OPERATION AND MAINTENANCE MANUAL

RICE LAKE STATE FISH AND WILDLIFE AREA
UPPER MISSISSIPPI RIVER RESTORATION
HABITAT REHABILITATION AND ENHANCEMENT PROJECT
FULTON COUNTY, ILLINOIS

SEPTEMBER 2021

APPENDIX H

PUMP STATION CONTROL BUILDING
MOTOR CONTROL CENTER

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MOTOR CONTROL CENTER

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Rice Lake Habitat Rehab & Enhancement

Illinois Waterway LaGrange Pool
Fulton County, IL.

Motor Control Center
Submittal Documentation

Contractor:
SAF, Inc.
Akron, OH

Engineer:
U. S. Army Corp of Engineers.
Rock Island District

Equipment Supplier:
Flow-Technics, Inc.
Frankfort, IL

Project No. W912EK-11-C-0090
Customer PO: PO00001805

S & K Job #501-11

APPROVAL RECOMMENDED
DATE 12/11/13 BY

Respectfully Submitted by:
S & K Equipment Company, Inc.
1243 Bayou Street
P. O. Box 342
Vincennes, IN 47591
Ph (812) 886-0245
Fx (812) 886-1211

S & K EQUIPMENT COMPANY, INC.
... When Quality Counts ...

P.O. Box 342
1243 Bayou Street
Vincennes, IN 47591
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Fx (812) 886-1211

Item 1: Installation (a summary of comments for each proposed submitted item is included as follows under item 1 and is broken out for each item listed on the Form 4025 as best as possible): Recommend Code E, Not Acceptable.

a. All future shop drawing submittals should be provided on 11x17 size paper because the text is not clearly legible on several of these submitted MCC transmittal drawings. Catalog cuts are acceptable on 8.5x11 paper.

Acknowledged, Please find enclosed

b. MCC Manufacturer fabrication shop drawings not smaller than 11"x17" paper size shall be provided for approval and eventually upon final approval submitted with as-constructed drawings.

Acknowledged, Please find enclosed

c. Drawing 2 of 10; MCC unit cannot be fully evaluated because the unit height is not identified, the MCC electrical ratings are not identified to show compliance, and equipment such as Main Circuit Breaker, TVSS, MCC Unit space heaters, space heater thermostat(s), and power meter are not identified. The unit exterior appearance is correct as required by contract drawing E-601.

Enclosed please find submittal documentation from Square D. Once MMC line-up is received, we (S & K) will up fit to meet specific project requirements. This is why there are two sets of MCC drawings.

d. Drawing 5 of 10, Rung 503, Verify and correct as required. The shop drawings identify isolation contactor "IC-1", but there are no "IC1" isolation power contacts located in the 480 Volt power circuit wires 5L1, 5L2, and 5L3 as shown on contract drawing E-603. Are the 480 Volt contacts for "IC1" shown incorrectly on the contract drawing E- 603 or otherwise why are different controls proposed for this? What will be the timed setting of the timing relay TR1-1? This comment generally applies to Pump No. 2 (IC2 and TR2-1) and Pump No . 3 (IC3 and TR3-1) also.

The IC-1, IC-2, IC-3 contacts were a separate layer within the Auto Cadd file and was inadvertently omitted during plotting. We apologize for this oversight.

The start delay relay (TR-1, TR-2 & TR-3) will be field adjustable. However we would recommend a time delay of 10 seconds to avoid any fault starts.

e. Drawing 5 of 10, Rung 510; Verify and change timing relay label from "TR2-1" to "TR1-2".

Duly Noted & Amended

f. Drawing 9 of 10, Rung 910; Verify and change left timing relay label from "TR3-1" to "TR3 - 2" .

Duly Noted & Amended

g. Drawing 9 of 10, Rung 916, Verify and change "PL1-5" to "PL3-6".

Duly Noted & Amended

h. Drawing 9 of 10, Rungs 917 thru 919 . Change equipment labels from Pump No. 1 labels so they correspond to Pump No. 3 labels as follows:

- Contact "CR1-3" to "CR3-3"
- Contact "CRl-6 to "CR3- 6"
- Contact "CR1-7" to "CR3-7"
- Contact "CR1-8" to "CR3-8"
- Contact "SSRV-1 to SSRV-3"

Duly Noted & Amended

i. Submersible Pump Thermal-magnetic molded case circuit breaker comments:
(1) Molded case circuit breaker is identified to be "Country of Origin.... MX".

(2) Additionally, the catalog cut for this proposed circuit breaker is not most current dated CY 2009 and must ensure that the latest most current catalog information CY2012 is submitted.

Proposed circuit breaker is a current offering by Square D. Enclosed please find updated catalog cut sheets from the CY2012 catalog.

(3) Circuit breakers must be coordinated with the actual pump and SSRV that will be provided to ensure that device is correctly selected and coordinated.

Circuit breaker sizing is based upon NEC requirements to properly protect the ABS M2200/12, 295 HP, 466 full amp motors.

(4) This 600 Amp thermal-magnetic molded case circuit breaker is electrically acceptable, But is it the most current product offered and does this equipment comply with the Buy American Act?

The proposed breaker is a current production product for Square D. Square D product is manufactured all over the world with strong US manufacturing influence.

i. Isolation Contactor IC-1, IC-2, and IC-3; Contactor is acceptable, but note Comment d . above which identifies the IC's power contacts are not shown in their respective elementary control diagrams.

Duly Noted & Amended

k. Control Transformer T-1, T-2, and T-3. Acceptable, Code A.

Acknowledged

l. Circuit Breaker - Square D Declaration of conformity; Acceptable EXCEPT see review Comment in above regarding The Buy American Act.

See Previous Comment

m. Pump Controller and Monitor PC-1, PC-2, & PC-3; The proposed Rockwell Acceptable.

Acknowledged

n. CR Control and Timing Control Relays; Code E, Not acceptable with the following comments:

(1) The manufacturer is the Finder company. The parent company is located in Italy. The control and timer control relays appear to be manufactured in Europe. The Finder company has a subsidiary office located in U.S.A. (Georgia) . Do these relays meet the Buy American Act?

(2) 56 Series relay : The options are not identified and cannot determine compliance with Section 26 24 19.00 40, Paragraph 2.6.6.3. Assume that this is for the 120 VAC control relays, but identify which relays for which this data is intended.

Duly Noted & Amended

(3) 55 Series relay: The options are not identified and cannot determine compliance with Section 26 24 19.00 40, Paragraph 2.6 . 6.3. Assume that this is for the 24 VDC control relays, but identify which relays for which this data is intended.

Duly Noted & Amended

(4) Time Delay Relays: Sockets shall be provided with hold-down clip to comply with Section 26 24 19.00 40, Paragraph 2 . 6.6 . 3.

Hold down clips shall be provided for all plug in relays

m. Pushbuttons; Code C, Acceptable, except as noted as follows:

(1) Independent information search on the internet identified that this pushbutton's Country of origin is Mexico. Does this equipment comply with The Buy American Act?

(2) Appropriately labeled escutcheon plates (legend plates) must be provided with each pushbutton.

Acknowledged

n. Pilot Lights; Code C, Acceptable, except as noted as follows:

(1) Independent information search on the internet identified that this pushbutton' Country of origin is Mexico. Does this equipment comply with The Buy American Act?

(2) The proposed light module is submitted, but the proposed pilot light is not submitted. Pilot lights are required to be LED type and push-to-test in accordance with Section 26 24 19.00 40, Paragraph 2.6.6.2.

Pilot lights shall be LED lamped with associated required lenses for proper visibility.

(3) Appropriately labeled escutcheon plates (legend plates) should be provided with each pilot light.

The proposed Finder relays are manufactured abroad. We have researched several manufactures and have found none that manufacture relays, bases and or pilot lights within the United States. Should the Corp be able to provide information otherwise, we would appreciate the sharing of information.

o. Terminal Blocks; Code A, Acceptable .

Acknowledged

p. Power Supplies, PS-1, PS-2 , & PS-3; Code C, Acceptable, except as noted as follows:
(1) Independent information search on the internet identified that this power supply company is Lovato Electric USA, but the parent company Lovato Electric is located in Italy. Does this equipment comply with The Buy American Act?

The proposed power supplied is manufactured abroad.

q. Control Fuses; Code A, Acceptable.

Acknowledged

r. ABS Sealminder system leak detector; Recommend Code B. Proposed product is same manufacturer as proposed pump manufacturer. Unit presumed to have been coordinated with pump manufacturer to satisfy the requirement for SECTION 22 11 23. 00 10, Paragraph 2.3.6 e. Also presumed that the Contractor has selected sensor and control cables which will be operable suitable for the application.

The ABS Sealminder® is the pump manufacturer's supplied and recommended seal monitoring module. This device offers proper protection and monitoring for moisture within the various detection chambers in the complete pumping unit..

s. Level Transducer; Recommend Code C, Acceptable with the following comments:

(1) Process and compensated temperature ratings are acceptable.

Acknowledged

(2) The transducer is required to be provided with cable length as required by SECTION 22 11 23.00 10, Paragraph 2.3.5 and shall comply with. Keyed. Note 9 on Contract Drawing E-102.

Transducers to be provided with 500-feet of cable length. Contractor to field verify and advise should the length need to be adjusted based upon routing of conduit and field conditions.

(3) The Series 815 Aneroid Bellows; does this unit need a constant temperature. Does the enclosure in which the bellows will be installed need to be heated? Contractor shall provide a control environment as needed for proper operation.

The Aneroid bellows allows for the transducer to properly breathe along with protecting the device from mildew and moisture. The device does not need to be in a controlled environment. Bellows will be factory mounted with the control cabinet near the transducers termination points.

(4) Cable hanger accessory is acceptable.

Acknowledged

(5) The mating Level Transceiver is not identified. What is the system plan for water level sensing and control? The system appears to be differently configured than required by contract (a variation?).

Transducer level control and monitoring will be through the Allen-Bradley PLC. The level will be monitored and displayed through the Automation Direct Human Interface Screen. Based upon field adjustable set points the pump will cycle on and off based upon the process level in relationship to the set points. The low and high level alarms will also be in this same manner.
Pump moisture and thermal monitoring will also be through the individual associated PLC.

Item 2: Wiring: Recommend Code E . No information provided.

Duly Noted & Amended

Item 3: Field amplifiers: Code E . No information provided. Are any field amplifiers needed or proposed?

None Required nor Submitted

Item 4: Amplifiers: Code E . No information provided. Are any amplifiers needed or proposed?

None Required nor Submitted

Item 5: Transmitters; Recommend Code C. See Item 7. Are there any other transmitters proposed?

None Required nor Submitted

Item 6 : Process Indicators: Recommend Code C, resubmittal is required based on the following comments:

a. The Pump Controllers and Monitors PC-1, PC-2, PC-3; The proposed Rockwell Automation small logic controllers and the EZSeries Color Panels are recommended for Code A, Acceptable.

Acknowledged

b . What is intended for the mating transceiver for level indicators LI-101, LI-102, and LI-103?

Our proposed Submersible Transducers (SubT-1, SupT-2 & SupT-3) operate in the same function and manner as the specified LI-101 thru LI-103.No other level sensing devices are required.

Item 7 : Submersible Pressure Transmitter (Product Data): Recommend Code C, resubmittal is required based on the following comments:

a. Process and compensated temperature ratings are acceptable.

Acknowledged

b. The transducer is required to be provided with cable length as required by SECTION 22 11 23.00 10, Paragraph 2. 3.5 and shall comply with Keyed Note 9 on Contract Drawing E-102 .

See Previous Comment

c. The Series 815 Aneroid Bellows; does this unit need a constant temperature. Does the enclosure in which the bellows will be installed need to be heated? Contractor shall provide a control environment as needed for proper operation.

See Previous Comment

d. Cable hanger accessory is acceptable.

See Previous Comment

e. The mating Level Transceiver is not identified. What is the system plan for water level sensing and control? The system appears to be differently configured than required by contract (a variation?).

Our offering functions in real time and will monitor and display each individual sump level within a 10^{th} of a foot. Its operational function is identical to the devices as specified in spec section 40.95.00-5 2.3.2.1. However our PLC is an upgrade to the Process Indicator as called for in 40.95. 00-5 2.3.1. The functionality is greater thru offering friendlier control and expanded capabilities.

Item 8: Hour Meters: Recommend Code C, Acceptable EXCEPT as noted as follows, resubmittal is required. The catalog cut identifies and is marked identifying two different models with two different styles. Resubmit identifying which RTM is intended to be provided.

So Noted & Amended

Item 9: Enclosures: Recommend Code E, not acceptable as noted as follows:
a. MCC fabrication, materials, and ratings not submitted.

So Noted & Amended

b. Control and Power junction boxes and their support structures have not been submitted.

By Others

c. None of the other pumping station building enclosed equipment has been submitted.

By Others

Item 10: Metering and Sensor wiring (Product Data) : Recommend Code E,: No information is submitted.

So Noted & Amended

Item 11: Power Line Surge Protection: Recommend Code E based on following comments:
a. TVSS is not submitted.

So Noted & Amended

b. Control surge protection was submitted f or the liquid level transducer which is acceptable.

Acknowledged

Item 12 : Control Drawings : Recommend Code C with comments as .follows :

a . Drawing 5 of 10, Rung 503, Verify and correct as required. The shop drawings identify isolation contactor " I C-1", but there are no "IC1" isolation power contacts located in the 480 Volt power circuit wires 5L1, 5L2 , and 5L3 as shown on contract

drawing E-603 . Are the 480 Volt contacts for "IC1" shown incorrectly on the contract drawing E-603 or otherwise why are different controls proposed for this? What will be the timed setting of the timing relay TR1-1? This comment generally applies to Pump No. 2 (IC2 and TR2-1) and Pump No . 3 (IC3 and TR3-1) also.

b. Drawing 5 of 10, Rung 510; Verify and change timing relay label from "TR2-1" to "TR1-2".

c. Drawing 9 of 10, Rung 910; Verify and change left timing relay label from "TR3-1" to "TR3-2".

d. Drawing 9 of 10, Rung 916; Verify and change "PL1-5" to PL3-6"

e. Drawing 9 of 10, Rung 917 thru 919 Change equipment labels from pump No . 1 labels so they correspond to pump No.3 labels as follows:

- Contact "CR1-3" to "CR3-3"
- Contact "CR1-6" to "CR3-6"
- Contact "CR1-7" to "CR3-7"
- Contact "CR1- 8" to "CR3-8"
- Contact "SSRV-1 to SSRV-3"

See Previous Comments

Item 18: Submersible Pressure Transmitter (Test Reports): Recommend Code C

a. Submersible Level Transmitter; Recommend Code C, Acceptable with the following comments:

(1) Process and compensated temperature ratings are acceptable.

(2) The transducer is required to be provided with cable length as required by SECTION 22 11 23.00 10, Paragraph 2.3. 5 and shall comply with Keyed Note 9 on Contract Drawing E-102.

(3) The Series 815 Aneroid Bellows; Does this unit need a constant temperature. Does the enclosure in which the bellows will be installed need to be heated? Contractor shall provide a control environment as needed for proper operation.

(4) Cable hanger accessory is acceptable.

(5) The mating Level Transceiver is not identified. What is the system plan for water level sensing and control? The system appears to be differently configured than required by contract (a variation?) .

See Previous Comments

Item 19: Control and Sensor Wire (Certificates) : Code E. Not submitted.

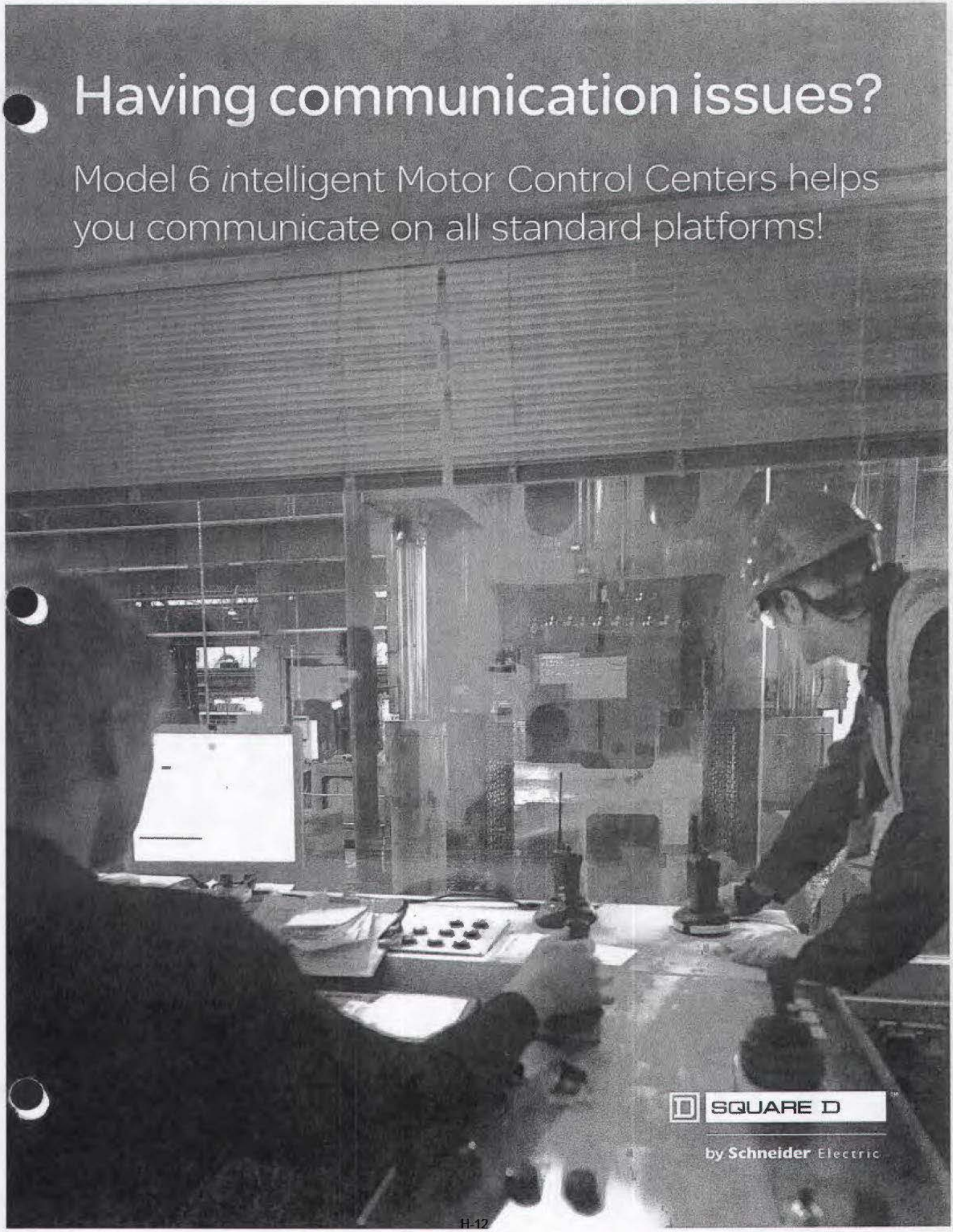
So Noted & Amended

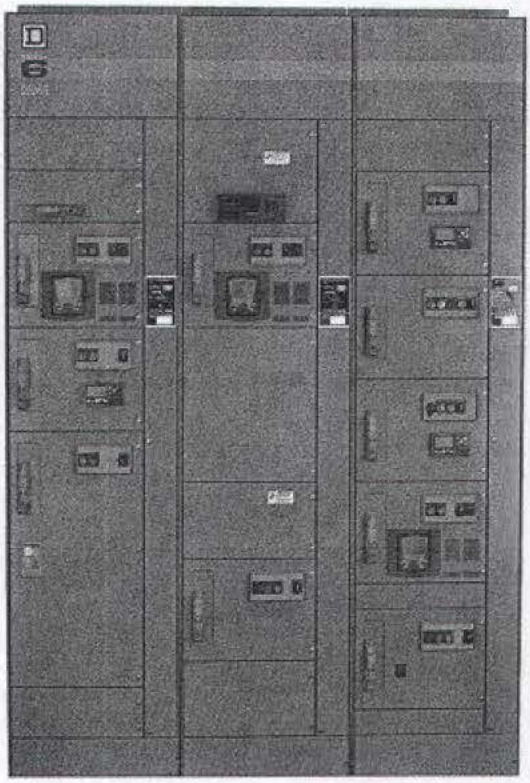
Item 20 : Instrumentation and control System (O&M Data): Code E . No O&M information submitted.

Complete Operational & Maintenance manuals shall be provided at time of shipment. Should a preliminary (less as-builts) be desired for review, please advise accordingly.

Note: Although a few of our minor components are manufactured abroad, we do not see this interfering with the Buy America Act. Since the components are going into a system and through major transformation, we believe our Control System as a whole meets all requirements. Final assembly is at our facility in Southern Indiana.

Note: We will require notification that our proposed service entrance cabinet/section is as per current Ameren Illinois requirements and acceptable for this specific installation.


Having communication issues?
Model 6 intelligent Motor Control Centers helps you communicate on all standard platforms!
SQUARE D
by Schneider Electric



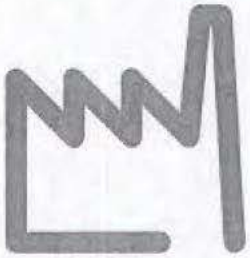
An *i*ntelligent solution.

Intelligence. We're all striving for it. Achieving it requires information that answers the big questions and leads to smart choices.

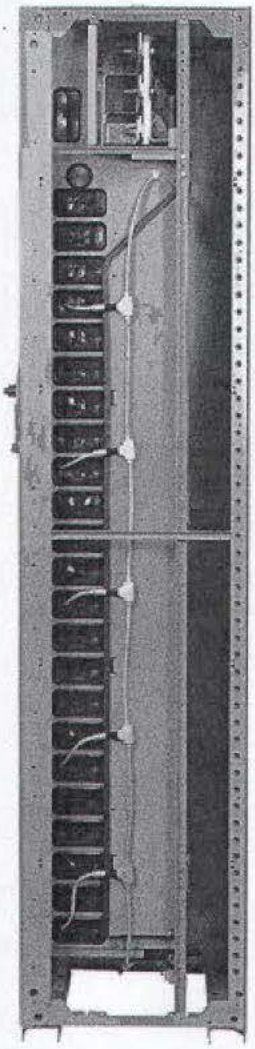
The Square D™ Model 6 intelligent Motor Control Center (iMCC) offers solutions to address your questions.

- How do I eliminate the cost of field wiring hundreds of I/O points?
- Is there a way to streamline troubleshooting?
- How do I predict unscheduled downtime?
- Do procedures exist for proper wire labeling and documentation?
- Can I utilize an existing PLC or factory network?

Factory wiring, popular network protocols, and extensive testing and documentation can make your MCC installation simple. Whether your application calls for hard-wired I/O or a network solution, Square D Model 6 *i*MCCs can deliver the integrated package while reducing acquisition, installation, and commissioning costs.



Industry-leading components



Network communication protocols of your choice

CANopen, DeviceNet, Ethernet, Modbus™, PROFIBUS . . .

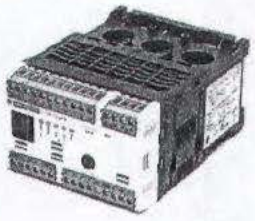
A key feature of our *i*MCC solution is the integration of intelligent devices and device-level networks for control and automation that delivers improved performance. Popular network protocols such as CANopen, DeviceNet™, Ethernet, Modbus and PROFIBUS communicate directly with every unit of the *i*MCC connecting centralized control and widely distributed I/O. The network of your choice creates a common thread for a variety of motor control equipment that not only improves control, but also allows for simple and easy installation and operation.

