

PRIMEX Training 2024



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Understanding Incoming Power

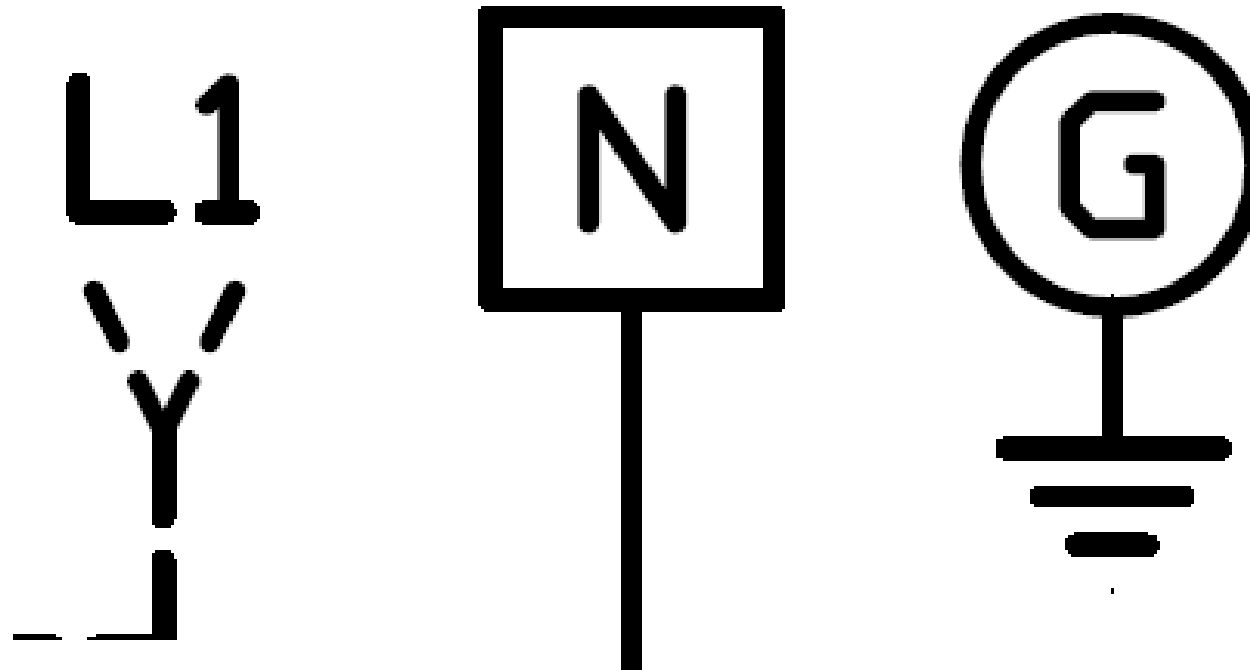
Adam Conover

Understanding Incoming Power



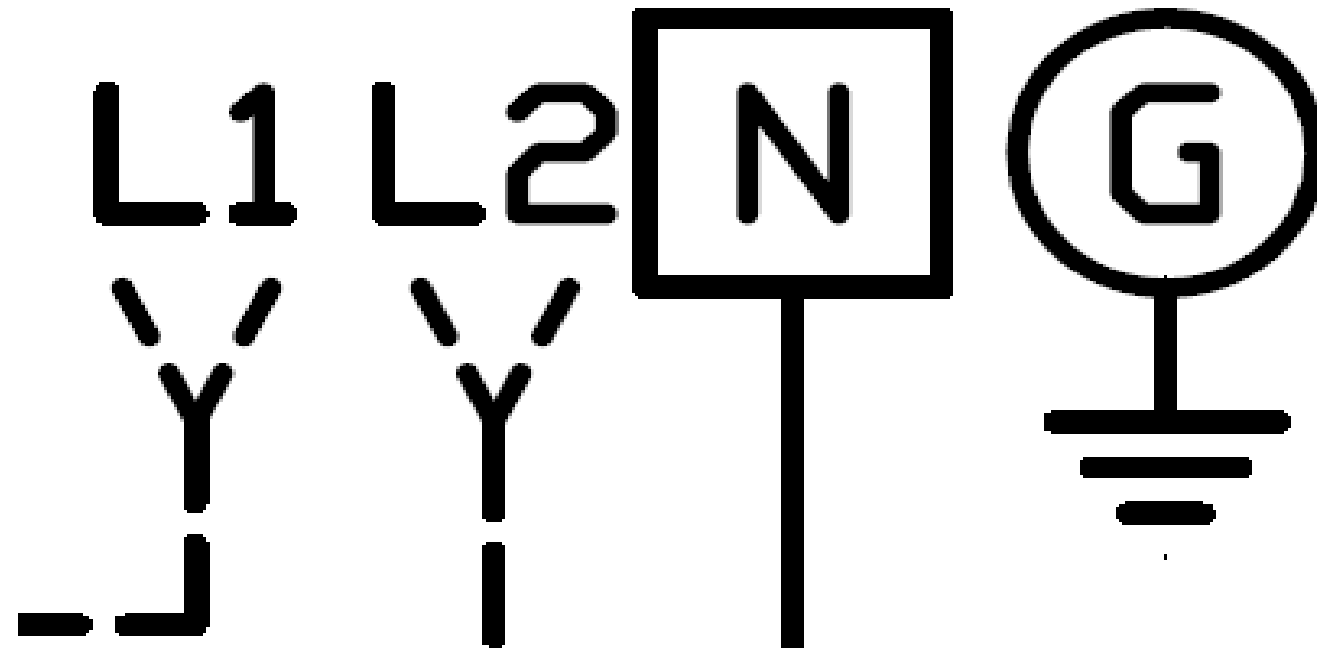
Incoming Power Types

115V Single Phase



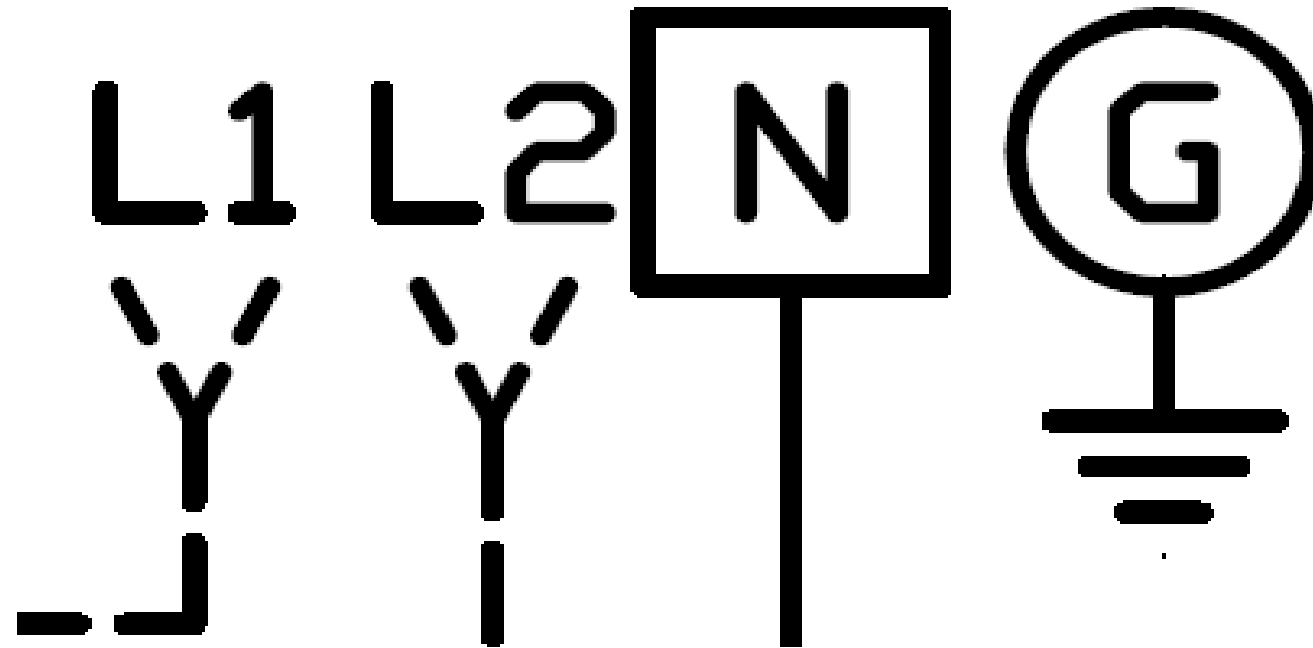
Incoming Power Types

115/230V Single Phase

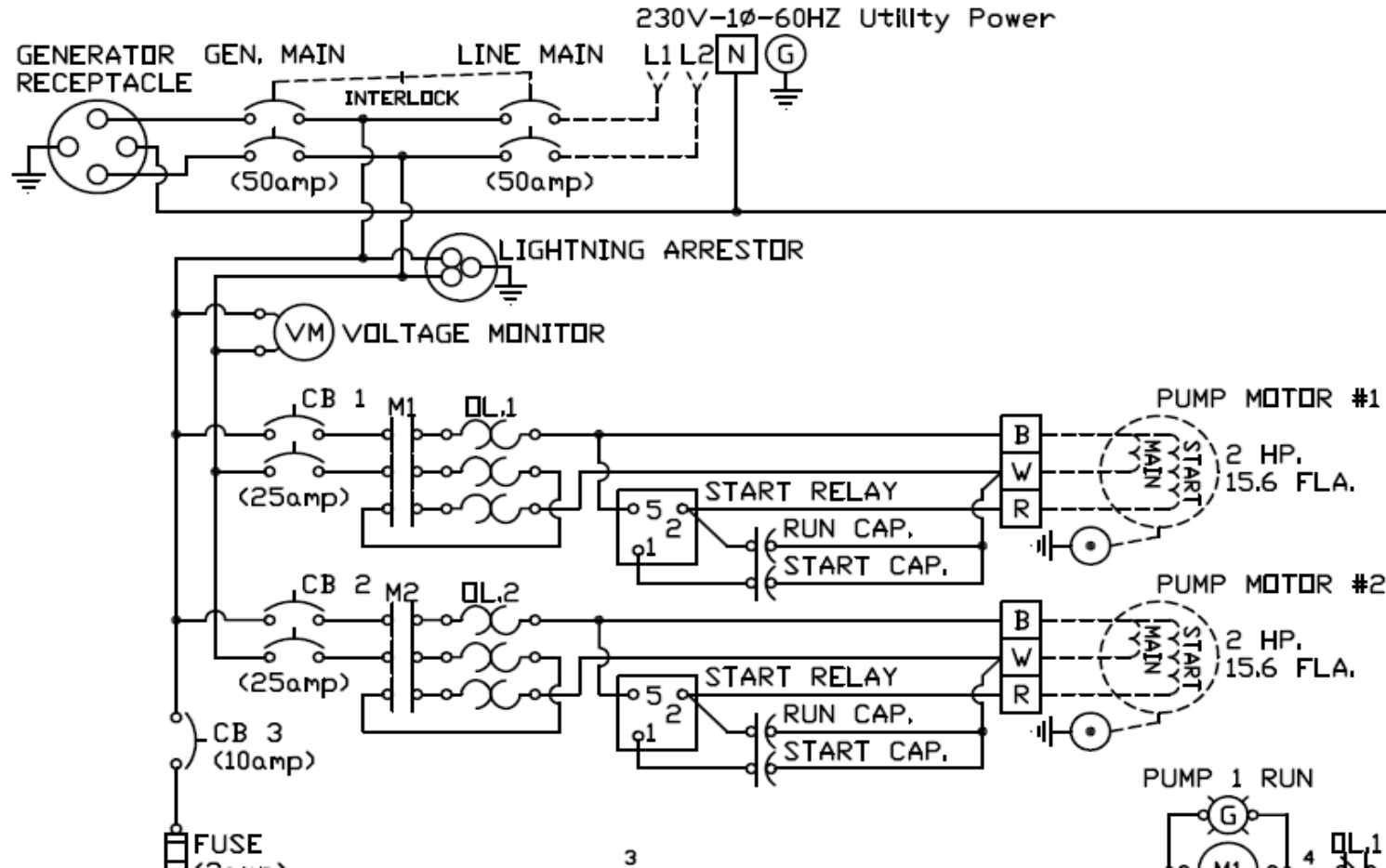


Incoming Power Types

208 V Single Phase

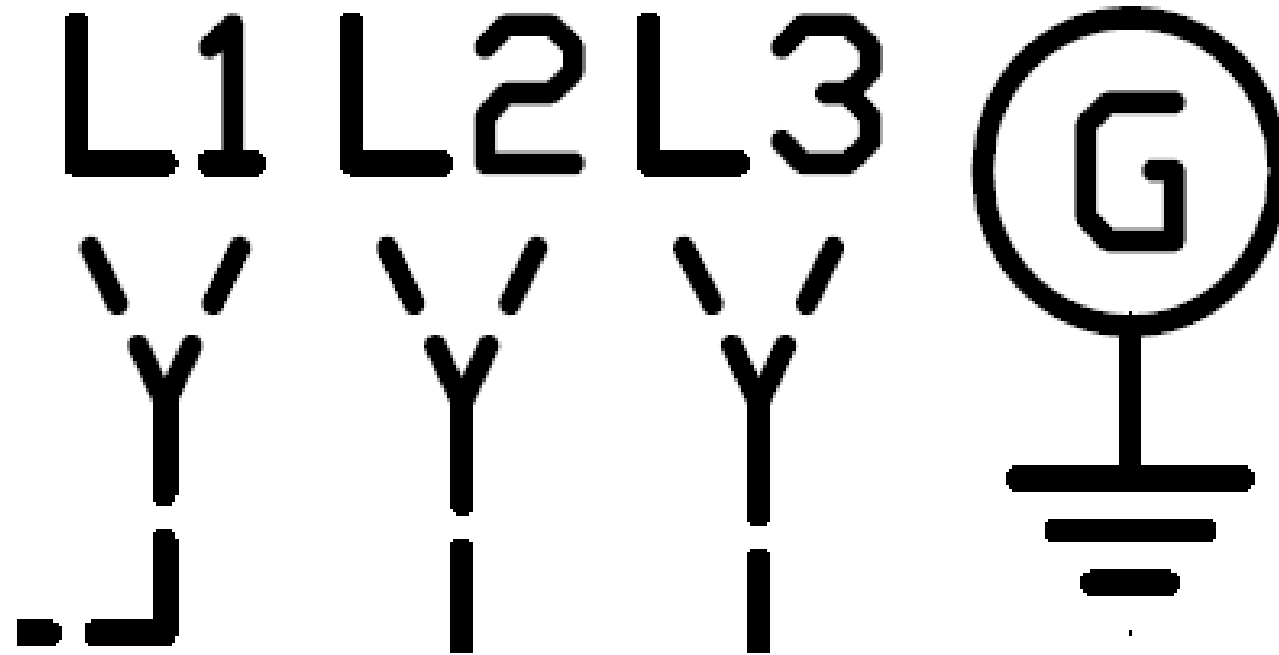


Incoming Power Types



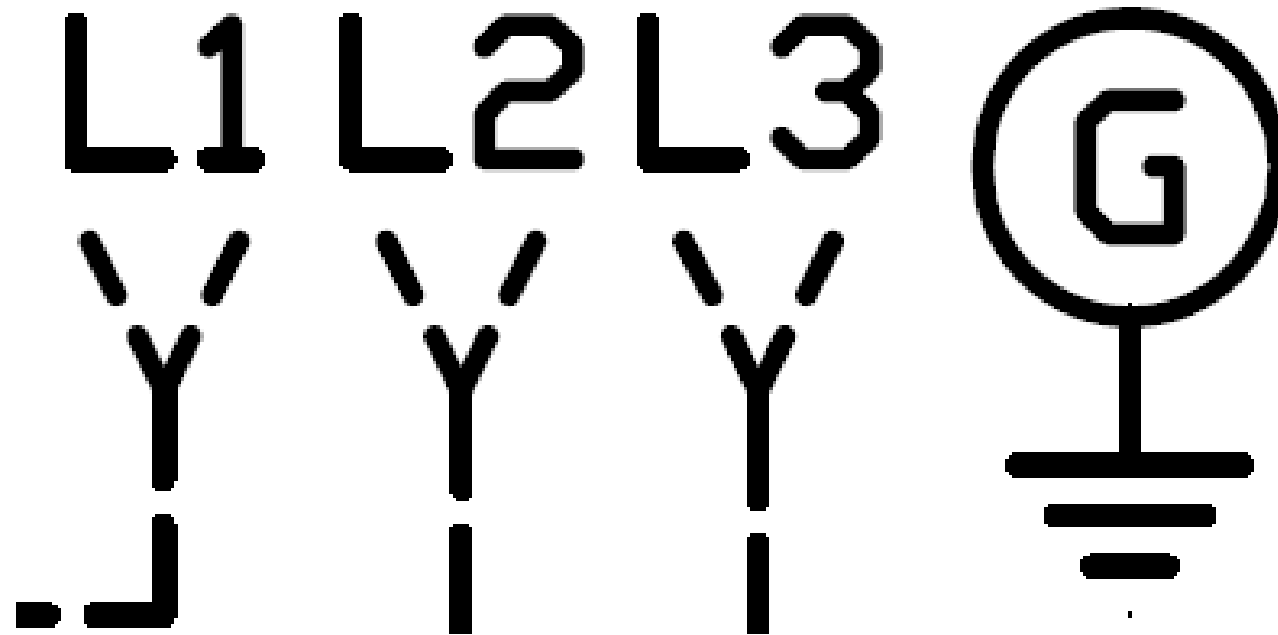
Incoming Power Types

208 V 3 Phase



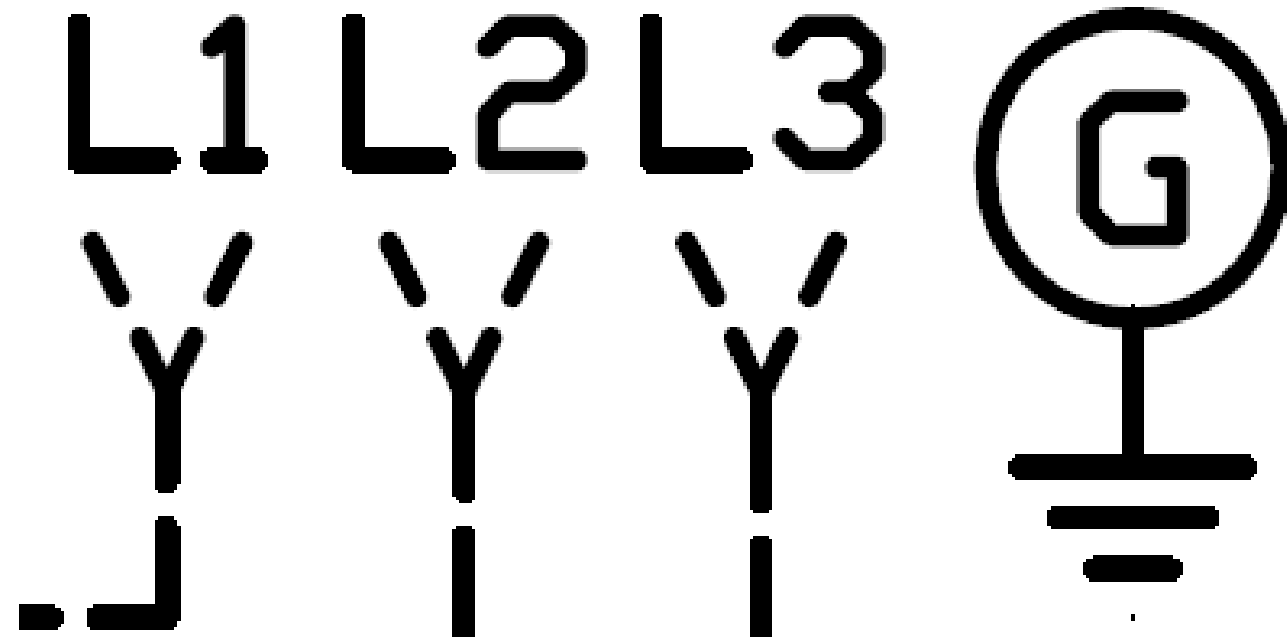
Incoming Power Types

230 V 3 Phase

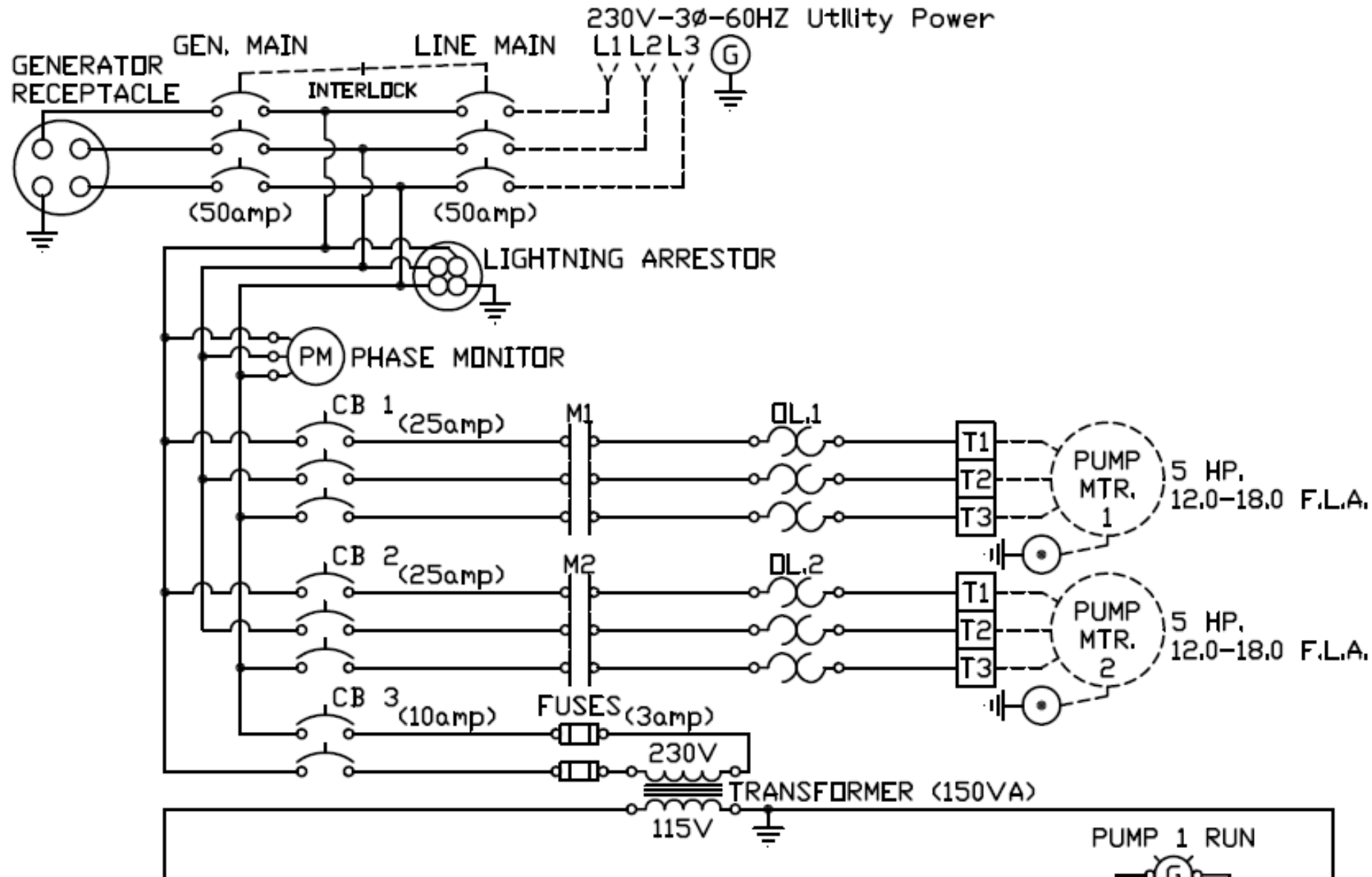


Incoming Power Types

575 V 3 Phase



Incoming Power Types

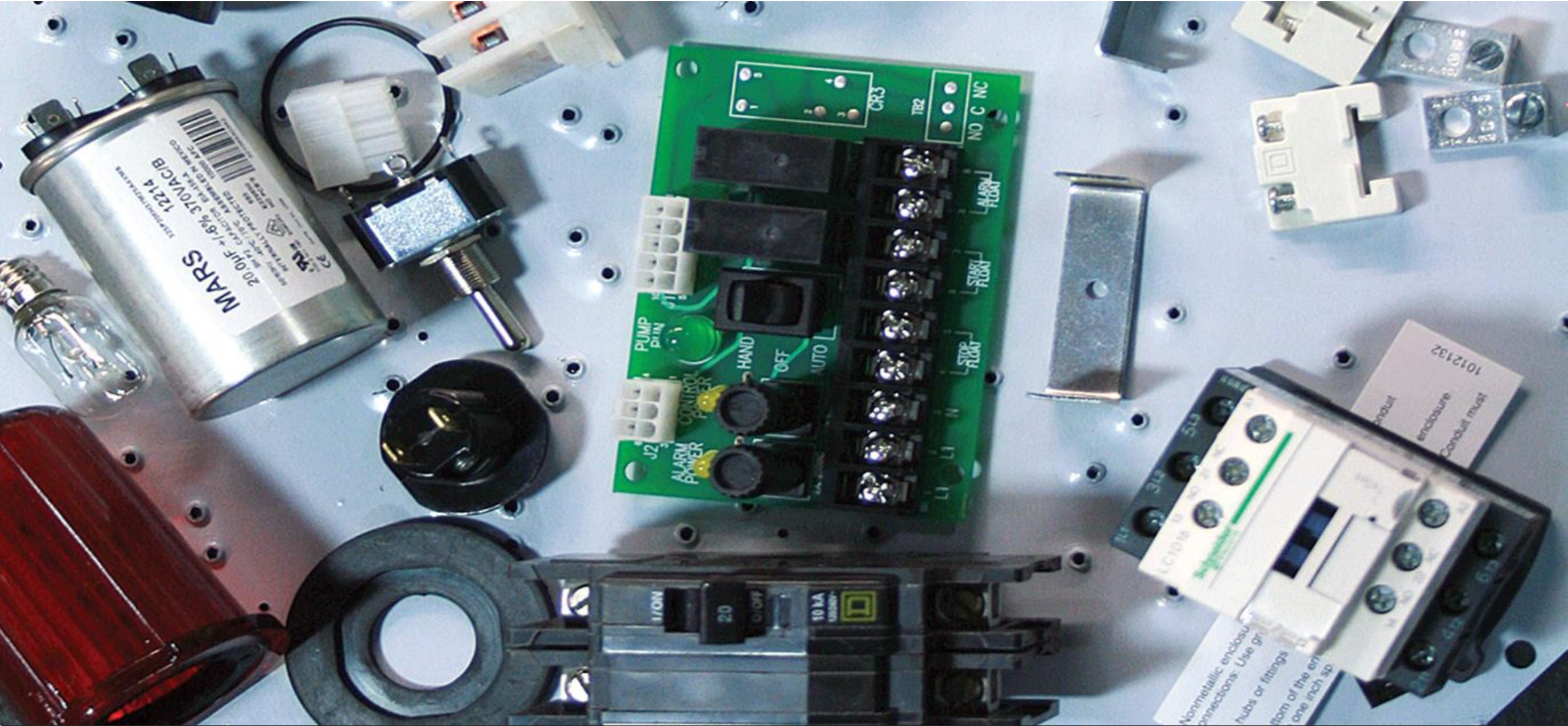


Questions?

Panel Characteristics

Adam Conover

Control Panel Characteristics



Control Panel Enclosures

Enclosures



Control Panel Characteristics

NEMA Type 1 Enclosure

Enclosures constructed for indoor use to provide a degree of protection to personnel against access to hazardous parts and to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt).

Control Panel Characteristics

NEMA Type 3R Enclosure

Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow); and that will be undamaged by the external formation of ice on the enclosure.

Control Panel Characteristics

NEMA Type 4 Enclosure

Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); and that will be undamaged by the external formation of ice on the enclosure.

Control Panel Characteristics

NEMA Type 4X Enclosure

Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); that provides an additional level of protection against corrosion; and that will be undamaged by the external formation of ice on the enclosure.

Control Panel Characteristics

NEMA Type 6P Enclosure

Type 6P Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (hose directed water and the entry of water during prolonged submersion at a limited depth); that provides an additional level of protection against corrosion and that will be undamaged by the external formation of ice on the enclosure.

Control Panel Characteristics

Hazardous Location Enclosures

