to 90% non-condensing.

Connections: Removable screw terminal blocks accept 12 to 22 AWG wire, RJ45 for external relays, digital I/O, and serial communication adapters.

Enclosure: 1/8 DIN, high impact plastic, UL 94V-0, color: black

Mounting: 1/8 DIN panel cutout required: 3.622" x 1.772" (92 mm x 45 mm). Two panel mounting bracket assemblies are provided.

Tightening Torque: Screw terminal connectors: 5 lb-in (0.56 Nm)

Overall Dimensions: 4.68" x 2.45" x 5.64" (119 mm x 62 mm x 143 mm) (W x H x D)

Weight: 9.5 oz (269 g)

UL File Number: UL & c-UL Listed. E160849; 508 Industrial Control Equipment.

Warranty: 3 years parts & labor

Process Input

Inputs: Field selectable: 0-20, 4-20 mA, ±10 VDC (0-5, 1-5, 0-10 V)

Accuracy: ±0.03% of calibrated span ±1 count, square root & programmable exponent accuracy range: 10-100% of calibrated span

Temperature Drift: 0.005% of calibrated span/°C max from 0 to 65°C ambient, 0.01% of calibrated span/°C max from -40 to 0°C ambient

Math Function: Linear, square root, programmable exponent, or round horizontal tank volume calculation.

Multi-Point Linearization: 2 to 32 points

Programmable exponent: 1.0001 to 2.9999

Low-Flow Cutoff: 0-999999 (0 disables cutoff function)

Decimal Point: Up t ve decimal places or none: d.ddddd, dd.dddd, ddd.ddd, dddd.dd, ddddd.d, or dddddd.

Calibration Range: Minimum span: 0.15 mA or 0.10 V. An Error message will appear if input 1 and input 2 signals are too close together.

Input Impedance: Voltage ranges: greater than 1 MΩ. Current ranges: 50 - 100 Ω (depending on resettable fuse impedance).

Input Overload: Current input protected by resettable fuse, 30 VDC max. Fuse resets automatically after fault is removed.

Relays

Rating: 2 or 4 SPDT (Form C) internal and/or 4 SPST (Form A) external; rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP @ 125/250 VAC for inductive loads

Noise Suppression: Noise suppression is recommended for each relay contact switching inductive loads.

Deadband: 0-100% of span, user programmable

High or Low Alarm: User may program any alarm for high or low trip point. Unused alarm LEDs and relays may be disabled (turned off).

Relay Operation: automatic (non-latching), latching (requires manual acknowledge), sampling (based on time), and pump alternation control (2 to 8 relays).

Relay Reset: User selectable via front panel buttons or digital inputs.

1. Automatic reset only (non-latching), when input passes the reset point.
2. Automatic + manual reset at any time (non-latching).
3. Manual reset only, at any time (latching).
4. Manual reset only after alarm condition has cleared (latching).

Note: Front panel button or digital input may be assigned to acknowledge relays programmed for manual reset.

Time Delay: 0 to 999.9 seconds, on & off relay time delays. Programmable and independent for each relay.

Fail-Safe Operation: Programmable and independent for each relay. *Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.*

Auto Initialization: When power is applied to the meter, relays will re ect the state of the input to the meter.

ProVu • Model PD6000 Process Meter

Isolated 4-20 mA Transmitter Output

Output Source: Process variable (PV), max, min, set points 1-8, or manual control mode

Scaling Range: 1.000 to 23.000 mA for any display range

Calibration: Factory calibrated: 4.000 to 20.000 = 4-20 mA output

Accuracy: ± 0.1% of span ± 0.004 mA

Temperature Drift: 0.005% of calibrated span/°C max from 0 to 65°C ambient, 0.01% of calibrated span/°C max from -40 to 0°C ambient
Note: Analog output drift is separate from input drift.

Isolated Transmitter Power Supply: Terminals I+ & R: 24 VDC ± 10% @ 40 mA maximum, may be used to power the 4-20 mA output or other devices. Present on both AC & DC powered units.

External Loop Power Supply: 35 VDC maximum

Output Loop Resistance:

Power supply	Minimum	Maximum
24 VDC	10 Ω	700 Ω
35 VDC (external)	100 Ω	1200 Ω

Serial Communications

Meter Address: 1 - 247

Baud Rate: 300 - 19,200 bps

Transmit Time Delay: Programmable between 0 and 199 ms or transmitter always on for RS-422 communication

Data: 8 bit (1 start bit, 1 stop bit)

Parity: None

Turn Around Delay: Less than 2 ms (xed)

Digital I/O Expansion Module

Channels: 4 digital inputs & 4 digital outputs per module

System: Up to 2 modules for a total of 8 inputs & 8 outputs

Digital Input Logic: High: 3 to 5 VDC **Low:** 0 to 1.25 VDC

Digital Output Logic: High: 4.75 to 5 VDC **Low:** 0 to 0.4 VDC

Source Current: 10 mA maximum

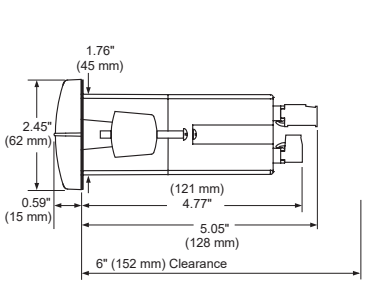
Sink Current: 1.5 mA minimum

+5 V Terminal: To be used as pull-up for digital inputs only.

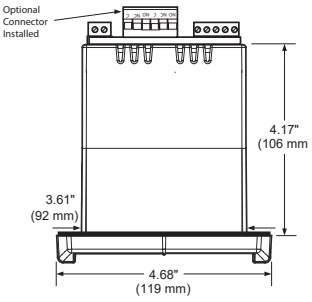
4-Relay Expansion Module

Relays: Four Form A (SPST) rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP @ 125/250 VAC for inductive loads.

MOUNTING DIMENSIONS



Side View



Top View

Notes:
1. Panel cutout required: 1.772" x 3.622" (45mm x 92mm)
2. Panel thickness: 0.040 - 0.250" (1.0mm - 6.4mm)
3. Mounting brackets lock in place for easy mounting
4. Clearance: Allow 6" (152 mm) behind the panel

ORDERING INFORMATION

ProVu • Model PD6000		
85-265 VAC Model	**12/24 VDC Model**	**Options Installed**
PD6000-6R0	PD6000-7R0	None
PD6000-6R2	PD6000-7R2	2 Relays
PD6000-6R3	PD6000-7R3	4-20 mA Output
PD6000-6R4	PD6000-7R4	4 Relays
PD6000-6R5	PD6000-7R5	2 Relays & 4-20 mA Output
PD6000-6R7	PD6000-7R7	4 Relays & 4-20 mA Output
Note: 24 V Transmitter power supply standard on all models.		