Networking allows for easy monitoring of critical data of each motor or load connected to the *i*MCC, enabling precise process control at all times. With this information, your staff can respond to potential problems proactively. Real-time access to information and records of last faults allow for simplified diagnostics and reduced downtime.

Using network control to consolidate all I/O communications significantly reduces the amount of tedious wiring that would normally be required for a hard-wired I/O MCC with similar functionality. The network cabling consists of a five-conductor cable and is constructed into the topology that is appropriate for your networked solution. Our industry-leading full-depth wireway effectively separates network cabling from high voltage cabling. Additionally, our standard wireway barrier isolates the communication cabling from the load cabling routed in the vertical wireway.

Experience the benefits of an *i*MCC network:

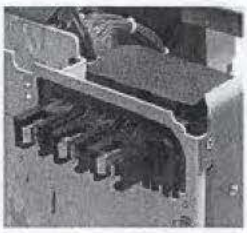
- Remote monitoring capability
- Reduced downtime and system interwiring
- Control to every bucket
- Lower commissioning costs
- Flexible configuration
- Cabling system compliant to applicable standards. DeviceNet solution is Open DeviceNet Vendor Association (ODVA™) certified.



TeSys™ T Motor Management Controllers

Delivering effective protection and control functions to minimize production shutdowns. Configurable functions include overload/underload, phase loss/imbalance, stall, jam, zero sequence ground fault, restart delay timers, and PTC thermistor inputs. Completely open, TeSys T controllers can be incorporated in all industrial communication protocols available: CANopen, DeviceNet, Ethernet, Modbus and PROFIBUS.

*i*MCC: Delivering quality, innovation and reliability.



Shrouded power stabs

Protects the power stabs against damage during unit maintenance and provides a self-aligning method for installation of units and connection to the vertical bus.

PowerLogic™ circuit monitor

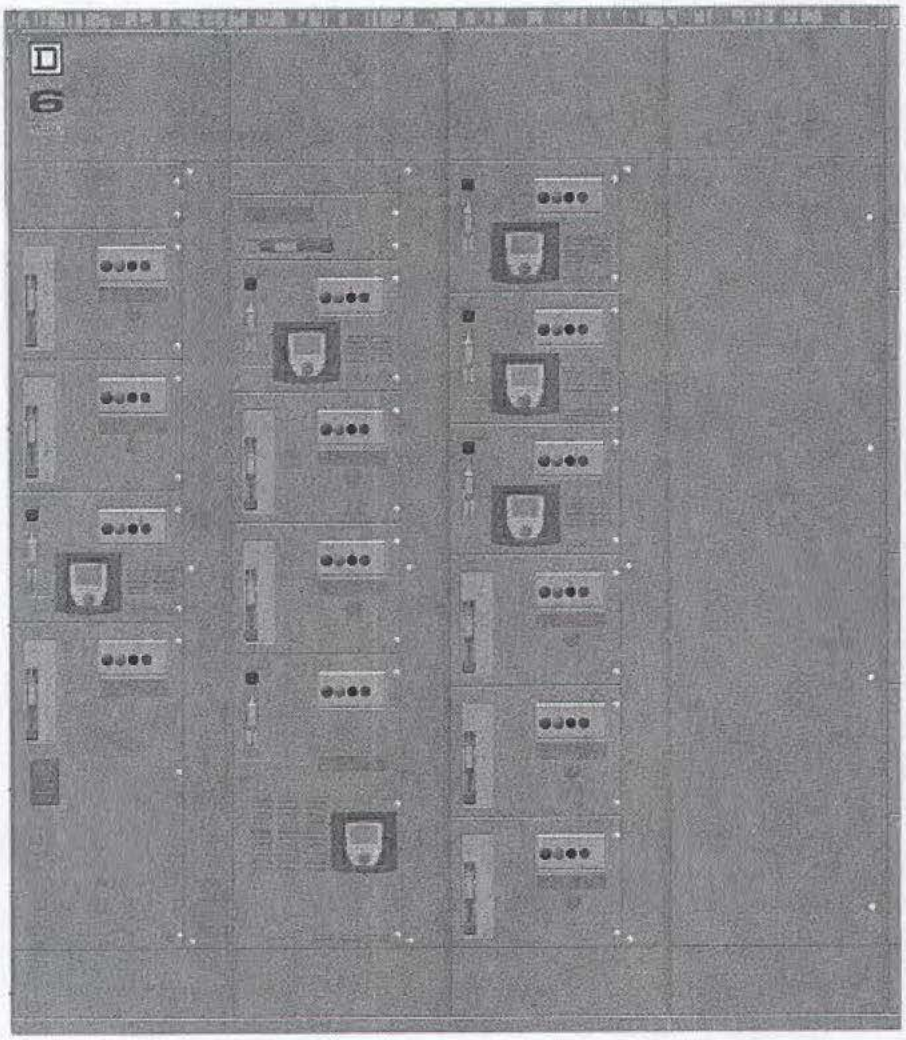
Replaces a variety of meters, relays, transducers and other components. This multifunctional digital metering and monitoring device displays metered values plus extensive min/max alarm, analog/digital input and other key data for local viewing.

PowerPact™ electronic motor circuit protector

The PowerPact MCP offers simple solutions that deliver more reliable start-ups, better protection and a complete adjustment range for your motor starters.

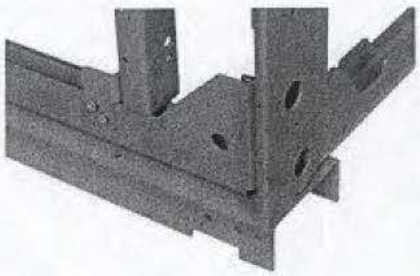
Cast metal handle

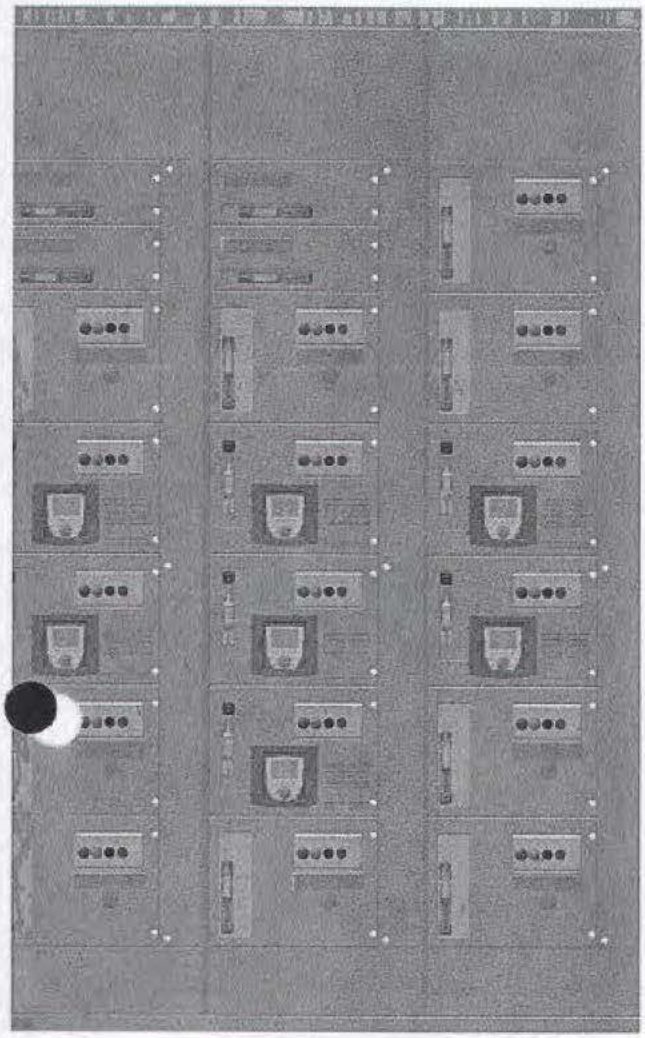
An industry-exclusive feature, more rugged than composites, the metal handle clearly indicates disconnect status, including a "tripped" circuit breaker.

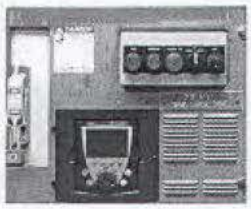


Structural integrity.

The strong, durable Square D Model 6 *i*MCC structure reflects a commitment to quality unsurpassed in the industry. The welded side frames and oversized channels establish the structural ruggedness to meet the most demanding applications.

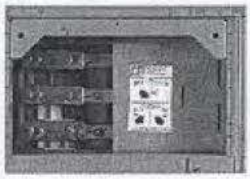






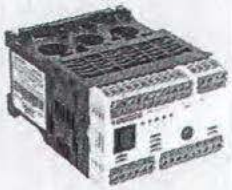
Altivar™ AC drives

Featuring highly expandable I/O, communication, and programmable controller cards, with more than 150 built-in functions, Altivar AC drives are ideal for any application. A long product life and reliability are assured by protective features at all levels.



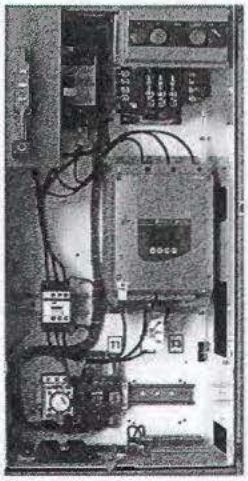
Sliding horizontal bus barriers

The sliding panel design provides easy access to the horizontal bus so preventative maintenance is quicker and easier. A non-conductive material enhances operator safety when performing predictive maintenance. An integrated track system means you do not need to remove the panels to splice or inspect the horizontal bus connections.



TeSys™ T motor management controller

The innovative TeSys T motor management controller product offers the greatest degree of flexibility for selecting the amount of motor protection, control and automation you require. Fully integrated in the Square D Model 6 *i*MCC utilizing the latest protection technology compatible with all existing industrial communication protocols.



Versatility.

The Square D Model 6 *i*MCC offers flexibility to meet your requirements with the integration of a wide selection of intelligent components. Components include electromechanical motor starters, solid state soft starters, adjustable frequency drives, programmable logic controllers and power metering and monitoring units.

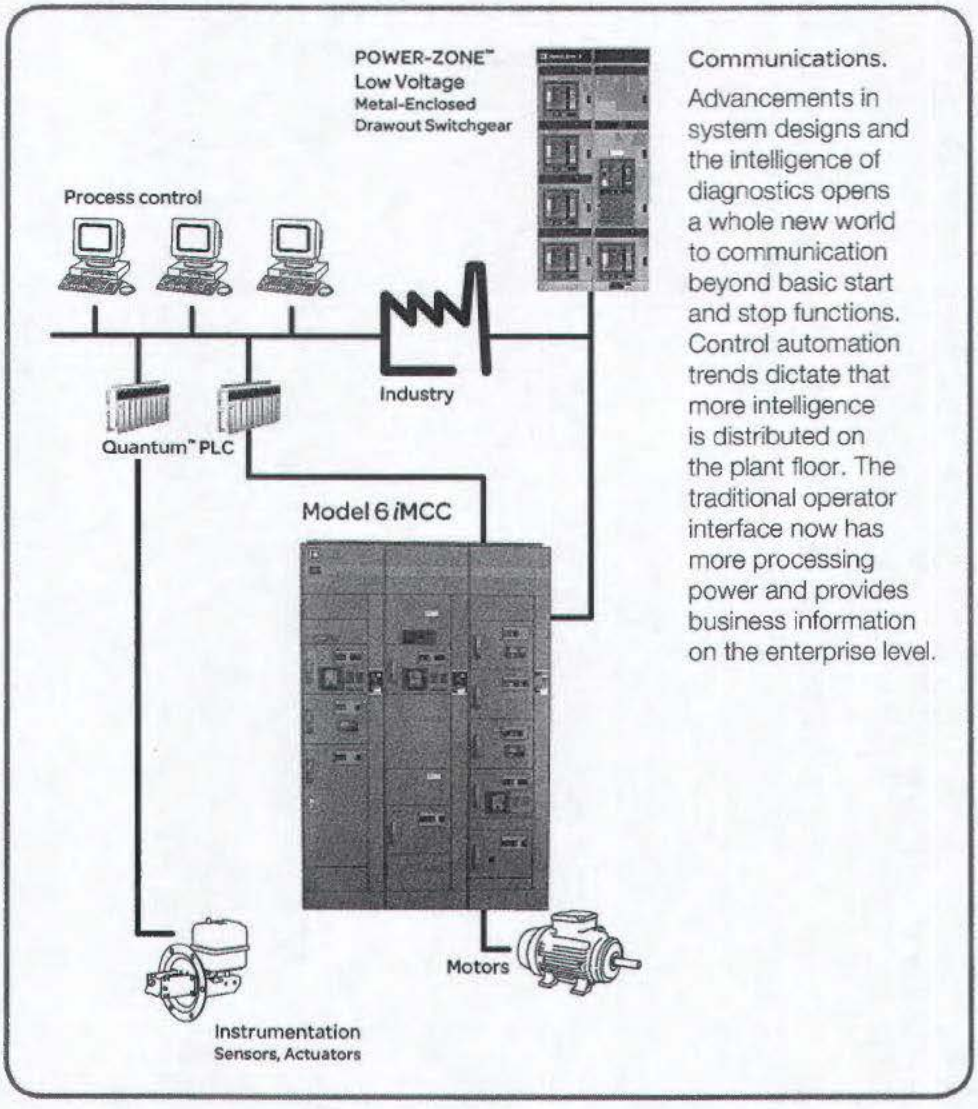
The right information. At the right time.

Square D™ Model 6 *i*MCC

Streamline troubleshooting and maximize uptime by incorporating "intelligent" components and cabling solutions into your motor control center.

We've made it easier to gain access to the information you need in real time, around the clock, from anywhere. Our solutions work on open Modbus™ and Ethernet standards. You can monitor AC drive parameters, view full voltage starter status, spot abnormal conditions immediately, and quickly diagnose equipment failures from any networked computer using any standard Web browser.

It is quick and easy to integrate into your local area network (LAN). Just obtain the IP address, subnet mask and default gateway from your network administrator and connect with a standard 100Base TX twisted pair. It's that simple. Authorized users who have access to your company intranet will have the freedom to check power system information whenever they need. And it does not stop within the walls of the facility. If external access is granted, you can check power system information as easily as you can check your email.



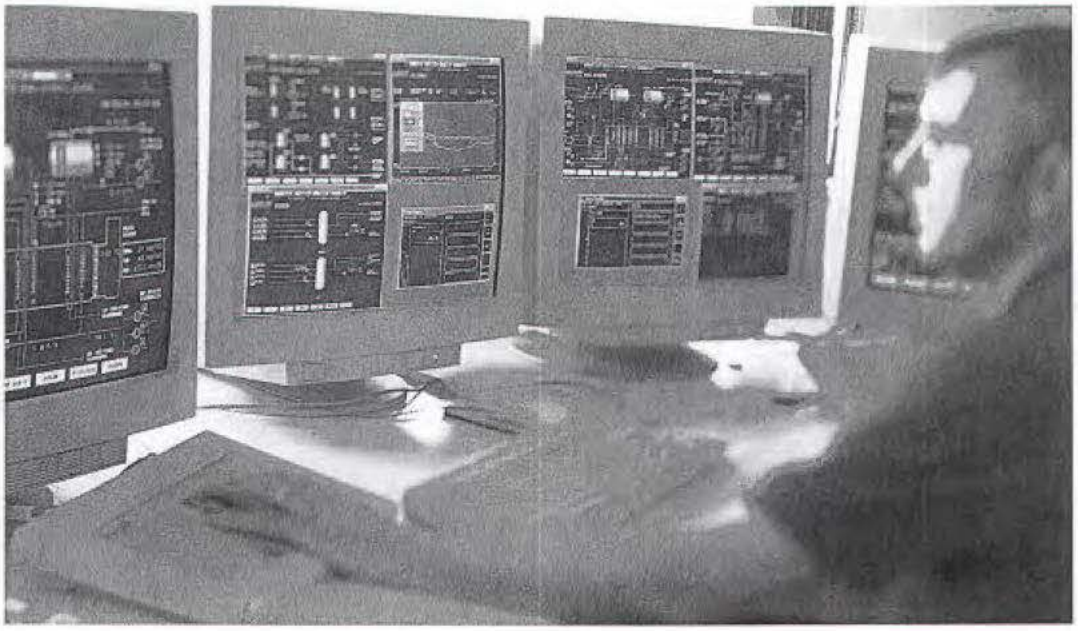
Communications.

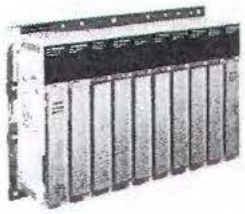
Advancements in system designs and the intelligence of diagnostics opens a whole new world to communication beyond basic start and stop functions. Control automation trends dictate that more intelligence is distributed on the plant floor. The traditional operator interface now has more processing power and provides business information on the enterprise level.

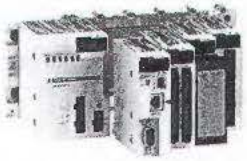
Delivering a basic hard-wired I/O solution.

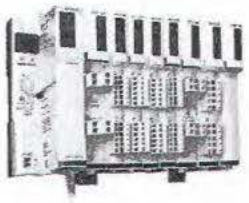
Programmable Logic Controllers (PLCs) or Distributed Control Systems (DCSs) are often part of a networked process. With the basic hard-wired I/O solution, the *i*MCC is factory wired and labeled, tested, and documented, eliminating the time and cost associated with routing, terminating, and labeling of hundreds of wires during installation. Whether a stand-alone processor or several remote I/O drops, you can integrate your hard-wired control scheme into our *i*MCCs.

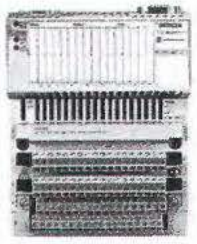
Basic hard-wired I/O delivers a classic approach to troubleshooting during a production breakdown. Electricians and technicians are familiar with this construction and can easily pinpoint problems without additional training.











Flexibility

Choose various distributed I/O configurations with unit mounting or full section mounting options.

Efficiency

Basic solutions allow automation integration capabilities without complexity. Electricians and technicians can easily perform their functions without additional training due to the familiar construction and equipment.

Accuracy

All connections and wire harnesses terminate to pull-apart terminal blocks to reduce errors. Complete factory testing ensures meticulous quality control.

Versatility

You select the choice of CPU and I/O styles for the system that meets your needs. Options range from the high-end, full-function PLC designed for high-performance industrial applications to the more compact mid-range device. The choice is yours.

>> Achieve a new level of *i*ntelligence.

For more information on how our intelligent motor control centers can integrate into your communication protocol of choice, visit **www.schneider-electric.us/go/iMCC** or call **1-888-SquareD.**

Schneider Electric USA, Inc.

1415 S. Roselle Road
Palatine, IL 60067
Tel: 847-397-2600
Fax: 847-925-7500
www.schneider-electric.us

Document Number 8998BR0001R05/11

July 2011

Q2C Number: 30736399 | Quote Number: 3 | Revision Number: 0
Project Name: RICE LAKE SWITCHBOARD | Quote Name: REVISED 1/15/11

Motor Control Center Bill 0f Material (Sq D)

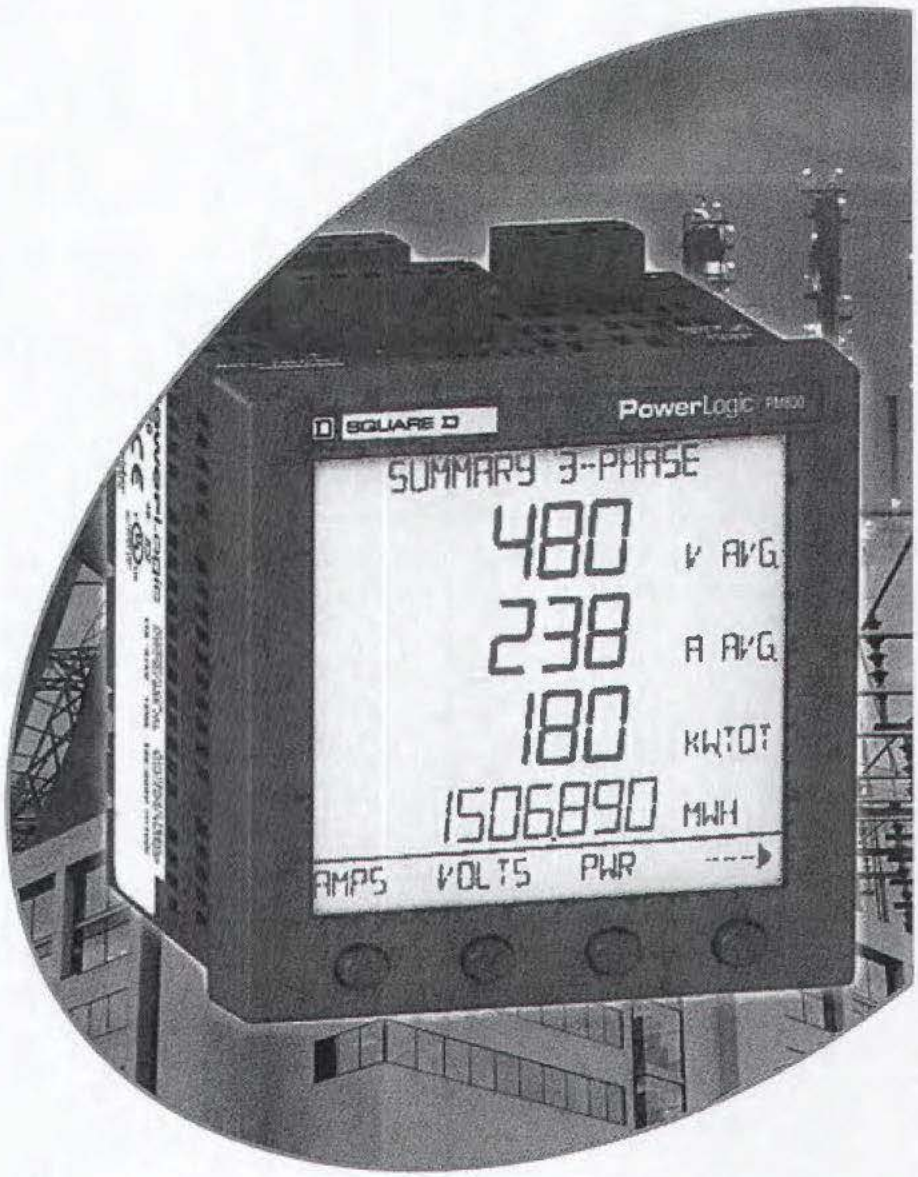
Item No.	Qty.	Catalog Number / Details
006-00	1	**Designation:** MCC1 SQUARE D STANDARD QED SWITCHBOARD QED Switchboard --- Square D Power Style Standard Switchboard Designed and Tested in accordance with: UL 891/NATIONAL ELECTRIC CODE/NEMA PB-2 System Voltage - 480Y/277V 3Ph 4W 60Hz Source Description - Main is Remote System Ampacity - 1600A Bussing - Aluminum Plated w/Tin and Copper Plated w/Silver Neutral Bus - 100% Max Available Fault Current (RMS) - 65kA Enclosure - Type 1 Accessibility: Front Only Exterior Paint Color - ANSI 49 Ground Lug provided for each device Standard Aluminum Ground Bus Lineup 1 BTU: 5614 Dimensions --- 1 - 36" Wide Section(s) 1 - 36" Deep Enclosure(s) Dimensions: 36.00" W X 36" Max D X 91.5" H Approximate Weight: 865.00 Incoming Requirements --- UL Dead Front Entry Point: Right of Lineup Through the Bottom Hot Sequence Utility: Ameren PT Provisions Required **Estimated Ship Days (ARO):** 80 Working Days
007-00	1	**Designation:** MCC1 Model 6 LVMCC Model 6 MCC - Industrial Package --- System Voltage: 480Y/277V 3PH 4W 60Hz Max Available Fault Current (RMS) - 42kA Control Power - 120Vac General Purpose Type 1 Enclosure 1/4" x 1" Horizontal Ground Bus, Tin Plated Copper 1600A Tin Plated Copper Horizontal Bus Class 1 Type B Wiring 20" Deep Construction 42kA Bus Withstand Rating Vertical Ground Bus, Tin Plated Copper White Interior Neutral Bus Minimum Drops per Lineup Master Nameplate Engraved with Black Surface/White Letters Standard Exterior Paint ANSI 49 Equipment Mounting Height 72" Manual Vertical Bus Shutters Fishtape Barrier Unit Nameplate Engraved with Black Surface/

Q2C Number: 30736399	Quote Number: 3	Revision Number: 0
Project Name: RICE LAKE SWITCHBOARD		Quote Name: REVISED 1/15/11

Item No.	Qty.	Catalog Number / Details
		White Letters Rodent Barriers Engineered To Order (ETO) 4 - Section(s) with no Vertical Bus 2 - Section(s) with 600A Tin Plated Copper Vertical Bus DIMENSIONS AND WEIGHT --- Dimensions: 170.00"W X 20"D X 94.5"H Approximate Weight: 4500.00 lbs / 2041.20 kgs INCOMING --- Incoming Connection: Cable UL Service Entrance Label SPD Surge Counter SPD 160kA Surge Rating for Wye Secondary Transformer - with disconnect MAIN --- Main Breaker Top Entry 1600A 100kA Interrupting Rating 24Vdc Trip Unit Power Supply Neutral Lug Termination Electronic Trip Unit with Ammeter Electronic Trip Circuit Breaker with Ground Fault Long-time + Short-time + Instantaneous + Ground Fault Protection #14 AWG MTW Control Wire (Metering) Power Meter PM820 w/ Display FEEDERS --- 1 - Compac 6 Circuit Breaker Branch Feeder 35A 65kA Interrupting Rating 3 - Compac 6 Circuit Breaker Branch Feeder 20A 65kA Interrupting Rating MISCELLANEOUS DEVICES --- 3 - 72" H x 35" W Empty Mounting Unit (1) MOUNT 600A BKR TOP LEFT SECT (TAG#: 8998-19) 8 - 12" Empty Mounting Unit 1 - Surge Protection Device 2 - 6" Empty Mounting Unit **Estimated Ship Days (ARO):** 25 Working Days
008-00	6	PK49SP GRAY SPRAY PAINT **Markings:** DO NOT ship by air. Call CIC in Florence Ky to have Q2C routing updated.