In Hazardous Locations, when completely and properly installed and maintained, Type 7 and 10 enclosures are designed to contain an internal explosion without causing an external hazard. Type 8 enclosures are designed to prevent combustion through the use of oil-immersed equipment. Type 9 enclosures are designed to prevent the ignition of combustible dust.

Type 7 Enclosures constructed for indoor use in hazardous (classified) locations classified as Class I, Division 1, Groups A, B, C, or D as defined in NFPA 70.

Control Panel Characteristics

Hazardous Location Enclosures

Type 8 Enclosures constructed for either indoor or outdoor use in hazardous (classified) locations classified as Class I, Division 1, Groups A, B, C, and D as defined in NFPA 70.

Type 9 Enclosures constructed for indoor use in hazardous (classified) locations classified as Class II, Division 1, Groups E, F, or G as defined in NFPA 70.

Type 10 Enclosures constructed to meet the requirements of the Mine Safety and Health Administration, 30 CFR, Part 18.

Control Panel Characteristics

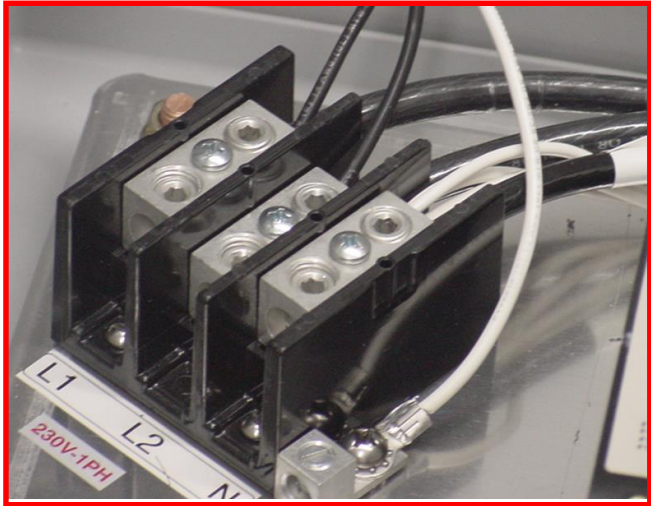
Nema 12 Enclosures can be used in outdoor locations.
True or False?

False

Control Panel Characteristics



Control Panel Characteristics



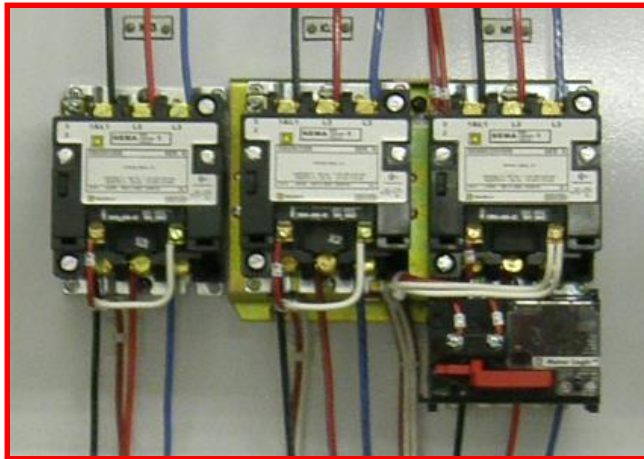
Control Panel Characteristics

Pump Circuit Breakers



Control Panel Characteristics

NEMA Rated Starters & Overloads



Control Panel Characteristics

Reduced Voltage Soft Starts



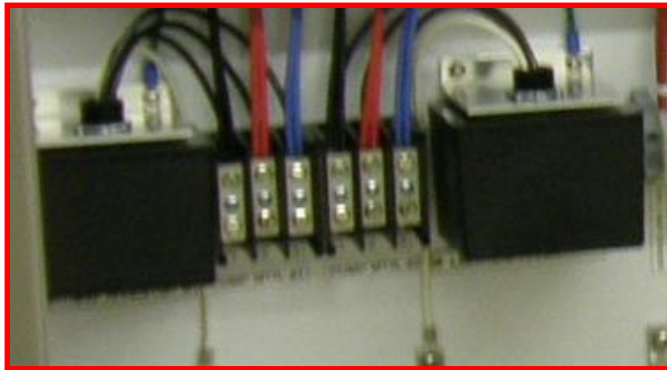
Control Panel Characteristics

Lightning Arrestors



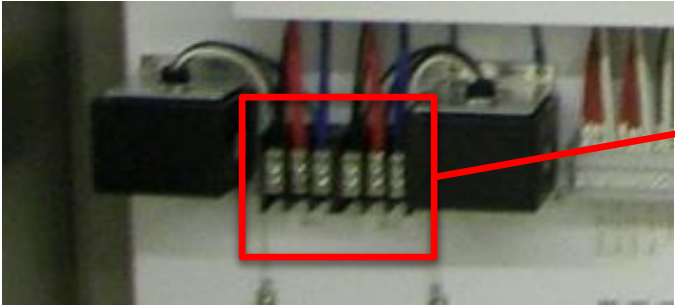
Control Panel Characteristics

Lightning Arrestors



Control Panel Characteristics

Pump Terminal Blocks



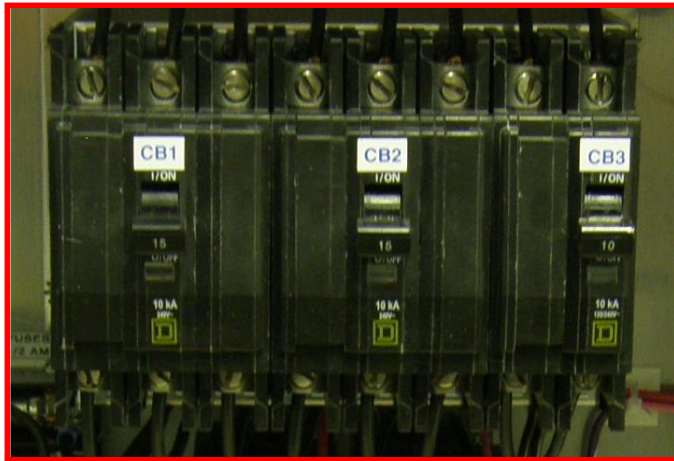
Control Panel Characteristics

Transient Voltage Surge
Suppressor



Control Panel Characteristics

Control Circuit Breakers



Control Panel Characteristics

Input Terminal Blocks



Control Panel Characteristics

Intrinsically Safe Relay & Barrier



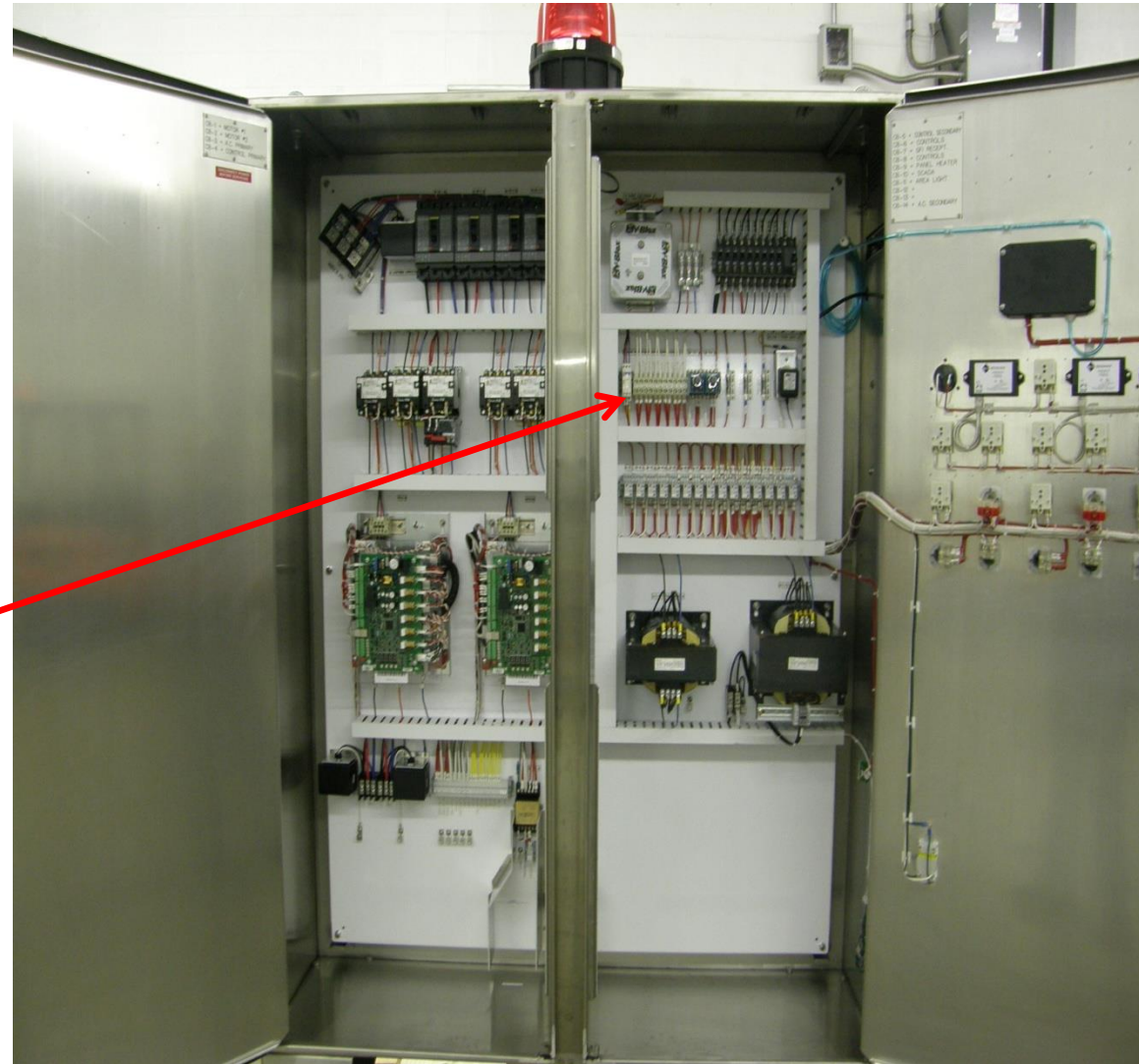
Control Panel Characteristics

Enclosure Heater



Control Panel Characteristics

Phase Failure Relay



Control Panel Characteristics

Time Delay Relays



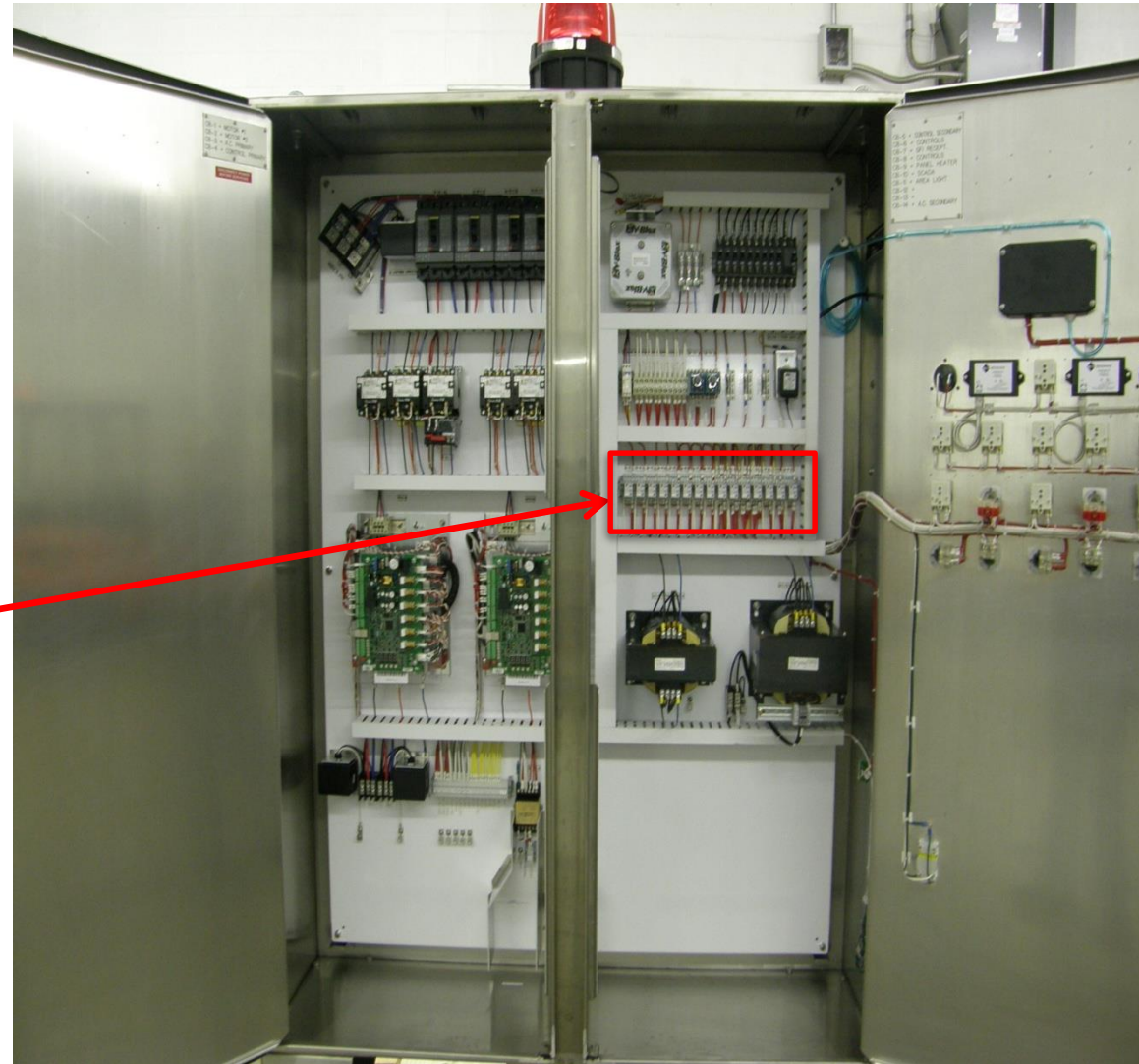
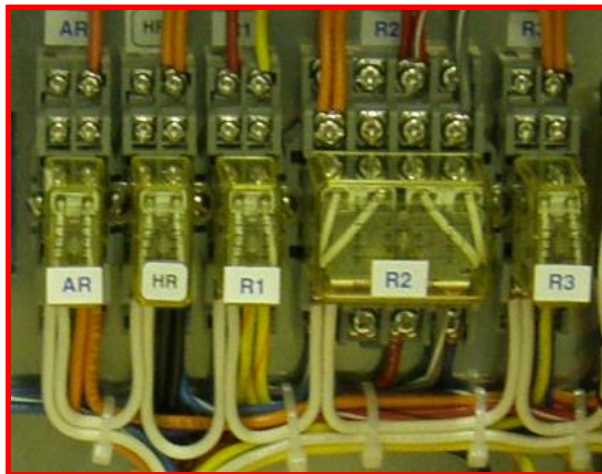
Control Panel Characteristics