Accessories	
Model	**Description**
PDA1002	DIN Rail Mounting Kit for Two Expansion Modules
PDA1004	4-Relay Expansion Module
PDA1044	4 Digital Inputs & 4 Digital Outputs Module
PDA1200	Meter Copy Cable
PDA1232	RS-232 Serial Adapter
PDA1485	RS-422/485 Serial Adapter
PDA7485-I	RS-232 to RS-422/485 Isolated Converter
PDA7485-N	RS-232 to RS-422/485 Non-Isolated Converter
PDA8232-N	USB to RS-232 Non-Isolated Converter
PDA8485-I	USB to RS-422/485 Isolated Converter
PDA8485-N	USB to RS-422/485 Non-Isolated Converter
PDX6901	Suppressor (snubber): 0.01 µF/470 Ω, 250 VAC

ProVu Series

Disclaimer

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Your Local Distributor is:

LDS6000_C 08/08

PRECISION DIGITAL CORPORATION
89 October Hill Rd • Holliston MA 01746 USA • Tel (800) 343-1001 • Fax (508) 655-8990
www.predig.com

Product data sheet
Characteristics

9001KT38LG

Main

Range of product	Harmony 9001K
Product or component type	Pilot light
Device short name	K

Complementary

Bezel material	Chromium plated metal
Mounting diameter	30 Mm
Light source	Green LED
Light block supply	Direct 120 V
Shape of screw head	Round
Operating mode	Push-to-test

Environment

Product certifications	UL listed file E42259 CCN NKCR CE CSA LR25490 class 3211 03
NEMA degree of protection	NEMA 1/2/3/3R/4/6/12/13

Offer Sustainability

Sustainable offer status	Green Premium product
REACh Regulation	REACh Declaration
EU RoHS Directive	Pro-active compliance (Product out of EU RoHS legal scope) EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS Declaration
Environmental Disclosure	Product Environmental Profile
Circularity Profile	No need of specific recycling operations
WEEE	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins

Product Life Status : Commercialised

Product data sheet
Characteristics

9001G31
green Fresnel lens cap - for pilot light Ø 30

Product availability: Stock - Normally stocked in distribution facility

Price*: 9.90 USD

Main

Commercial Status	Commercialised
Range of product	Harmony 9001K Harmony 9001SK
Accessory / separate part designation	Fresnel lens cap
Accessory / separate part type	Lens cap
Accessory / separate part category	Spare parts
Accessory / separate part destination	Pilot light

Complementary

Mounting diameter	1.18 in (30 mm)
Cap/Operator or lens colour	Green
Product weight	0.01 lb(US) (0.005 kg)

Ordering and shipping details

Category	21433 - 9001 ACCESS FOR K,KX,SK
Discount Schedule	CS1
GTIN	00785901056119
Nbr. of units in pkg.	1
Package weight(Lbs)	0.01
Product availability	Stock - Normally stocked in distribution facility
Returnability	Y
Country of origin	MX

Offer Sustainability

Sustainable offer status	Not Green Premium product
RoHS	Compliant - since 0921 - Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold

Contractual warranty

Period	18 months

Product data sheet
Characteristics

9001KT38LG

Main

Range of product	Harmony 9001K
Product or component type	Pilot light
Device short name	K

Complementary

Bezel material	Chromium plated metal
Mounting diameter	30 Mm
Light source	GelloE LbD
Light kloc2 supply	Direct 1V0 S
whape of screE head	Round
Operating mode	Push-to-test

bnvironment

Product certifications	Cb UL listed file b4VV59 CCN NKCR CwA LRV5490 class 3V11 03
NbMA degree of protection	NbMA 1/V/3/3R/4/6/1V/13

Offer wustainakility

wustainakle offer status	(reen Premium product
RbACh Regulation	RbACh Declaration
bU RoHw Directive	Pro-active compliance)Product out of bU RoHw legal scopeYbU RoHw Declaration
Mercury free	Ges
RoHw exemption information	Ges
China RoHw Regulation	China RoHw Declaration
bnvironmental Disclosure	Product bnvironmental Profile
Circularity Profile	No need of specific recycling operations
Wbbb	The product must ke disposed on buropean Union mar2ets folloEing specific Easte collection and never end up in rukkish kins

Product Life wtatus : Commercialised

Product data sheet
Characteristics

9001Y31
yellow Fresnel lens cap - for pilot light Ø 30

Product availability: Stock - Normally stocked in distribution facility
Price*: 9.90 USD

Main

Commercial Status	Commercialised
Range of product	Harmony 9001K Harmony 9001SK
Accessory / separate part designation	Fresnel lens cap
Accessory / separate part type	Lens cap
Accessory / separate part category	Spare parts
Accessory / separate part destination	Pilot light

Complementary

Mounting diameter	1.18 in (30 mm)
Cap/Operator or lens colour	Yellow
Product weight	0.01 lb(US) (0.005 kg)

Ordering and shipping details

Category	21433 - 9001 ACCESS FOR K,KX,SK
Discount Schedule	CS1
GTIN	00785901056072
Nbr. of units in pkg.	50
Package weight(Lbs)	0.01
Product availability	Stock - Normally stocked in distribution facility
Returnability	Y
Country of origin	MX

Offer Sustainability

Sustainable offer status	Not Green Premium product
RoHS	Compliant - since 0921 - Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold

Contractual warranty

Period	18 months

Product data sheet
Characteristics

9001KT38LR
PILOT LIGHT 120VAC 30MM TYPE K +OPTIONS

Main

Range of product	Harmony 9001K
Product or component type	Pilot light
Device short name	K

Complementary

Bezel material	Chromium plated metal
Mounting diameter	30 mm
Light source	Red LED
Light block supply	Direct 120 V
Shape of screw head	Round
Operating mode	Push-to-test

Environment

Product certifications	CSA LR25490 class 3211 03 CE UL listed file E42259 CCN NKCR
NEMA degree of protection	NEMA 1/2/3/3R/4/6/12/13

Offer Sustainability

Sustainable offer status	Green Premium product
REACh Regulation	REACh Declaration
EU RoHS Directive	Pro-active compliance (Product out of EU RoHS legal scope) EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration
Environmental Disclosure	Product Environmental Profile
Circularity Profile	No need of specific recycling operations

Product data sheet
Characteristics

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End of Life Information

WEEE	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins

Product data sheet
Characteristics

RXM4AB2F7
Zelio, RXM, miniature plugin relay, 4 C/O, 6 A, 120 VAC, with LED

Product availability : Stock - Normally stocked in distribution facility

Price* : 8.30 USD

Main

Range of product	Zelio Relay
Series name	Miniature
Product or component type	Plug-in relay
Device short name	RXM
Contacts type and composition	4 C/O
[Uc] control circuit voltage	120 V AC, 50/60 Hz
[Ithe] conventional enclosed thermal current	6 A at -40...131 °F (-40...55 °C)
Status LED	With
Control type	Lockable test button
Utilisation coefficient	20 %

Complementary

Shape of pin	Flat
[Ui] rated insulation voltage	250 V conforming to IEC 300 V conforming to UL 300 V conforming to CSA
[Uimp] rated impulse withstand voltage	2.5 kV 1.2/50 µs
Contacts material	AgNi
[Ie] rated operational current	3 A at 28 V DC (NC) conforming to IEC 3 A at 250 V AC (NC) conforming to IEC 6 A at 28 V DC (NO) conforming to IEC 6 A at 250 V AC (NO) conforming to IEC 6 A at 277 V AC conforming to UL 8 A at 30 V DC conforming to UL
Maximum switching voltage	250 V conforming to IEC
Resistive rated load	6 A at 250 V AC 6 A at 28 V DC