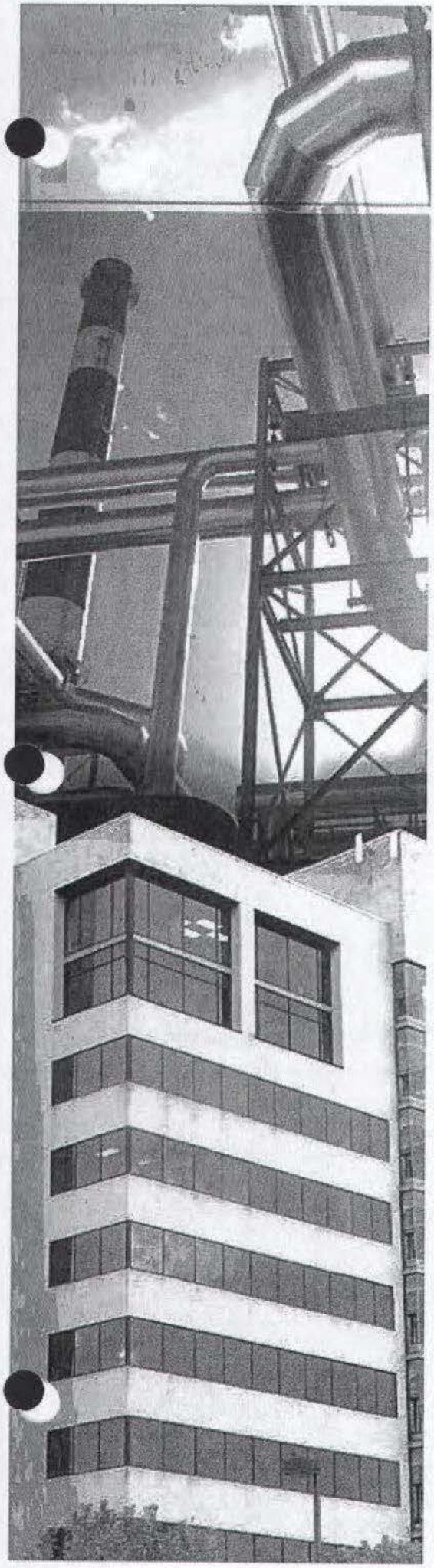
PowerLogic® PM800 series

power meter Model PM820 with Display



a brand of Schneider Electric

SQUARE D



Compact power, energy and power quality meters

The Square D® PowerLogic® PM800 series power meters combine accurate, 3-phase energy and power measurement with data logging, power quality analysis, alarm and I/O capabilities not typically available in a compact meter. The meters are ideally suited to local and remote monitoring of low or high voltage electrical installations in industrial facilities, commercial buildings, utility networks or critical power environments. Facility and operations personnel will benefit in reducing energy-related costs while avoiding power quality conditions that can reduce equipment life and productivity.

PowerLogic® PM800 series power meters are easy to install and use, offering integrated or remote high-visibility displays. A choice of three models and a range of expansion modules help match features to the application and support field-upgrading of meters as required. Serial and Ethernet communication options enable the meters to be used within a PowerLogic power and energy management system or with third-party automation systems.

Typical applications

Power quality compliance monitoring

Validate that power delivered or received complies with the EN50160 international power quality standard.

Disturbance and harmonic analysis

Detect, troubleshoot and resolve power anomalies that can affect sensitive manufacturing, production, data or laboratory processes and equipment.

Energy metering, cost allocation and sub-billing

Upload metered energy values to software to support utility bill verification, contract optimization and cost allocation or billing by department, area or process.

Demand and power factor control

Trend and forecast energy and demand to help analyze usage patterns, compare load characteristics and manage energy costs. Manage demand or power factor using setpoint-triggered relays to control loads or capacitor banks.

Load studies and circuit optimization

Optimize load curtailment and load preservation programs to drive down energy costs and improve system reliability. Reveal unused electrical system capacity.

Equipment monitoring and control

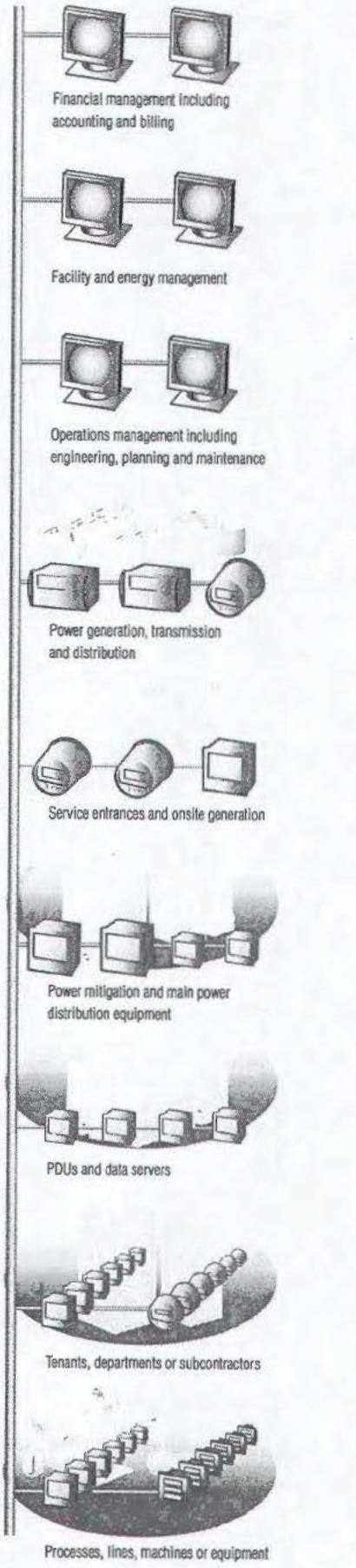
Monitor the status or condition of breakers, generators or other equipment. Automatically or manually control equipment using on-board relays.

Preventive maintenance

Track and alarm on equipment conditions that could indicate excessive wear, imminent malfunction or poor energy inefficiency. Verify that power distribution and mitigation equipment is operating reliably and within specified tolerances.

Integrated utility metering

Read energy pulses from other water, air, gas, electric, or steam (WAGES) meters. Automatically aggregate and convert pulses to energy units for upload to energy management software.



Typical PM800 series application within a PowerLogic® system

Features

Cost-effective, modular design

Standard features include a range of 3-phase power and energy measurements, total harmonic distortion (THD) metering, one RS-485 Modbus communication port, one digital input, one KY-type digital output, and alarming on critical conditions. A choice of four models offers incremental levels of custom logging and power quality analysis capabilities, while expansion modules offer additional logging, I/O and Transparent Ready® Ethernet port. Downloadable firmware helps keeps meter capabilities updated.

Easy installation

Mounts into panel cutouts using two clips with no tools required. Direct connect to circuits up to 600 VAC, eliminating the need for voltage (potential) transformers.

High-visibility display

Optional integrated or remote LCD offers multi-phase measurements, summary screens, bar charts, intuitive navigation and selectable languages.

High accuracy measurements

IEC 62053-22 class 0.5S and ANSI C12.20 Class 0.5S energy accuracy for sub-billing and cost allocation.

Power quality analysis

A choice of THD metering, individual current and voltage harmonics readings, waveform capture, EN50160 power quality compliance evaluation, and voltage and current disturbance (sag/swell) detection.

Extensive data logging, trending and forecasting

Non-volatile on-board logging of min/max values, energy and demand, maintenance data, alarms, and any measured parameters. Trending and short-term forecasting of energy and demand.

Custom alarming with time stamping

Trigger alarms on over 50 definable power or I/O conditions. Use boolean logic to combine up to four alarms.

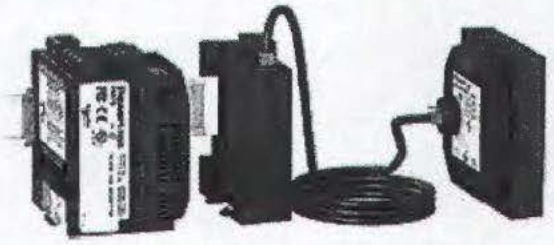
Expandable I/O

A wide choice of standard or optional digital and analog inputs and outputs for pulse counting, demand metering for other WAGES utilities (pulse inputs from water, air, gas electricity or steam meters), equipment status/position monitoring, demand synchronization, triggering conditional energy metering, equipment control or interfacing.

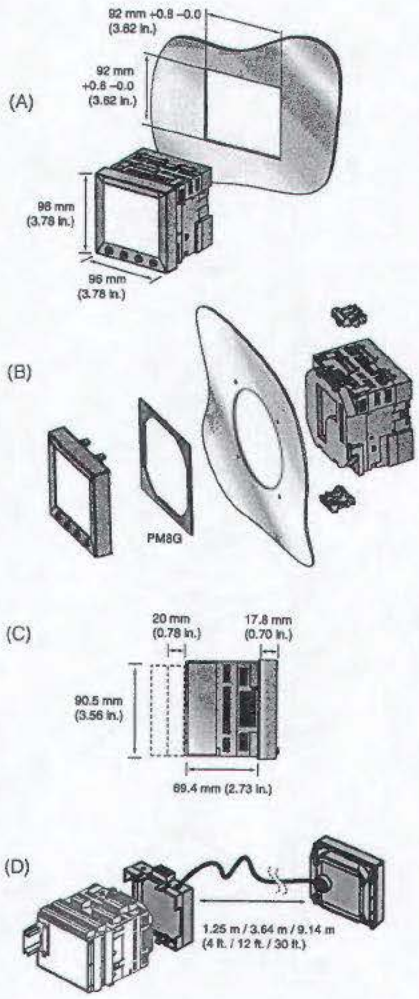
Multi-port serial and Ethernet communications

Two Modbus serial ports and one ethernet port. Use the RS-485 port on the base meter unit or the optional Ethernet port that offers e-mail on alarm, web server and an Ethernet-to-serial RS485 gateway. The remote display adapter option offers an additional RS-485/RS-232 port.

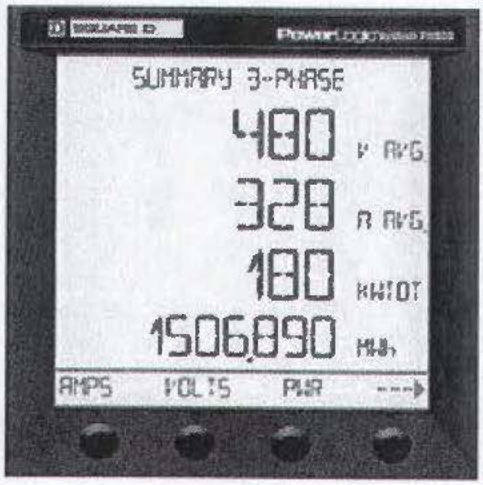
Panel-mount meter with integrated display.



DIN-rail mounted meter with remote display option, including adapter, cable and display.



A. Meter with integrated-display panel, mounted into square cutout.
B. Meter with integrated-display retrofit into existing 4" round meter cutout.
C. Meter unit side view showing mounting depth with and without option modules.
D. DIN rail mounted meter unit with optional remote display package, including display adapter module, display cable and display module. Three cable length options are available.



Front panel display showing function selection buttons and 3-phase voltage, current and power summary display.

Installation

Mounting Options

A meter with integrated display, or a remote display module, can be panel-mounted through a square cutout or retrofit through an existing round meter hole using two clips with no tools required. A small panel footprint and shallow depth make the meters suitable for low voltage switchboards, shallow cable compartments or on stand-alone machines. The meter unit (without display) is DIN rail compatible.

Meters with the optional integrated display can be door panel mounted when voltage connections are within the local regulation limits. When voltage exceeds these limits, the meter unit can be mounted inside the electrical cabinet with an optional remote display connected via a display adapter and cable. The display adapter includes a configurable 2- or 4-wire RS-485/RS-232 port. A single remote display can be transferred between any meter units equipped with display adapters.

Circuit and control power connections

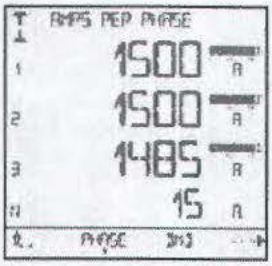
Compatible with low and high voltage 3 and 4-wire, wye and delta systems. Direct connect inputs up to 600 V ac line-to-line or use voltage (potential) transformers for higher voltage systems. All models offer a universal AC or DC power supply.

Input(s)	Specifications
Voltage inputs	
Nominal full scale:	347 direct V ac line-to-neutral, 600 V ac direct line-to-line, up to 3.2 MV with external VT/PT
Metering over-range	50%
Input impedance	5 Mohm
Frequency range	45 to 67 Hz, 350 to 450 Hz 0.01 Hz @ 45-67 Hz 0.01 Hz @ 350-450 Hz
Current inputs	
Nominal current	1 A or 5 A ac
Metering range	5 mA to 10 A ac
Withstand	15 A continuous, 50 A for 10 s per hour, 500 A for 1 s per hour
Load/burden	< 0.15 VA
Impedance	< 0.1 ohm
Control power	
Operating range	115 to 415 V ac ±10% at 45 to 67 Hz or 350 to 450 Hz 125 to 250 V dc ±20%
Load/burden	15 VA (ac) or 10 W (dc) with all options
Ride through	45 ms at 120 V ac or 125 V dc

Front panel display

The unique, anti-glare backlit white LCD can be easily read in extreme lighting conditions or viewing angles. An intuitive navigation with self-guided menus make the meter easy to use. Multilingual operation can be user-configured for English, French, or Spanish.

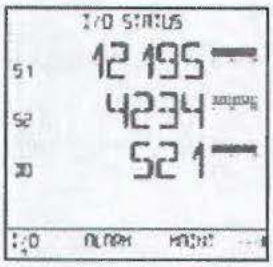
The large 6-line display offers summary screens that simultaneously presents up to 4 concurrent values, including power and energy values, I/O conditions or alarm status. For example, all three voltage or current phases plus neutral can be quickly reviewed at one time. Bar chart displays graphically represent system loading and I/O conditions. Historical and active alarms are displayed with time stamping.



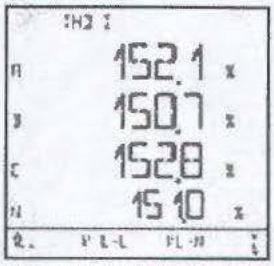
3-phase and neutral current display

Energy in, out, total display

Peak power demand date/time display



Digital inputs and outputs display



Current total harmonic distortion display

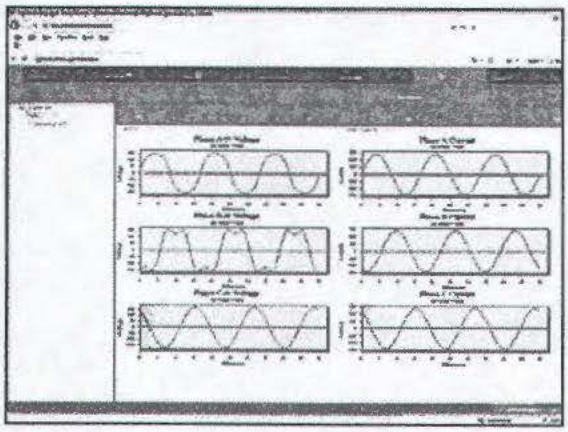
Alarm display showing active alarm

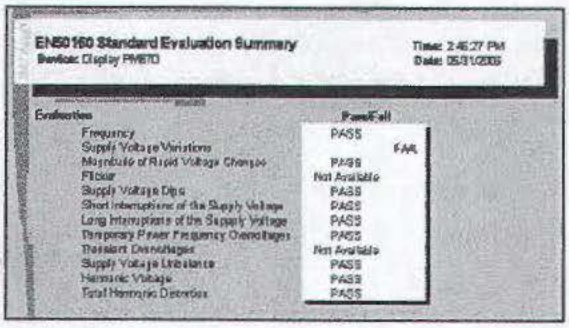
Power and energy measurements

Metering is performed by zero-blind sampling all inputs at 128 samples/cycle with a data update rate of 1 second. The meter offers a range of high-accuracy instantaneous RMS, power, demand and energy measurements suitable for real-time monitoring, energy management and sub-billing purposes.

Measurement	Accuracy
Current: per phase, neutral, min/max	± 0.075% reading + 0.025% full scale
Current demand: present, peak, predicted[3]	
Voltage (line-line, line-neutral): per phase, min/max, unbalance	± 0.075% reading + 0.025% full scale
Power: per-phase, total	± 0.15% reading + 0.025% full scale
Power demand: present, peak, predicted[4]	
Energy: real, reactive, apparent, in/out[2]	IEC 62053-22 0.5S (real), IEC 62053-23 Class 2 (reactive), ANSI C12.20 0.5S
Power factor: true and displacement, per phase, total, min/max[5]	± 0.002 to 0.5000 leading and ± 0.002 to 0.500 lagging
Frequency: present, min/max	±0.01 Hz at 45-67 Hz, ±0.01 Hz at 350-450 Hz

1 Selectable block, sliding, or thermal demand calculation mode with internal or external (via digital input) demand synchronization.
2 Configurable accumulation mode, triggerable from digital input.
3 Full scale = 10A, Add 0.006% (Temperature -25°C to upper limit error for temperatures below 25°C).
4 Full scale = 600V, Add 0.001% (Temperature -25°C to upper limit error for temperatures below 50°C).
5 Full scale = 120V x 10A, Add 0.006% (Temperature -25°C to upper limit error for temperatures below 25°C).


Captured voltage and current waveforms viewed using PowerLogic® System Manager™.



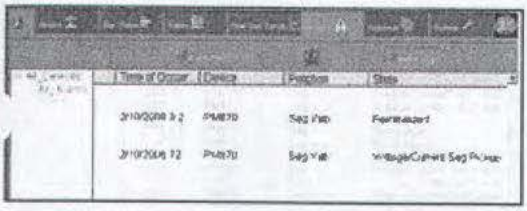
EN50160 evaluation summary viewed using PowerLogic® System Manager™.

Power quality analysis

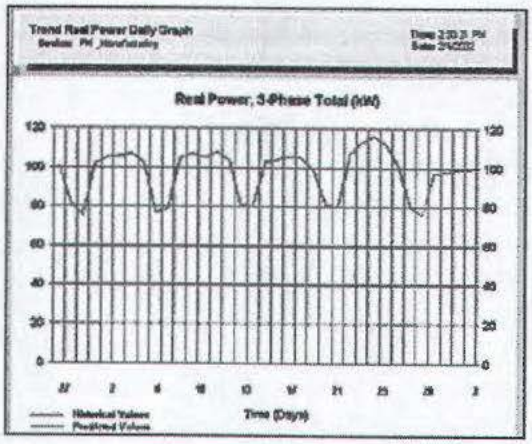
A choice of models offers an incremental range of measurement and event capture features for troubleshooting and diagnosing power quality related problems.

- Basic THD (all models): on voltage and current, per phase, min/max, custom alarming (see Alarm section)
- Individual harmonic magnitudes and angles on voltage and current, up to the 31st harmonic for the PM820, up to the 63rd for PM850 and PM870.
- Waveform capture (PM850 and PM870): triggered manually or by alarm, 3-cycle, 128 samples/cycle on 6 user configurable channels, manual or alarm-triggered initiation.
- Configurable waveform capture (PM870): flexible resolution permits you to adapt the waveform captures according to the type of event/disturbance on selected channels, from 185 cycles on 1 channel at 16 samples per cycle up to 3 cycles on 6 channels at 128 samples per cycle
- EN50160 standard compliance evaluation (PM850 and PM870): pass/fail indication on power frequency, supply voltage magnitude, supply voltage dips, short and long interruptions, temporary overvoltages, voltage unbalance and harmonic voltage
- Disturbance detection (PM870): sag/swell on any current and voltage channel, alarm on disturbances.

Use PowerLogic® System Manager™ or PowerLogic® ION Enterprise v.5.6 software to upload and plot PM850/PM870 waveforms to analyze conditions.

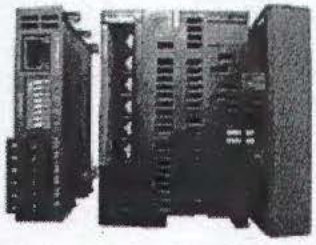


Meter alarm log viewed using PowerLogic® System Manager™ software.