Controller Power Supply



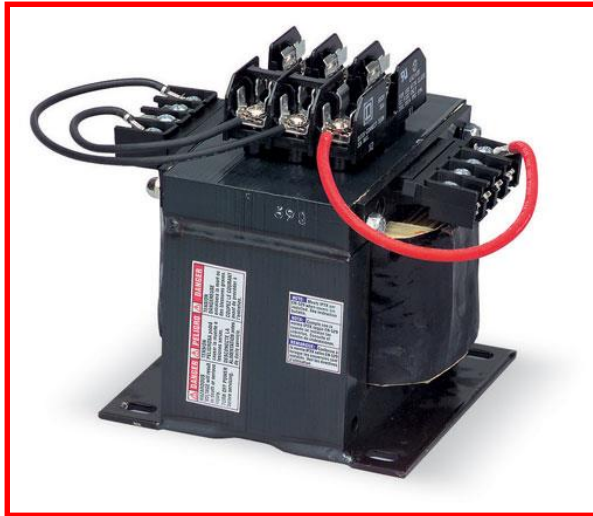
Control Panel Characteristics

Control Relays



Control Panel Characteristics

Secondary Control Transformer



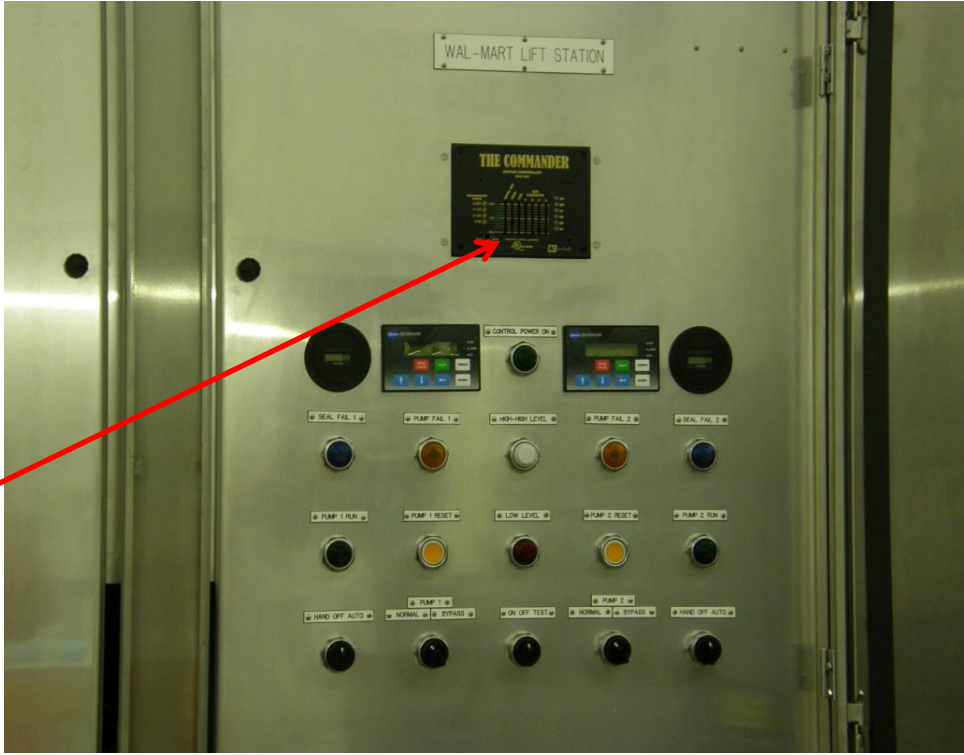
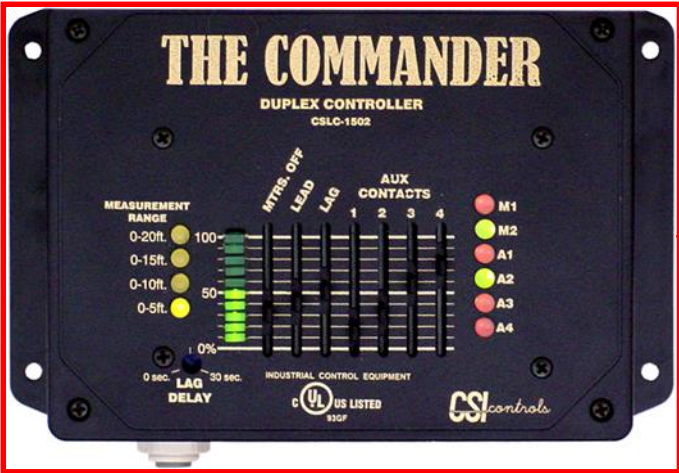
Control Panel Characteristics

Primary Control Transformer



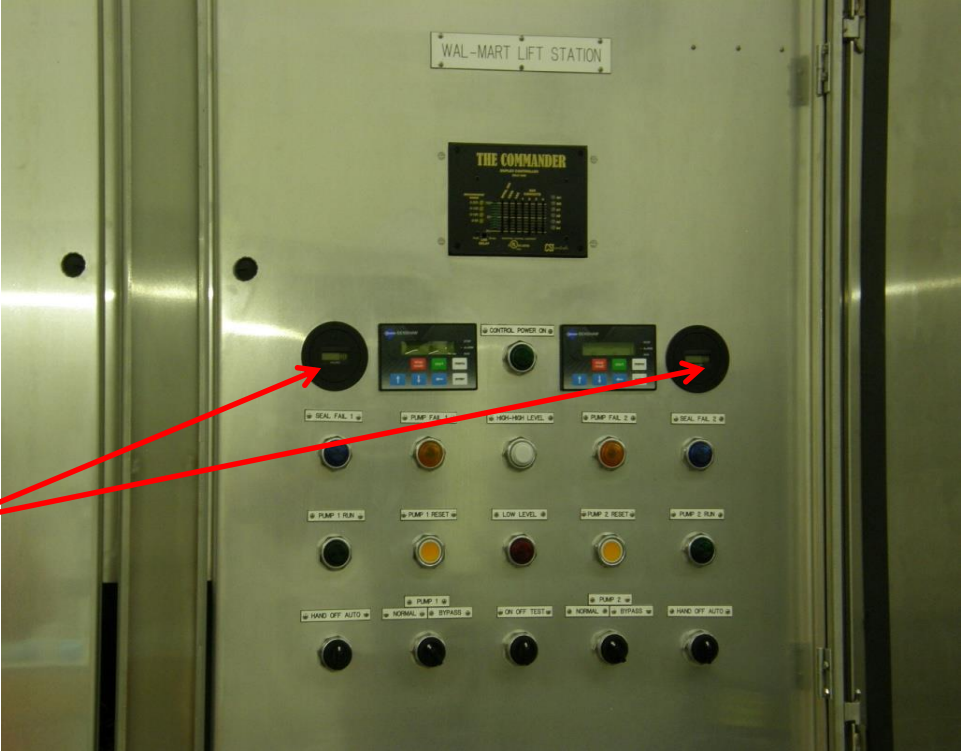
Control Panel Characteristics

Pump Controller



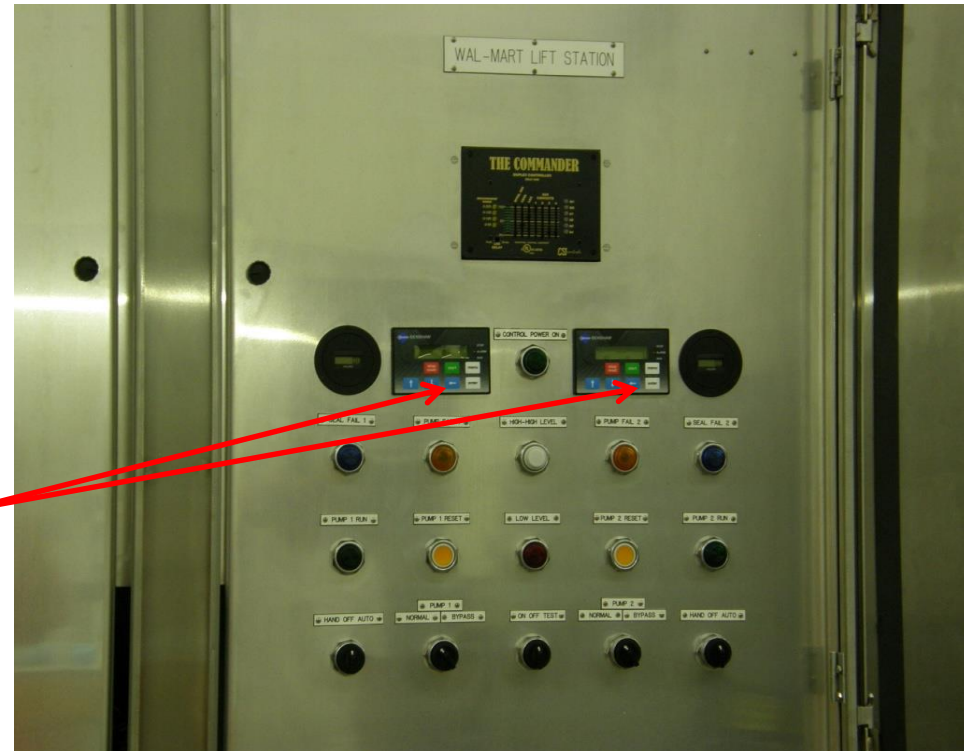
Control Panel Characteristics

Elapsed Time Meter



Control Panel Characteristics

Soft Start Displays



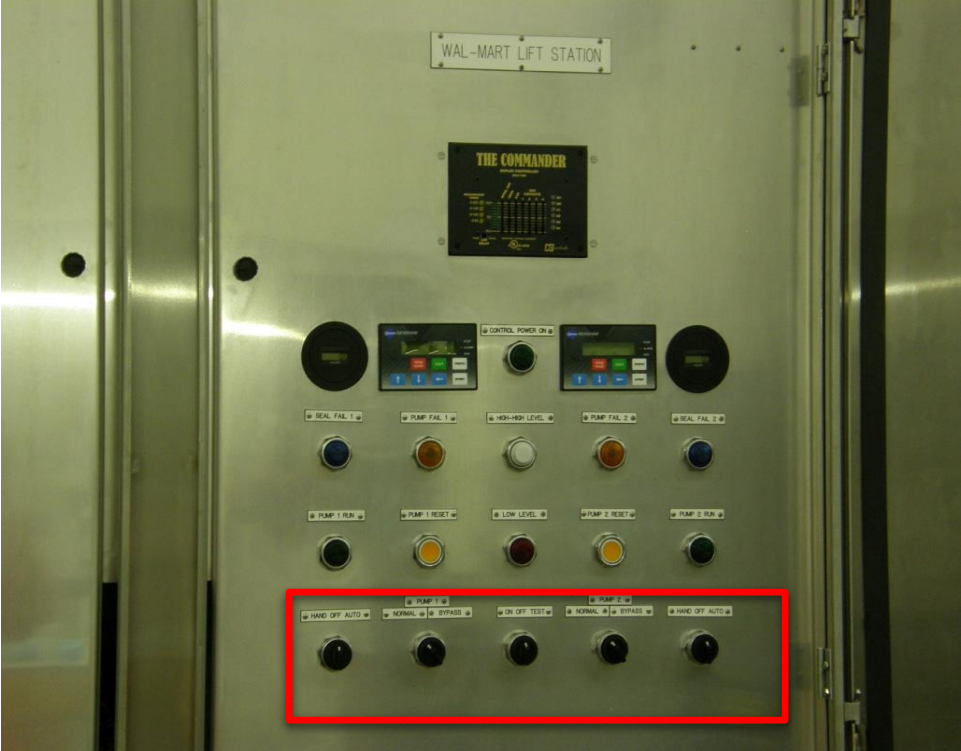
Control Panel Characteristics

Indicator Lights



Control Panel Characteristics

Switches & Pushbuttons



Control Panel Characteristics

GFI Receptacle



Control Panel Characteristics

Alarm Lights



Control Panel Characteristics



Air Conditioner



Control Panel Characteristics



Audible Alarm & Silence Button



Control Panel Characteristics

Transformers convert high voltage to lower voltage.
True or False?



True

Questions?

Level Sensing

Adam Conover

Level Sensing Alternatives



Diaphragm Switch



Digital Level Control

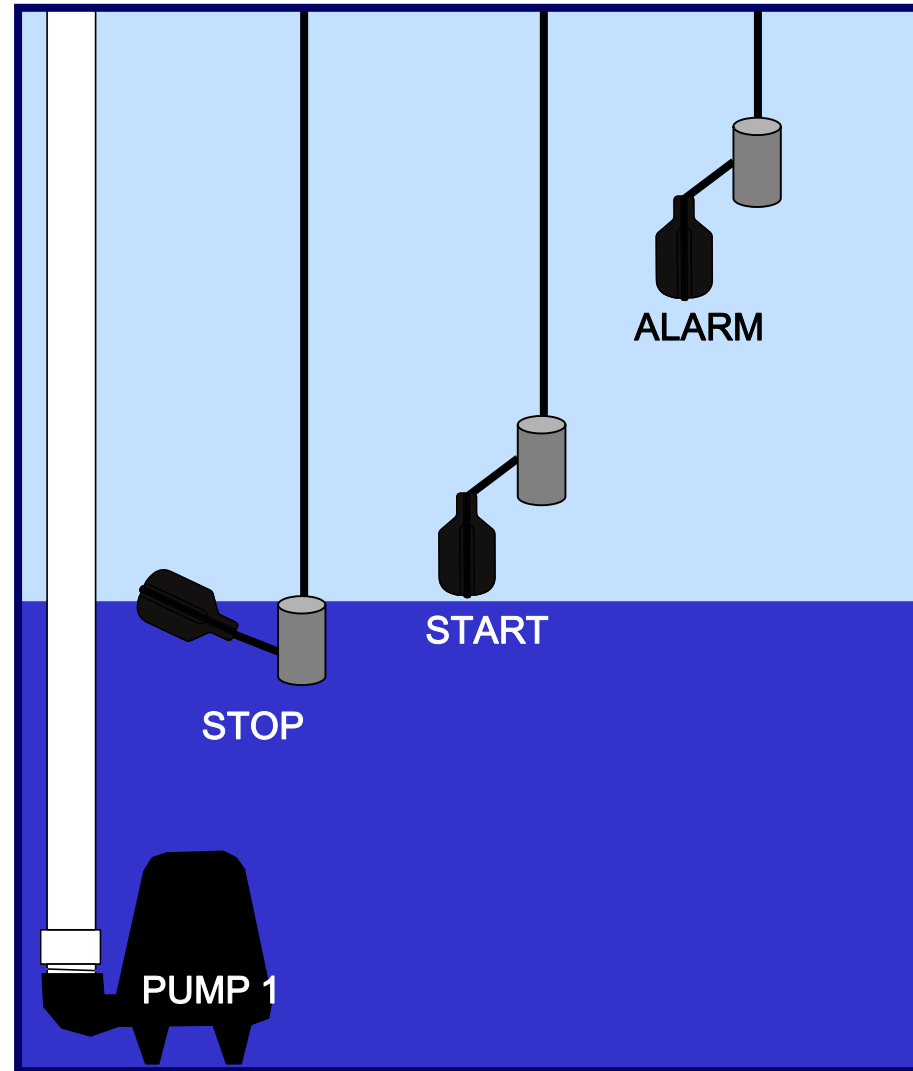


C-Level™ Sensor

Floats



Floats



Floats

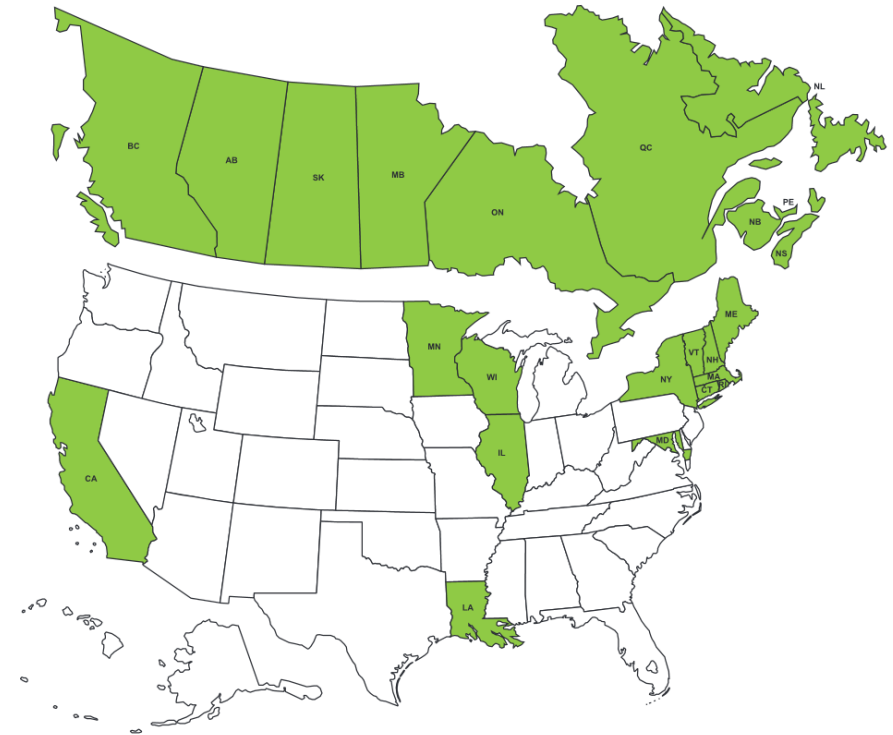
- Tethered or Vertical Type
- Directly controls pumps and control panels
- Narrow Angle vs. Wide Angle
- Piggyback plug or direct wire
- Adjustable pumping range
- Simple and cost effective
- Up to 20 FLA load rating