Maximum switching capacity	1500 VA/168 W
Minimum switching capacity	170 mW at 10 mA, 17 V
Operating rate	<= 18000 cycles/hour no-load <= 1200 cycles/hour under load
Mechanical durability	10000000 cycles
Electrical durability	100000 cycles resistive load
Average coil consumption in VA	1.2 at 60 Hz
Average consumption	1.2 VA 60 Hz
Drop-out voltage threshold	>= 0.15 Uc
Operate time	20 ms
Release time	20 ms
Average coil resistance	3630 Ohm at 20 °C +/- 15 %
Rated operational voltage limits	96...132 V AC
Safety reliability data	B10d = 100000
Protection category	RT I
Test levels	Level A group mounting
Operating position	Any position
CAD overall height	82.8 mm
CAD overall depth	80.35 mm
Product weight	0.08 lb(US) (0.037 kg)
Device presentation	Complete product

Environment

Dielectric strength	1300 V AC between contacts with micro disconnection insulation 2000 V AC between coil and contact with reinforced insulation 2000 V AC between poles with basic insulation
Product certifications	CE REACH RoHS CSA Lloyd's UL GOST
Standards	UL 508 EN/IEC 61810-1 CSA C22.2 No 14
Ambient air temperature for storage	-40...185 °F (-40...85 °C)
Ambient air temperature for operation	-40...131 °F (-40...55 °C)
Vibration resistance	3 gn (f = 10...150 Hz), amplitude +/- 1 mm (on 5 cycles in operation) 5 gn (f = 10...150 Hz), amplitude +/- 1 mm (on 5 cycles not operating)
IP degree of protection	IP40 conforming to EN/IEC 60529
Shock resistance	10 gn in operation 30 gn not operating
Pollution degree	2

Ordering and shipping details

Category	21127 - ZELIO ICE CUBE RELAYS
Discount Schedule	CP2
GTIN	00785901646464
Nbr. of units in pkg.	10
Package weight(Lbs)	8.0000000000000002E-2
Returnability	Y
Country of origin	CN

Offer Sustainability

Sustainable offer status	Green Premium product

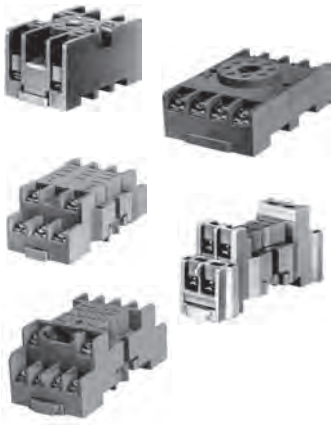
RoHS (date code: YYWW)	Compliant - since 0801 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Need no specific recycling operations
California proposition 65	WARNING: This product can expose you to chemicals including:
- - - - - - - Substance 1	Nickel compounds, which is known to the State of California to cause cancer, and
- - - - - - - Substance 2	Di-isodecyl phthalate (DIDP), which is known to the State of California to cause birth defects or other reproductive harm.
- - - - - - - More information	For more information go to www.p65warnings.ca.gov