Meter trend log with forecasting, viewed using PowerLogic® System Manager™ software.

Attachment of logging, I/O, or Ethernet expansion modules to meter unit.



Bottom view of PM8ECC Ethernet communications module and main meter unit, showing Ethernet and RS-485 communication port connectors and configuration switches.

Onboard data and event logging

Data is stored in nonvolatile onboard memory, increasing the reliability of critical information used for billing and troubleshooting by eliminating data gaps that can occur due to network outages or computer server downtime.

- Minimum/maximum log: for all instantaneous readings, logs worst phase since last reset, including date and time stamp. See measurements table for parameters logged.
- Maintenance log (all models): records date and time of energy, I/O and demand resets, firmware downloads, power outages and option module changes.
- Alarm log (all models): records all user-defined alarm conditions with date/time stamping to 1 second resolution.
- Billing log and energy per interval: logs kWh in and total, kVARh in and total, kVAh total, PF total, kW and kVar demand. Logs at 15 minute, daily and monthly intervals. Energy per interval log tracks usage and cost for up to three user-defined shifts per day.
- Customizable data logs: One on PM820, three on PM850 and PM870. Each log can record up to 96 user-defined parameters.
- Trend logging and forecasting (PM850 and PM870): trending for energy and demand average, minimum and maximum values by four trend curves. Min/max and average data available for each quantity at intervals of minutes, hours, days and months. Forecasting feature "looks into the future" by automatically forecasting average, minimum and maximum for the next four hours and next four days. Statistical summaries available for hours and weeks.

Logging capacity is 80 kB for PM820, and 800kB for PM850 and PM870. All models provide a battery-backed internal clock. Default logging is set at the factory, logging starts as soon as meter is powered up.

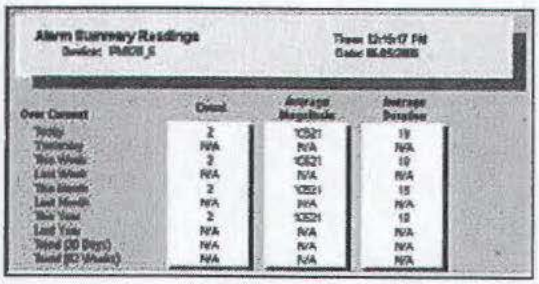
Digital and analog inputs and outputs

All models provide a single digital status/counter input and digital (KY type) output on the meter unit. A range of optional field-installable expansion modules will add more digital and analog I/O as required. Up to two expansion modules can be installed per meter (including logging or communication modules).

Digital output relays can act in response to internal alarms, external digital input status changes, or commands over communications. Digital inputs can be used to trigger alarms, trigger logging, synchronize to a demand pulse or control conditional energy accumulation. All models offer five channels for metering of water, air, gas, electricity or steam utilities (WAGES) through the digital input pulse counting and consumption/demand calculation capabilities of the meter. Pulses from multiple inputs can be summed through a single channel.

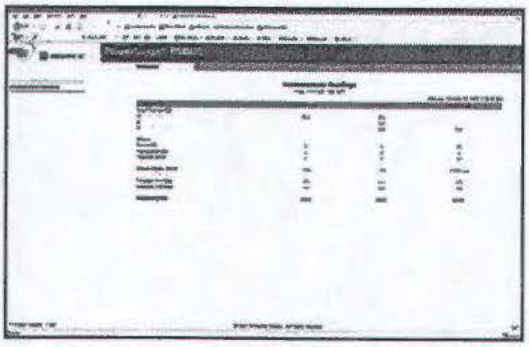
Type	Input / output	Specifications
Standard (meter unit)	1 digital KY output	6 to 220 V ac ±10 % or 3 to 250 V dc ±10 %, 100 mA maximum at 25 °C, 1350 V rms isolation
	1 digital input	20 to 150 V ac/dc ±10 %, < 5 mA maximum burden
PM8M26 option	2 digital relay outputs[1]	6 to 240 V ac or 6 to 30 V dc, 2 A rms, 5 A maximum for 10 seconds/hour
	6 digital inputs	20 to 150 V ac/dc, 2 mA max., 24 V internal supply: 20 to 34 V dc, 10 mA maximum (feeds 6 inputs)
PM8M2222 option[2]	2 digital relay outputs [1]	6 to 240 V ac or 6 to 30 V dc, 2 A rms, 5 A maximum for 10 seconds/hour
	2 digital inputs	20 to 150 V ac/dc, 2 mA maximum
	2 analog outputs	4 to 20 mA dc into 600 ohms maximum
	2 analog inputs	Adjustable from 0 to 5 V dc or 4-20 mA dc

1 Endurance: 5 million operations, 25000 commutations at 2 A / 250 V ac
2 When using two PM8M2222 modules the temperature should not exceed 25 °C.

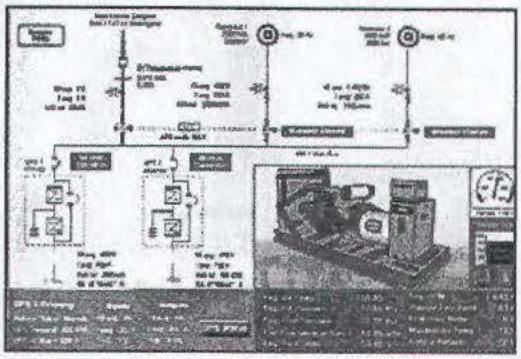


Meter alarm summary report viewed using PowerLogic® System Manager™ software.

Transparent Ready.



Example instantaneous readings web browser screen served from the PM8ECC ethernet communications card.



Example screen from PowerLogic® ION Enterprise® software showing electrical system diagram with multiple real-time metering points.

Alarm and control functions

Over 50 definable alarm conditions with 1 second response time can be used to log critical events or to perform control functions. Trigger on over or under conditions on any measured parameters, phase unbalance, digital input changes and more. Multiple alarms can be defined, with each alarm individually configured with pickup setpoint, dropout setpoint and delay. Each alarm can be assigned one of four priority classes. Assign multiple alarms to a single quantity to create alarm levels. Assign different actions based on the severity level of the alarm. Use alarms to trigger waveform recording, data logging or to control digital outputs.

Boolean alarm logic (PM850 and PM870 only) increases flexibility by allowing the combination of up to four other alarms using NAND, AND, OR, NOR and XOR functions.

Communications

Multiple simultaneously operating communication ports allow the meters to be used as part of a power and energy management system and interface with other automation systems. Captured waveforms, alarms, billing data, and more can be uploaded to software for viewing and analysis. Option modules offer a choice of communications standards.

- Standard RS-485 port (on meter unit): 2-wire connection, up to 38.4 kbaud, Modbus (ASCII and RTU) or JBUS protocol.
- PM8RDA display adapter module: offers a second RS-485/232 port, 2- or 4-wire, Modbus (ASCII and RTU). RS-485/232 port is disabled when a PM8ECC module is on the same meter
- PM8ECC Ethernet communications card: 10/100 Base-T UTP port supporting ModbusTCP/IP communications. Full-function embedded web server providing standard web browser access to meter data, and the ability to email on an alarm from the host meter. RS-485/232 port, 2- or 4-wire, Modbus (ASCII and RTU) master port providing Ethernet-to-serial line gateway functionality. Supports Transparent Ready - Level 1 (TRE) functionality.

Software integration

Integrate within PowerLogic® facility-level or enterprise-wide power and energy management systems. Real-time data and data logs stored onboard can be automatically retrieved on a scheduled basis for analysis at the system level. Compatible with PowerLogic® System Manager, PowerLogic® ION Enterprise®, PowerLogic® Tenant Metering Commercial Edition, and PowerLogic® PowerView™ software.

Modbus compatibility and register-based logged data supports integration and data access by building automation, SCADA and other third-party systems.

Special features

Hour counter: load running time in days, hours and minutes

Downloadable firmware: update your meters with the latest features by simply downloading them from www.powerlogic.com.

General specifications

Description	Specification
Weight	No options, no display: 0.5 kg (1.1 lb.) With integrated display 0.6 kg (1.3 lb.)
Standards	Europe: CE as per IEC 61010-1 protected throughout by double insulation. US and Canada: UL-listed per UL508, cUL508
Operating temp.	Meter. -25 °C to +70 °C, Display. -10 °C to+50 °C, Temperature derating may apply with remote display and multiple option modules. See PM8ECC Installation Guide
Storage temp.	-40 °C to +85 °C
Relative humidity	5 to 95% at 40 °C (non-condensing)
Altitude	3000 m maximum.
Pollution degree	2
Installation category	III, for distribution systems up to 347 Vac line-to-neutral / 600 Vac line-to-line
Dielectric withstand	As per EN 61010, UL508
IP degree of protection	As per IEC 60529: IP52 front display, IP30 meter body
Immunity	ESD: IEC 61000-4-2 Level 3, Radiated: IEC 61000-4-3 Level 3, Fast transients: IEC 61000-4-4 Level 3, Impulse waves: IEC 61000-4-5 Level 3 Conducted: IEC 61000-4-6 Level 3, Magnetic field: IEC 61000-4-8 Level 3, Voltage dips: IEC 61000-4-11
Emissions	Conducted and radiated: CE industrial environment / FCC part 15 class A EN 55011, Harmonics: IEC 61000-3-2, Flicker: IEC 61000-3-3

Features and options	PM820	PM850	PM870
Installation			
Fast installation, panel or DIN mount, ntegrated or remote display	■	■	■
Front panel display (optional)			
Backlit LCD, multilingual, bar graphs	■	■	■
Power and energy metering			
3-phase voltage, current, power, demand, energy, frequency, power factor	■	■	■
Power quality analysis			
THD	■	■	■
Harmonics: individual, up to	31	63	63
Waveform recording		standard	enhanced
EN50160 compliance evaluation		■	■
Disturbance (dip/swell) monitoring			■
Data and event logging			
Standard memory capacity	80 kB	800 kB	800 kB
Min/max log	■	■	■
Maintenence, alarm and event logs	■	■	■
Billing (energy, demand) log	■	■	■
Energy per interval	■	■	■
Customizable data logs	1	3	3
Trending and forecasting		■	■
Timestamp resolution in seconds	1	1	1
Digital and analog inputs/outputs			
Digital inputs (standard / optional)[1]	1/8	1/8	1/8
Digital outputs (standard / optional)[2]	1/4	1/4	1/4
Analog inputs (standard / optional)	0/2	0/2	0/2
Analog outputs (standard / optional)	0/2	0/2	0/2
Alarms and control			
Setpoint response time, seconds	1	1	1
Single & multi-condition alarms	■	■	■
Boolean alarm logic		■	■
Communications			
RS-485 port	2 wire (onboard) 4 wire (with remote display)		
RS-232	with remote display		
Ethernet port	optional (requires PM8ECC)		
Modbus TCP through Ethernet port			
Embedded web server			
Ethernet to RS-485 gateway			

1 On-board and optional digital inputs can be used for on/off status monitoring or for pulse counting
2 On-board digital output is KY type, optional digital outputs are relay type

Ordering Information	Part Number		
PM with integrated display	PM820	PM850	PM870
PM with remote display	PM820RD	PM850RD	PM870RD
PM unit only, no display	PM820U	PM850U	PM870U
PM8ECC Ethernet communication card	PM8ECC		
Remote display adapter alone†	PM8RDA		
Remote display kit includes remote display, adapter and 10' cable (3.04m)†	PM8RD		
RJ-11 thru door 12' cable extender for PM800	RJ11EXT		
PM800 Mounting Adapter for CM2000	PM8MA		
PM800 gasket for analog 4' round cutout	PM8G		
2 digital outputs (relays), 6 digital inputs	PM8M26		
2 digital outputs (relays), 2 digital inputs, 2 analog outputs, 2 analog inputs	PM8M2222		
Cable for remote display adapter 1.25 m (4 ft)	CAB4		
Cable for remote display adapter 3.65 m (12 ft)	CAB12		
Cable for remote display adapter 9.14 m (30 ft)	CAB30		

† RS-485/232 port is disabled when a PM8ECC module is on the same meter.

2007 FROST & SULLIVAN
North American Frost & Sullivan Award for Product Innovation

"The 2007 award recognizes Schneider Electric for its technological advancements and wide product range in the field of power quality (PQ) and energy management solutions. In total, this is the fourth award that Schneider Electric has received from Frost & Sullivan in recognition of achievements in this arena." — Prithvi Raj, Frost & Sullivan research analyst

PowerLogic® ION®

Power Measurement and its ION products were recently acquired by Schneider Electric and integrated within our PowerLogic® range of software and hardware, creating the world's largest line of energy and power management solutions.

Schneider Electric - North American Operating Division
295 Tech Park Drive
LaVergne, TN 37086
Tel: 866-466-7627 Toll Free
PowerLogic.com

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SQUARE D

Document# 3000BR0710 November 2007

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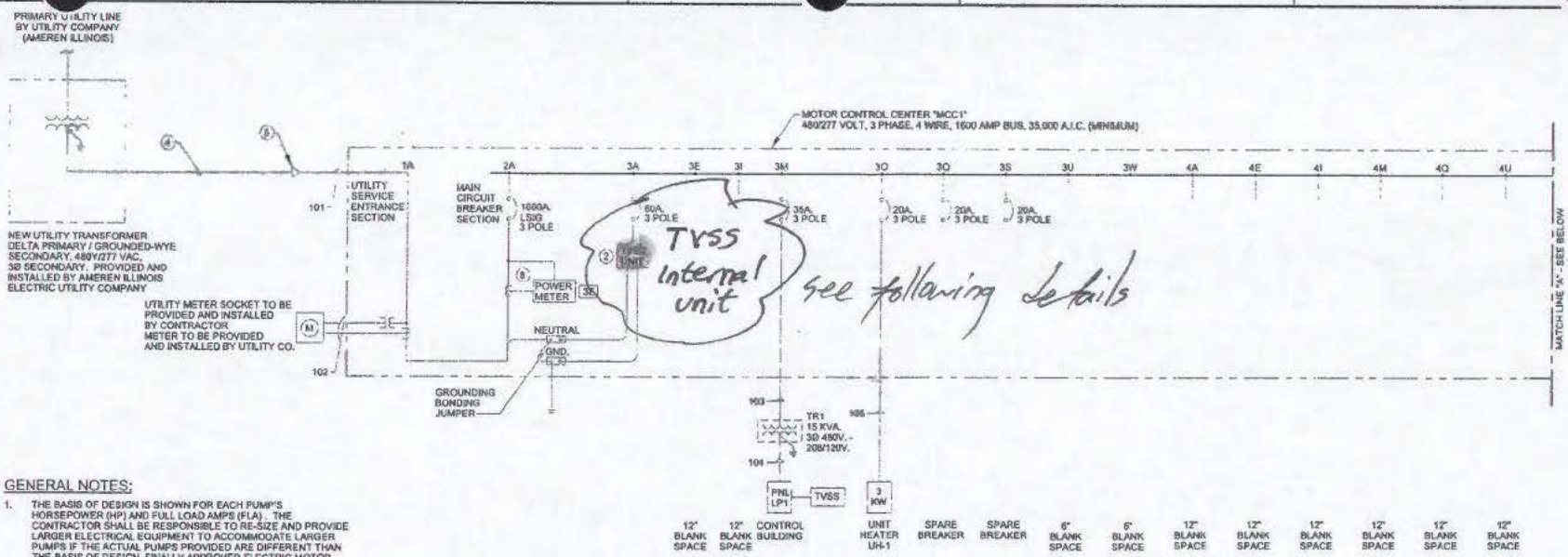
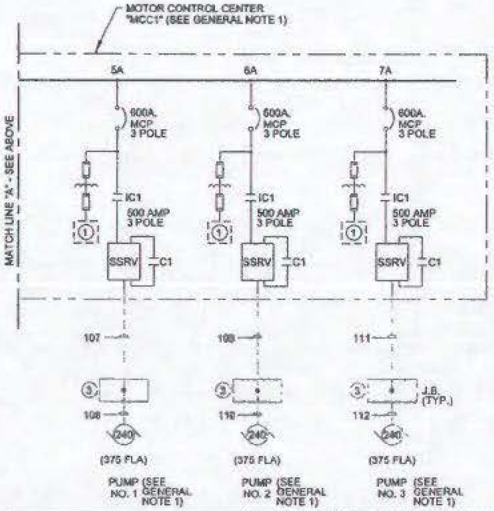


ONE-LINE DIAGRAM - MOTOR CONTROL CENTER "MCC1"

NOT TO SCALE

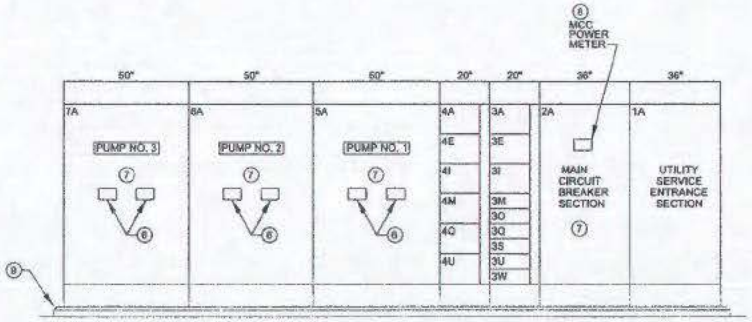
GENERAL NOTES:

1. THE BASIS OF DESIGN IS SHOWN FOR EACH PUMP'S HORSEPOWER (HP) AND FULL LOAD AMPS (FLA). THE CONTRACTOR SHALL BE RESPONSIBLE TO RE-SIZE AND PROVIDE LARGER ELECTRICAL EQUIPMENT TO ACCOMMODATE LARGER PUMPS IF THE ACTUAL PUMPS PROVIDED ARE DIFFERENT THAN THE BASIS OF DESIGN. FINALLY APPROVED ELECTRIC MOTOR SPECIFICATION DATA IS CRITICAL INFORMATION THAT SHALL BE PROVIDED BY THE CONTRACTOR TO BOTH AMEREN ILLINOIS POWER COMPANY AND TO THE CONTRACTING OFFICER'S REPRESENTATIVE.



KEYED NOTES:

1. REFER TO CONTROL WIRING DIAGRAMS ON SHEET E-603.
2. INTERNAL TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS) UNIT. REFER TO SPEC. SECTION 26 20 00 FOR RATINGS.
3. WATERTIGHT SPLICE PUMP CABLES TO ITS FIELD CABLES INSIDE ITS RESPECTIVE ELECTRICAL JUNCTION BOX LOCATED AT EACH PUMP.
4. OVERHEAD CONDUCTORS SHALL BE INSTALLED BY THE UTILITY COMPANY. UTILITY COMPANY TO MAKE FINAL TERMINATIONS AT THE WEATHERHEADS AT THE EXTERIOR OF THE BUILDING.
5. WEATHERHEADS SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR. CONTRACTOR SHALL INSTALL CONDUCTORS FROM MCC1 TO THE WEATHERHEADS, LEAVING A MINIMUM OF 3 FEET OF EXTRA CABLES OUT THE END OF THE WEATHERHEADS FOR CONNECTION BY THE UTILITY COMPANY.
6. PUMP MAS UNIT AND DISPLAY PANEL MOUNTED INSIDE STARTER.
7. CIRCUIT BREAKERS SHALL BE PROVIDED WITH PERMANENT ELECTRICAL SAFETY DISCONNECT LOCKOUT ATTACHMENT EQUIPMENT ACCESSORIES WHICH COMPLY WITH LOCKOUT EQUIPMENT AS STATED IN NFPA 70, NFPA 70E, AND OSHA REGULATION 29 CFR PART 1910.147. PUMP STARTER AND MAIN BREAKER COMPARTMENTS SHALL BE PROVIDED WITH SELF-ADHERING "DANGER" LOCKOUT SIGNS (4 TOTAL). SEE DETAIL 2 ON SHEET E-502 FOR MCC "DANGER" SIGN REQUIREMENTS.
8. THE POWER METER IDENTIFIED IN SECTION 2A IS A MCC ACCESSORY FOR THE PUMP STATION FACILITY USE. THIS METER IS NOT A UTILITY METER. THE UTILITY METER IS SEPARATE EQUIPMENT AND HAS SEPARATE REQUIREMENTS. THE DESIGNATION "3E" IDENTIFIES THAT THIS IS A THREE INSTRUMENT TRANSFORMER TYPE POWER METER. ALSO SEE THE DESCRIPTION OF THIS SYMBOL IDENTIFIED ON SHEET E-001.
9. 3-INCH HIGH (MINIMUM HEIGHT) CONCRETE HOUSE- KEEPING PAD WITH 1" CHAMFERED EDGE. PROVIDE PAD WIDTH AS REQUIRED TO SUPPORT THE MCC ENCLOSURE PROVIDED.
10. MCC SHALL BE PROVIDED WITH APPROPRIATELY SIZED, THERMOSTAT CONTROLLED, ENCLOSURE HEATERS IN EACH COMPARTMENT. HEATERS AND THERMOSTAT SHALL BE SIZED, PROVIDED, AND INSTALLED BY THE MCC MANUFACTURER.



ELEVATION - MOTOR CONTROL CENTER "MCC1"

SCALE IN FEET

ILLINOIS WATERWAY LAGRANGE POOL FULTON COUNTY, IL ROCK ISLAND DISTRICT

SINGLE-LINE DIAGRAM

Sheet ID E-601

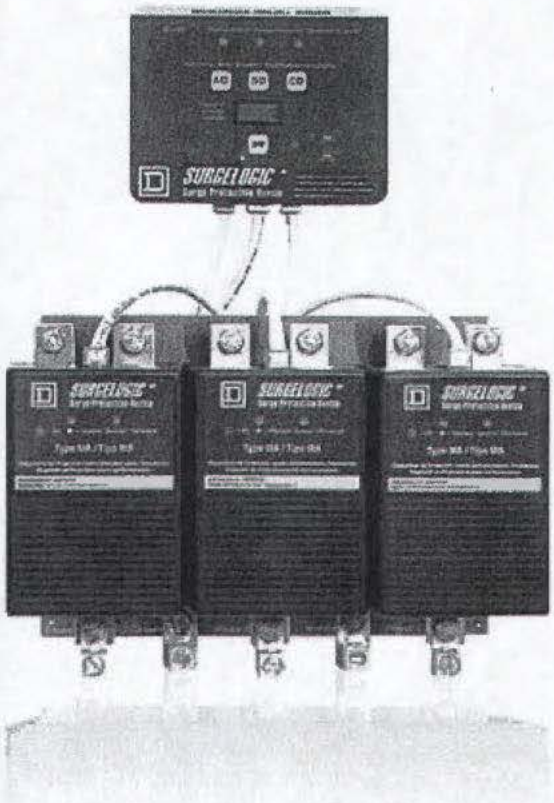
H-30

Enhance system protection and reduce equipment damage.