Mercury Legislation

RESTRICTED

The following areas restrict the sale of mercury-added switch products:

- Connecticut Effective 07-01-04
- Rhode Island Effective 01-01-06
- Maine Effective 07-01-06
- California Effective 07-01-06
- Vermont Effective 01-01-07
- Illinois Effective 07-01-07
- Minnesota Effective 08-01-07
(SJE Rhombus in compliance on 04-01-08)
- New York Effective 01-01-08
- Louisiana Effective 07-01-08
- New Hampshire Effective 07-01-08
- Massachusetts Effective 05-01-09
- Wisconsin Effective 10-01-10
- Canada Effective 11-08-15
- Maryland Effective 10-01-18



Diaphragm Switch

- Non-Moving technology
- Piggyback plug option
- Pressure activated
- Fixed on / off setting
- Multiple models for different pumping ranges
- Controls pumps up to 10 FLA



Digital Level Control

- Solid state technology
- Set pumping range, 2 models available 6" or 8.5"
- High Cycle rating
- Up to 15 FLA rating



C-Level™ Sensor



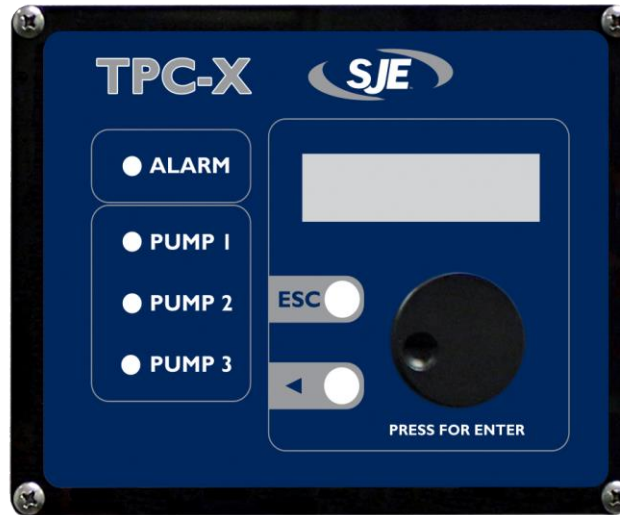
C-Level

- Floatless technology
- Compact design
- Low voltage
- Multiple set points
- Must use a controller or control panel to interpret C-level signal

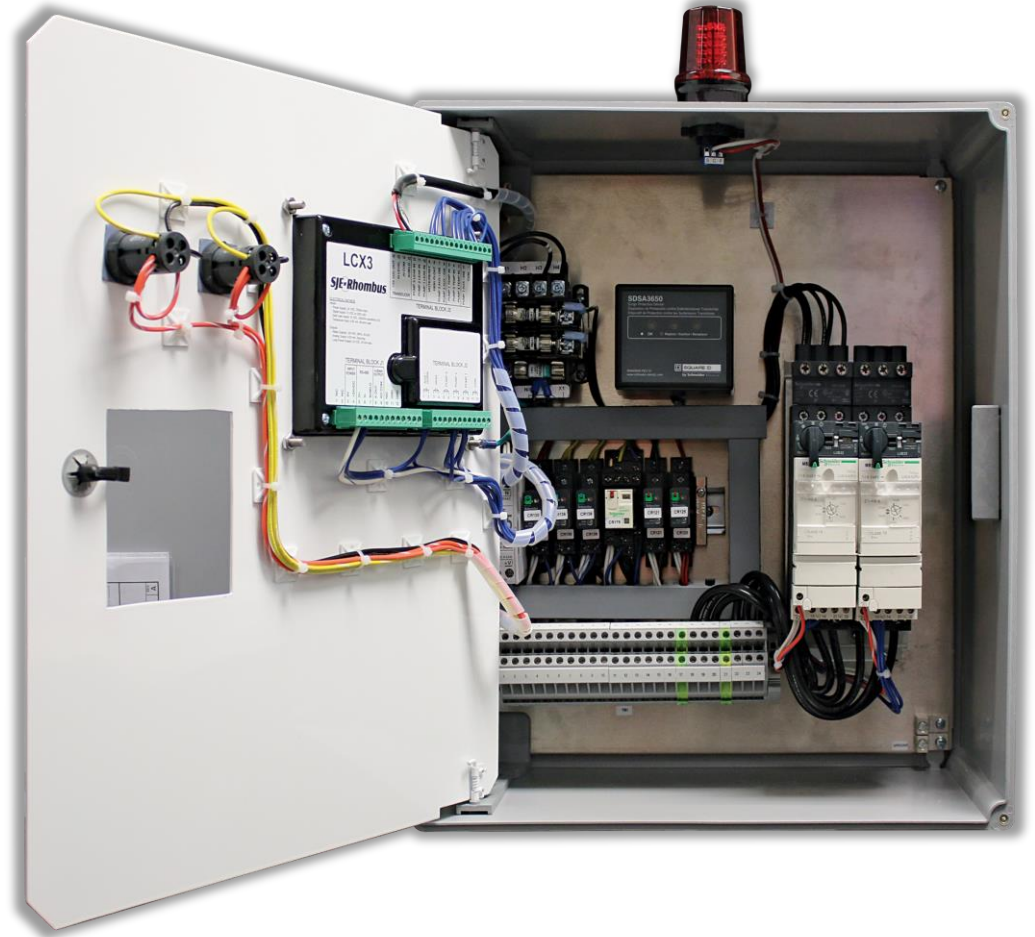
Hydrostatic Pressure Transducers



Level Control



Controllers for Transducers



Ultrasonic Sensors



Capacitive Level Sensing



Radar



Fluid Level Sensing

- Solid State technology
- High cycle rating
- No moving parts for level detection
- Fixed pumping range - 8" to 10" differential
- 9.8 FLA load rating

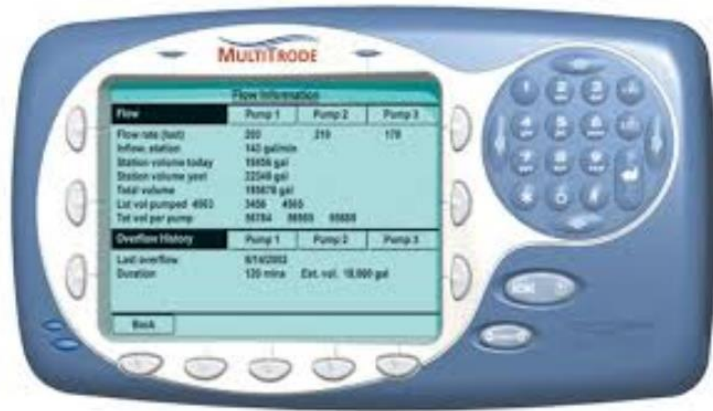


Bubbler Systems

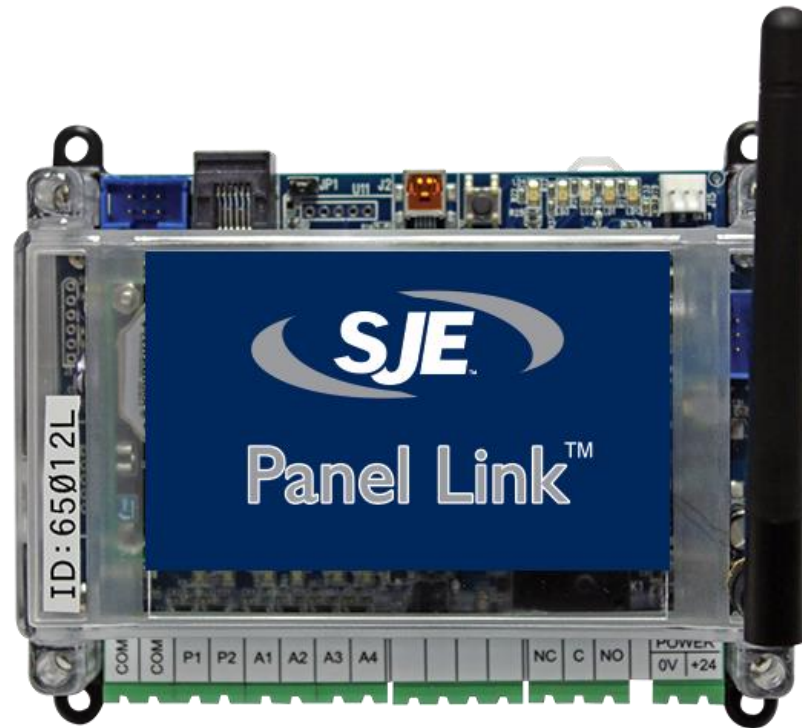
The compressibility of the air in the bubbler tube, air supply line and pressure sensing lines can produce a measurable lag time in the output level signal of the bubbler system.



Conductive Switch Technology



Remote Monitoring



Remote Monitoring

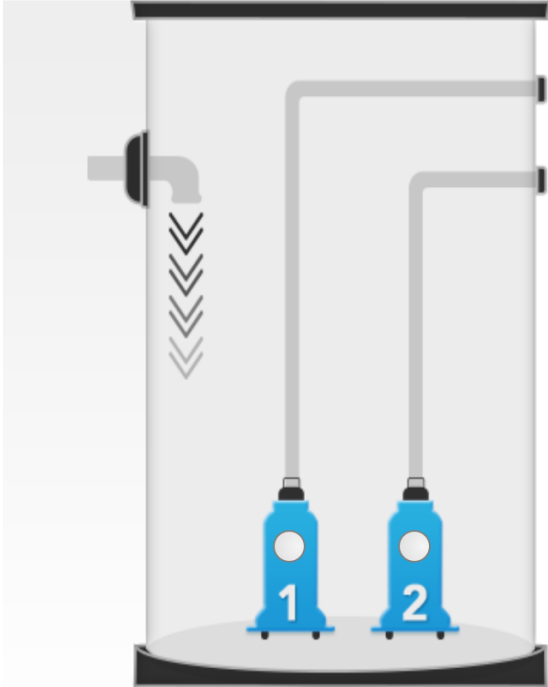
[Main](#) | [Reports](#) | [Setup](#) | [Documents](#) | [Back To Dashboard](#)

Main > Control > Main > 60080 PWE-L 3G(60080) | | Last status: 08/01/2018 10:34:28 AM

[Get Status](#)

ALARMS

P1 Overload P2 Overload High Float Spare POWER



Parameter	Value	Unit
Pump HP	5.0	HP
Pump Voltage	240	V
Pump FLA	27.0	A

PUMP 1

Parameter	Value	Unit
P1 Runtime Alarm	<input type="radio"/>	
P1 Cycles	5	/Day
P1 Runtime Minutes	10.4	/Day

PUMP 2

Parameter	Value	Unit
P2 Runtime Alarm	<input type="radio"/>	
P2 Cycles	6	/Day
P2 Runtime Minutes	11.4	/Day

REMOTE START

Remote Monitoring

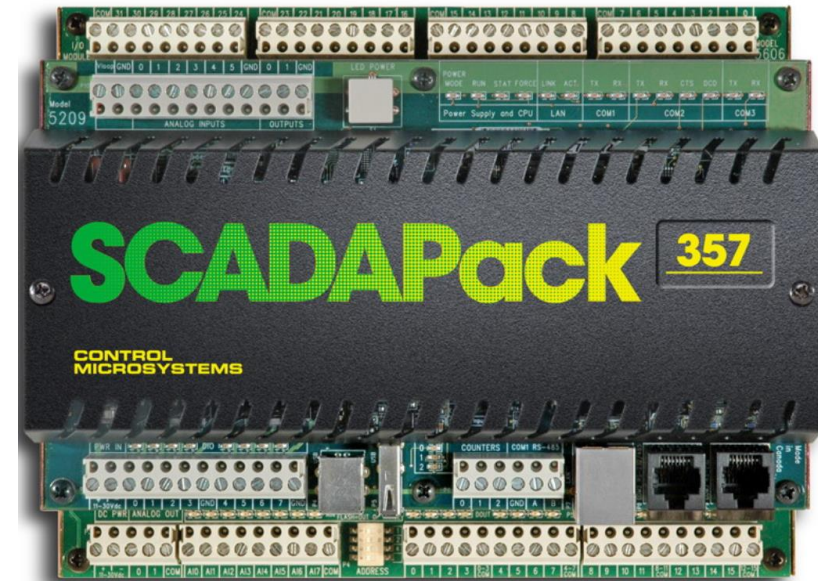
- Many variations
 - Cellular
 - Wifi
 - Internet, modbus, bacnet
 - Land Line Dialer
- Cellular, GSM only in future (CDMA is going away in 2020)

SCADA



SCADA

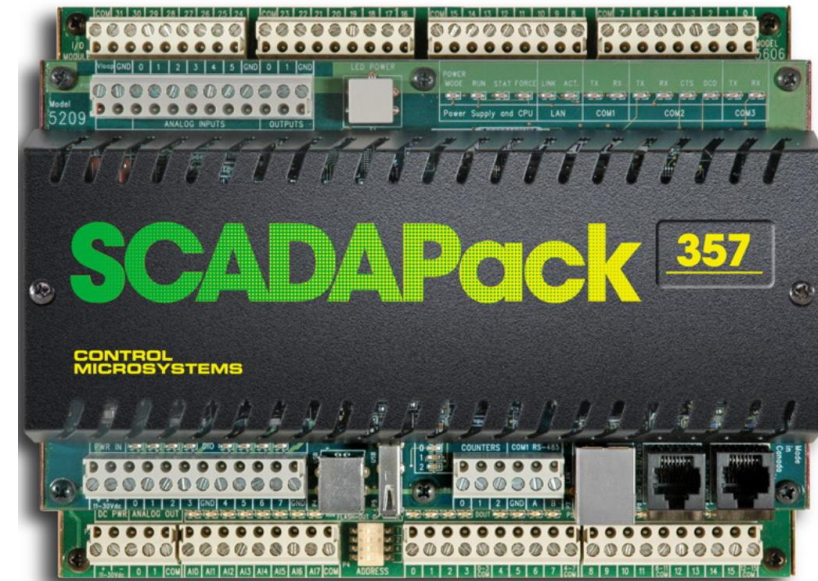
The term **SCADA** system can be used to describe a multitude of computer-based control systems that allow operators and facility personnel to monitor and control a facility's equipment either locally or remotely.



SCADA

What does SCADA stand for?

Supervisory Control And Data Acquisition













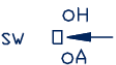


Questions?








Schematic Symbol Review

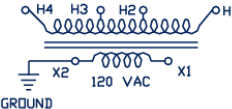





Adam Conover

Schematic Symbols & Review

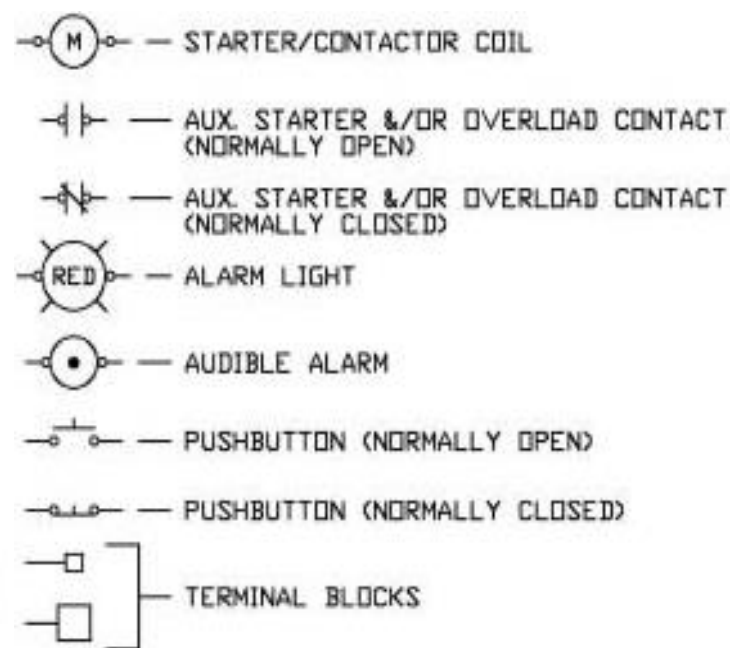
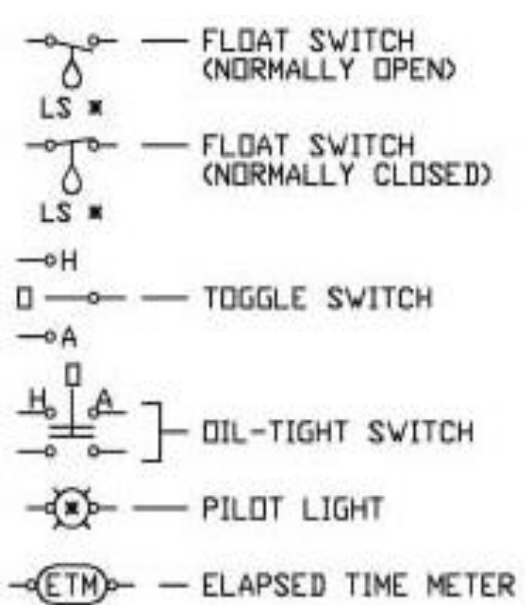
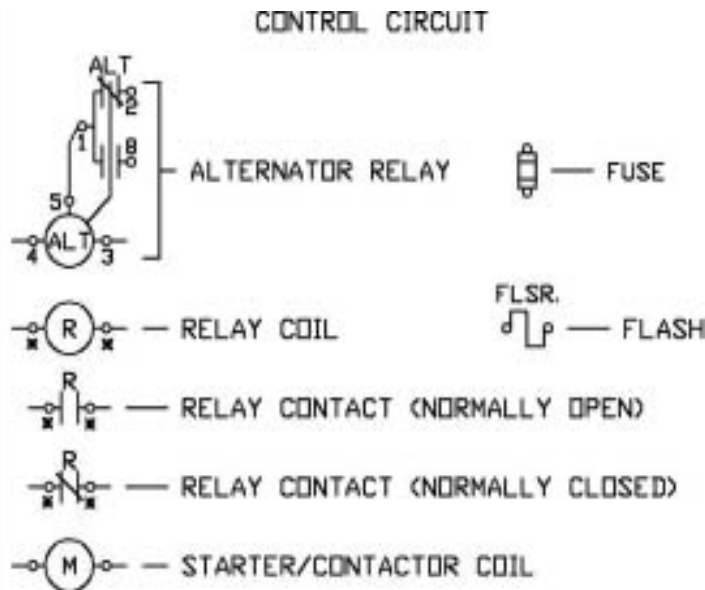
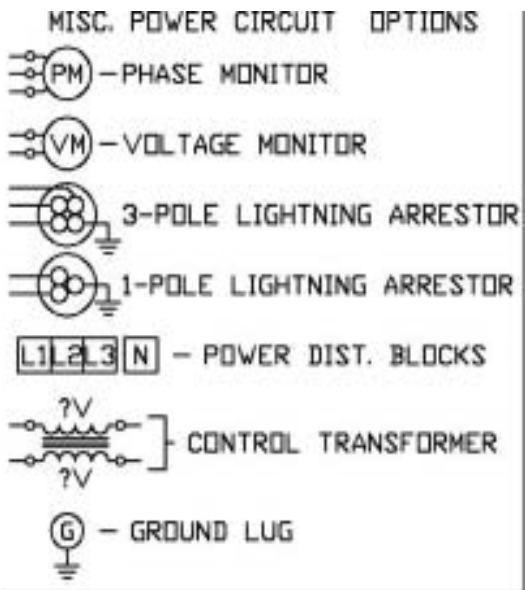
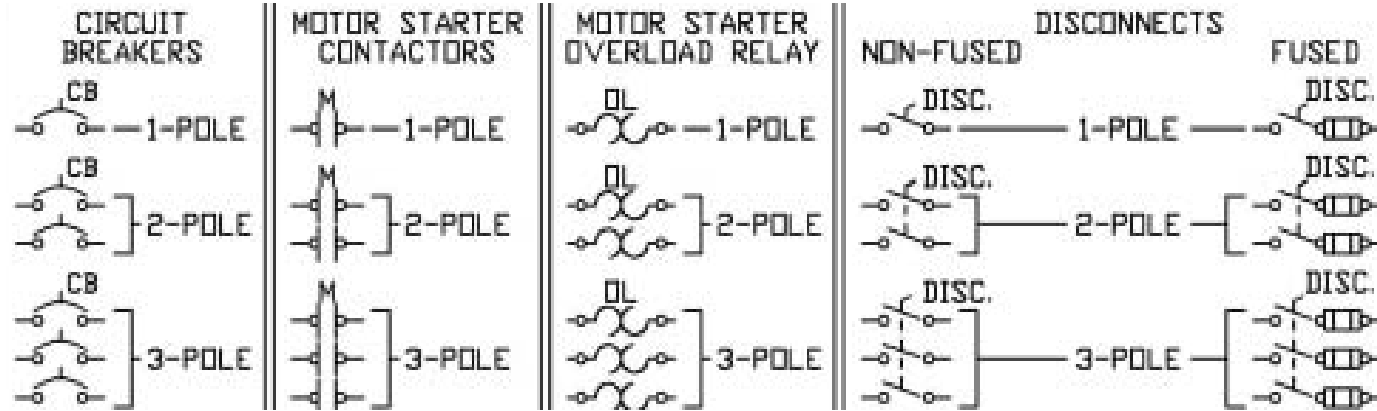
-  RED ALARM BEACON
-  AUDIO ALARM (HORN)
-  SOLID STATE FLASHER
-  MOTOR CONTACTOR COIL
-  ELAPSED TIME METER
-  EVENT COUNTER
-  GREEN INDICATOR LIGHT