Contractual warranty

Warranty period	18 months

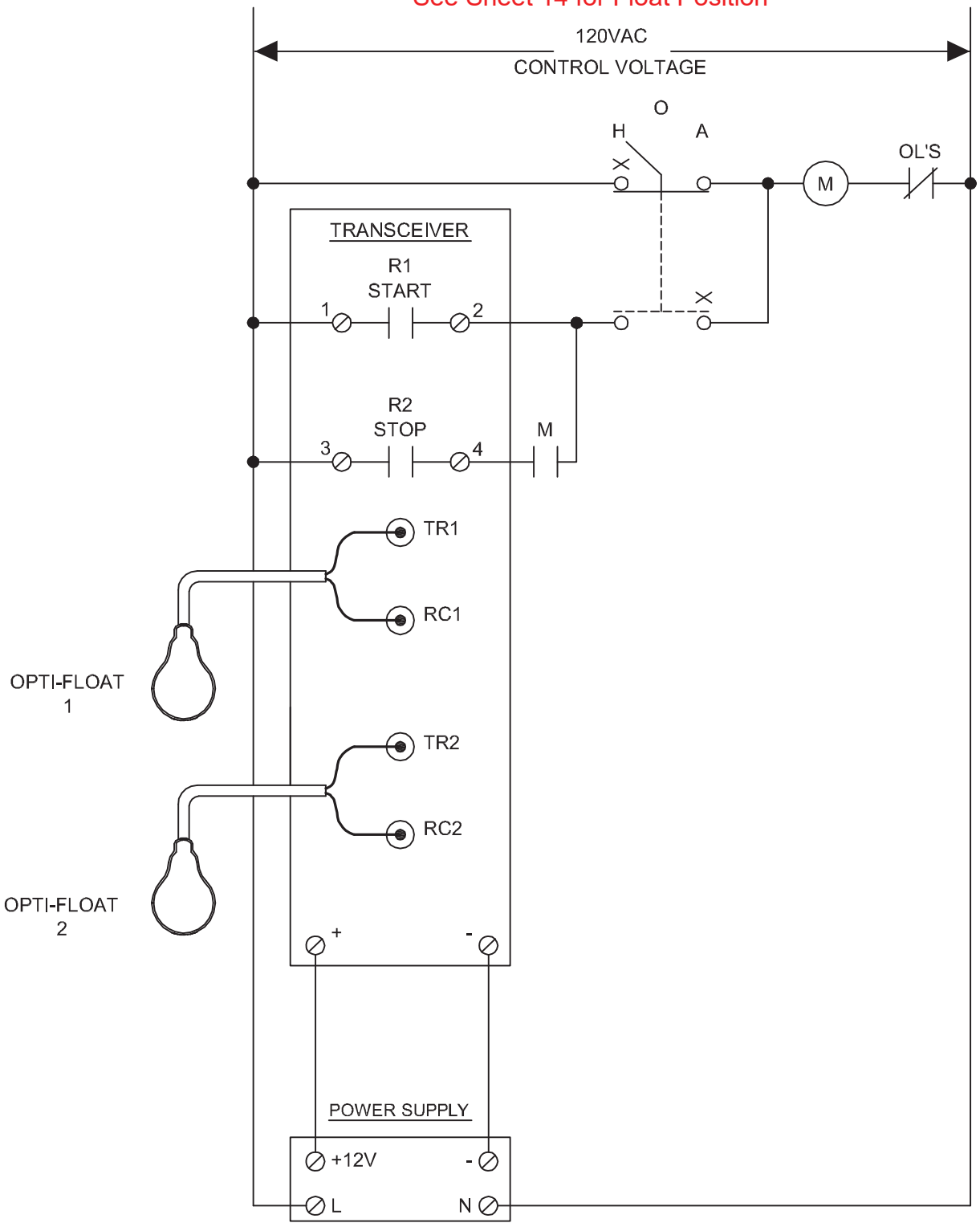
Relay and Timer Socket Selection Guide

Relay and Timer Sockets

Mounting	Series	Page	Part No.	No. of Poles	Receptacle	Terminal	Compatible IDEC Relay and Timer
DIN Rail Snap-Mount 	SR	F-6	SR2P-05 SR2P-05C SR2P-06	2	8-Pin	M3.5 Screw	RR2P, GT5P, RTE-P1, GT3 (8-pin)
			SR3P-05 SR3P-05C SR3P-06	3	11-Pin		RR3PA, RR2KP, RTE-P2 GT3 (11-pin)
			SR3B-05	3	11-Blade		RR1BA, RR2BA, RR3B, RTE-B
	SH	F-9	SH1B-05 SH1B-05C	1	5-Blade	M3.5 Screw Coil Terminal: M3	RH1B
			SH2B-05 SH2B-05C	2	8-Blade	M3.5 Screw	RH2B
			SH3B-05 SH3B-05C	3	11-Blade		RH3B, RH2LB
			SH4B-05 SH4B-05C	4	14-Blade		RH4B
	SY	F-13	SY2S-05 SY2S-05C	2	8-Blade	M3 Screw	RY2S, RY22S
			SY4S-05 SY4S-05C	4	14-Blade		RU4S, RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
	SM	F-15	SM2S-05 SM2S-05C				RU2S
Panel Mount 	SR	F-16	SR2P-51	2	8-Pin	Solder	RR2P, RAPP, RBPP, GT5P, RTE-P1, GT3 (8-pin)
			SR3P-51	3	11-Pin		RR3PA, RR2KP, RTE-P2, GT3 (11-pin)
			SR3B-51	3	11-Blade		RR1BA, RR2BA, RR3B
	SH	F-17	SH1B-51	1	5-Blade		RH1B, RAHB, RBHB
			SH2B-51	2	8-Blade		RH2B, RAMB, RBMB
			SH3B-51	3	11-Blade		RH3B, RH2LB
			SH4B-51	4	14-Blade		RH4B
	SY	F-19	SY2S-51	2	8-Blade		RY2S, RY22S
			SY4S-51	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
PCB Mount 	SH	F3-20	SH1B-62	1	5-Blade	PC Board	RH1B, RAHB, RBHB
			SH2B-62	2	8-Blade		RH2B, RAMB, RBMB
			SH3B-62	3	11-Blade		RH3B, RH2LB
			SH4B-62	4	14-Blade		RH4B
	SY	F3-21	SY2S-61	2	8-Blade		RY2S, RY22S
			SY4S-61	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
			SY4S-62	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
Surface Mount 	SH	F-23	SH2B-02	2	8-Blade	M3.5 Screw	RH2B, RAMB, RBMB
For Panel Mounted Timers							
	SR	F-23	SR6P-M08G	2	8-pin	M3.5 Screw	GE1A; RTE-P1; GT3A-1,-2,-3; GT3D-1,-2,-3; GT3W (8-pin); GT3S; GT3F
			SR6P-M11G		11-pin		RTE-P2; GT3A-4,-5,-6; GT3D-4,-8; GT3W (11-pin)

For relay mounting accessories, see page F-24.

See Sheet 14 for Float Position



TYPICAL START-STOP

SCHEMATIC

OPTI-FLOAT® LEVEL DETECTOR TRANCEIVER SCHEMATIC

DATE 02/10/09	DWG. 1 OF 1

OPTI-FLOAT®

Liquid Level Detector

Made in the USA

COX® RESEARCH

MERCURY & LEAD FREE, NON-MECHANICAL

12 MILLION OPERATIONS

Combining new technology with a familiar device, the Opti-Float® level detector is a revolutionary innovation in discrete level detectors. It's made of safe, recyclable materials. It's mercury and lead free and is built to last for years of service. Rated for over 12,000,000 operations.

The design of the Opti-Float® level detector is amazingly simple. Using fiber optic cable, it transmits a beam of light from an LED in a remote transceiver down to the float, where the beam makes and breaks depending on the tilt of the float. When the transceiver detects the presence or absence of light, it activates a relay in the transceiver, which can then operate other devices. The transceivers are all dual DIN rail mounted units, that can connect to two floats. Additional transceivers can be used for additional floats.

The fiber optic cable, created specifically for the Opti-Float® level detector, requires no special tools for connection. And while it looks similar to other float cables, there is one huge exception: No electrical wires and inherently safe! So now, for the first time, floats can be used directly, without special equipment, in hazardous locations.

Patented. Other U.S. and Foreign Patents Pending.

Installation instructions, warranty information and other downloads are available online at www.optifloat.com

OPTI-FLOAT® Liquid Level Detector

The OPTI-FLOAT® Liquid Level Detector is made of safe, recyclable materials. It's mercury and lead free, is built to last for years of service, and uses no electrical wires to connect to the external control panel.

OPTI -	F1	30	____
	A	B	C

A. F1 = Narrow Angle Float

B. 30 = 30' Cable, 60 = 60' Cable, XX = XX' Cable

C. WT1 = External Weight

___ = No Weight

OPTI-FLOAT® Accessories

The OPTI-FLOAT® Transceiver

Operating Voltage: 12 VDC ± 10%

Power Consumption: 1.2 VA max

Output: Relay SPDT 3 amp @ 240VAC, each channel

Ambient operating temperature: -15 to +130F (-25 to +55C)

Storage temperature: -15 to +155F (-25 to +70C)

UL Listed

OPTI - TR2

The OPTI-FLOAT® Power Supply

120/240VAC-12VDC, 10 Watt

Class 2 DIN Rail Mounted

UL Listed

OPTI - PS1

OPTI-FLOAT® Mounting Options

OPTI-FLOAT® Weight

Stainless Steel

OPTI - WT1

OPTI-FLOAT® Universal Attachment Bracket

For cable, chain or pipe. Easy to attach and remove.

OPTI - UAB1

RECOMMENDED SPECIFICATIONS

The Contractor shall furnish and install a float switch level detection system. The floats shall use fiber optic cable to transmit a beam of light from a transmitter in the control panel to the float where the beam makes and breaks depending on the tilt of the float. The receiver in the control panel shall detect the presence or absence of light and operate a relay in the receiver. The float shall have no electrical components or metallic wires that could cause arcs and sparks in an explosive atmosphere.

The float switch shall be mercury and lead free and shall be made of all safe, recyclable materials. The float switch housing shall be polypropylene. It shall be a simple robust device designed for many years of dependable service. The beam eclipser shall be stainless steel in an inert non-toxic dampening fluid that prevents chatter due to wave action. The viscosity of the fluid shall not change significantly over the range of -50 to +155F (-45 to +70C). The transceivers (transmitter and receiver combination) shall be dual DIN rail mounted units capable of connection to 2 floats. Provide one dual transceiver for every 2 floats. The fiber optic cable shall be custom made for the float and shall consist of dual plastic fibers with an overall specially blended PVC sheath for flexibility. No special tools or experience shall be required for connection of the optical cable to the transceivers. The cable shall be connected and sealed at the float housing using a double seal method that will prevent water from entering the float even if the outer sheath is damaged. The float color shall be two tone with the lighter color on the dome for easier viewing underwater when tilted up.

The transceivers shall operate in ambient temperatures of -15 to +130F (-25 to +55C). The transceivers shall operate at 12 VDC and shall be protected against accidental polarity reversal. The system shall operate in the visible and infrared light region with wavelengths between 400 and 1200 nm. The output relays in the receivers shall have the capability of being connected normally open or normally closed. The transceivers shall have a green LED power-on light and red LED lights on each channel indicating that the light beam is being received – float tilted up. The floats shall operate in liquid temperatures of +32 to +130F (0 to +55C). The floats shall have an ambient air standby operating temperature rating of –15 to +155F (-25 to +70C). The transceiver shall be UL listed.