Surge Protection System 160 kA

Surgelogic™

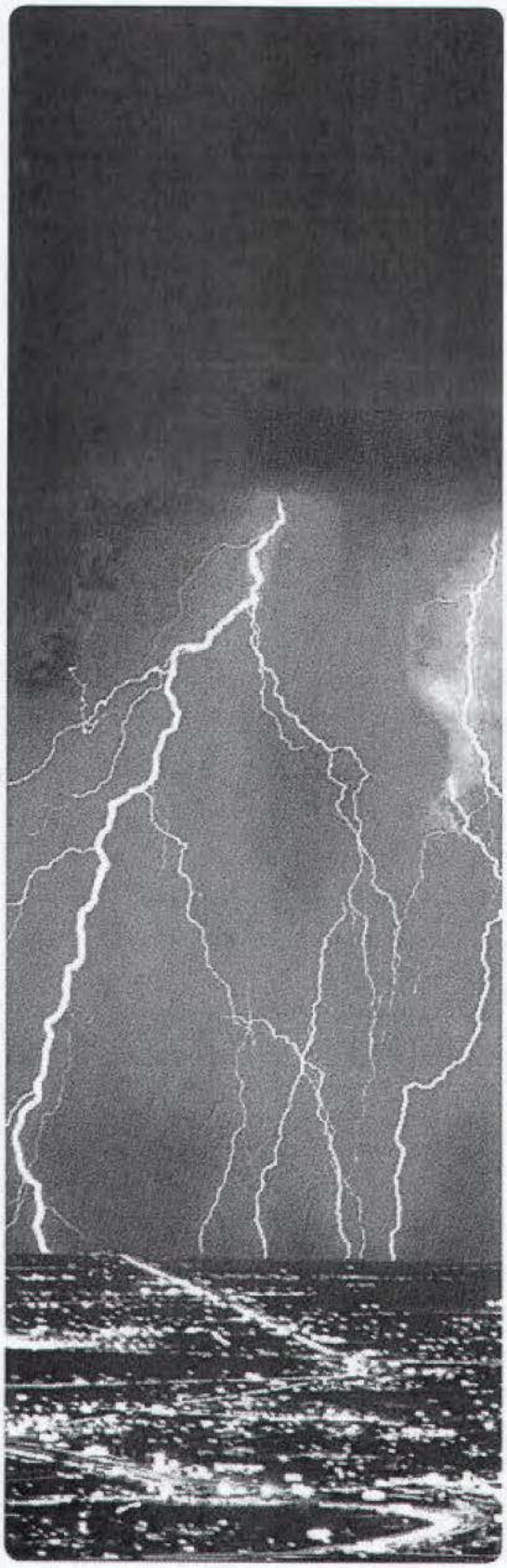
Surge Protective Devices



SQUARE D™

by Schneider Electric

The high cost of surge damage



Utility industry experts estimate that power quality problems including those **resulting from transient voltage surges cost U.S. companies a stunning $80 billion annually**. That figure not only includes the high price of direct damage to electrical distribution systems, electronic equipment, software and tools, but also the crippling cost of lost productivity. Facility downtime, lost data, lost orders and the disruption of critical processes can seriously reduce productivity. This means that minimizing the risk of damage from electrical surges is an absolute priority for companies of all types, all across the globe.

Power disturbances

Lightning and fluctuations in utility power (caused by grid switching, for example) are often assumed to be the main sources of power disturbances. However, the overwhelming cause is actually equipment, such as motors and appliances, turning on and off. Even simply switching lights on and off will cause electrical surges. In many cases, 80 percent of all transient voltage surges are generated from inside sources, while only 20 percent come from outside a facility.

Key causes of internal transients

- Motor switching
- X-ray generators
- AC chillers
- Production machinery
- Robotics
- Welders
- Laser printers
- Copiers
- Capacitor bank switching
- Pumps

Location variables that increase the risk of external transients

- Regions of high lightning activity
- At the end of a utility line
- On a transmission line downstream of industrial facilities
- At a higher elevation than surrounding structures
- In an open, rural location

☑ Internally and externally mounted surge protective devices
☑ Retrofit or new construction
☑ Low let-through levels
☑ High surge ratings

Square D Brand Surgelogic Surge Protective Devices

Unmatched surge suppression. Unequaled experience.

With the Surgelogic line of surge protective devices (SPDs), Square D by Schneider Electric offers world-class solutions for electrical distribution systems. From simple applications to mission-critical implementations in commercial and industrial environments, the Surgelogic line provides a SPDfor every need.

Each Surgelogic SPD is designed, tested, and manufactured in-house, confirming that your solution is:

- Built to the highest standards.
- Features the most advanced technologies.
- Meets the industry's most rigorous testing criteria.
- Backed by the expertise that only 100 years of experience in electrical distribution can bring.
- Made in the United States.

We have the knowledge and resources to help you select the system that's right for your specific needs. This is critical when considering that choosing devices with a higher level of suppression than you need can be unnecessarily costly, while too little suppression can result in serious equipment damage and power outages.

Product safety: Industry-leading testing and design

Schneider Electric has an industry recognized laboratory in the U.S. dedicated to testing and evaluating SPD technologies. We test all of our SPDs by installing them into environments that take into account system components and processes to increase product reliability.

Our lightning laboratory is one of the few places in the world where high energy tests can be performed up to 150,000 A. As a result, we can simulate worst-case scenarios and use the data to improve product performance and safety.

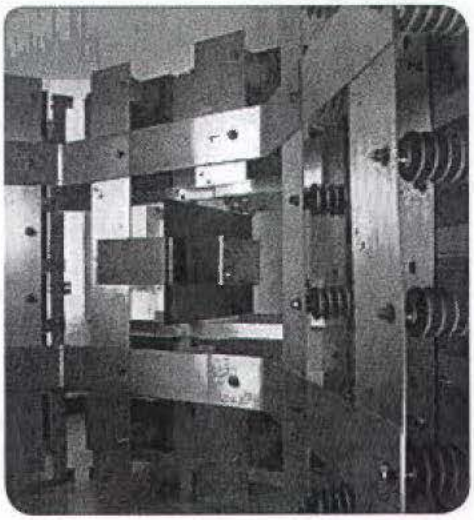
Schneider Electric commits tremendous resources to improving containment and end-of-life events to reduce the additional hazards that could result in catastrophic facility problems. Additionally, our product design and development teams constantly evaluate new suppression technologies and regulatory changes to provide products and systems that meet your needs, and the needs of your customers, anywhere in the world.

- ☑ Internal fusing coordinated with distribution system
- ☑ Modular construction for ease of maintenance
- ☑ Thermal fusing
- ☑ 200 kA short circuit current rating

Expertise that drives design for maximum safety

The Surgelogic family of SPDs incorporates a wealth of electrical distribution and surge suppression expertise that allows you to design with confidence and know that your customers will receive superior surge suppression. We've dedicated extensive resources to advance the power quality industry, including:

- Understanding the effects of transients and lightning on power systems
- Investigating SPD technologies and their coordination with the entire power system
- Defining appropriate product installation practices
- Driving improvements in the NEC, UL, and ANSI codes and standards for the benefit of the industry and its customers
- Designing products for improved performance
- Qualifying all Surgelogic SPDs under severe power conditions to improve performance and end-of-life conditions



▲ *Schneider Electric lighting generators test Surgelogic SPDs in real-world systems and situations.*

A full line: Flexibility across the board

With Square D brand Surgelogic SPDs, you can **choose a surge solution that satisfies the level of suppression you require**. Our systems cover all categories of transient severity as described by the ANSI/IEEE® C62.41 standards. These range from transients of the highest level of severity at service entrance switchgear and switchboards (Category C) to distribution panelboards or switchboards (Category B).

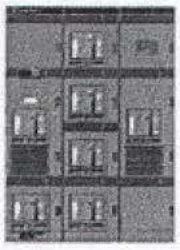
Internal SPDs

Switchboards

QED-2 and QED-S

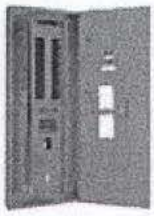
Switchgear

Power-Zone™ 4



Panelboards

NQ

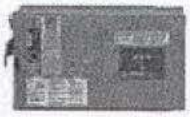


NF

I-Line

Busway

I-Line II

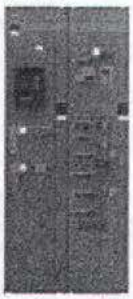


OEM Internal Kit

IMA SPD

Motor Control Centers

Model 6



Surgelogic internal SPDs: Built-in performance

No question, the best way to ensure cost-effective power quality (especially important for critical power facilities) is to use SPDs that are built directly into end-use equipment. That's why Surgelogic internal SPDs are the perfect choice. They are specifically designed for integration with Square D equipment, built-in at the factory for maximum reliability, and fully tested and certified as specified by UL 1449 Third Edition, UL 1283 and UL 67, UL 891, UL 1558, UL 845, and UL 857 as applicable. Surgelogic internal SPD systems use leading-edge technologies to address specific equipment powered by switchgear and switchboards, distribution panelboards, motor control centers, and Busway, as well as a variety of other applications.

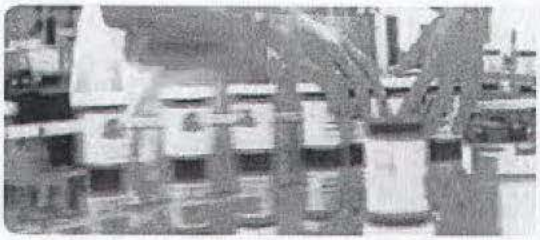
Surgelogic retrofit: Internal and external SPDs

Retrofitting SPD units into I-Line,™ QMB, MCC, and Busway applications is simple. The QMB fusible switch, 6" MCC Bucket, I-Line, and Busway plug-on units come with the SPD already installed. These units can be easily added to existing equipment to provide the performance of a fully integrated SPD.

Schneider Electric also offers a full range of externally mountable SPDs. These units are typically used to address a single piece of equipment or for retrofit applications and can include an internal disconnect and remote monitor as available options. Surgelogic external SPDs are designed to be used alone or in conjunction with internal devices to provide superior surge suppression. Surgelogic external SPDs are also fully tested and certified as specified by UL 1449 Third Edition and UL 1283.

Diagnostics at a glance

All Square D brand Surgelogic SPD systems feature LED-based diagnostics as standard equipment. These monitor the SPD, so you always know its status. You can verify the operational integrity of MOVs, overcurrent, and thermal protection at a glance. Loss of suppression indication and power loss detection are also standard. Switchable audible alarm with test functions, dry contacts, and surge counter come standard on all internal, EMA, and EBA products. A remote monitor is an available option as well.



Modular makes it easy.

All internal and EMA external Surgelogic systems feature a modular design for a flexible, cost-effective way to achieve superior surge suppression at every level of the electrical distribution system. Modularity means lower life cycle costs and fast, easy field service or replacement.

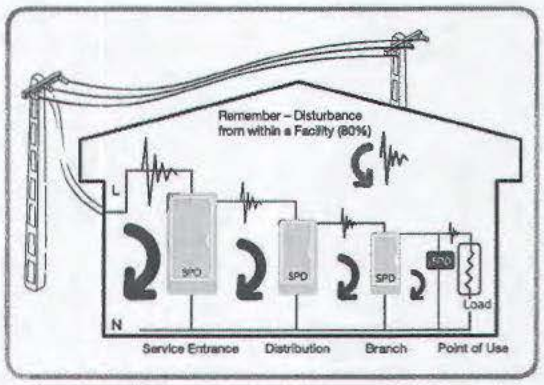
All Surgelogic modular devices share a common architecture, so the same type of module fits NQ or NF panels, I-Line or QMB installations, Busway, MCC, or EMA surge suppressors. Each module includes its own internal diagnostics for a redundant system. If there's ever a problem, any module can be quickly replaced to restore the device.

The Surgelogic SPD diagnostic panel provides quick and clear status indication for the SPD.

Maximizing the effectiveness of your SPDs

Multi-point suppression

Protecting all your equipment within a facility typically requires more than a single SPD located at the service entrance. Strategically locating SPDs throughout your electrical distribution system, commonly referred to as cascading, will provide maximum surge suppression. A cascaded approach to your surge suppression provides suppression of not only the surge events coming in from the utility, but also those surges generated inside the facility.



Lead lengths

Internal/integral SPDs don't require the extra several feet of conductor used by externally mounted devices. That's key because every foot of conductor can increase potentially damaging let-through voltage by more than 100 volts per foot.

The elimination of cables and their impedance in the SPD connection results in the lowest possible let-through voltage, thereby providing maximum suppression to your systems.

Square D Surgelogic SPDs

All the right reasons...

- Specifically designed for distribution systems and the transient environment.
- A comprehensive selection of internal and external devices.
- Internal surge suppression systems expressly engineered for Square D electrical distribution systems.
- Modular systems for flexibility and long-term value.
- Duty-cycle tested – IMA/EMA/EBA: 20,000 impulses, HWA: 10,000 impulses. ANSI C62.41, 10 kA, 20 kV.
- UL-listed designs (in accordance with UL 1449, UL 1283 and UL 67, UL 891, UL 1558, UL 845, UL 857 as applicable).
- Low UL 1449 voltage protection rating (VPR).
- 200 kA short circuit current ratings.
- Ten-year warranty.
- Unmatched level of safety testing.
- Highest UL-defined nominal discharge (In) rating.
- Made in the United States.

The heart of the Square D brand Surgelogic surge suppression solution.

Application guidelines

Exposure Level	Surge Rating	Environment	Internal Mount	External Mount
Extreme	480 kA 320 kA	• Larger ampacity service entrance • Extreme lightning area • Other large industries in area • Large facility in rural locations	• Switchboard • Switchgear	• Modular (EMA)
High to medium	240 kA 160 kA	• High lightning areas • High to medium ampacity service entrance • Service entrance switchboards • Service entrance panelboards	• Switchboard • Switchgear • MCC • I-Line/QMB Panel	• Modular (EMA) • Brick (EBA)
Medium	160 kA	• Distribution switchboards • Branch circuits not protected by a SPD at service entrance • Panels feeding heavy industrial motors • Branch circuits feeding loads outside the facility	• Switchboard • MCC • I-Line/QMB Panel • NQ/NF Panel • Busway	• Modular (EMA) • Brick (EBA)
Medium to low	160 kA 120 kA	• Computer equipment loads • Branch circuits with no upstream surge suppression	• Switchboard • MCC • I-Line/QMB Panel • NQ/NF Panel • Busway	• Modular (EMA) • Brick (EBA)
Low	120 kA 100 kA 80 kA 50 kA	• Branch circuits well inside the facility • Branch circuits with very sensitive loads and upstream surge suppression	• NQ/NF Panel	• Modular (EMA) • Brick (EBA) • Nipple Mount (HWA)

Advanced SPD product specifications

	IMA					EMA/EBA	HWA
Feature	**Switchgear**	**Switchboard**	**Panelboards**	**MCC**	**Busway**	**External modular/ external brick**	**Nipple mount**
Regulatory standards	UL 1558	UL 891	UL 67	UL 845	UL 857	UL 1449	UL 1449
UL 1449 3rd Edition listed	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UL 1283	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Surge current rating per phase	480 kA 320 kA 240 kA 160 kA 120 kA	480 kA 320 kA 240 kA 160 kA 120 kA	240 kA 160 kA 120 kA	240 kA 160 kA 120 kA	240 kA 160 kA 120 kA	480 kA 320 kA 240 kA 160 kA 120 kA	100 kA (HWA only) 80 kA (HWA only) 50 kA (HWA only)
UL 1449 3rd Ed. SPD Type	Type 1 and 2	Type 1 and 2	Type 1 and 2	Type 1 and 2	Type 1 and 2	Type 1 and 2	Type 1 and 2
Nominal discharge current (I_n)	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Voltage protection rating (VPR)							
120/240 V, 1Ø, 3W	700V L-N, L-G, N-G, 1200V L-L						900V L-N, 1200V L-G, 1500V L-L, 700V N-G
240/120 V, 3Ø, 4W high leg delta	700V L-N, L-G, N-G, 1000V H-N, H-G, 1200V L-L, 1500V H-L						1000V L-N, 1200 V H-N and L-G, 1500V H-G and L-L, 1800V H-L, 700V N-G
208Y/120 V, 3Ø, 4W	700V L-N, L-G, N-G, 1200V L-L						900V L-N, 1200V L-G, 1500V L-L, 700V N-G
480Y/277 V, 3Ø, 4W	1200V L-N, L-G, N-G, 2000V L-L						1200V L-N, 2000V L-G, 2500V L-L, 1000V N-G
600Y/347 V, 3Ø, 4W	1500V L-N, L-G, N-G, 2500V L-L						1500V L-N and N-G, 2500V L-G, 3000V L-L
240 V Delta (HWA only)	—	—	—	—	—	—	1500V L-L
480 V Delta (HWA only)	—	—	—	—	—	—	3000V L-L
600 V Delta (HWA only)	—	—	—	—	—	—	3000V L-L
Duty cycle tested ANSI C62.41, 10 kA, 20 kV	20,000 impulses						10,000 impulses
Short circuit current rating (SCCR) (NEC® Article 285)	200,000 A						
Component level fusing	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LED per phase	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Full-time online diagnostics	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Loss of suppression indication	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Audible alarm	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Dry contacts	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Surge counter	Standard	Standard	Standard	Standard	Standard	Standard	No
Remote monitor	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Internal SPD switch	Yes	Yes	Yes (I-Line & QMB) Optional (all others)	Yes	Yes	Optional	No
Mounting location	Internal	Internal Plug-in (QMB) Plug-in (I-Line)	Internal Direct Bus Plug-in (QMB) Plug-in (I-Line)	Internal Plug-in	Internal Plug-in	External	External
Modes of suppression	L-N, L-G, N-G, L-L	L-N, L-G, N-G, L-L	L-N, L-G, N-G, L-L	L-N, L-G, N-G, L-L	L-N, L-G, N-G, L-L	L-N, L-G, N-G, L-L	L-N, L-G, N-G, L-L
Replaceable modules	Yes	Yes	Yes	Yes	Yes	Yes	No
SPD warranty	10 years	10 years	10 years	10 years	10 years	10 years	10 years

Meeting the world's needs for quality power.

With the rapid growth of the Internet and web-hosting facilities, and an explosion in the use of sensitive electronic equipment and controls in manufacturing plants, offices, hospitals and homes, there is universal demand for reliable power. Schneider Electric is the world's leader in power protection. From circuit breakers to surge suppressors, Square D brand Surgelogic products are **dedicated to advancing technology to safely deliver and control electrical power for all of our customers around the world**.

In addition to the featured products, the following products are also instrumental in monitoring your electrical system and creating a cascaded surge suppression network.

Surgelogic XR SPDs

Surge suppression in a compact, hardwired package for 50,000 A and 80,000 A, configurations on single-phase power systems.

SDSA1175 and SDSA3650 Series SPDs

Designed for use against lightning and large surge events in high exposure areas, such as antennas and parking lot lighting systems. These devices may also be used for surge suppression of irrigation pumps, oil pumps, and motors operating below 600 V.

PowerLogic™ Series 4000T circuit monitor

A multifunctional monitor designed to provide detailed electrical and energy system information, including impulse transient detection and capture. Series 4000 circuit monitors help you measure and control energy costs, reduce downtime, and extend the life of your equipment.

★ Visit the Schneider Electric Surgelogic website at **www.surgelogic.com**

Schneider Electric USA

1751 South 4800 West
Salt Lake City, UT 84104
Tel: 801-977-9009
Fax: 801-977-0200

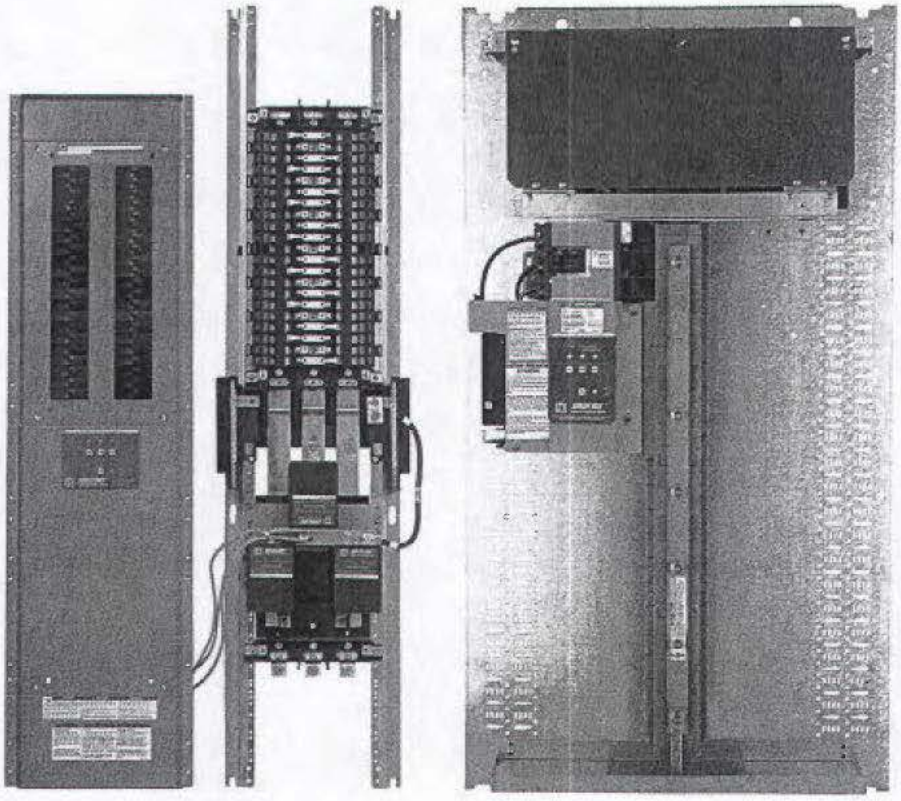
Document Number 1300BR0201R08/11

August 2011

Internal Modular SPDs

Square D Internally Mounted Surge Protective Devices

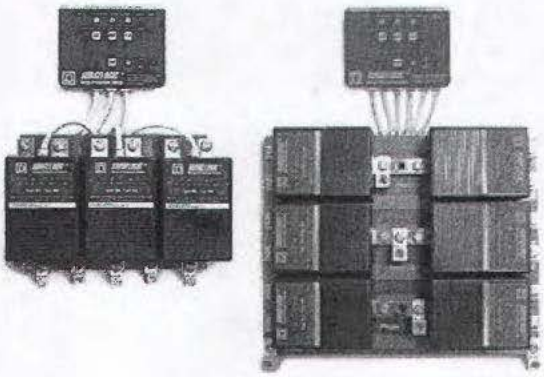
Square D™ brand Surgelogic™ internal modular Surge Protective Devices (SPDs) deliver specification grade performance for service entrance or critical branch panel applications. This multi-phase system provides suppression for all critical modes inside electrical equipment and shorter lead lengths with superior SPD performance.



SQUARE D™

by Schneider Electric

Internal Modular SPDs
Features



Internal panel modular Surge Protective Devices (SPDs) provide superior design and service life for a wide variety of commercial, industrial, or institutional applications. Square D brand SurgeLogic SPDs offer first-rate performance and surge suppression for demanding service entrance applications or as part of a suppression network. The robust modular construction reduces possible down time and maintenance costs.

Superior Performance

Surgelogic SPDs utilize a high-energy suppression circuit that provides 10 modes of suppression from 120,000 to 480,000 peak Amps of surge current rating per phase. Modular SPDs feature circuitry that provides not only transient surge suppression, but also noise filtration.

Installation

Integral solutions come professionally pre-wired into electrical gear and panels from the factory insuring short lead lengths and high performance. All units are tested at the factory before delivery to their final destination, maintaining Square D brand's high standard of quality. There is also no need for additional enclosures or installation labor costs.

Warranty

Surgelogic internal modular SPDs have a 10-year warranty.