-  FUSE
-  SPST SWITCH
-  SPST PUSH SWITCH
-  HAND, OFF, AUTO SWITCH
-  GROUND
-  LIQUID LEVEL (N.O.) FLOAT

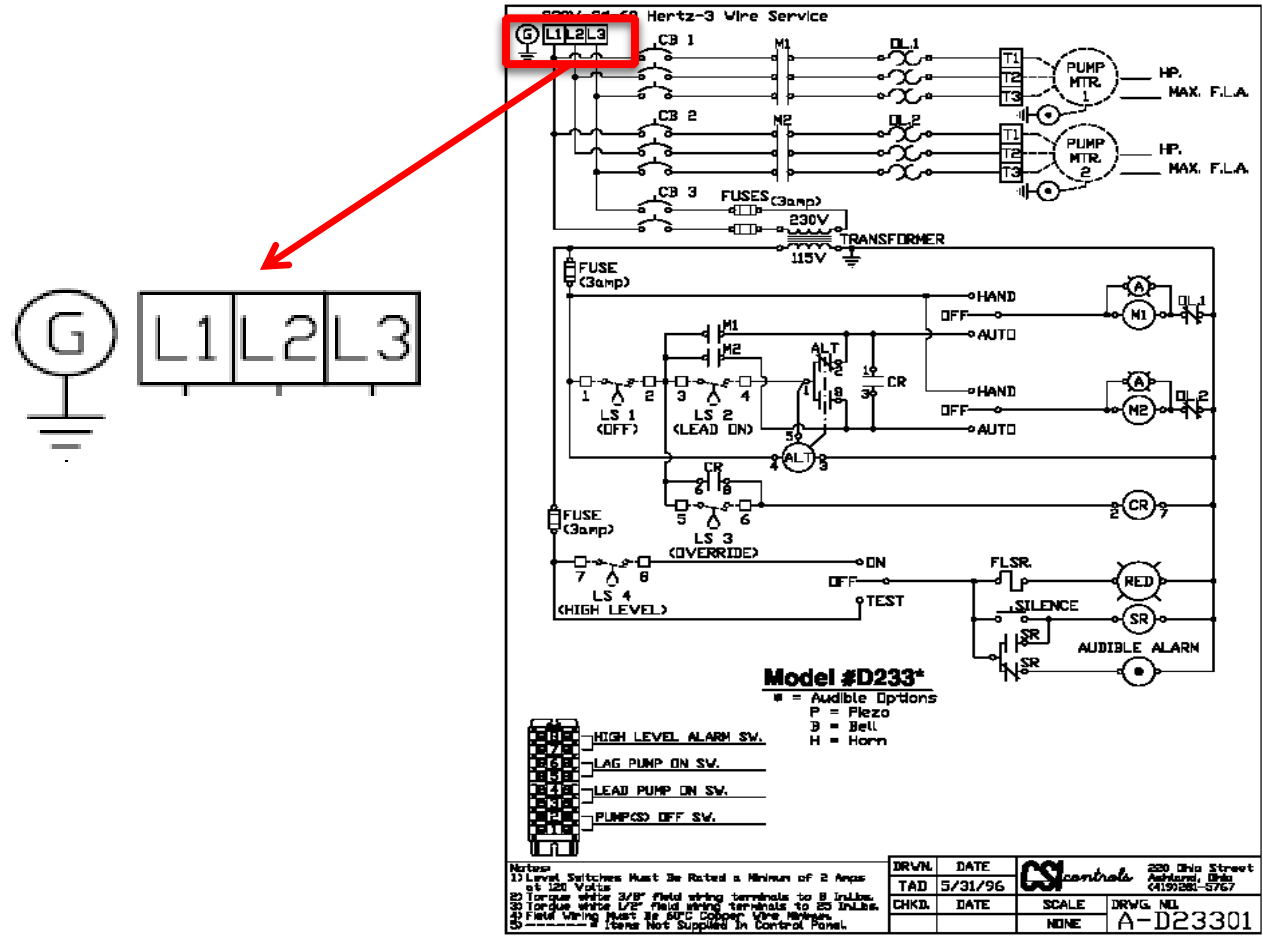
-  START RELAY COIL
-  START RELAY (N.C.) CONTACT
-  RUN CAPACITOR
-  START CAPACITOR
-  CONTROL RELAY COIL
-  (N.O.) CONTACT
-  (N.C.) CONTACT

-  MULTITAP TRANSFORMER
-  ANTI-CONDENSATION HEATER
-  LIGHTNING ARRESTOR
-  THERMAL CUTOFF (N.C.)
-  PUMP (MOTOR)
-  CIRCUIT BREAKER

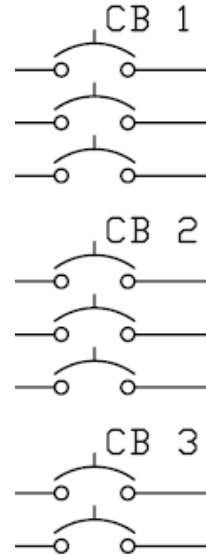
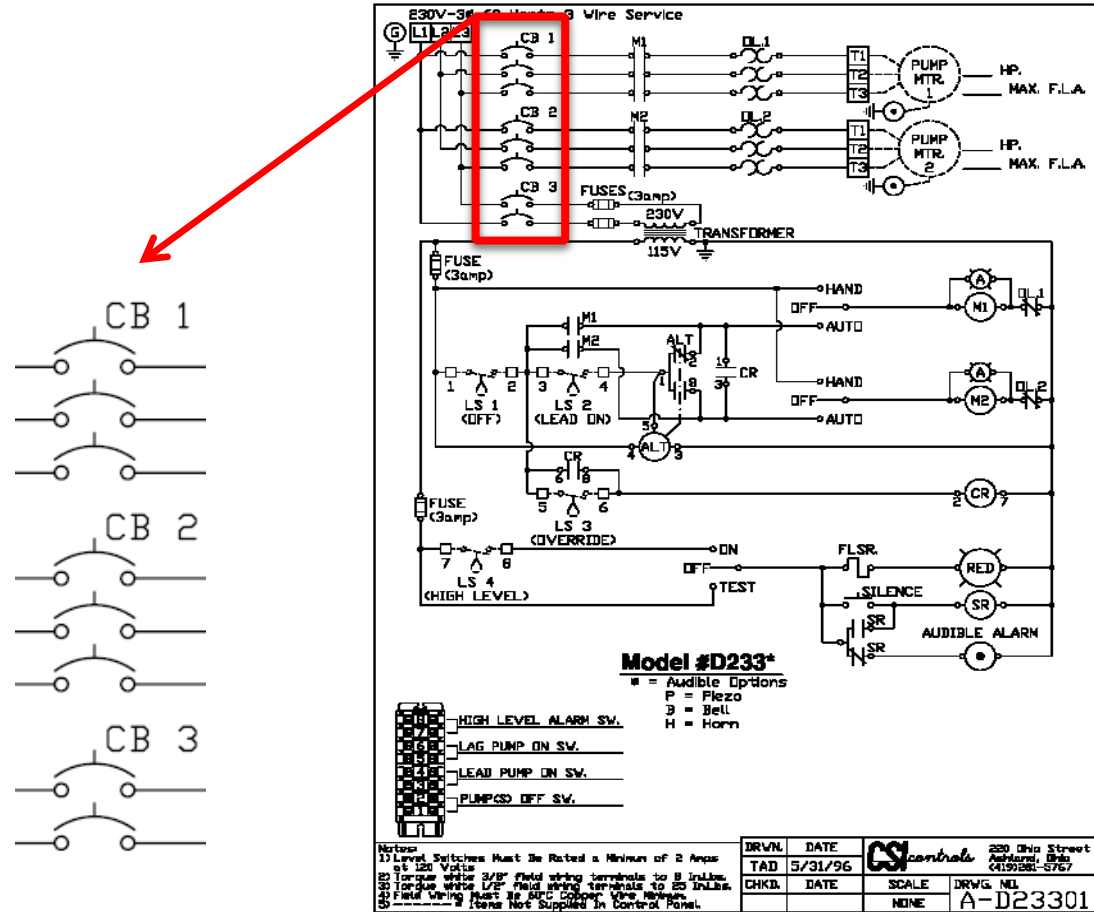
Schematic Symbols & Review



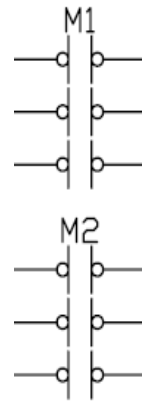
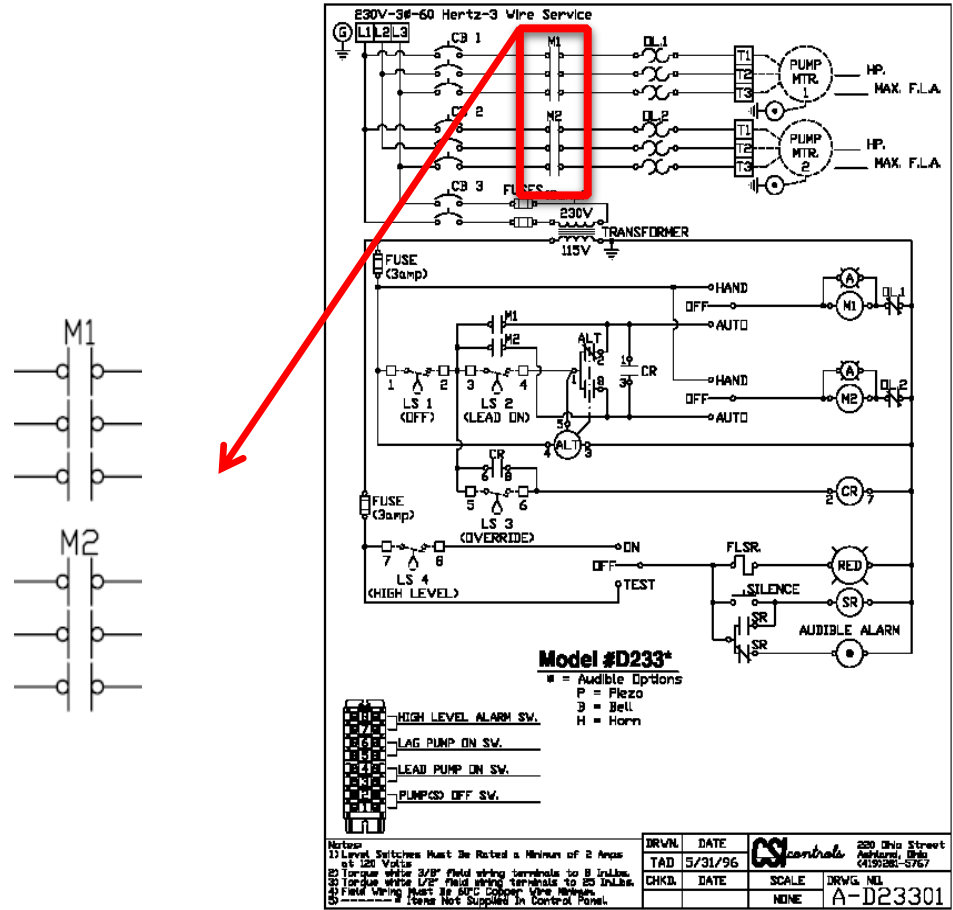
Schematics



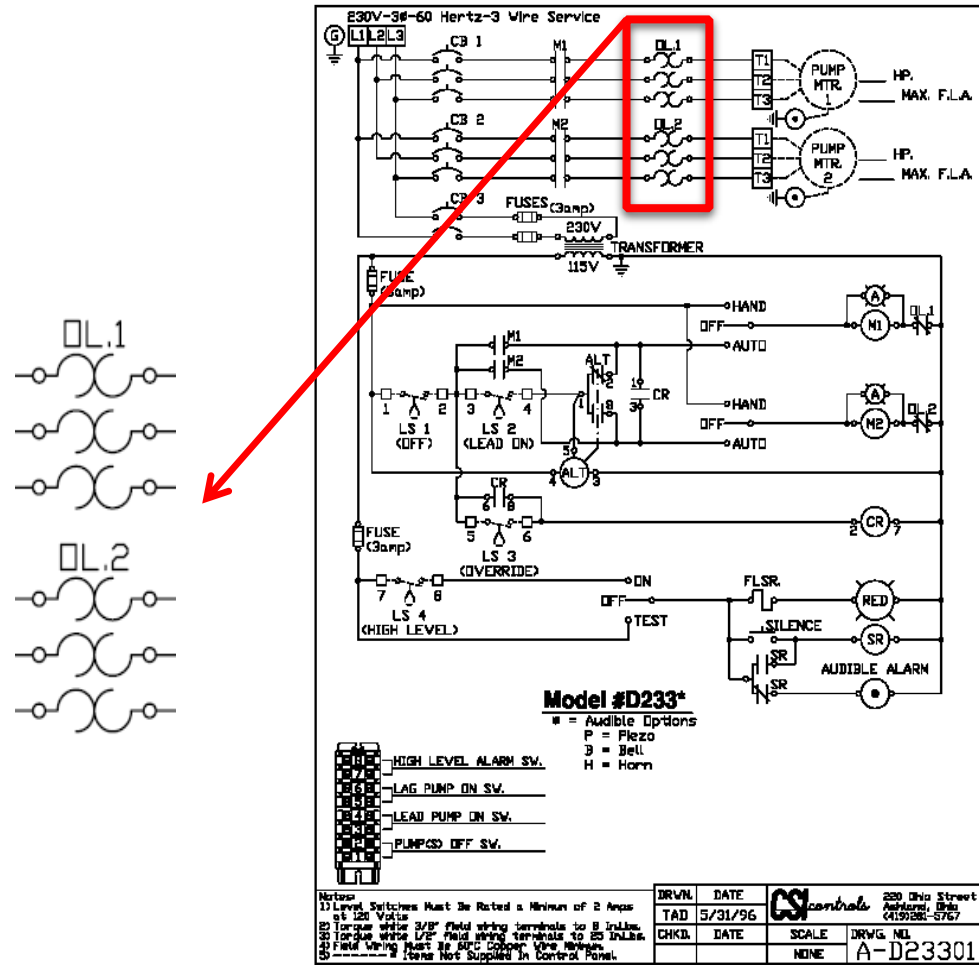
Schematics



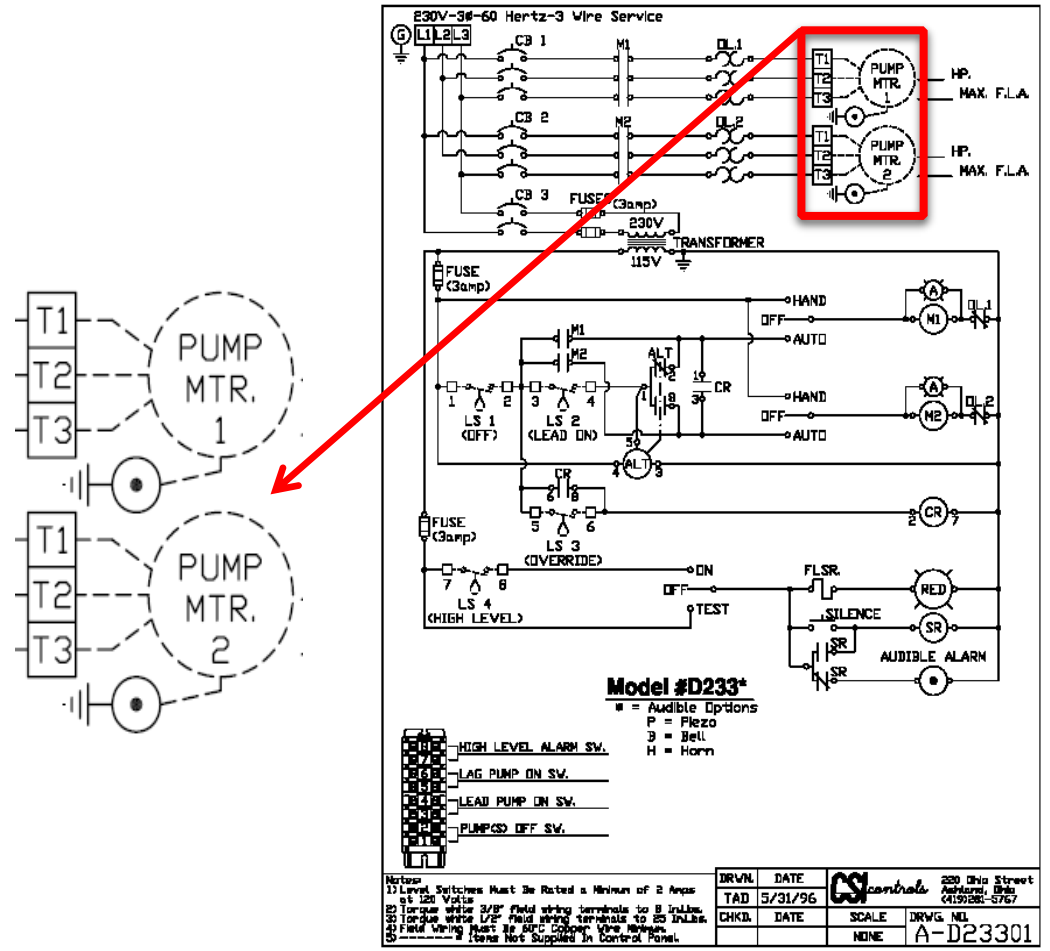
Schematics



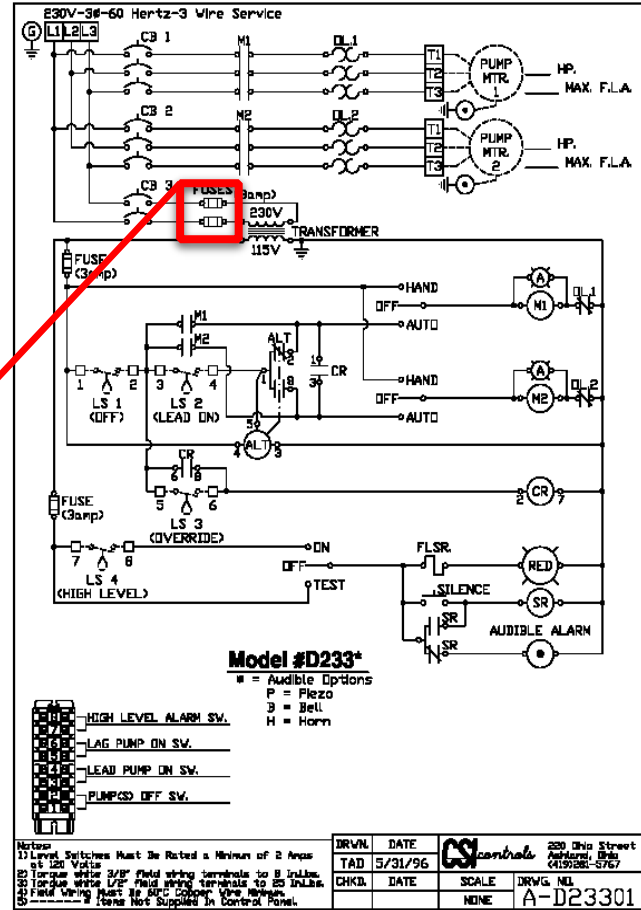
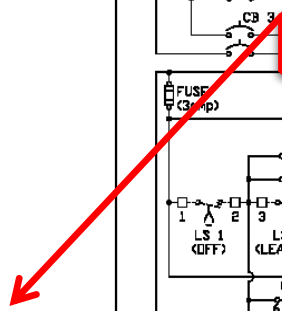
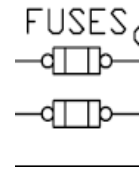
Schematics