The float switches and transceivers shall be the Optical Float® level detection system by Cox Research and Technology, Inc., Baton Rouge, LA. The dual transceivers shall be model TR2 and the floats shall be Opti-Float® model F1.

TECHNICAL DATA

DUAL TRANSCEIVER:

Operating voltage:
12 VDC +/-10%

Power consumption:
1.2 VA max.

Output :
Relay SPDT 3 amp @ 240VAC, each channel

Ambient operating temperature:
-15 to +130F (-25 to +55C)

Storage temperature:
-15 to +155F (-25 to +70C)

UL Listed and RoHS Compliant

FLOAT:

Housing material:
Polypropylene

Cable:
PVC over dual plastic fibers (.31" O.D.)

Standard cable lengths:
30' and 60' (contact factory for other lengths)

Ambient liquid operating temperature:
+32 to +130F (0 to +55C)

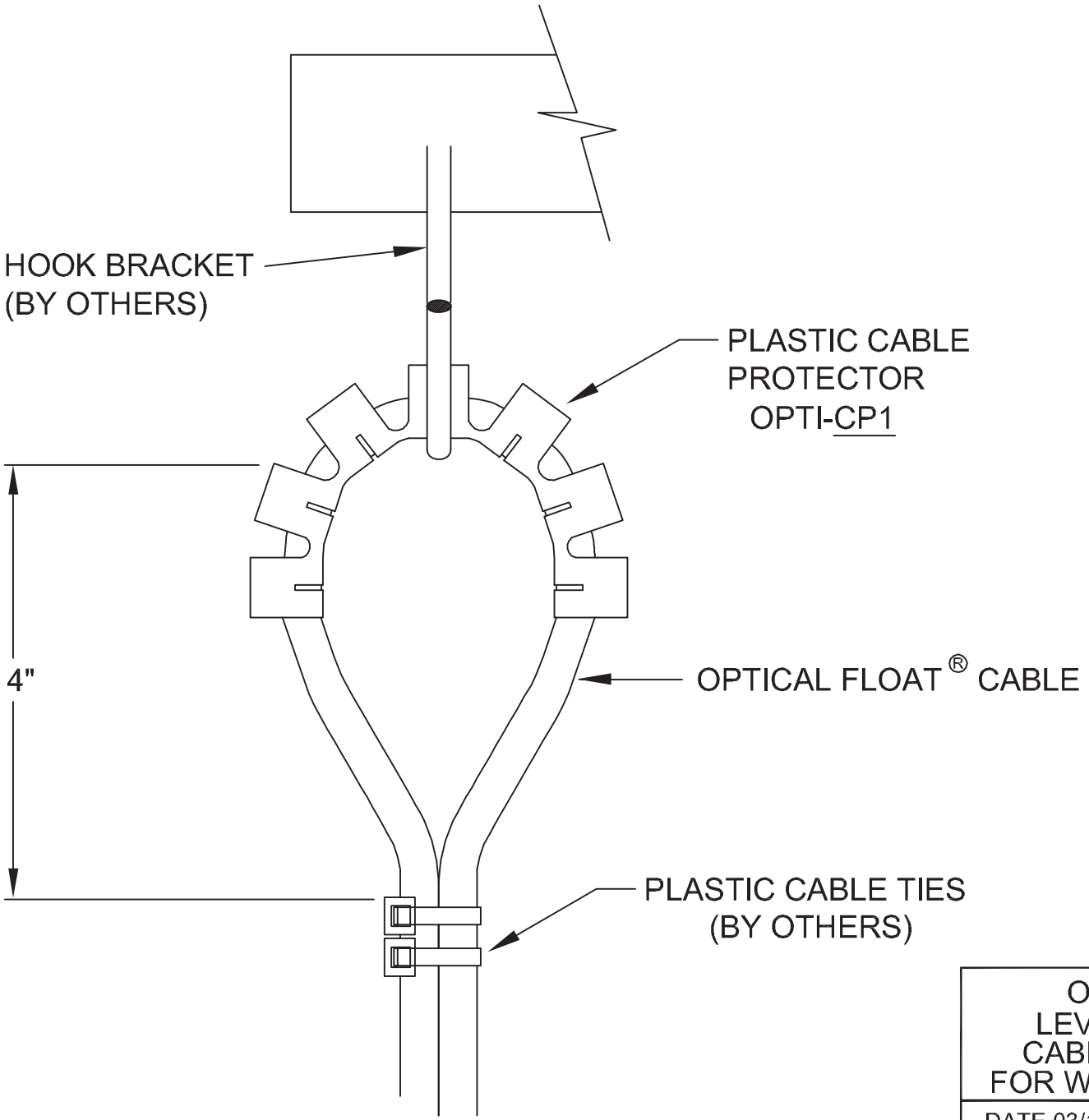
Ambient air standby operating temperature:
-15 to + 155F (-25 to +70C)

Storage temperature:
-15 to + 155F (-25 to +70C)

Operating Wavelength:
400 to 1200 nm

COX® RESEARCH

Cox Research and Technology, Inc. 225.756.3271 > 800.910.9109 > f: 225.755.1030
www.optifloat.com > P.O. Box 77808 > Baton Rouge, LA 70879



OPTI-FLOAT®
LEVEL DETECTOR
CABLE PROTECTOR
FOR WEIGHTED FLOATS

DATE 03/19/09 | DWG. 1 OF 1

Tools to your success

Pump Selection Software - HELPS

HELPS has been specifically designed and tailor made for consulting engineers. The software saves substantial time and effort calculating system curves, selecting pumps and analyzing variable speed curves. HELPS will dynamically link your pump selection to the proper specifications and AutoCAD drawings to complete your work effectively and efficiently.

Ask your local KSB representative for a copy or a demonstration.

The solution for protecting your pump

The PumpSafe™ Module is used for monitoring all KSB submersible motors for moisture, thermal and bearing temperature. The PumpSafe™ is specifically designed for modern control systems utilizing constant speed or variable frequency drives (VFD). The module provides independent 5A, 120 VAC rated form C outputs.

Advantages:

- UL approved to both USA and Canadian requirements
- Power supply - 24-240VAC/1/60 hertz
- A manual/automatic selector switch for manual or automatic reset after alarm.
- RJ-11 connector configured as an RS485 port, for the Broadcast version, to retrieve archival data using a laptop computer. View firmware revision level, model/configuration, analog inputs, fault conditions, fault connectors, and reset counter.
- PumpSafe™ relays can also be purchased with a Modbus option that uses a RS-485 communications bus allowing any Modbus master to query and/or control various aspects of its operation. The advantage is that one or several devices may be connected to a host through a single multi-drop communications channel which allows monitoring and control from a remote location.
- Can be installed in previous Flygt installations with minimal modifications of the existing control system. Just swap out the Flygt MiniCAS with a PumpSafe™. Applies to both 120 VAC and 24 VAC operation. No additional wiring is required from the control panel to the pump/mixer.

KSB SupremeServ

Nationwide service for submersible pumps and mixers

KSB has authorized service shops throughout North America. The service shops personnel can trouble shoot, diagnose, repair and maintain KSB products. Large pumps and expert services are provided from our seven KSB SupremeServ Service Centers in the US.