FEATURES	ADVANTAGES	BENEFITS
Integral to electrical gear and panels	SPDs are professionally installed inside electrical gear and panels	Delivers high levels of SPD performance and saves on enclosure and installation expenses
120,000 to 480,000 Amp Capacity (depending on model)	Longer service life and suppression against high-energy lightning strikes	High performance surge suppression even in severe electrical conditions
EMI/RFI Noise Rejection	Increased transient suppression	Improves surge suppression to the equipment
Advanced Diagnostics	Allows for online testing of the suppressor's functionality	Provides immediate response if suppressor is damaged
Suppression Status Alarms	Allows multiple methods of alarm notification	Provides immediate notification through audible, visual and remote signaling if reduced suppression occurs
Coordinated Fuse Technology	Coordinated fusing allows disconnection methods for thermal and high-current events	Provides premium surge suppression while managing both thermal and high-current end-of-life events

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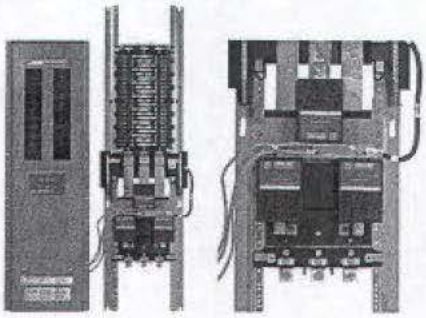
Internal Modular SPDs
Features (continued)

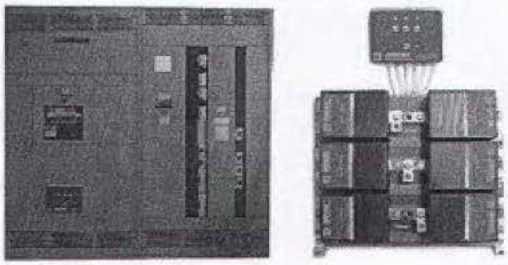
NQ/NF Panelboard



NQ and NF panelboards are primarily used for lighting and power distribution up to 600 Amps. These panelboards, following the 2008 National Electric Code changes, provide electrical capacity up to 84 circuit breakers. Both types of panels are designed with 200% rated copper neutrals for non-linear loads. (NQ max volts 240 Vac, NF max volts 600/347 Vac)

SPD available surge current ratings: 120, 160, 240 kA

QED Switchboard



QED Switchboards are made for use as service entrance equipment or as distribution centers in commercial, institutional, and industrial applications. QEDs are extremely versatile providing front accessible load connections with multiple breaker and fusible switch options. QEDs enable easy access to power monitoring equipment such as products from our PowerLogic™ brand. (Max volts 600 Vac, max current 4,000 Amps)

SPD available surge current ratings: 120, 160, 240, 320, 480 kA

Internal SPDs

Performance

Surge Current Rating per Phase	Up to 480kA
Short Circuit Current Rating	200kA
Modes of Protection	10
Fusing	Individually fused MOVs
Thermal Fusing	Yes
Ocercurrent Fusing	Yes
Filtering	Yes
Operating Frequency	50/60 Hz

Mechanical Description

Connection Method	#10-#2 AWG Terminals
Mounting Method/Circuit Type	Parallel
Operating Altitude	Sea Level-12,000' (3,658 m)
Storage Temperature	-40° F (-40° C) to 149° F (65° C)
Operating Temp.	-4° F (-20° C) to 149° F (65° C)
LCD Operating Temp.	32° F (0° C) to 149° F (65° C)
Operating Humidity	0 to 95% non-condensing

Diagnostics

Push to test diagnostic switches, red and green status LEDs per phase (internal redundant status LEDs are green), module status LEDs per mode, dry contacts, audible alarm with disable switch, surge counter.

Options

- Remote monitor

Safety and Performance

cULus Listed per UL1449 3rd Edition Type 2 SPD, UL 1283 5th Ed., and CAN/CSA C22.2 No. 8-M1986.

Complies with UL 96A 12th Ed. Master Label requirements for Lighting Protection Systems

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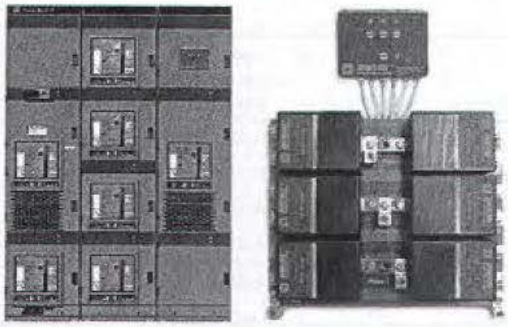
Internal Modular SPDs
Features (continued)

Power-Zone™ Switchgear



The Square D brand Power-Zone 4 low voltage metal-enclosed drawout switchgear is designed to provide superior electrical distribution and power quality management. Power-Zone 4 switchgear is designed to deliver maximum uptime, system selectivity, and ease of maintenance. All of these features are packed into one of the smallest footprints available for low voltage drawout switchgear. (Max volts 600 Vac, max current 5,000 Amps)

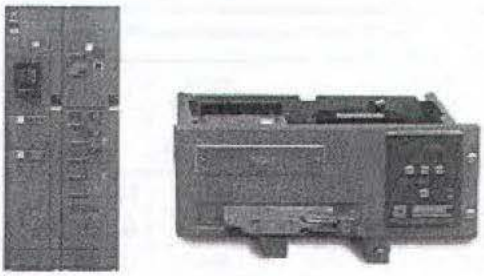
SPD available surge current ratings:
120, 160, 240, 320, and 480 kA

QMB Panelboard

When specifications or electrical codes call for a fusible panelboard, the QMB family offers superior performance and time-saving installation features. The reliability of the QMB panelboard makes it the product of choice for large commercial and industrial applications. (Max volts 600 Vac, max current 400 Amps)

SPD available surge current ratings: 120, 160, 240 kA

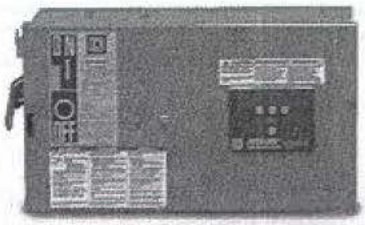
Motor Control Center



The feature-rich modular design minimizes space and maximizes ease-of-use and accessibility of motor control devices. The Model 6 MCC has integrated industry-leading components into the smallest and one of the most flexible footprints possible to meet industry's power, control, and automation needs. (Max volts 480 Vac, max current 2,500 Amps)

SPD available surge current ratings: ~~120~~, 160, ~~240~~ kA

Busway



Square D brand I-Line™ Busway is engineered to replace old cable and conduit systems. This next-generation power distribution system is loaded with exceptional features, including a 200% neutral and a 100% isolated ground path. (Max volts 600 Vac, max current 5,000 Amps)

SPD available surge current ratings: 120, 160, 240 kA

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March 2011 bw

Internal Modular SPDs Specifications

Voltage	Surge Current per Phase	Modes of Protection	Configuration	Model Number	MCOV	I_n	VPR L-N	VPR L-G	VPR L-L	VPR N-G
120/240V	120kA	6	1 Ø, 3-wire+G	TVS1IMA12_	150V	20kA	700V	800V	1200V	700V
208Y/120V ■	120kA	10	3 Ø, Wye, 4-wire+G	TVS2IMA12_	150V	20kA	700V	800V	1200V	700V
480Y/277V ▲	120kA	10	3 Ø, Wye, 4-wire+G	TVS4IMA12_	320V	20kA	1200V	1200V	2000V	1200V
600Y/347V	120kA	10	3 Ø, Wye, 4-wire+G	TVS8IMA12_	420V	20kA	1500V	1500V	2500V	1500V
120/240V	160kA	6	1 Ø, 3-wire+G	TVS1IMA16_	150V	20kA	700V	800V	1200V	700V
208Y/120V ■	160kA	10	3 Ø, Wye, 4-wire+G	TVS2IMA16_	150V	20kA	700V	800V	1200V	700V
480Y/277V ▲	160kA	10	3 Ø, Wye, 4-wire+G	TVS4IMA16_	320V	20kA	1200V	1200V	2000V	1200V
600Y/347V	160kA	10	3 Ø, Wye, 4-wire+G	TVS8IMA16_	420V	20kA	1500V	1500V	2500V	1500V
120/240V	240kA	6	1 Ø, 3-wire+G	TVS1IMA24_	150V	20kA	700V	800V	1200V	700V
208Y/120V ■	240kA	10	3 Ø, Wye, 4-wire+G	TVS2IMA24_	150V	20kA	700V	800V	1200V	700V
480Y/277V ▲	240kA	10	3 Ø, Wye, 4-wire+G	TVS4IMA24_	320V	20kA	1200V	1200V	2000V	1200V
600Y/347V	240kA	10	3 Ø, Wye, 4-wire+G	TVS8IMA24_	420V	20kA	1500V	1500V	2500V	1500V
120/240V	320kA	6	1 Ø, 3-wire+G	TVS1IMA32_	150V	20kA	700V	800V	1200V	700V
208Y/120V ■	320kA	10	3 Ø, Wye, 4-wire+G	TVS2IMA32_	150V	20kA	700V	800V	1200V	700V
480Y/277V ▲	320kA	10	3 Ø, Wye, 4-wire+G	TVS4IMA32_	320V	20kA	1200V	1200V	2000V	1200V
600Y/347V	320kA	10	3 Ø, Wye, 4-wire+G	TVS8IMA32_	420V	20kA	1500V	1500V	2500V	1500V
120/240V	480kA	6	1 Ø, 3-wire+G	TVS1IMA48_	150V	20kA	700V	800V	1200V	700V
208Y/120V ■	480kA	10	3 Ø, Wye, 4-wire+G	TVS2IMA48_	150V	20kA	700V	800V	1200V	700V
480Y/277V ▲	480kA	10	3 Ø, Wye, 4-wire+G	TVS4IMA48_	320V	20kA	1200V	1200V	2000V	1200V
600Y/347V	480kA	10	3 Ø, Wye, 4-wire+G	TVS8IMA48_	420V	20kA	1500V	1500V	2500V	1500V

■ 208Y/120 series also applies to the following voltage 220Y/127 ▲ 480Y/277 series also applies to the following voltages 380Y/220, 400Y/230, and 415Y/240

Voltage	Surge Current per Phase	Modes of Protection	Configuration	Model Number	MCOV	I_n	VPR L-N	VPR H-N	VPR L-G	VPR H-G	VPR L-L	VPR H-L	VPR N-G
240/120HLD	120kA	10	3 Ø, HLD*, 4-wire+G	TVS3IMA12_	150V	20kA	700V	1200V	800V	1200V	1200V	1500V	700V
240/120HLD	160kA	10	3 Ø, HLD*, 4-wire+G	TVS3IMA16_	150V	20kA	700V	1200V	800V	1200V	1200V	1500V	700V
240/120HLD	240kA	10	3 Ø, HLD*, 4-wire+G	TVS3IMA24_	150V	20kA	700V	1200V	800V	1200V	1200V	1500V	700V
240/120HLD	320kA	10	3 Ø, HLD*, 4-wire+G	TVS3IMA32_	150V	20kA	700V	1200V	800V	1200V	1200V	1500V	700V
240/120HLD	480kA	10	3 Ø, HLD*, 4-wire+G	TVS3IMA48_	150V	20kA	700V	1200V	800V	1200V	1200V	1500V	700V

Model numbers not recognized as line items in Schneider Electric ordering system until a suffix code is applied
*HLD = High-leg delta

MODEL NUMBER SUFFIX CODES

- P NQ/NF panelboard *(Not available in 320 and 480 kA)*
- B QED switchboard
- Z PZ3/PZ4 switchgear *(Not available in TVS1 or TVS3)*
- Q QMB switchboard *(Not available in 320 and 480 kA)*
- M Motor Control Center *(Not available in 320 and 480 kA)*
- O OEM kit *(Not available in 320 and 480 kA)*

SPD OPTIONS

Remote Monitor	TVS12RMU

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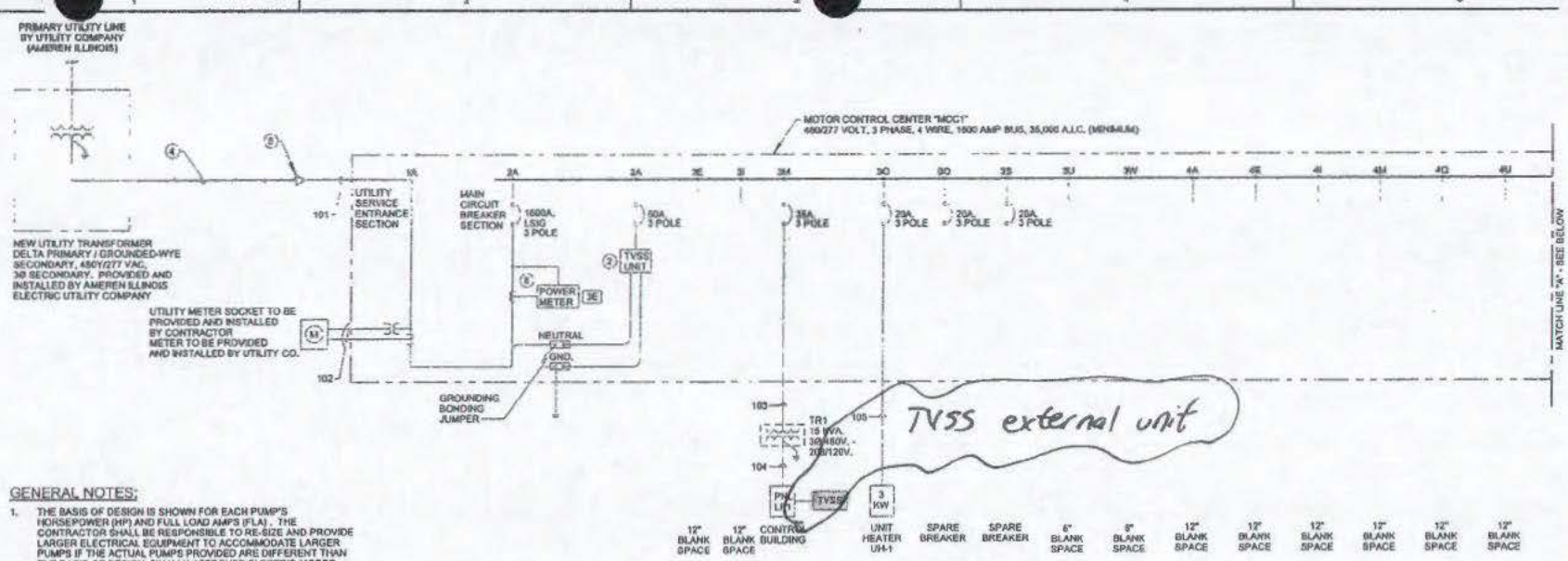
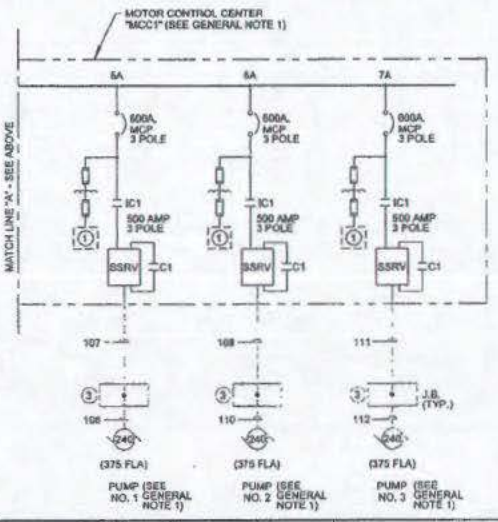
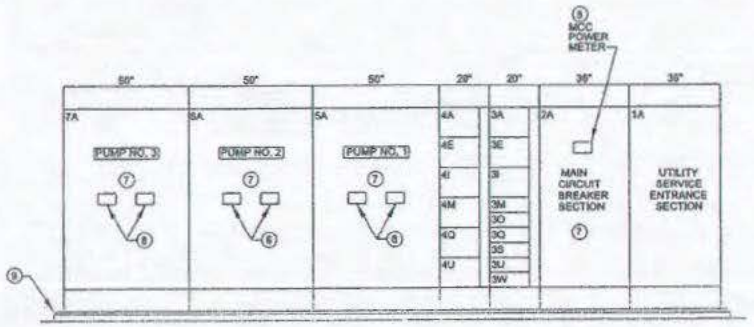
Document Number 9990-0116C March 2011 bw



ONE-LINE DIAGRAM - MOTOR CONTROL CENTER "MCC1"

NOT TO SCALE





ELEVATION - MOTOR CONTROL CENTER "MCC1"

SCALE IN FEET

KEYED NOTES:

(#) KEYED NOTES:

(1) REFER TO CONTROL WIRING DIAGRAMS ON SHEET E-603.

(2) INTERNAL TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS) UNIT. REFER TO SPEC. SECTION 26 29 00 FOR RATINGS.

(3) WATERTIGHT SPLICE PUMP CABLES TO ITS FIELD CABLES INSIDE ITS RESPECTIVE ELECTRICAL JUNCTION BOX LOCATED AT EACH PUMP.

(4) OVERHEAD CONDUCTORS SHALL BE INSTALLED BY THE UTILITY COMPANY. UTILITY COMPANY TO MAKE FINAL TERMINATIONS AT THE WEATHERHEADS AT THE EXTERIOR OF THE BUILDING.

(5) WEATHERHEADS SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR. CONTRACTOR SHALL INSTALL CONDUCTORS FROM MCC1 TO THE WEATHERHEADS, LEAVING A MINIMUM OF 3 FEET OF EXTRA CABLES OUT THE END OF THE WEATHERHEADS FOR CONNECTION BY THE UTILITY COMPANY.

(6) PUMP MAS UNIT AND DISPLAY PANEL MOUNTED INSIDE STARTER.

(7) CIRCUIT BREAKERS SHALL BE PROVIDED WITH PERMANENT ELECTRICAL SAFETY DISCONNECT LOCKOUT ATTACHMENT EQUIPMENT ACCESSORIES WHICH COMPLY WITH LOCKOUT EQUIPMENT AS STATED IN NFPA 70, NFPA 70E, AND OSHA REGULATION 29 CFR PART 1910147. PUMP STARTER AND MAIN BREAKER COMPARTMENTS SHALL BE PROVIDED WITH SELF-ADHERING "DANGER" LOCKOUT SIGNS (4 TOTAL). SEE DETAIL 2 ON SHEET E-502 FOR MCC "DANGER" SIGN REQUIREMENTS.

(8) THE POWER METER IDENTIFIED IN SECTION 2A IS A MCC ACCESSORY FOR THE PUMP STATION FACILITY USE. THIS METER IS NOT A UTILITY METER. THE UTILITY METER IS SEPARATE EQUIPMENT AND HAS SEPARATE REQUIREMENTS. THE DESIGNATION "3E" IDENTIFIES THAT THIS IS A THREE INSTRUMENT TRANSFORMER TYPE POWER METER. ALSO SEE THE DESCRIPTION OF THIS SYMBOL IDENTIFIED ON SHEET E-001.

(9) 3-INCH HIGH (MINIMUM HEIGHT) CONCRETE HOUSE- KEEPING PAD WITH 1" CHAMFERED EDGE. PROVIDE PAD WIDTH AS REQUIRED TO SUPPORT THE MCC ENCLOSURE PROVIDED.

(10) MCC SHALL BE PROVIDED WITH APPROPRIATELY SIZED, THERMOSTAT CONTROLLED, ENCLOSURE HEATERS IN EACH COMPARTMENT. HEATERS AND THERMOSTAT SHALL BE SIZED, PROVIDED, AND INSTALLED BY THE MCC MANUFACTURER.

GENERAL NOTES:

1. THE BASIS OF DESIGN IS SHOWN FOR EACH PUMP'S HORSEPOWER (HP) AND FULL LOAD AMPS (FLA). THE CONTRACTOR SHALL BE RESPONSIBLE TO RE-SIZE AND PROVIDE LARGER ELECTRICAL EQUIPMENT TO ACCOMMODATE LARGER PUMPS IF THE ACTUAL PUMPS PROVIDED ARE DIFFERENT THAN THE BASIS OF DESIGN. FINALLY APPROVED ELECTRIC MOTOR SPECIFICATION DATA IS CRITICAL INFORMATION THAT SHALL BE PROVIDED BY THE CONTRACTOR TO BOTH AMEREN ILLINOIS POWER COMPANY AND TO THE CONTRACTING OFFICER'S REPRESENTATIVE.