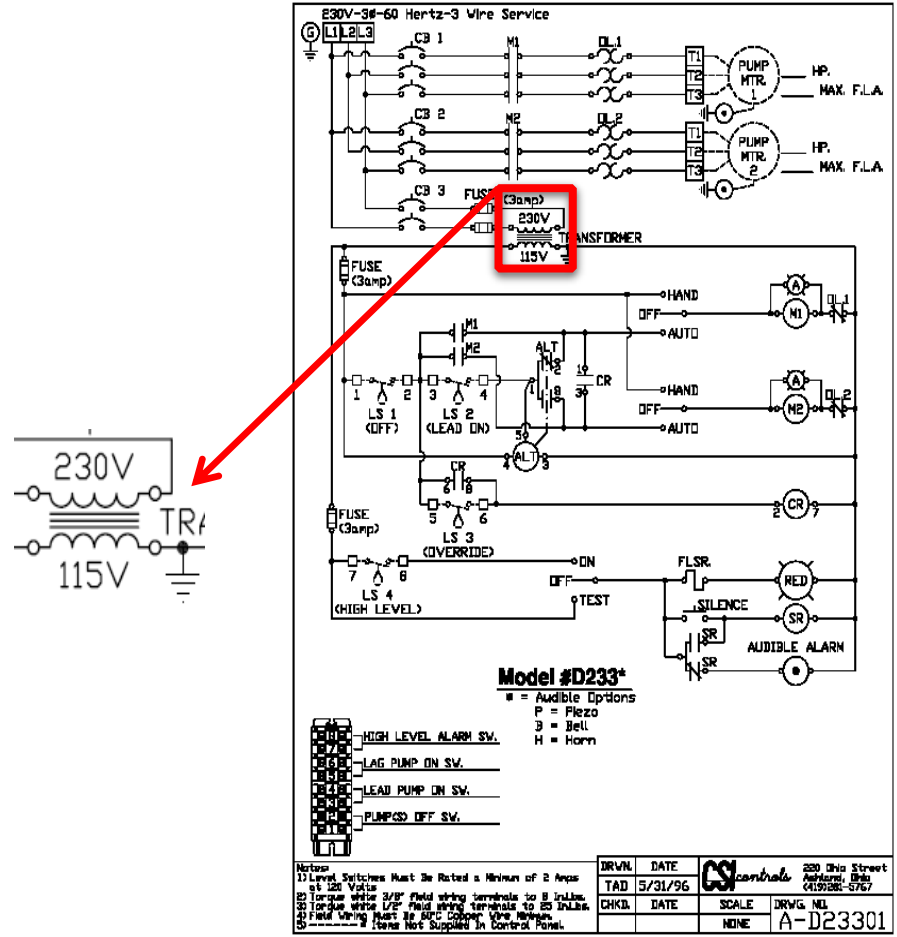
Schematics



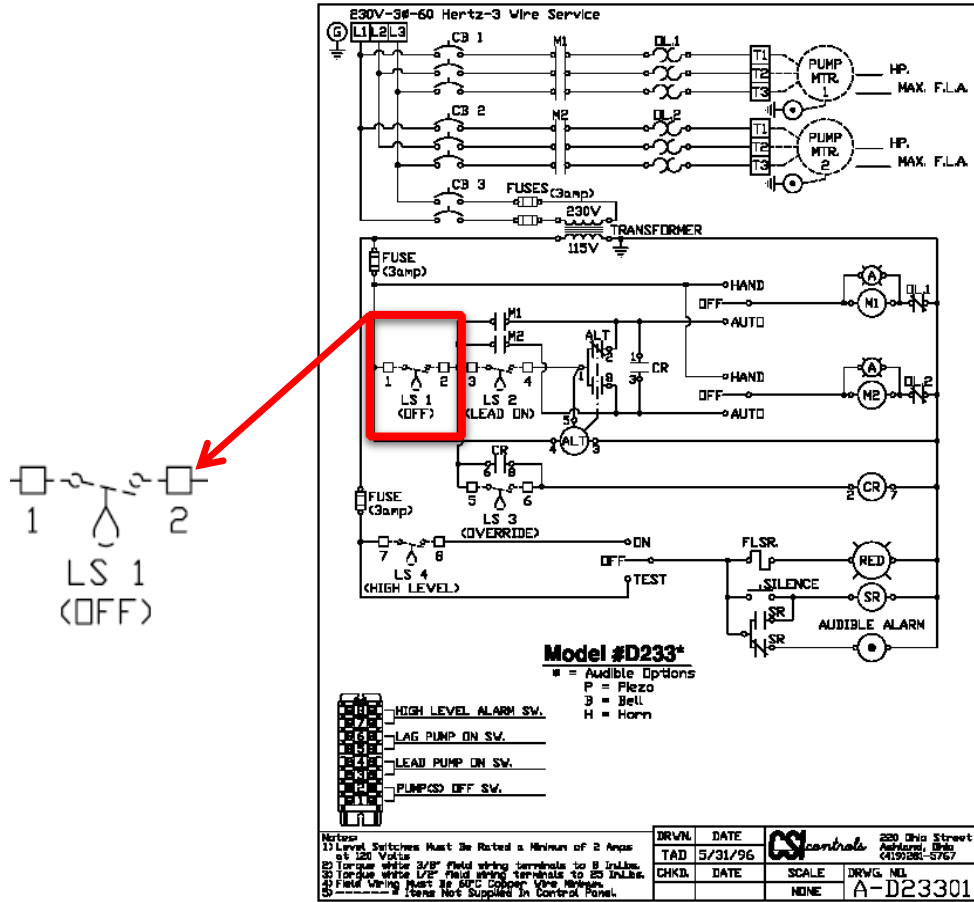
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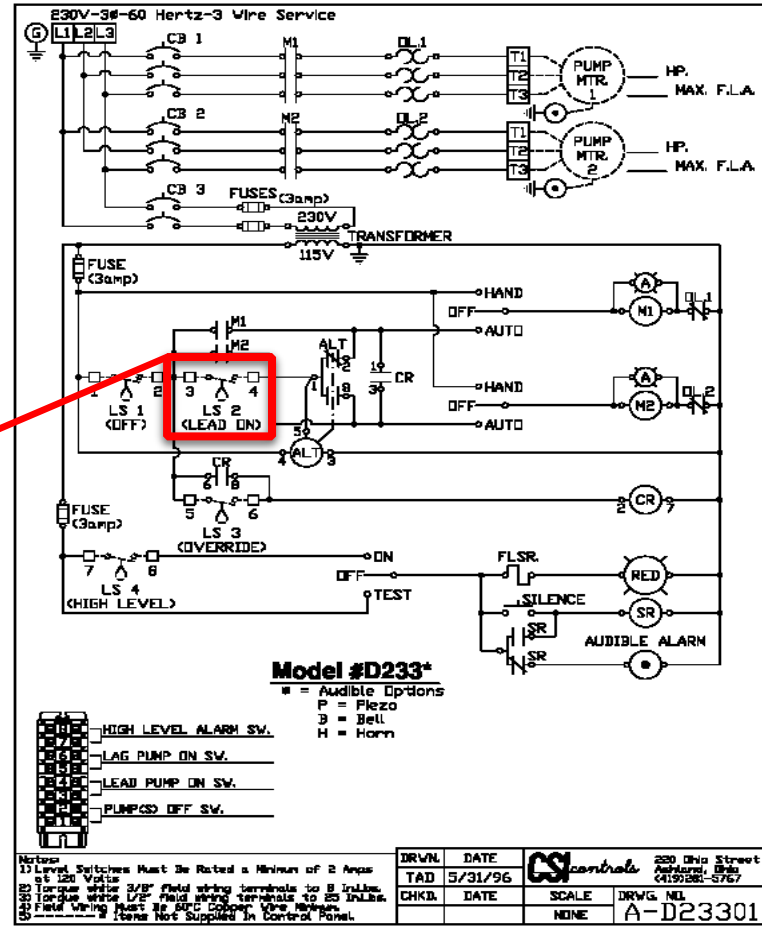
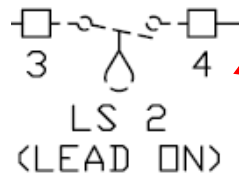
Schematics



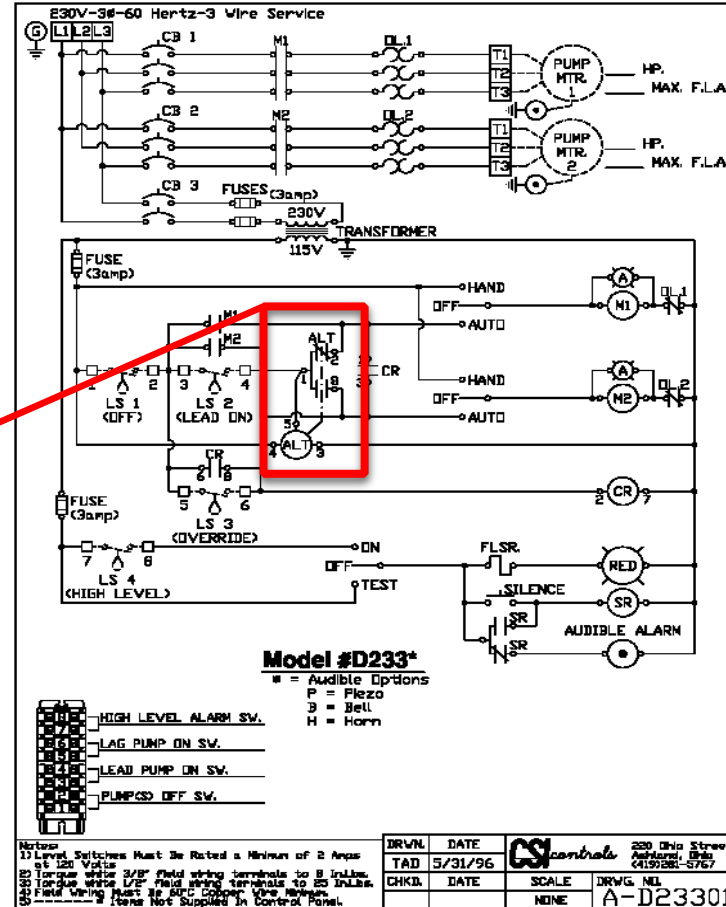
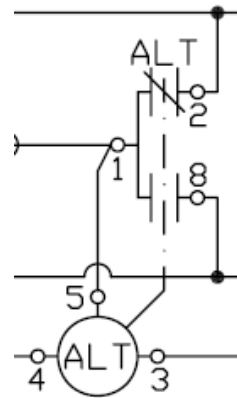
Schematics



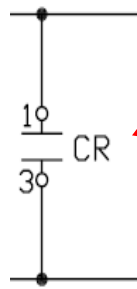
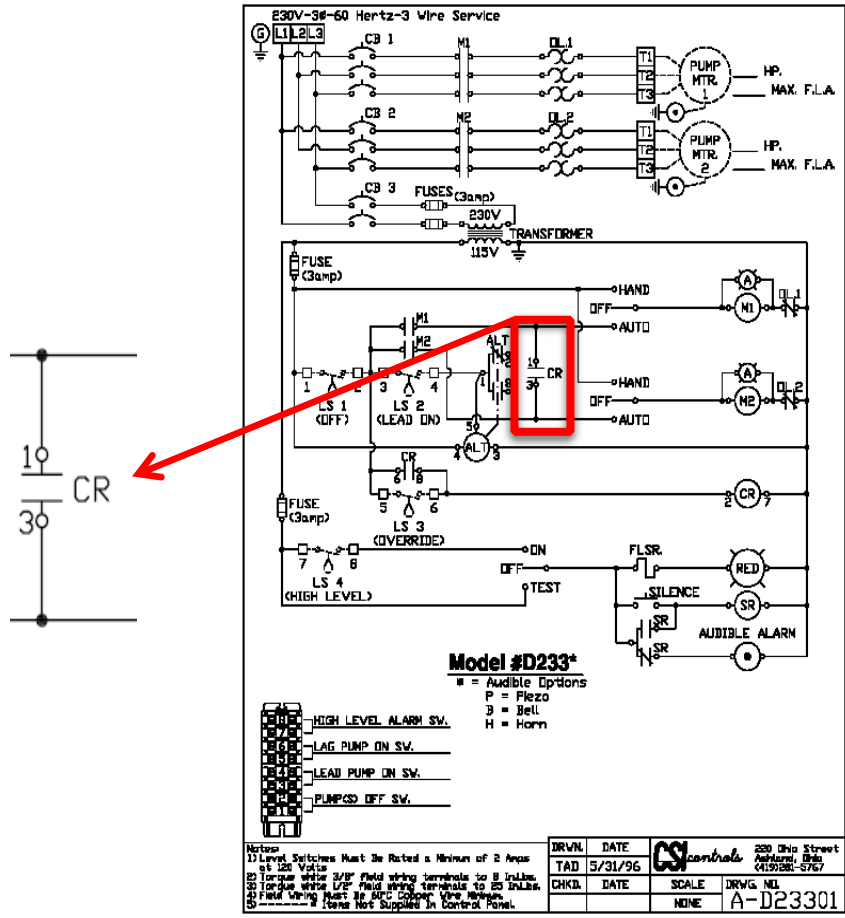
Schematics



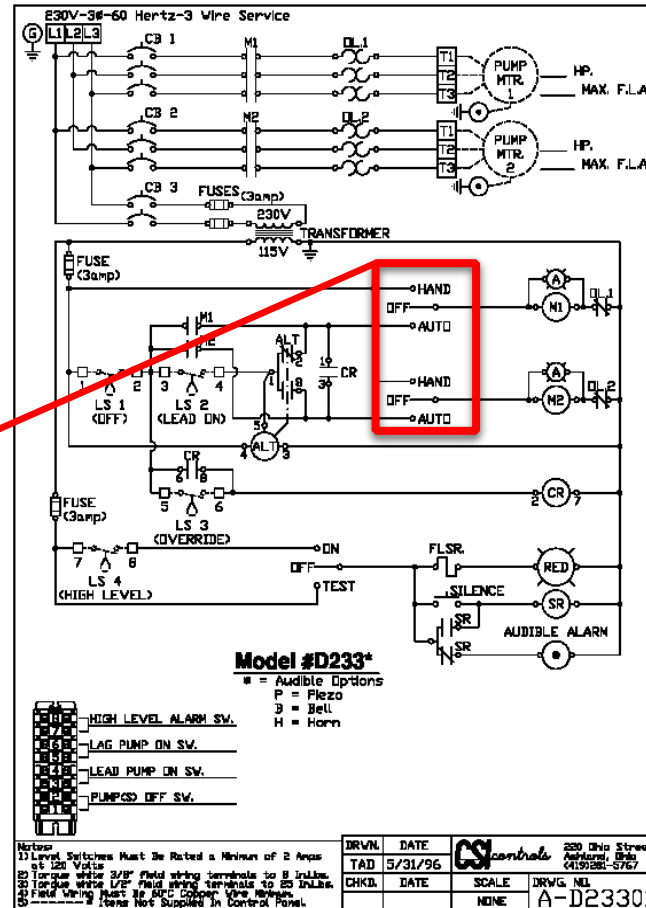
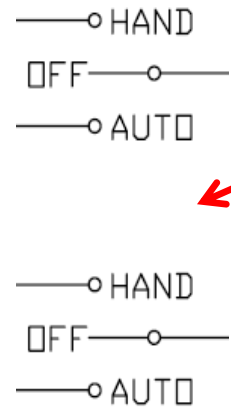
Schematics