SUMP PUMP KRT K80-217/24XEG-S

9.3 Wiring diagrams

9.3.1 Wiring diagrams for installation types P and S

9.3.1.1 Wiring diagram for one power cable 8G1.5 (AWG 15-8)

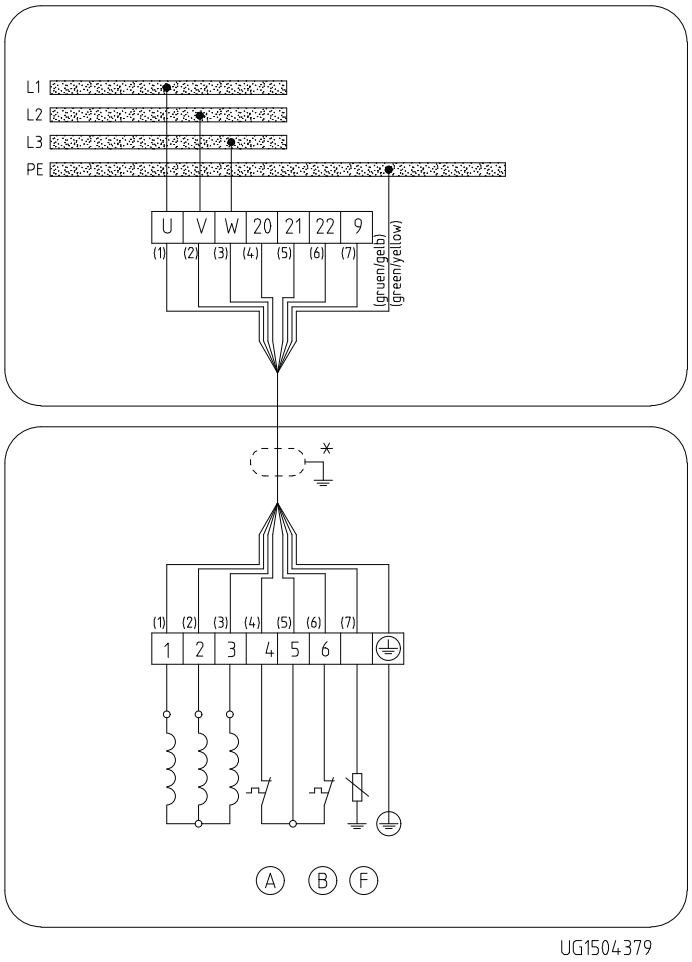


Fig. 55: Wiring diagram for pump sets of installation types P or S with one power cable 8G1.5

Ⓐ	Motor temperature 1
Ⓑ	Motor temperature 2
Ⓕ	Leakage inside the motor
*	Shielded cable optional

P-1 KRT K200-317/156XEG-S

9.3.1.3 Wiring diagram for one power cable 7G4 + 5×1.5, 7G6 + 5×1.5 or 7G10 + 5×1.5 (AWG 11 - 7 + 15 - 5, AWG 9 - 7 + 15 - 5 or AWG 7 - 7 + 15 - 5)

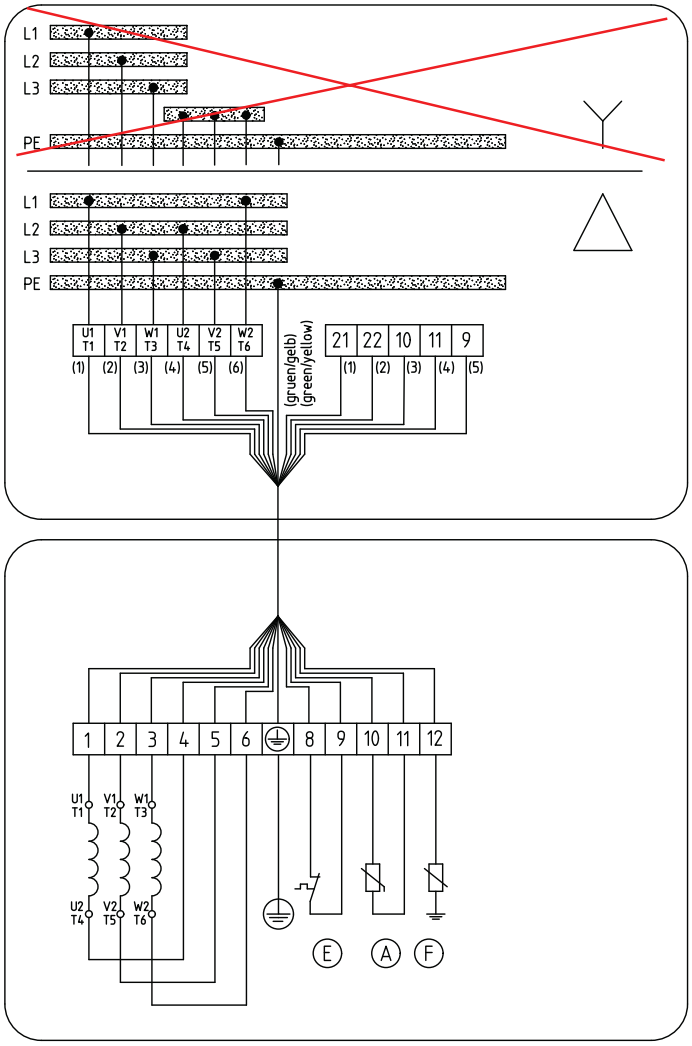


Fig. 57: Wiring diagram for pump sets of installation types P or S with one power cable 7G4 + 5×1.5, 7G6 + 5×1.5 or 7G10 + 5×1.5

Ⓐ	Motor temperature (PTC thermistor)
Ⓔ	Motor temperature
Ⓕ	Leakage inside the motor
*	Shielded cable optional