US Army Corps of Engineers

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LOCK AND DAM 13
FULTON COUNTY, IL
RICE LAKE HABITAT REHAB & ENHANCEMENT
STAGE I
SINGLE-LINE DIAGRAM

Sheet ID
E-601

H-44

TPS3 11

Type 1 Surge Protective Device (SPD) Mounts External to Electrical Distribution Equipment

Features:

- UL 1449 3rd Edition – 2009, cUL
- UL 1283
- Type 1 SPD (Type 2 cUL)
- Mounts external to electrical distribution equipment
- Large block, individually fused, thermally protected, 50kA MOV's
- 20kA I_n (most models)
- 200kA SCCR (most models)
- All UL-required OCP & safety coordination included
- UL96A Lightning Protection Master Label compliant (@20kA In)

- SPD Specifications
- Surge Current Rating Per Phase

Per Phase	L-N	L-G	N-G
100kA	50kA	50kA	50kA
150kA	100kA	50kA	50kA
200kA	100kA	100kA	100kA

- 100% monitoring – Every MOV is monitored, incl. N-G
- Individually fused and thermally protected MOV's
- Solid state bi-directional operation
- EMI/RFI filtering: Active tracking up to -50db from 10kHz to 100MHz
- Repetitive impulse: 5,000 hits
- Less than 1 nanosecond response time
- Relative humidity range: 0 -95% non-condensing
- Operating frequency: 47-63Hz
- Operating temperature: -25°C (-15°F) to +60°C (140°F)

- Standard Configuration
- Standard NEMA 4X polycarbonate enclosure (UL 746C (f1), UL 94-5VA)
- Wire size: #8 AWG to #10 AWG
- Standard size: 6" x 6" x 4" (152mm x 152mm x 102mm)
- Standard weight: 5 lbs. (2.27kg)

UL 1449 3rd Edition SPD

SIEMENS

SPD Features
- UL 1449 3rd Edition effective September 2009
- Designed, manufactured and tested consistent with:
  - ANSI/IEEE C62.41.1-2002, c62.41.2-2002, C62.45-2002,
  - 1992/2000 NEMA LS-1
  - NEC Article 285
  - IEC 61643, CE

SPD Features
- Large block, individually fused, thermally protected, 50kA MOV's
- 10 year warranty

SPD Monitoring
- LED indicators

Available Options
- Dry contacts & audible alarm

Key Bid Specifications
- UL 1449 3rd Edition – 2009, cUL
- UL 1283
- Type 1 SPD❶
- Protection modes on L-N, L-G, L-L, N-G
- I_n Rating – 20kA
- Short Circuit Current Rating – 200kA
- Surge Current Rating

Per Phase =	L-N	+	L-G
100kA	50kA		50kA

Ordering Information

Catalog # TPS3 [C] 11 [0][0] [D]

Voltage Code
- A = 120/240V, 1Ø, 3W (Fig 1)
- B = 120/240V, 3Ø, 4W (Fig 3)
- C = 120/208V, 3Ø, 4W (Fig 2)
- D = 240V, 3Ø, 3W (Fig 4)
- E = 277/480V, 3Ø, 4W (Fig 2)
- F = 480V, 3Ø, 3W (Fig 4)
- G = 600V, 3Ø, 3W (Fig 4)❷
- K = 380/220V, 3Ø, 4W (Fig 2)
- L = 600/347V, 3Ø, 4W (Fig 2)
- S = 400/230V, 3Ø, 4W (Fig 2)

Surge Current (kA)
- 10 = 100kA per phase
- 15 = 150kA per phase
- 20 = 200kA per phase

Options
- D = Dry contacts & audible alarm

- Example: TPS3C1110D = Type 1 SPD for a 208/120V application with a surge current capacity of 100kA per phase, in a standard NEMA 4X enclosure with dry contacts and audible alarm option
- When an option is not selected, include a zero (0) in the field

Available Accessories: Ordered Separately
- RMSIE - Remote monitor
- KITFMXF = Flush mount plate

UL 1449 3rd Edition - 2009 Test Data Summary
Voltage Protection Rating (VPR - 6kV, 3kA)

Voltage Code	Service Voltage	L-N	L-G	N-G	L-L	Type❶	In	SCCR	MCOV
A	120/240V, 1Ø, 3W (Fig 1)	700	700	600	1000	Type 1	20kA	100kA	150
B	120/240V, 3Ø, 4W (Fig 3)	700 / 1200	700 / 1200	600	1000	Type 1	20kA	200kA	150 / 320
C	120/208V, 3Ø, 4W (Fig 2)	700	700	600	1000	Type 1	20kA	200kA	150
D	240V, 3Ø, 3W (Fig 4)		1200		2000	Type 1	20kA	200kA	320
E	277/480V, 3Ø, 4W (Fig 2)	1200	1200	1200	2000	Type 1	20kA	200kA	320
F	480V, 3Ø, 3W (Fig 4)		1800		2000	Type 1	10kA	200kA	552
G	600V, 3Ø, 3W (Fig 4)		2500		2500	Type 1	10kA	200kA	690
K	380/220V, 3Ø, 4W (Fig 2)	1200	1200	1200	2000	Type 1	20kA	200kA	320
L	600/347V, 3Ø, 4W (Fig 2)	1500	1500	1500	2500	Type 1	10kA	200kA	420
S	400/230V, 3Ø, 4W (Fig 2)	1200	1200	1200	2000	Type 1	20kA	200kA	320

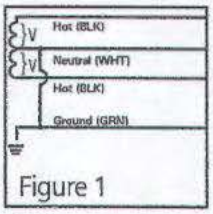


Figure 1

Split
2 Hots, 1 Neu, 1 Gnd

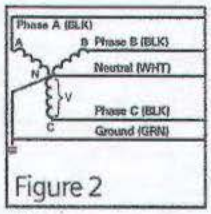


Figure 2

Wye
3 Hots, 1 Neu, 1 Gnd

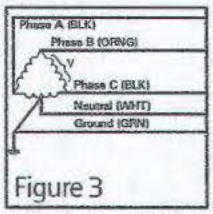


Figure 3

Hi-Leg Delta (B High)
3 Hots, (B High),
1 Neu, 1 Gnd

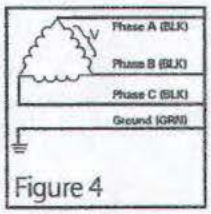


Figure 4

Delta & HRG Wye
3 Hots, 1 Gnd

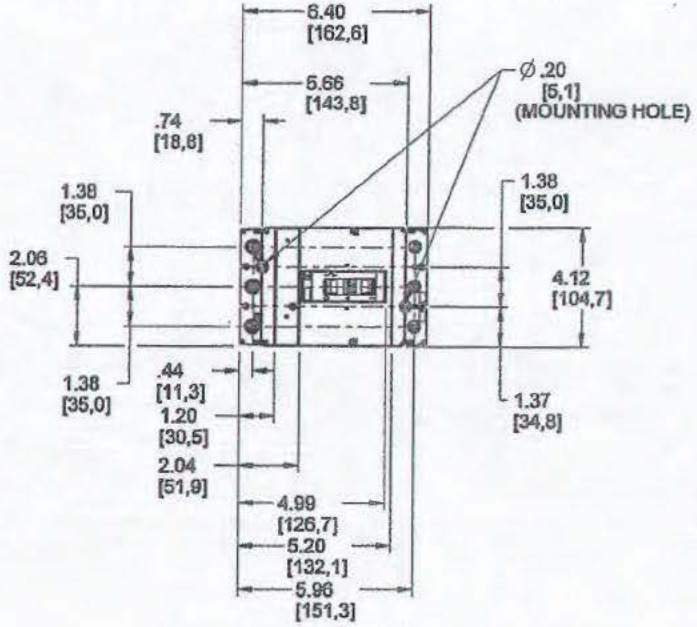
Siemens Industry, Inc.
Building Technologies Division
5400 Triangle Parkway
Norcross, GA 30092

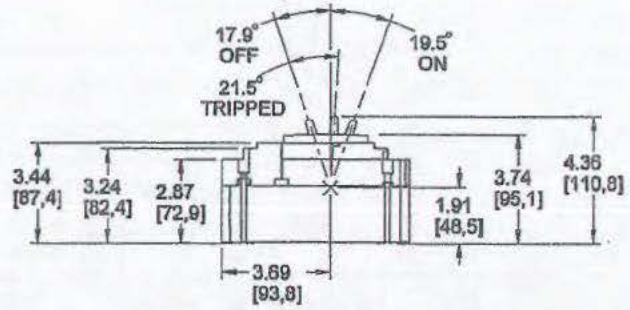
888-333-3545
info.us@siemens.com

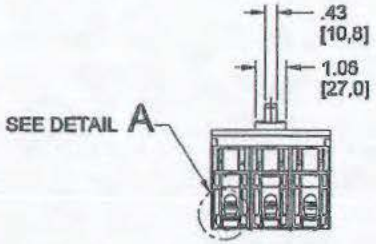
www.usa.siemens.com/spd

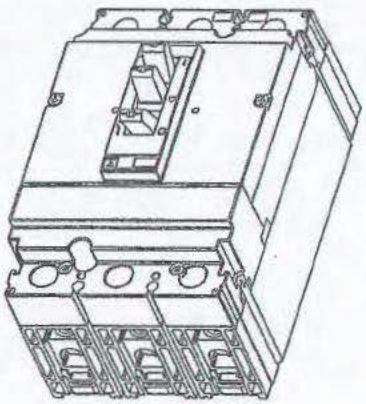
4.27.10.al

Notes:
❶ Type 2 cUL
❷ Available in 100kA per phase only

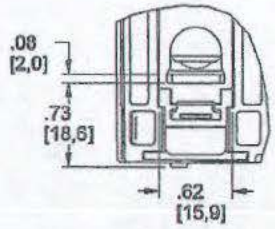








ISOMETRIC VIEW
SCALE 1:2



DETAIL A
SCALE 1:1

CATALOG NUMBER:	
DESCRIPTION:	H-Frame 15A - 150A 3P Toggle Lug-Lug
DRAWN BY: LRG	DATE: 12AUG2003
CHECKED BY: RLS	DATE: 11MAR2004
DRAWING FILE:	48996-012-01 .DRW
ECN: J532	

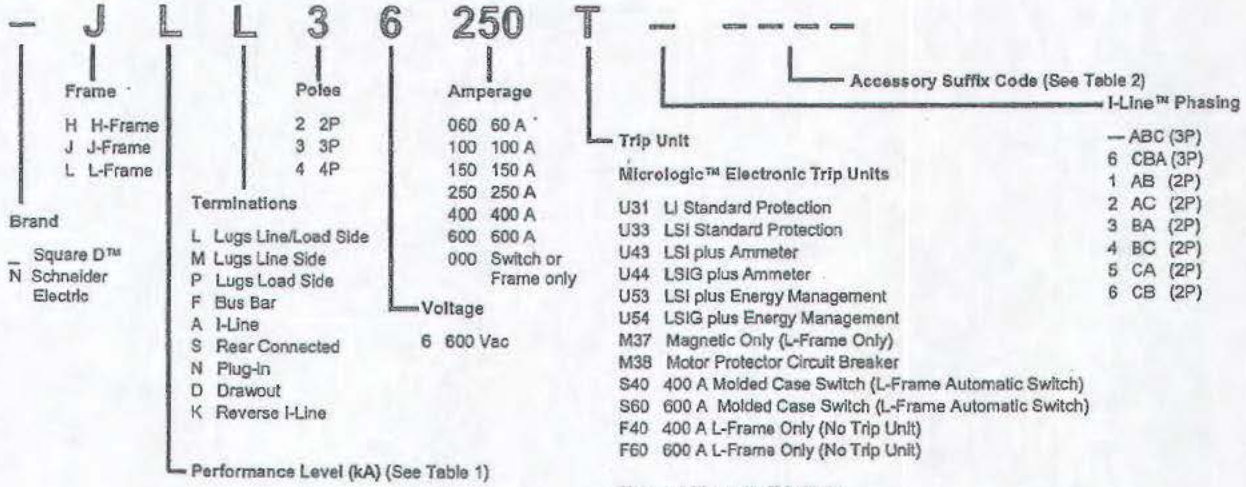
DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE
IN / mm

THIRD ANGLE

SQUARE D
Schneider Electric

DRAWING NUMBER 48996-012-01 | REVISION 0

Catalog Numbering



[1] 100% ratings valid for:
3P H/J frame unit mount only
3P/4P L-frame 250 A and 400 A unit mount
3P L-frame 250 A and 400 A I-Line

Table 1: Interrupting Rating

	UL/CSA/NOM					IEC 647-2 Icu/Ics					
	240 Vac	480 Vac	600 Vac	250 Vdc[1]	500 Vdc[2]	220/240 Vac	380/440/415 Vac	500/525 Vac	690 Vac	250 Vdc[1]	500 Vdc[3]
D	25 kA	18 kA	14 kA	20 kA	—	25/25 kA	18/18 kA	14/14 kA	—	20 kA	20 kA
G	65 kA	35 kA	18 kA	20 kA	20 kA	65/65 kA	35/35 kA	18/18 kA	—	20 kA	20 kA
J	100 kA	65 kA	25 kA	20 kA	—	100/100 kA	65/65 kA	25/25 kA	—	20 kA	20 kA
L	125 kA	100 kA	50 kA	20 kA	—	125/125 kA	100/100 kA	50/50 kA	—	20 kA	20 kA
R	200 kA	200 kA	100 kA	—	—	150 kA	125 kA	75 kA	20 kA	—	—

[1] 250 Vdc ratings only available with PowerPact H or J circuit breakers with thermal-magnetic trip units (not including MCP).
[2] UL 500 Vdc ratings only available with PowerPact J circuit breakers with thermal-magnetic trip units (not including MCP).
[3] IEC 500 Vdc rating only available on PowerPact J-frame circuit breakers.

Table 6: Circuit Breakers

Circuit Breaker		150 A H-Frame					250 A J-Frame					400 A L-Frame					600 A L-Frame				
Circuit Breaker Type		HD	HG	HJ	HL	HR	JD	JG	JJ	JL	JR	LD	LG	LJ	LL	LR	LD	LG	LJ	LL	LR
Number of poles[1]		2, 3				3	2, 3				3	3, 4					3, 4				
Amperage Range (A)		15-150					70-250					70-400					200-600				
UL 489 Circuit Breaker Ratings																					
UL/CSA/NOM (kA rms)	240 Vac	25	65	100	125	200	25	65	100	125	200	25	65	100	125	200	25	65	100	125	200
	480 Vac	18	35	65	100	200	18	35	65	100	200	18	35	65	100	200	18	35	65	100	200
	600 Vac	14	18	25	50	100	14	18	25	50	100	14	18	25	50	100	14	18	25	50	100
	250 Vdc[2]	20	20	20	20	—	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—
	500 Vdc[2, 3]	—	—	—	—	—	—	20	—	—	—	—	—	—	—	—	—	—	—	—	—
IEC 947-2 Circuit Breaker Ratings																					
Ultimate breaking capacity (Icu) (kA rms)	220/240 Vac	25	65	100	125	150	25	65	100	125	150	25	65	100	125	150	25	65	100	125	150
	380/415 Vac	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125
	440/480 Vac	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125
	500/525 Vac	14	18	25	50	75	14	18	25	50	75	14	18	25	50	75	14	18	25	50	75[4]
	690 Vac	—	—	—	—	20	—	—	—	—	20	—	—	—	—	20	—	—	—	—	20
	250 Vdc[2]	—	—	—	—	—	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—
	500 Vdc[2, 3]	—	—	—	—	—	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—
Service breaking capacity (Ics)	% Icu	100%					100%					100%					100%				
Insulation Voltage	V_i	750 Vac					750 Vac					750 Vac					750 Vac				
Impulse Withstand Voltage	V_{imp}	8 kVac					8 kVac					8 kVac					8 kVac				
Operational Voltage	V_e	690 Vac					690 Vac					690 Vac					690 Vac				
Sensor Rating	I_n	150 A					250 A					400 A					600 A				
Utilization Category	—	A					A					A					A				
Operations (Open-Close Cycles)																					
Without Current		4000					5000					5000					5000				
With Current		4000					1000					1000					1000				
Protection and Measurements																					
Short-circuit protection	Magnetic only	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Overload/short-circuit protection	Thermal-magnetic	■	■	■	■	■	■	■	■	■	■	—	—	—	—	—	—	—	—	—	—
	Electronic	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	with neutral protection (Off-0.5-1-OSN)[5]	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	with ground fault protection	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	with zone selective interlocking (ZSI)[6]	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Display / I, V, f, P, E, THD measurements / interrupted-current measurement		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Options	Front display module (FDM121)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Operating assistance	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Counters	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Histories and alarms	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Metering Com	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Device status/control com	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Dimensions / Weight / Connections																					
Dimensions 3P (Unit Mount) In. (mm)	Height	6.4 (163)					7.5 (191)					13.38 (340)					13.38 (340)				
	Width	4.1 (104)					4.1 (104)					5.51 (140)					5.51 (140)				
	Depth	3.4 (86)					3.4 (86)					4.33 (110)					4.33 (110)				
Weight 3P - lb. (Kg)		4.8 (2.2)					5.3 (2.4)					13.2 (6.0)					13.7 (6.2)				
Connections / Terminations	Unit Mount	■					■					■					■				
	I-Line™	■					■					■					■				
	Rear Connection	■					■					■					■				
	Plug-In	■					■					■					■				
	Drawout	■					■					■					■				
	Optional Lugs	■					■					■					■				

1 H and J-frame breakers with Micrologic™ trip units available only with 3P. The HJ, HL and the J-Frame 2P breakers are 3P modules.

2 DC not available with PowerPact H, J or L-frame circuit breakers with Micrologic trip units.

3 500 Vdc specific catalog numbers, ungrounded UPS systems only.

4 I_{cs} for 600 A L-frame circuit breaker at 525 V is 19 kA.

H- and J-Frame Catalog Numbers

Unit-Mount Circuit Breaker Catalog Numbers

Table 12: PowerPact H-Frame 150 A Unit-Mount[1] Thermal-Magnetic Circuit Breakers (600 Vac, 250 Vdc) with Factory Sealed Trip Unit (Suitable for Reverse Connection)

Current Rating @ 40 C	Fixed AC Magnetic Trip		Interrupting Rating							
			D		G		J[2]		L[2]	
	Hold	Trip	Standard (80%) Rated	100% Rated[3]	Standard (80%) Rated	100% Rated[3]	Standard (80%) Rated	100% Rated[3]	Standard (80%) Rated	100% Rated[3]
H-Frame, 150 A, 2P, 600 Vac 50/60Hz, 250 Vdc[4]										
15 A	350 A	750 A	HDL26015	HDL26015C	HGL26015	HGL26015C	HJL26015	HJL26015C	HLL26015	HLL26015C
20 A	350 A	750 A	HDL26020	HDL26020C	HGL26020	HGL26020C	HJL26020	HJL26020C	HLL26020	HLL26020C
25 A	350 A	750 A	HDL26025	HDL26025C	HGL26025	HGL26025C	HJL26025	HJL26025C	HLL26025	HLL26025C
30 A	350 A	750 A	HDL26030	HDL26030C	HGL26030	HGL26030C	HJL26030	HJL26030C	HLL26030	HLL26030C
35 A	400 A	850 A	HDL26035	HDL26035C	HGL26035	HGL26035C	HJL26035	HJL26035C	HLL26035	HLL26035C
40 A	400 A	850 A	HDL26040	HDL26040C	HGL26040	HGL26040C	HJL26040	HJL26040C	HLL26040	HLL26040C
45 A	400 A	850 A	HDL26045	HDL26045C	HGL26045	HGL26045C	HJL26045	HJL26045C	HLL26045	HLL26045C
50 A	400 A	850 A	HDL26050	HDL26050C	HGL26050	HGL26050C	HJL26050	HJL26050C	HLL26050	HLL26050C
60 A	800 A	1450 A	HDL26060	HDL26060C	HGL26060	HGL26060C	HJL26060	HJL26060C	HLL26060	HLL26060C
70 A	800 A	1450 A	HDL26070	HDL26070C	HGL26070	HGL26070C	HJL26070	HJL26070C	HLL26070	HLL26070C
80 A	800 A	1450 A	HDL26080	HDL26080C	HGL26080	HGL26080C	HJL26080	HJL26080C	HLL26080	HLL26080C
90 A	800 A	1450 A	HDL26090	HDL26090C	HGL26090	HGL26090C	HJL26090	HJL26090C	HLL26090	HLL26090C
100 A	900 A	1700 A	HDL26100	HDL26100C	HGL26100	HGL26100C	HJL26100	HJL26100C	HLL26100	HLL26100C
110 A	900 A	1700 A	HDL26110	HDL26110C	HGL26110	HGL26110C	HJL26110	HJL26110C	HLL26110	HLL26110C
125 A	900 A	1700 A	HDL26125	HDL26125C	HGL26125	HGL26125C	HJL26125	HJL26125C	HLL26125	HLL26125C
150 A	900 A	1700 A	HDL26150	HDL26150C	HGL26150	HGL26150C	HJL26150	HJL26150C	HLL26150	HLL26150C
H-Frame, 150 A, 3P, 600 Vac 50/60Hz, 250 Vdc										
15 A	350 A	750 A	HDL36015	HDL36015C	HGL36015	HGL36015C	HJL36015	HJL36015C	HLL36015	HLL36015C
20 A	350 A	750 A	HDL36020	HDL36020C	HGL36020	HGL36020C	HJL36020	HJL36020C	HLL36020	HLL36020C
25 A	350 A	750 A	HDL36025	HDL36025C	HGL36025	HGL36025C	HJL36025	HJL36025C	HLL36025	HLL36025C
30 A	350 A	750 A	HDL36030	HDL36030C	HGL36030	HGL36030C	HJL36030	HJL36030C	HLL36030	HLL36030C
35 A	400 A	850 A	HDL36035	HDL36035C	HGL36035	HGL36035C	HJL36035	HJL36035C	HLL36035	HLL36035C
40 A	400 A	850 A	HDL36040	HDL36040C	HGL36040	HGL36040C	HJL36040	HJL36040C	HLL36040	HLL36040C
45 A	400 A	850 A	HDL36045	HDL36045C	HGL36045	HGL36045C	HJL36045	HJL36045C	HLL36045	HLL36045C
50 A	400 A	850 A	HDL36050	HDL36050C	HGL36050	HGL36050C	HJL36050	HJL36050C	HLL36050	HLL36050C
60 A	800 A	1450 A	HDL36060	HDL36060C	HGL36060	HGL36060C	HJL36060	HJL36060C	HLL36060	HLL36060C
70 A	800 A	1450 A	HDL36070	HDL36070C	HGL36070	HGL36070C	HJL36070	HJL36070C	HLL36070	HLL36070C
80 A	800 A	1450 A	HDL36080	HDL36080C	HGL36080	HGL36080C	HJL36080	HJL36080C	HLL36080	HLL36080C
90 A	800 A	1450 A	HDL36090	HDL36090C	HGL36090	HGL36090C	HJL36090	HJL36090C	HLL36090	HLL36090C
100 A	900 A	1700 A	HDL36100	HDL36100C	HGL36100	HGL36100C	HJL36100	HJL36100C	HLL36100	HLL36100C
110 A	900 A	1700 A	HDL36110	HDL36110C	HGL36110	HGL36110C	HJL36110	HJL36110C	HLL36110	HLL36110C
125 A	900 A	1700 A	HDL36125	HDL36125C	HGL36125	HGL36125C	HJL36125	HJL36125C	HLL36125	HLL36125C
150 A	900 A	1700 A	HDL36150	HDL36150C	HGL36150	HGL36150C	HJL36150	HJL36150C	HLL36150	HLL36150C

1 Standard Lug Kit: PL150HD Terminal Wire Range: 14–3/0 AWG Al or Cu

2 UL Listed/CSA Certified as current limiting circuit breakers.

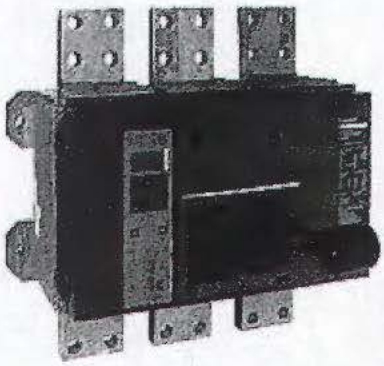
3 100% rated circuit breakers have copper lugs and can be used with copper wire only.

4 HD and HG circuit breakers are true 2-pole construction.

Product Data Sheet

RJF36160CU44A

Electronic Trip Circuit Breaker (R-Frame) 1600A, 3-Pole, 100% Rated, LSIG, 600 Vac



SQUARE D
by Schneider Electric

List Price $35,436.00 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

Main Disconnect Breaker CB2A

Technical Characteristics

Sensor Rating	1600A
Approvals	UL Listed - CSA Certified - IEC Rated
General Application	Provides overload and short circuit protection
For Use With	Panelboards and Switchboards
Circuit Breaker Type	Standard
Marketing Trade Name	Powerpact
Installed Rating Plug	Type A
Frame Type	R-Frame
Voltage Rating	600 Vac
Mounting Type	Unit Mount
Circuit Breaker Rating	100% Rated
Electronic Trip Unit	Micrologic Ammeter Trip Unit (6.0A)
Weight	52 Pounds
Interrupting Rating	100kA@240Vac - 65kA@480Vac - 25kA@600Vac
Number of Poles	3-Pole
Rating Plug Range	0.4A to 1A
Terminal Type	No Lugs (Includes terminal nut kit for ON and OFF
Trip Function	LSIG
Wire Size	#3/0 to 600 AWG/kcmil(Al/Cu)

Shipping and Ordering

Category	01245 - Circuit Breakers, Electronic Trip, Type RGA, RJA & RLA, UL/CSA, Unit Mount
Discount Schedule	DE2
GTIN	00785901278962
Package Quantity	1
Weight	75 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	US

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

Generated: 11/17/2011 10:56:35

Schneider Electric

Mutalib Atekoja

From: Taylor, Tracy A <TTaylor@ameren.com>
Sent: Monday, October 08, 2012 12:25 PM
To: Moore, Lennie D; John Schulz; Mutalib Atekoja
Subject: RE: Ameren Cabinet
Attachments: image001.jpg

The switchgear is approved.