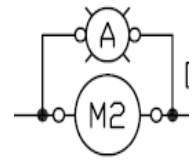
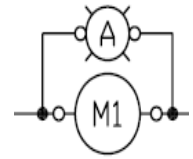
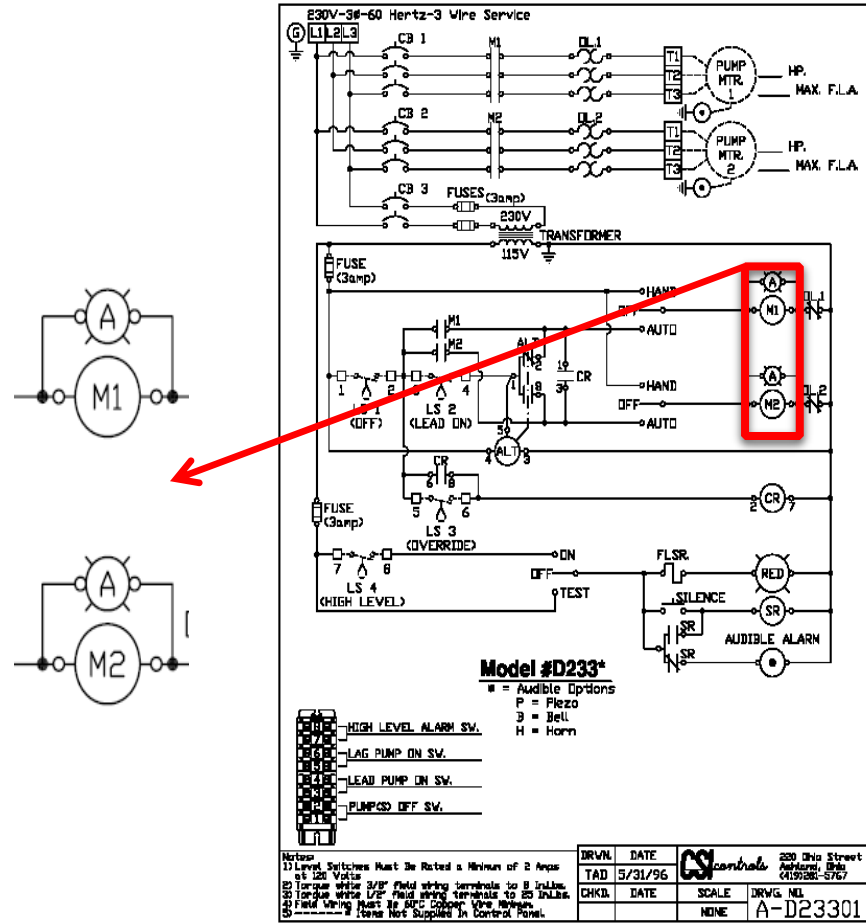
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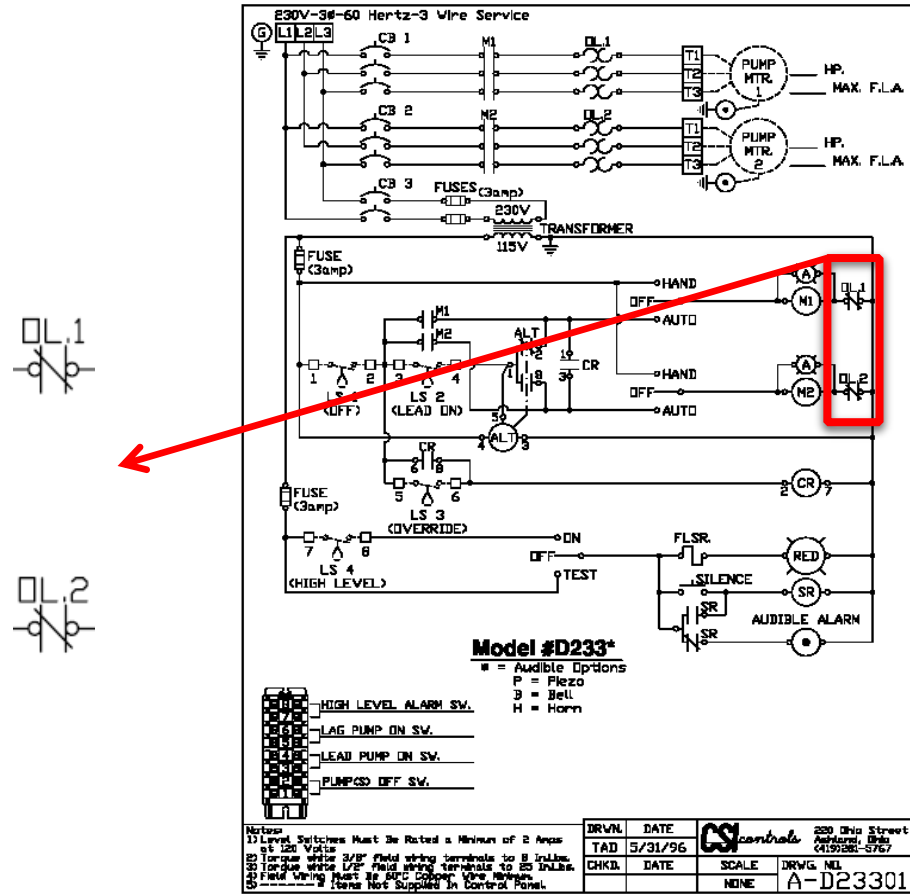
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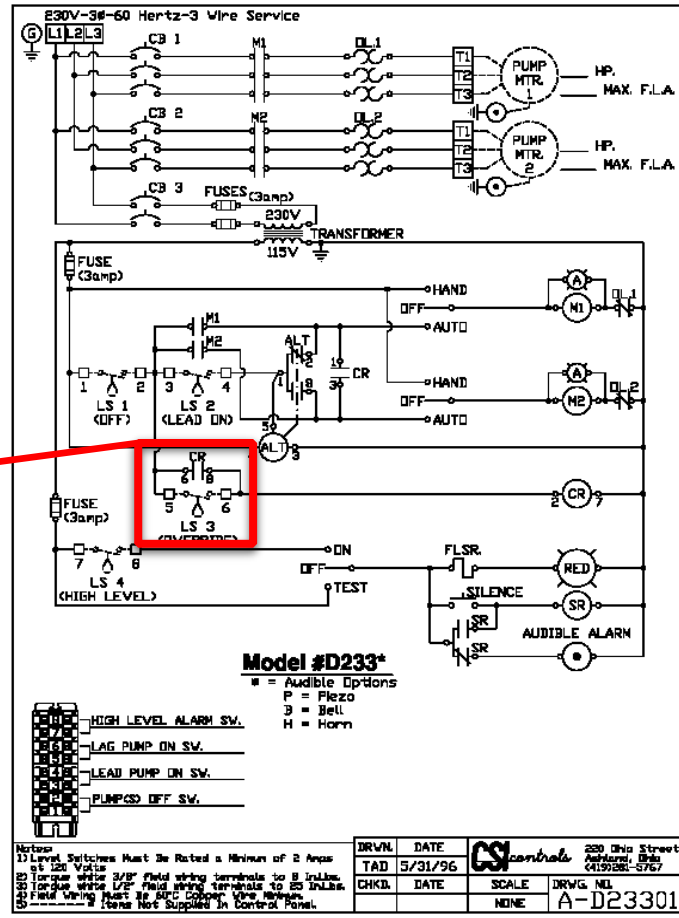
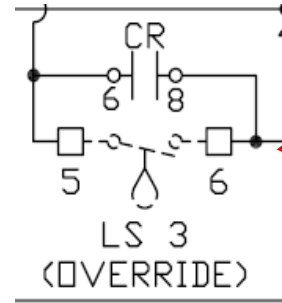
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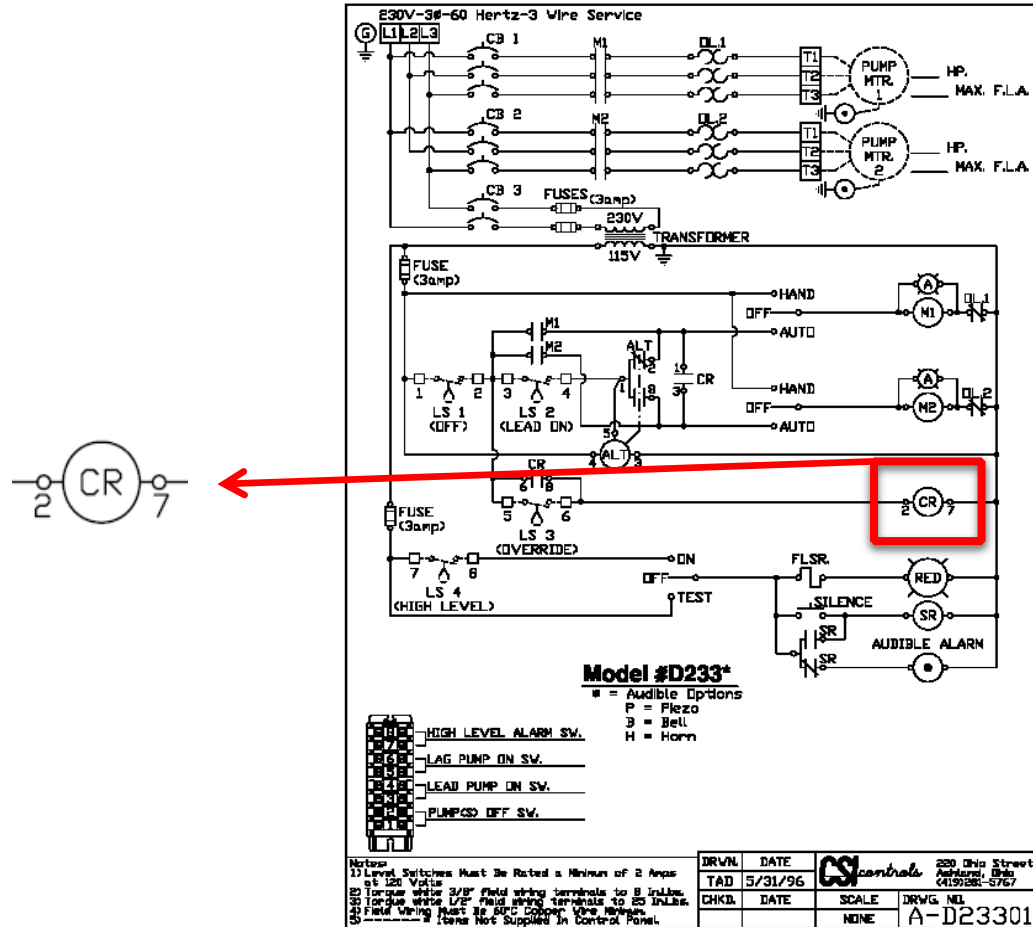
Schematics



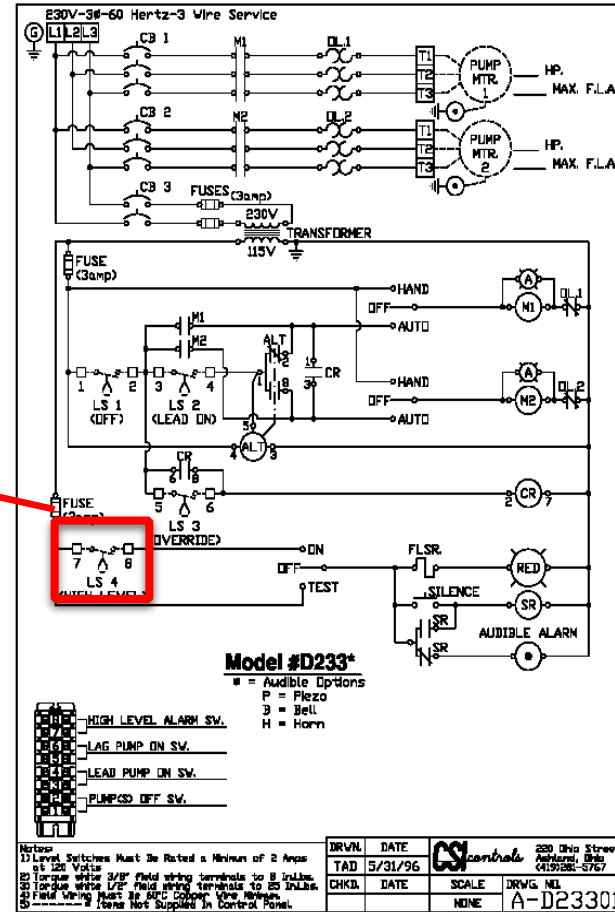
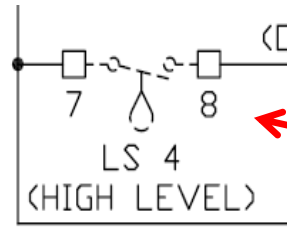
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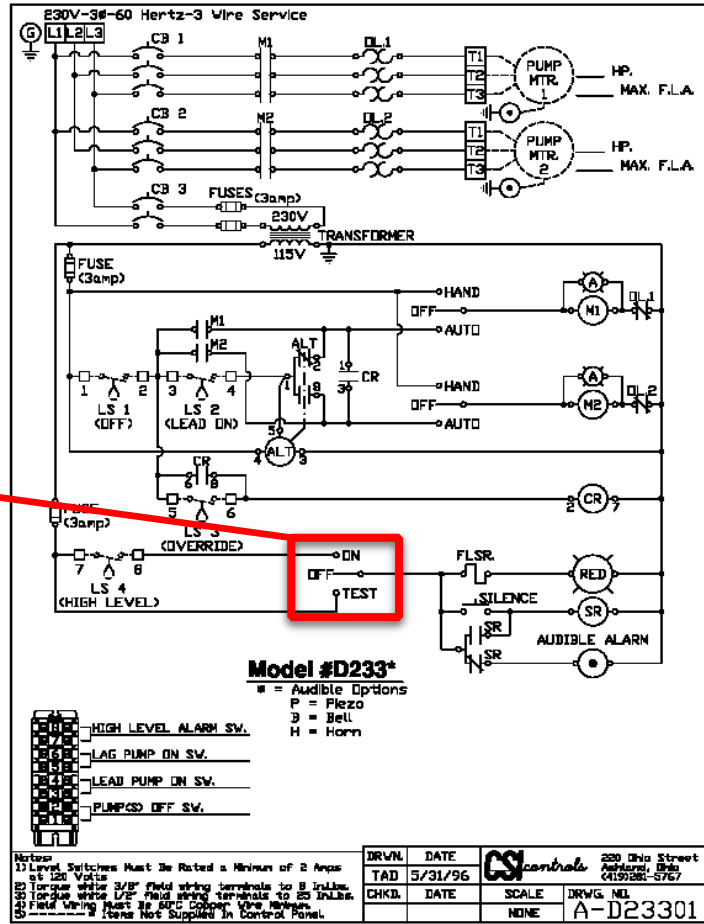
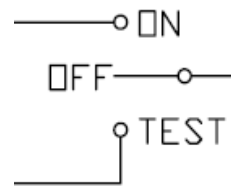
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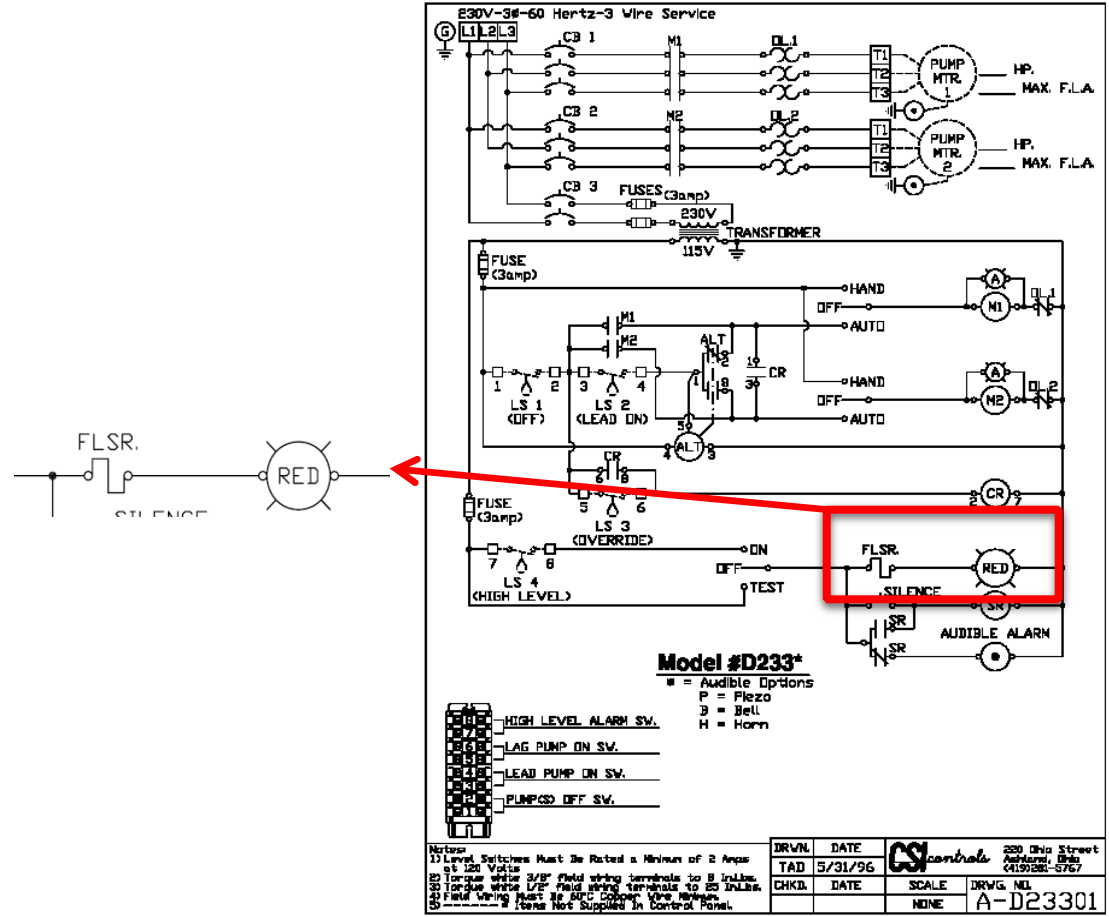
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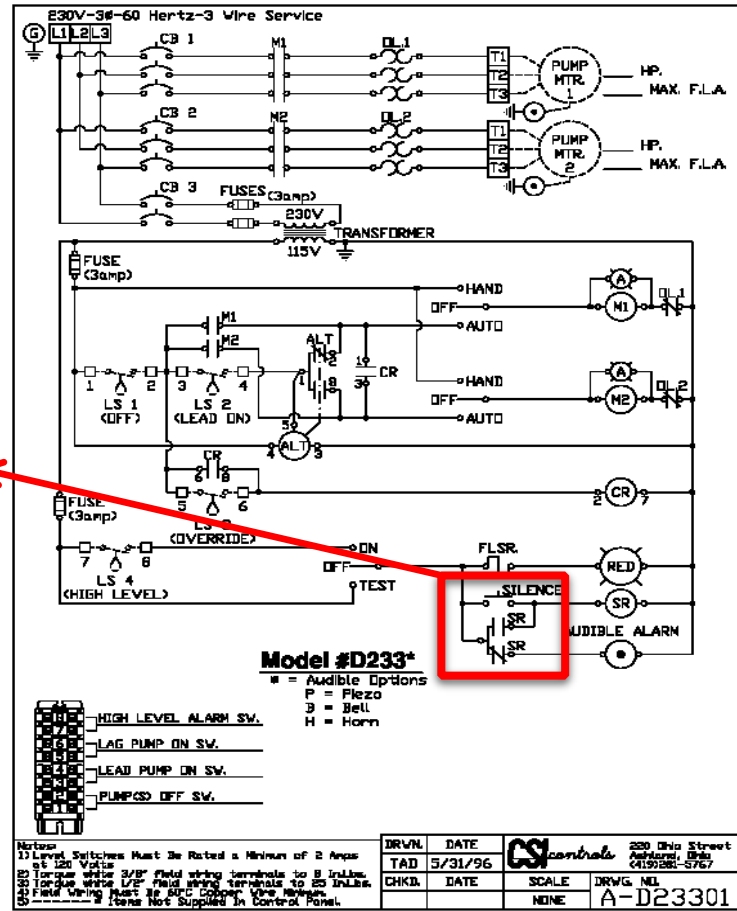
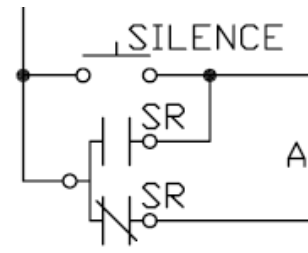
Schematics



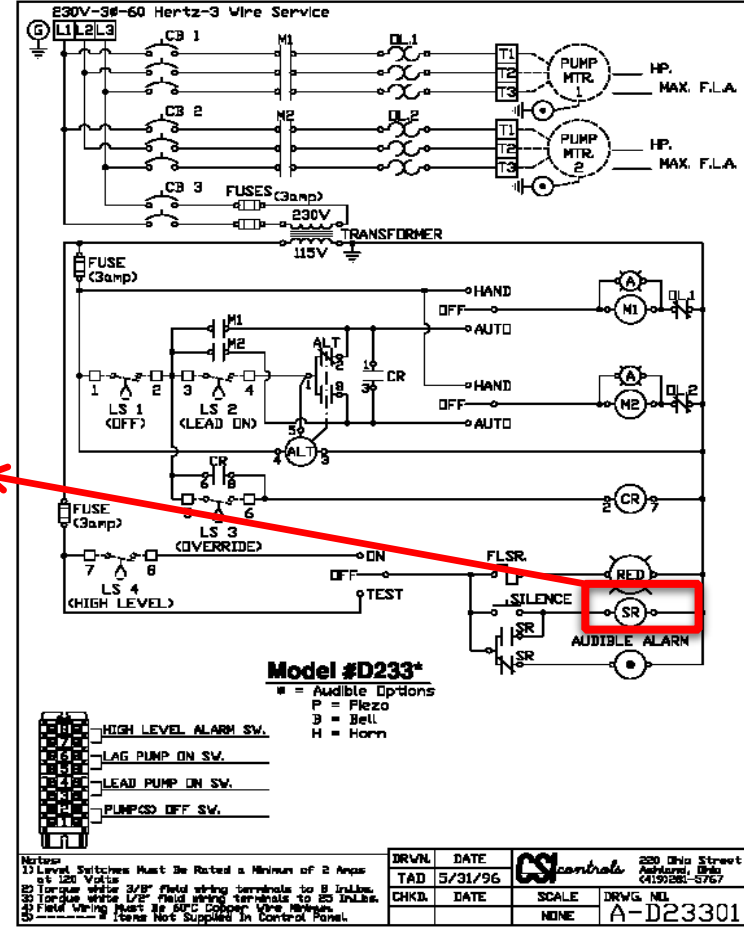
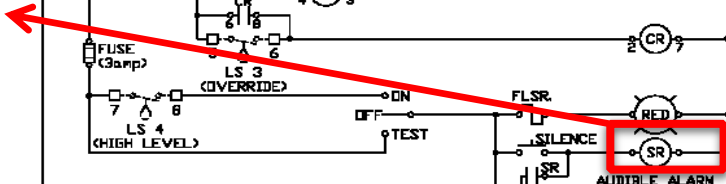
Schematics



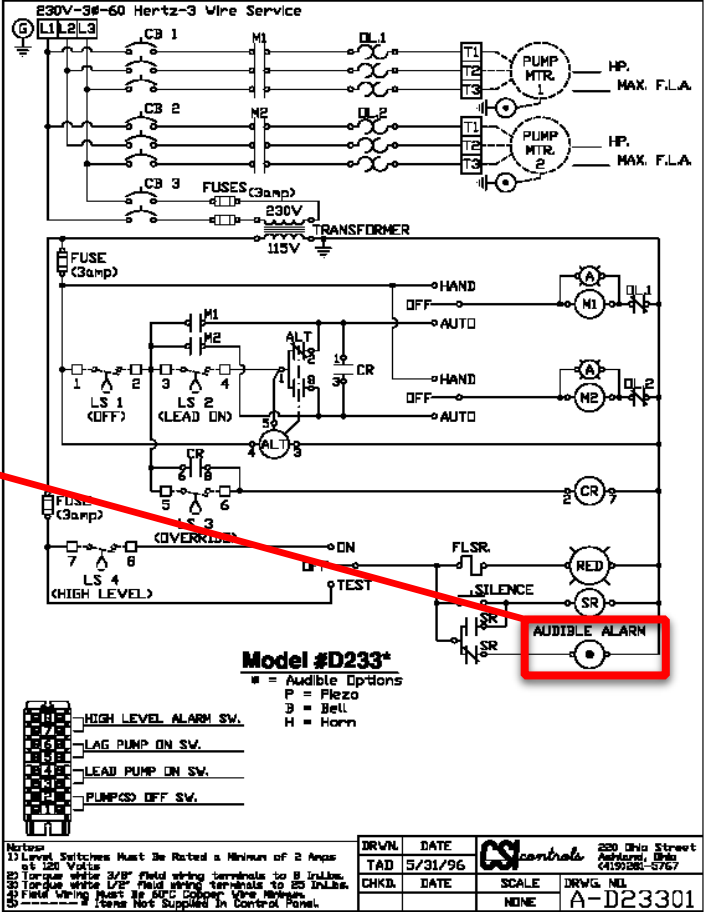
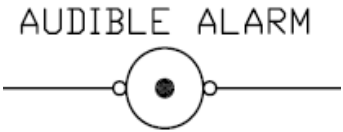
Schematics