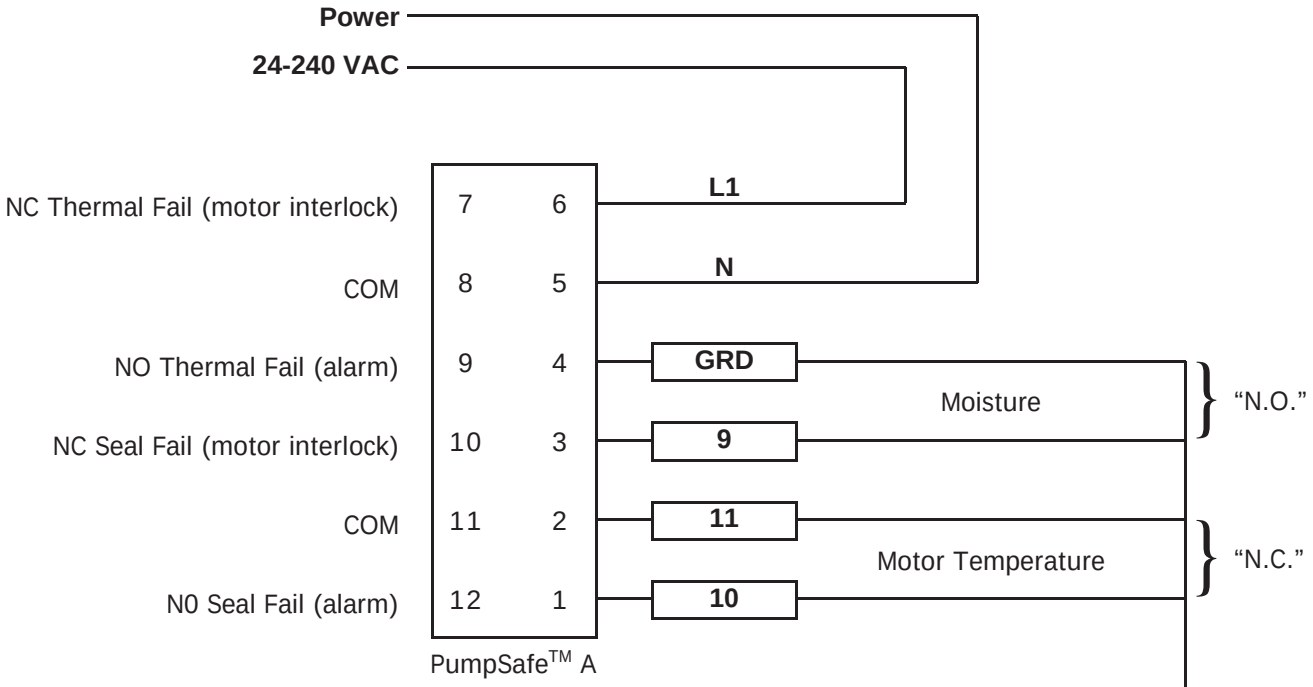
PumpSafe™ Wiring Diagram

KRT Submersible Pumps - Drawing # 3.1

JAB Jan. 2009

PumpSafe™ Relays Required:

(1) Module A with form C outputs rated 5A @ 120VAC



Note: Relays are fail safe. Relays shown in the energized state. Contacts change state at loss of power. Therefore, pushbutton resets on the front of control panel should only be used with timers. PumpSafe™ relays have built in reset button.

PumpSafe™ Wiring Diagram

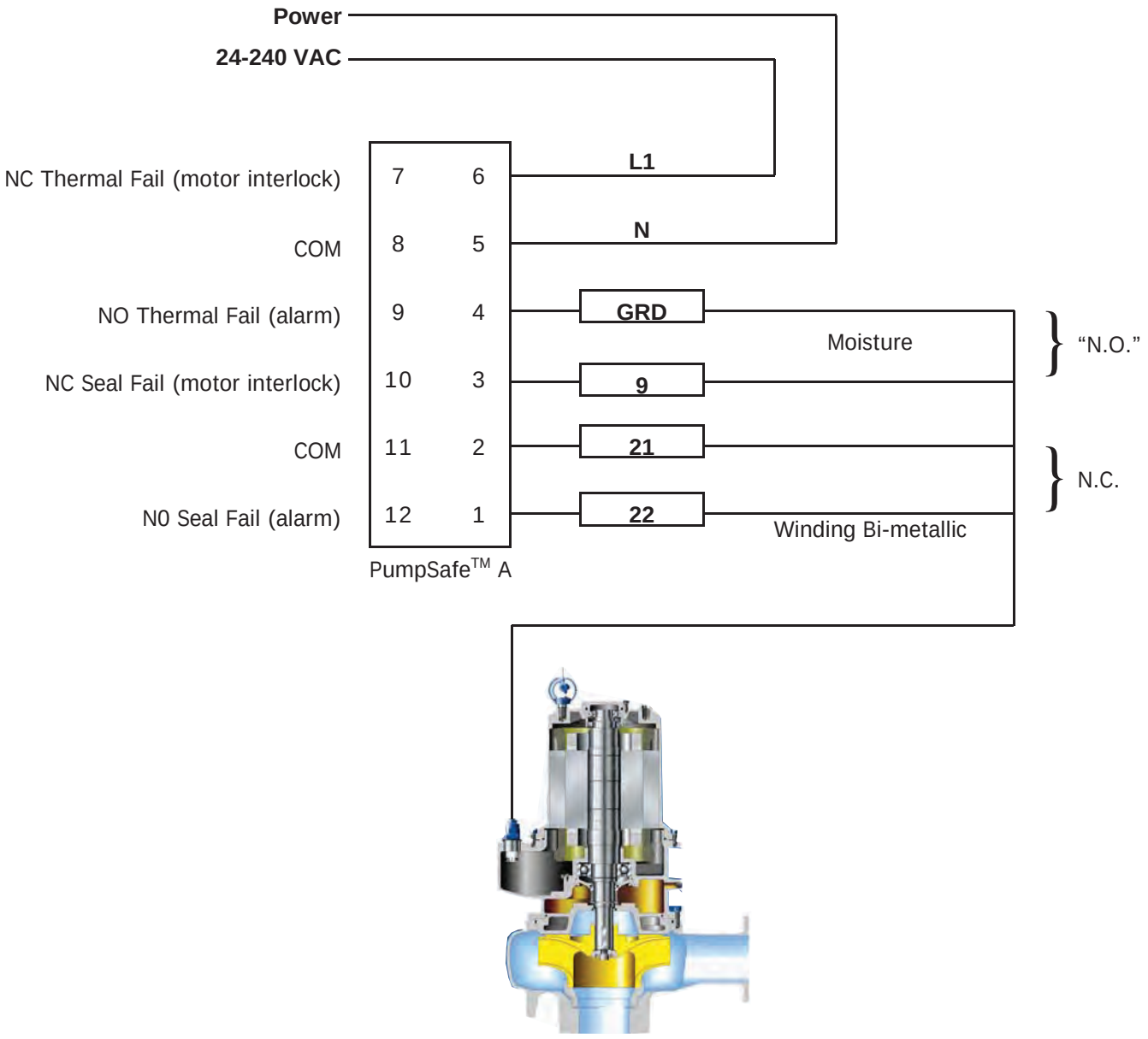
Pump #P-1 & Sump

KRT Submersible Pumps - Drawing # 1.0

JAB Jan. 2009

PumpSafe™ Relays Required:

(1) Module A with form C outputs rated 5A @ 120VAC



Note: Relays are fail safe. Relays shown in the energized state. Contacts change state at loss of power. Therefore, pushbutton resets on the front of control panel should only be used with timers. PumpSafe™ relays have built in reset button.

Rev. 4 1/23/2009

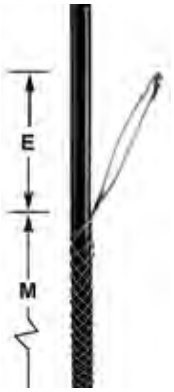
Standard Duty Support Grips

Offset Eye, Single Weave, Tin-Coated Bronze and Stainless Steel.

IMPORTANT:
Read all breaking strength, safety and technical data relating to this product.

Refer to pages X-33 and X-34.