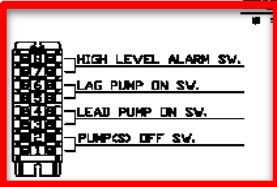
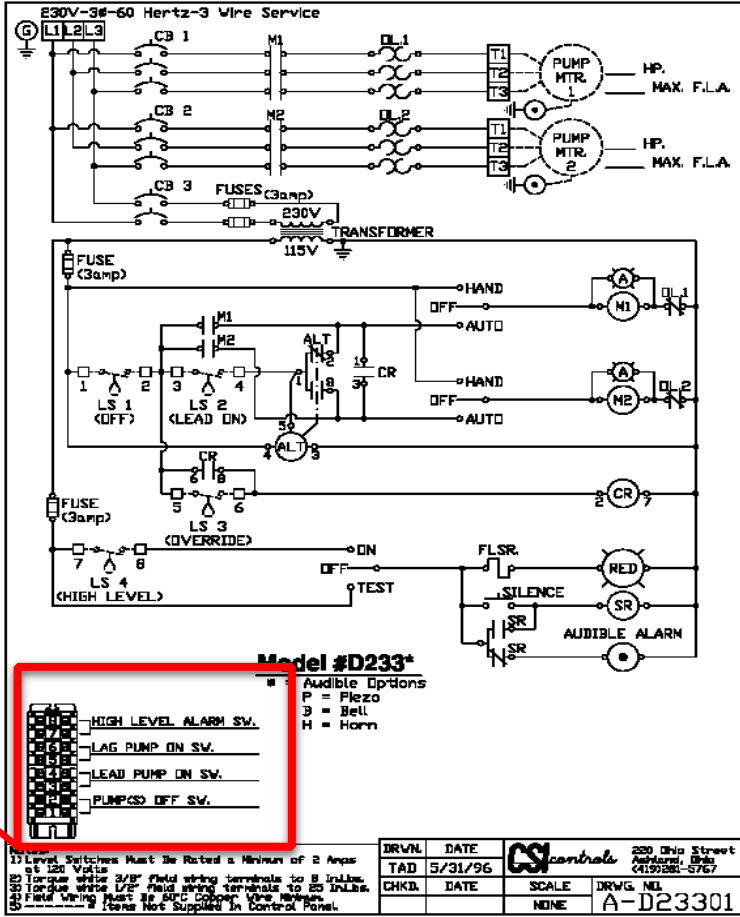
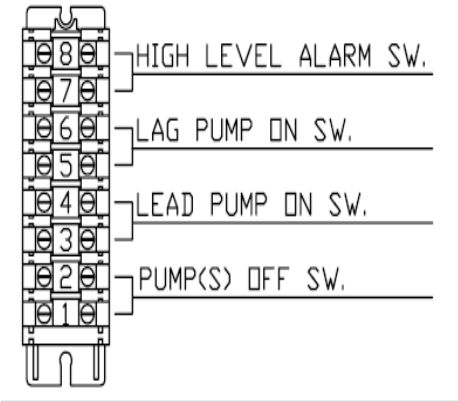
Schematics



Schematics



Schematics

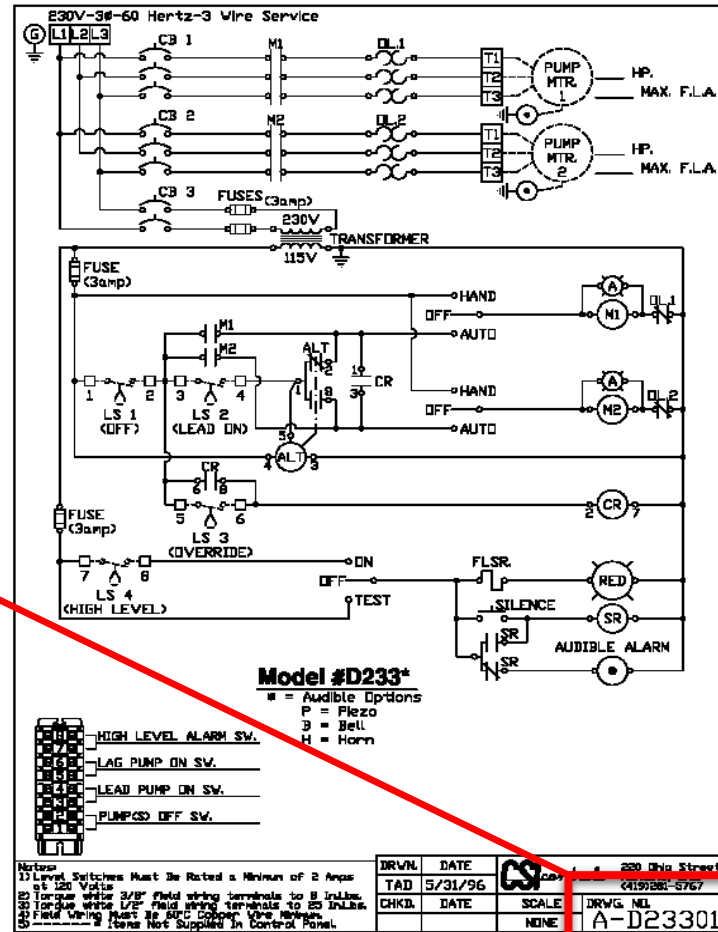


17 Level Switches Must Be Rated a Minimum of 2 Amps at 120 Volts.
 20 Torque when 2/3" field wiring terminals to 8 in/lbs.
 21 Torque when 1/2" field wiring terminals to 20 in/lbs.
 22 Field Wiring must be 18 AWG Copper Wire Minibus.
 23 Items Not Supplied in Control Panel.

DRWN.	DATE	CScontrols	220 Ohio Street Aurora, Ill. 60105-5767
TAD	5/31/96		
CHKD.	DATE	SCALE	DRWG. NO.
		NONE	A-D23301

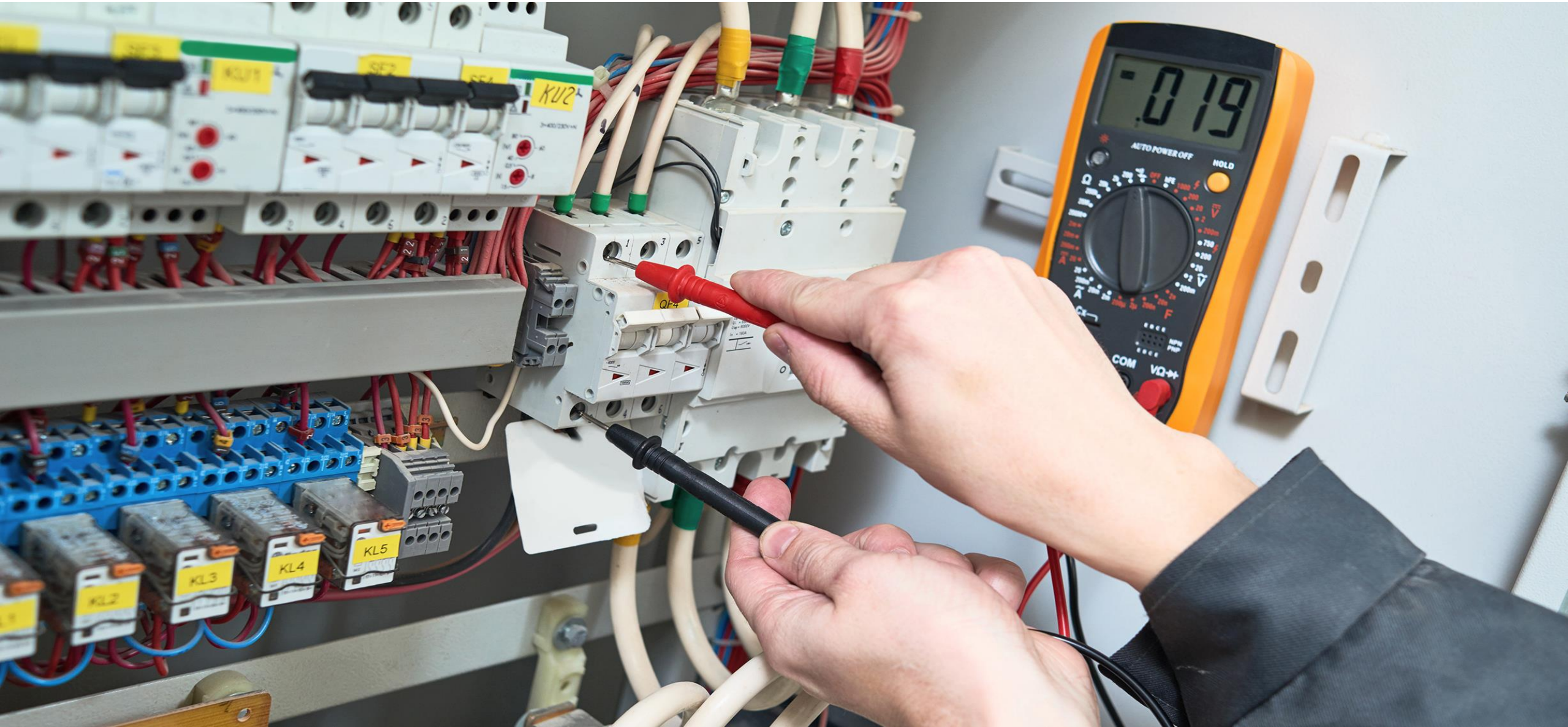
Schematics

DRWG. NO.
A-D23301

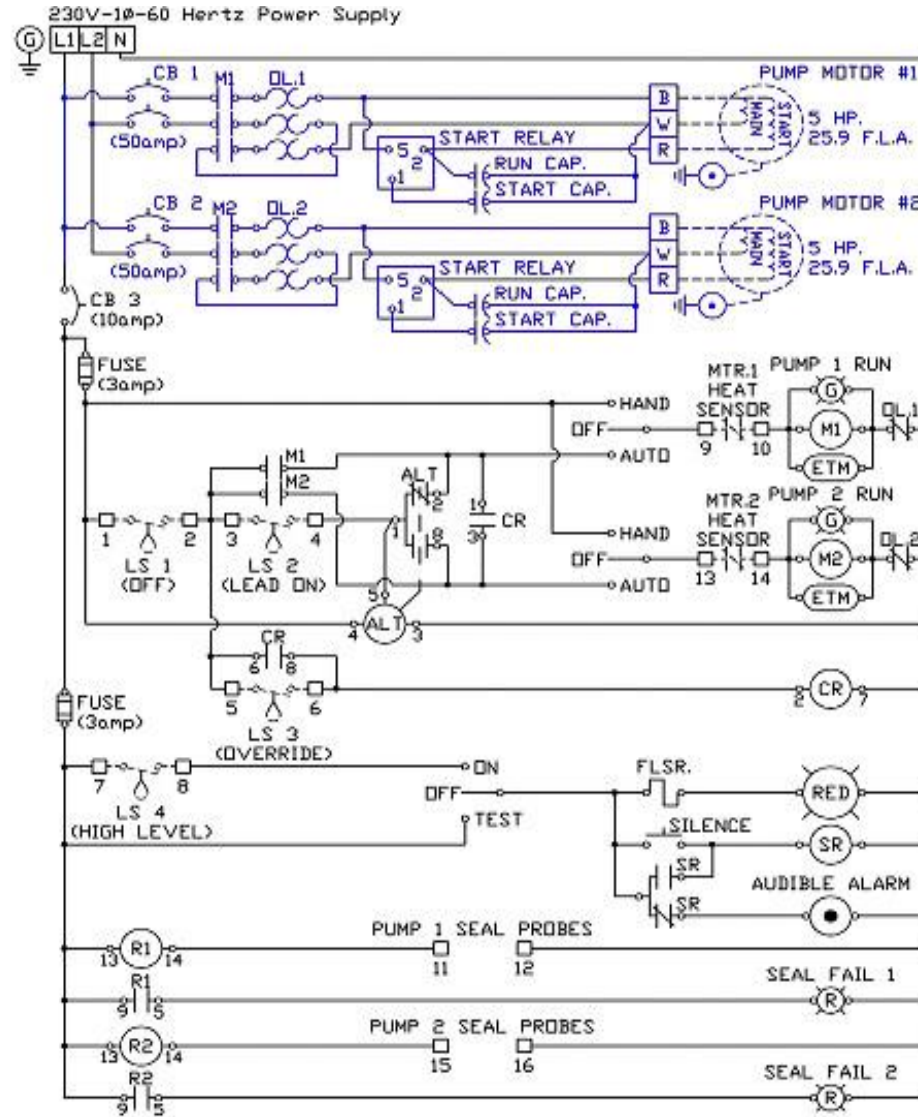


Questions?

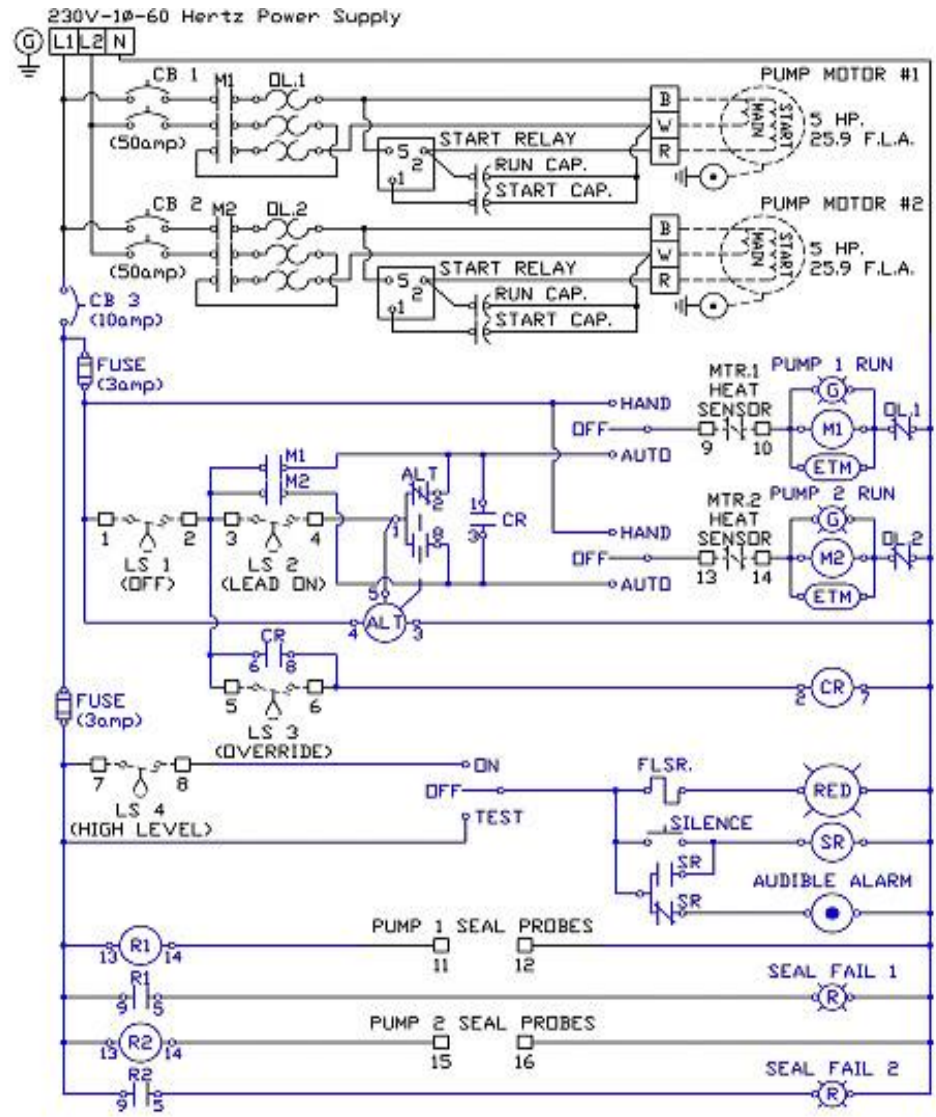
Troubleshooting



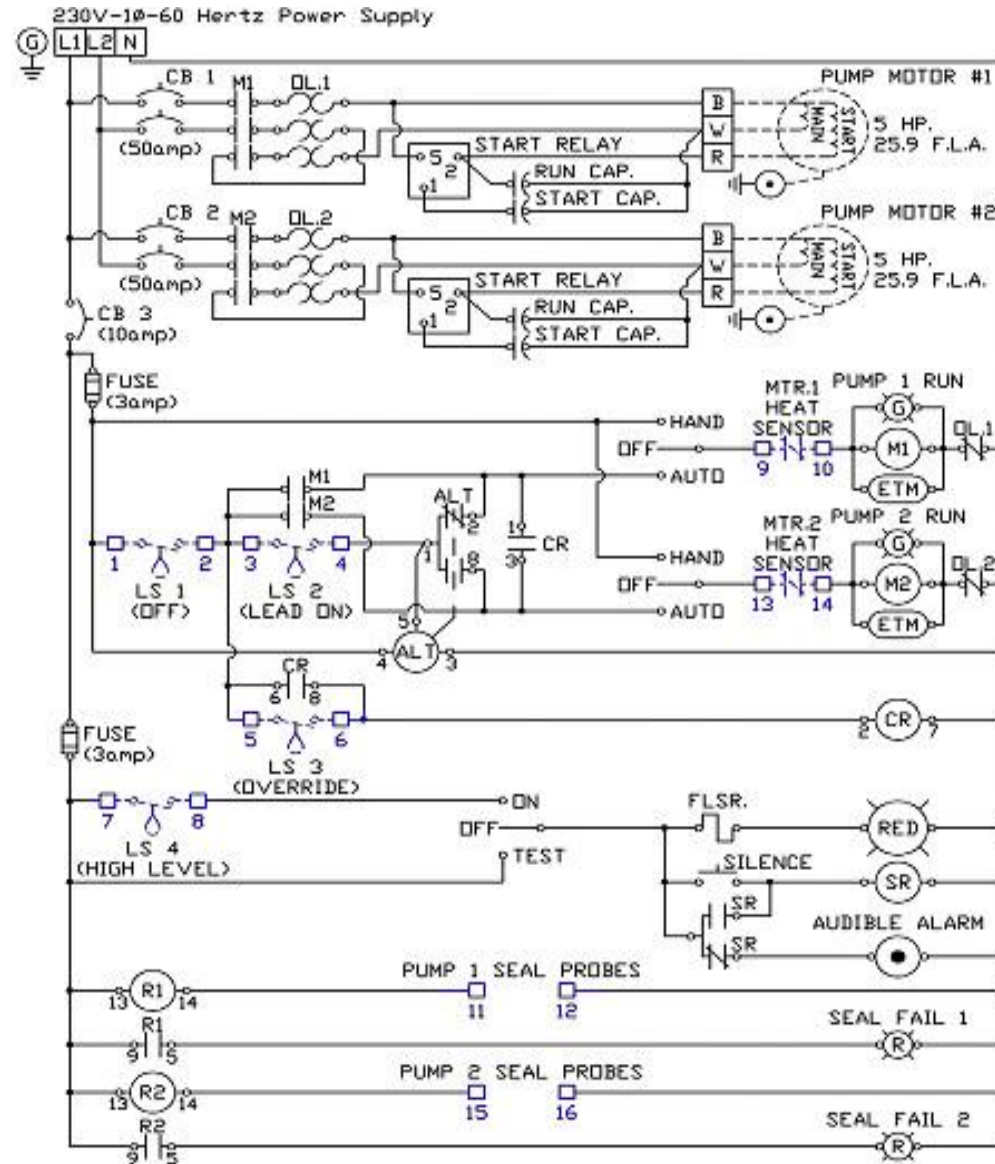
Line Voltage



Control Circuit



Inputs



Thank You!

www.primexcontrols.com

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