Offset Eye, Closed Mesh



For permanent support when cable end is available to be installed through grip.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. Tin-Coated Bronze	Approx. Breaking Strength Lbs. Stainless Steel	Working Load Lbs. Tin-Coated Bronze	Working Load Lbs. Stainless Steel	E Inches (cm)	M Inches (cm)	Tin-Coated Bronze	Stainless Steel
.50"-.62" (1.27-1.57)	530	1,370	53	137	4" (10.16)	10" (25.40)	**02201037**	**02401037**
.63"-.74" (1.60-1.88)	750	1,950	75	195	4" (10.16)	10" (25.40)	**02201038**	**02401038**
.75"-.99" (1.90-2.51)	950	2,060	95	206	4" (10.16)	13" (33.02)	**02201039**	**02401039**
1.00"-1.24" (2.54-3.15)	1,500	2,678	150	268	5" (12.70)	14" (35.56)	**02201041**	**02401041**
1.25"-1.49" (3.17-3.78)	1,500	4,490	150	449	5" (12.70)	15" (38.10)	**02201042**	**02401042**
1.50"-1.74" (3.81-4.42)	1,500	3,700	150	370	5" (12.70)	17" (43.18)	**02201043**	**02401043**
1.75"-1.99" (4.44-5.05)	2,000	4,375	200	437	6" (15.24)	19" (48.26)	**02201044**	**02401044**
2.00"-2.49" (5.08-6.32)	3,100	5,500	310	550	9" (22.86)	21" (53.34)	**02201045**	**02401045**
2.50"-2.99" (6.35-7.59)	3,100	—	310	—	9" (22.86)	23" (58.42)	**02201046**	**—**
3.00"-3.49" (7.62-8.86)	3,800	—	380	—	11" (27.94)	25" (63.50)	**02201047**	**—**
3.50"-3.99" (8.89-10.13)	3,250	—	325	—	11" (27.94)	27" (68.58)	**02201048**	**—**

Offset Eye, Split Mesh, Lace Closing

For permanent support when cable end is not available.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N) Tin-Coated Bronze	Approx. Breaking Strength Lbs. (N) Stainless Steel	Working Load Lbs. Tin-Coated Bronze	Working Load Lbs. Stainless Steel	E Inches (cm)	M Inches (cm)	Tin-Coated Bronze	Stainless Steel
.50"-.62" (1.27-1.57)	500	—	50	—	4" (10.16)	10" (25.40)	**02202037**	**—**
.63"-.74" (1.60-1.88)	750	1,952	75	195	4" (10.16)	10" (25.40)	**02202038**	**02402038**
.75"-.99" (1.90-2.51)	950	—	95	—	4" (10.16)	13" (33.02)	**02202039**	**—**
1.00"-1.24" (2.54-3.15)	1,500	—	150	—	5" (12.70)	14" (35.56)	**02202041**	**—**
1.25"-1.49" (3.17-3.78)	1,500	4,490	150	449	5" (12.70)	15" (38.10)	**02202042**	**02402042**
1.50"-1.74" (3.81-4.42)	1,500	—	150	—	5" (12.70)	17" (43.18)	**02202043**	**—**
1.75"-1.99" (4.44-5.05)	1,800	4,375	180	437	6" (15.24)	19" (48.26)	**02202044**	**02402044**
2.00"-2.49" (5.08-6.32)	2,150	5,500	215	550	9" (22.86)	21" (53.34)	**02202045**	**02402045**
2.50"-2.99" (6.35-7.59)	2,150	5,500	215	550	9" (22.86)	23" (58.42)	**02202046**	**02402046**
3.00"-3.49" (7.62-8.86)	3,250	10,190	325	1,019	11" (27.94)	25" (63.50)	**02202047**	**02402047**
3.50"-3.99" (8.89-10.13)	3,250	—	325	—	11" (27.94)	27" (68.58)	**02202048**	**—**

Offset Eye, Split Mesh, Rod Closing

For support when cable end is not available.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N) Tin-Coated Bronze	Approx. Breaking Strength Lbs. (N) Stainless Steel	Working Load Lbs. Tin-Coated Bronze	Working Load Lbs. Stainless Steel	E Inches (cm)	M Inches (cm)	Tin-Coated Bronze	Stainless Steel
.50"-.62" (1.27-1.57)	500	1,000	50	100	4" (10.16)	7" (17.78)	**02203037**	**02403037**
.63"-.74" (1.60-1.88)	750	1,950	75	195	4" (10.16)	9" (22.86)	**02203038**	**02403038**
.75"-.99" (1.90-2.51)	950	1,950	95	195	4" (10.16)	10" (25.40)	**02203039**	**02403039**
1.00"-1.24" (2.54-3.15)	1,500	2,500	150	250	5" (12.70)	12" (30.48)	**02203041**	**02403041**
1.25"-1.49" (3.17-3.78)	1,500	4,200	150	420	5" (12.70)	14" (35.56)	**02203042**	**02403042**
1.50"-1.74" (3.81-4.42)	1,500	4,500	150	450	5" (12.70)	15" (38.10)	**02203043**	**02403043**
1.75"-1.99" (4.44-5.05)	2,000	4,375	200	437	6" (15.24)	16" (40.64)	**02203044**	**02403044**
2.00"-2.49" (5.08-6.32)	3,100	8,350	310	835	9" (22.86)	19" (48.26)	**02203045**	**02403045**
2.50"-2.99" (6.35-7.59)	3,100	—	310	—	9" (22.86)	20" (50.80)	**02203046**	**—**
3.00"-3.49" (7.62-8.86)	4,300	8,400	430	840	11" (27.94)	21" (53.34)	**02203047**	**02403047**
3.50"-3.99" (8.89-10.13)	4,900	—	490	—	11" (27.94)	21" (53.34)	**02203048**	**—**

Note: E-Eye length. M-Mesh length at nominal diameter.

Dimensions in Inches (mm)

Appendix D

Pump Station Contact & Notification Information

Emergency Contact Information:

Below is the contact information for all staff members from each party involved listed from primary contact to secondary contact and so on.

Mosser Construction, Inc. - Personal			
Name	*Title*	*Phone*	*Email*
Nick Steyer	Project Manager	Office: (419) 355-3266 Cell: (567) 207-7353	nsteyer@mossergrp.com
Ed Fisher	Superintendent	Cell: (419) 461-0868	efisher@mossergrp.com
ODOT District 8 - Personal			
Name	*Title*	*Phone*	*Email*
Justin Kemp	Hamilton County TA	Office: (513) 933-6120 Cell: (513) 520-3329	Justin.kemp@dot.ohio.gov
Chuck Hecht	District 8 Roadway Services Manager	Office: (513) 933-6523 Cell: (513) 309-2268	Chuck.hecht@dot.ohio.gov
Marvin Lennon	Project Engineer	Office: (513) 933-6129 Cell: (513) 320-54136	marvin.lennon@dot.ohio.gov
Charles Rowe	Senior Project Manager/Design Build Coordinator	Office: (513) 933-6596	charles.rowe@dot.ohio.gov
Allied Technical Services, Inc - Personal			
Name	*Title*	*Phone*	*Email*
Emergency Contact	Emergency Contact	1-877-987-8677	N/A
Doug Sayre	Project Manager	Office: (513) 793-0499 Cell: (513) 607-6100	doug.sayre@alliedtechnicalservicesinc.com
Lykins Energy Solutions – Personal			
Name	*Title*	*Phone*	*Email*
Emergency Contact	Emergency Contact	1-800-875-8820	N/A
Terry Murray	Sales Representative	(513) 641-0150	tmurray@lykinsenergy.com
Steve Krebs	Sales Representative	(513) 641-0150	skrebs@lykinsenergy.com