From: Moore, Lennie D
Sent: Thursday, October 04, 2012 11:49 AM
To: John Schulz; Mutalib Atekoja; Taylor, Tracy A
Subject: RE: Ameren Cabinet

Tracy Taylor is our power meterman and will be the authority on this.

Tracy can you help them out?

Thanks

From: John Schulz [mailto:John@leanderconstructioninc.com]
Sent: Tuesday, October 02, 2012 1:22 PM
To: Moore, Lennie D; Mutalib Atekoja
Subject: FW: Ameren Cabinet

Lennie,

The Rice Lake switchgear needs Ameren approval. Mo is sending the information along with a letter for review. Please forward/process so we have everyone's approval.

Thank you

John E. Schulz, Jr
Vice President of Project Management
Leander Construction, Inc.
Box 345
Canton, IL 61520
(309) 647-7400 phone
(309) 647-7401 fax
(309) 357-0627 cell

S & K EQUIPMENT COMPANY, Inc.
... When Quality Counts ...

P. O. Box 342
1243 Bayou Street
Vincennes, IN 47591
Ph (812) 886-0245
Fx (812) 886-1211

September 28, 2012

S & K Job # 501-11

Mutalib (Moe) Atekoja
SAF, Inc.
130 E. Voris Street, Suite A
Akron, OH 44311

330-253-1600

Re: Rice Lake Habitat Rehabilitation
LaGrange Pool
Fulton County, IL

Dear Moe,

We will be providing the CT, PT service entrance cabinet for Ameren to bring their feed into. To date, we have yet to confirm whether the cabinet as submitted meets their criteria. Attached are the submittal cut sheets. Please forward onto Ameren for consideration, and approval. Note, we will not release to production until we have their approval.

Should additional information be required or questions arise please do not hesitate to call.

Sincerely,

Steven Gott

Attachments

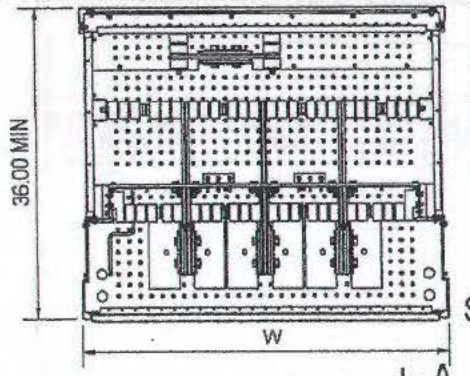
Cc: Mike Carney – Flow technics, Inc.

AMPS	BARS PER PH.	BUS SIZE	JMPS PER PH.	JMPR SIZE	WIDTH MIN W	DEPTH MIN W/MAIN	DEPTH MIN W/O MAIN
1600	2	0.25X3.25	2	0.25X3.25	36	36	36
2000	2	0.25X4.0	2	0.25X4.0	36	36	36
2500	2	0.25X5.0	2	0.25X5.0	36	36	36
3000	2	0.25X6.0	3	0.25X5.0	42	48	36
4000	3	0.25X6.0	4	0.25X5.0	42	48	36

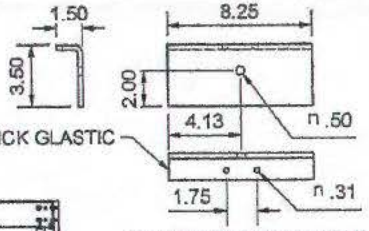
NOTES:

1. FRONT OF 36" WIDE CT AND PT COMPARTMENTS ARE ENCLOSED BY A SINGLE DOOR OR DOUBLE DOORS FOR 42" WIDE COMPARTMENTS. DOORS ARE TO BE HINGED ON THE SIDE AND EQUIPPED WITH A SEALING HASP FOR A PADLOCK TYPE SEAL.
2. CT AND PT COMPARTMENTS ARE FULLY BARRIERED.
3. TOP FEED CT AND PT COMPARTMENTS SHOWN. INVERT FOR BOTTOM FEED.
4. THIS SERVICE SECTION IS FOR USE ON:
   - 120 / 208 Y 3 PH. 4W
   - 277 / 480 Y 3 PH. 4W - PT COMPT REQ'D
   - 240 V Δ 3 PH. 3W
   - 480 V Δ 3 PH. 3W - PT COMPT REQ'D

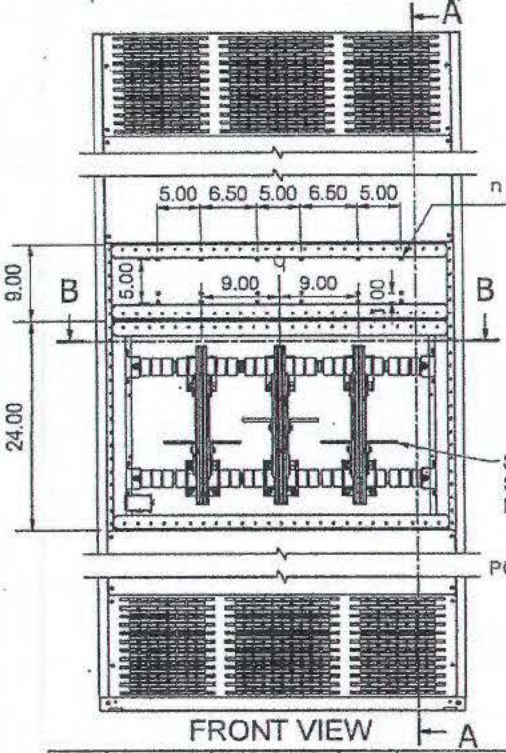
   PT COMPARTMENT REQIRED ONLY FOR 277/480V AND 480V SERVICE. PT COMPARTMENT MUST BE LOCATED DIRECTLY ABOVE OR BELOW THE CT COMPARTMENT.
5. PROVIDE TWO 1" MIN DIAMETER HOLES FOR ROUTING METER WIRING BETWEEN CT AND PT COMPARTMENTS.
6. PROVIDE GROUND LUG IN CT COMPARTMENT TO ACCEPT CUSTOMER #10 COPPER GROUND WIRE. LUG TO BE CONNECTED BY SQUARE D TO THE SWITCHBOARD GROUND.



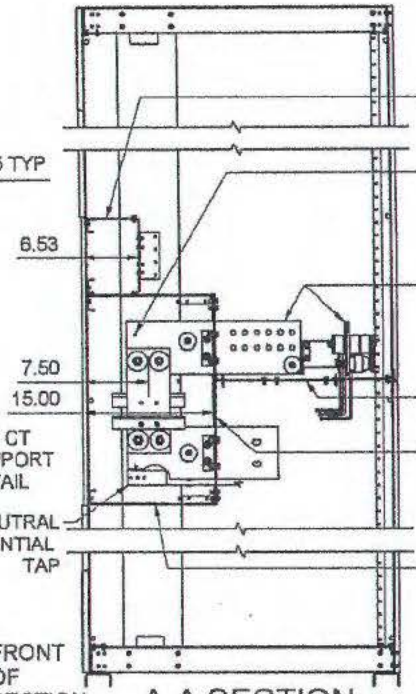
B-B SECTION



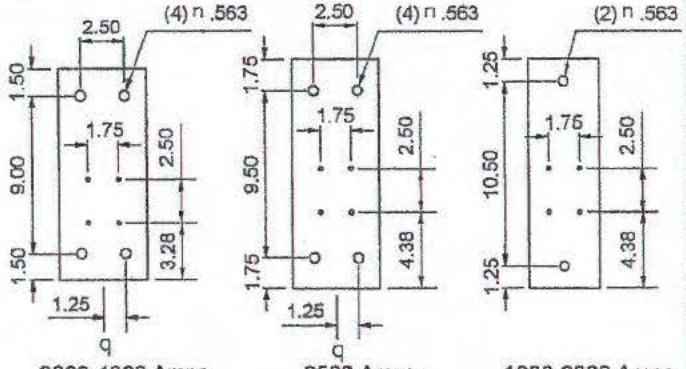
CT SUPPORT DETAIL



FRONT VIEW



A-A SECTION



JUMPER DETAIL

REV	AN	DATE	BY	REVISION DESCRIPTION

Schneider Electric

POWER STYLE QED SWBD 1600-4000 AMPS
UTILITY COMPARTMENT DRAWING

Number: 09FF2400P0H00 | Revision: | Sheet: 1/2

State: Eng: SN July 20, 2010

REV	DESCRIPTION	BY	DATE	-	-----	---	--/--/--	-	-----	---	--/--/--
-	-----	--	--/--/--	-	-----	---	--/--/--	-	-----	---	--/--/--

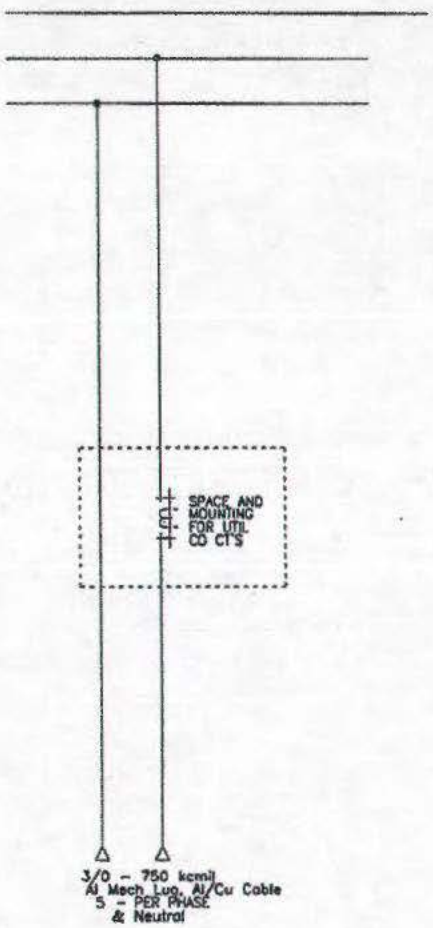
POWER STYLE QED-2 SWITCHBOARD

SECT NO	CKT NO	GMD HEIGHT	DEVICE/FRAME RATING	TRIP AMP	FUSE/ TRIP	#P	DESIGNATION	N/P	LUG INFORMATION				ACCESSORIES
									QTY	PHASE WIRE RANGE	QTY	NEUT. WIRE RANGE	
1	UCT	-	1600A	-	-	-		No	5	3/0 - 750 kcmil	5	3/0 - 750 kcmil	

LEGEND
No Accessories

JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION:	SWBD
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	QED Switchboard
DRAWN BY:	(Q2C)	DRAWING TYPE:	SCHEDULE
ENGR:			
DATE:	October 20 2011		
DRAWING STATUS:	QUOTE	Orig# 0307353P9-01	PG 2 OF 2 REV -

REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--	-	----	--	--/--/--
-	-----	--	--/--/--	-	----	--	--/--/--	-	----	--	--/--/--

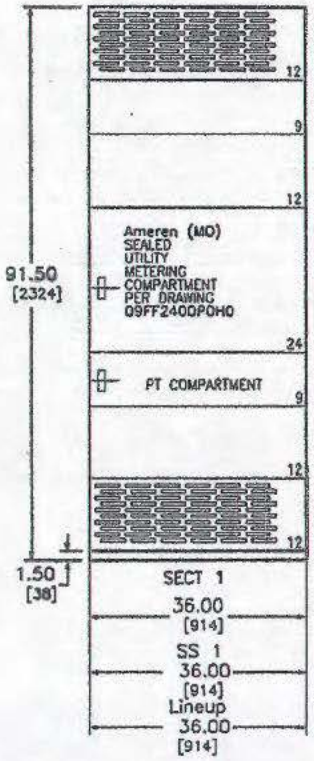


SECTION 1

JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION: SWBD	
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	QED Switchboard
DRAWN BY:	(QZC)	DRAWING TYPE:	ONE LINE
ENGR:			[redacted]
DATE:	October 20 2011		
DRAWING STATUS:	QUOTE	DWG# Q307.6399-01	PG 1 OF 2 REV -

REV	DESCRIPTION	BY	DATE
-	-----	--	--/--/--

T-bus
27.0 in



SWITCHBOARD GENERAL NOTES

PRODUCT DESCRIPTION & RATINGS

Power System Data

480Y/277V 3Ph 4W 60Hz / 3 Phase Wye
Solidly Grounded
System Short Circuit Current Rating: 65kA RMS
Incoming Section 1 Cable Through the Bottom Right of Lineup

Bus System Data

1600A Tin/Aluminum & Silver/Copper Main Bus
(4) .25x2.00 IN/6x51 mm Al Bus Bar Per Phase/Neutral
(1) .25x1.50 IN/6x38 mm Al Ground Bus

Enclosure Data

Type 1 Free Standing
Exterior Paint Color: ANSI 49
Front Accessibility Only Required
Handling: Rollers & Lifting Assemblies
Utility sealing hardware installed for unmetered bus compartments

Estimated Shipping Weight

Shipping Split 1 865.00 lbs / 392.36 kgs
Complete Lineup 865.00 lbs / 392.36 kgs

Code Standards

U.L. Deadfront

Rating Nameplates

ST1- Deadfront- Section Bus 1600A

PRODUCT INFORMATION

Wiring

All wiring to be Machine Tool Wire type

Instruction Bulletins

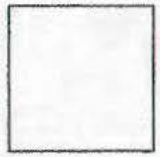
Reference 80043-055 For Handling, Installation, Anchoring, Inspection And Maintenance Information

Product Accessories/Options

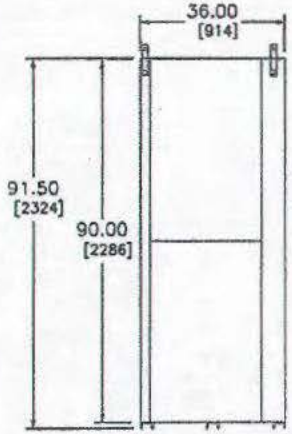
ENGLISH DIMENSIONS: INCHES

JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION:	SWBD
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	QED Switchboard
DRAWN BY:	(@2C)	DRAWING TYPE:	ELEVATION VIEW
ENGR:			
DATE:	October 20 2011		
DRAWING STATUS: QUOTE	NOT FOR CONSTRUCTION	DWG# F30736399-01	(PG 1 OF 2) REV -

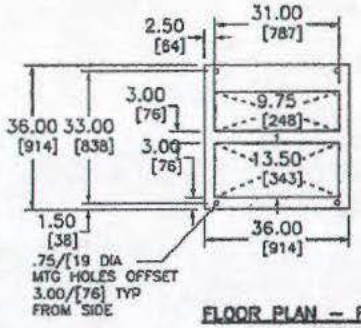
REV	DESCRIPTION	BY	DATE	-	-----	--	--/--/--	-	-----	---	--/--/--
-	-----	---	--/--/--	-	-----	--	--/--/--	-	-----	---	--/--/--



TOP VIEW – FRONT



LEFT SIDE VIEW



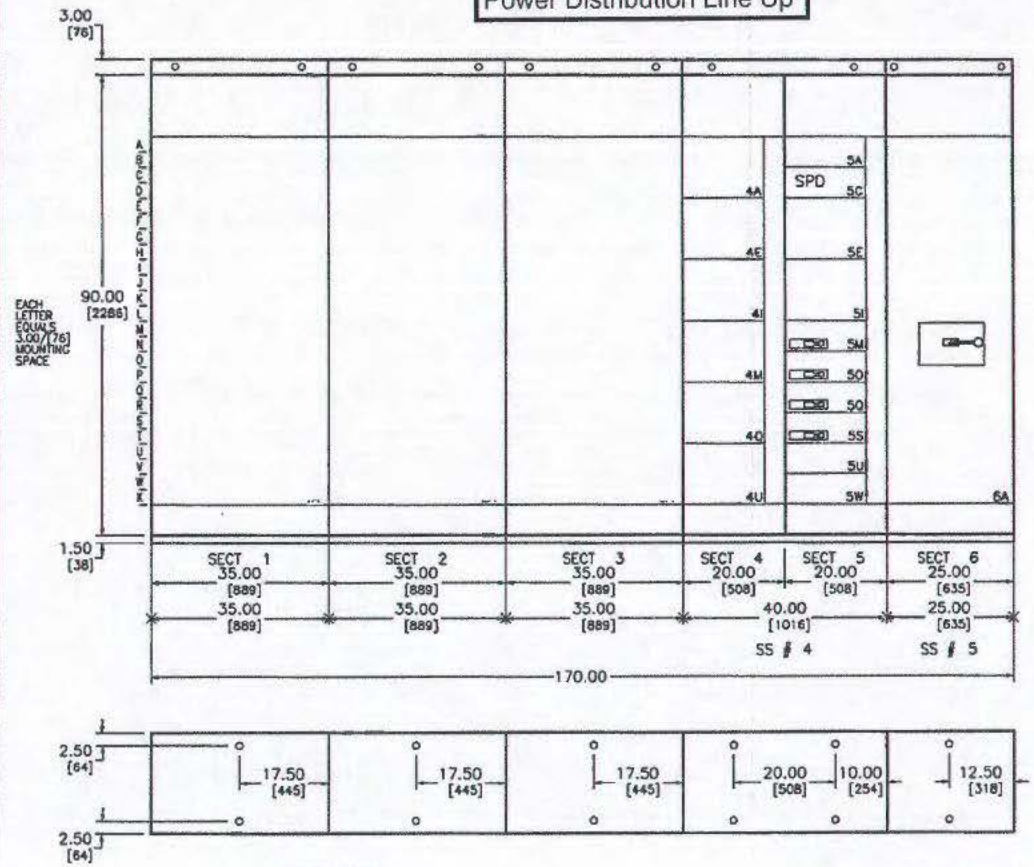
FLOOR PLAN – FRONT

ENGLISH DIMENSIONS: INCHES

JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION: SWBD	
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	QED Switchboard
DRAWN BY:	(QZC)	DRAWING TYPE:	SIDE, TOP VIEW & FLOOR PLAN
ENGR:			
DATE:	October 20 2011		
DRAWING STATUS:	QUOTE NOT FOR CONSTRUCTION	DWG# F30736399-01	PG 2 OF 2 REV -

REV	DESCRIPTION	BY	DATE
-	----	--	--/--/--

Power Distribution Line Up



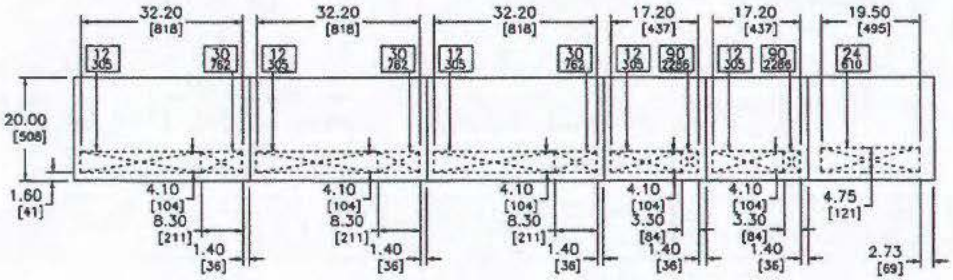
ANCHOR DETAIL

ENGLISH DIMENSIONS: INCHES

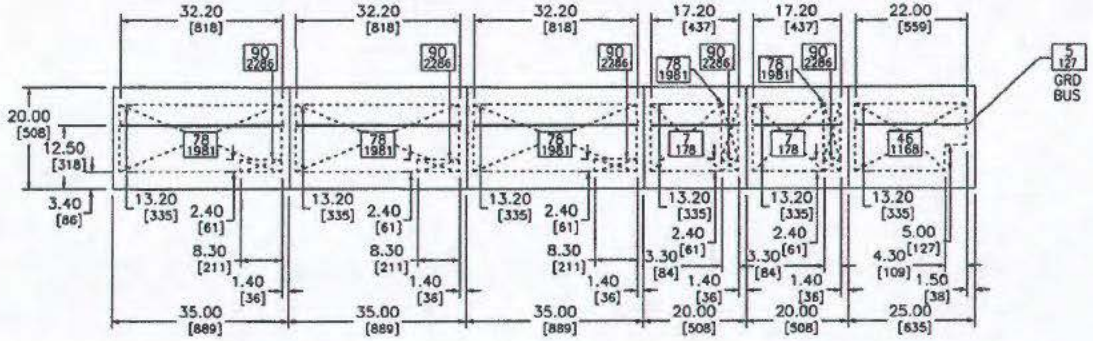
JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	(Q2C)	DRAWING TYPE:	ELEVATION
ENGR:		BY:	[redacted]
DATE:	November 15 2011		
DRAWING STATUS:	QUOTE	DWG #	F30736396-01

PG 1 OF 3 REV -

REV	DESCRIPTION	BY	DATE
-	----	--	--/--/--



TOP VIEW



FLOOR VIEW

CROSSED AREA REPRESENTS CONDUIT ENTRY AREA. NUMBERS IN BOXES INDICATE VERTICAL CLEARANCE TO NEAREST OBSTRUCTION.

ENGLISH DIMENSIONS: INCHES

JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	(02C)	DRAWING TYPE:	ELEVATION
ENGR:			
DATE:	November 15 2011		
DRAWING STATUS:	QUOTE	DWG #	F307363993-01 PG 2 OF 3 REV -

S & K EQUIPMENT COMPANY, Inc.
... When Quality Counts ...

P. O. Box 342
1243 Bayou Street
Vincennes, IN 47591
Ph (812) 886-0245
Fx (812) 886-1211

October 25, 2012

S & K Job # 501-11

Mutalib (Moe) Atekoja
SAF, Inc.
130 E. Voris Street, Suite A
Akron, OH 44311

330-253-1600

Re: Rice Lake Habitat Rehabilitation
LaGrange Pool
Fulton County, IL

Dear Moe,

Please find attached supporting documentation regarding the amperage rating of the neutral bussing. Note that Schneider Corp (Sq D) states the neutral bus will be 100% rated up to 1200 amps and 50% at 1500 amps. Note the attachment reflects the size of the Neutral bus. It is 1.5" x .25" for 1200 amps for 100% rating.

Sq D furthers stated that in order for the actual drawing being changed, it must go through Square D Engineering. This process will take 4 weeks after the order is released for the actual construction drawings. These drawings will then reflect the verbiage.

Should additional information be required or questions arise please do not hesitate to call.

Sincerely,

Steven Gott

Attachments

Cc: Mike Carney – Flow technics, Inc.

YAHOO! SMALL BUSINESS

FW: Q2C30736399 RICE LAKE SWITCHBOARD Thursday, August 30, 2012 1:42 PM

From: "Dick Cannon" <dickc@vesupply.com>
To: kkoch@altek.us

From: Dick Cannon [mailto:dickc@vesupply.com]
Sent: Thursday, August 30, 2012 1:37 PM
To: kkoch@altek.us
Subject: FW: Q2C30736399 RICE LAKE SWITCHBOARD

Hi Karl –

I just received the following response back from Square D. Apparently, above 1200A, they only offer a 50% rated bus. Let me know if The Corps requires any other documentation.

Sincerely,
Dick Cannon
Valley Electric Supply

From: debbie.broeckling@schneider-electric.com [mailto:debbie.broeckling@schneider-electric.com]
Sent: Thursday, August 30, 2012 1:05 PM
To: Dick Cannon
Subject: Re: Q2C30736399 RICE LAKE SWITCHBOARD

Dick,

Since this is 1600 amp bussing, we only have 50% neutral available -

"The neutral bus will be 100 percent rated for main bus ratings through 1200 amps, and 50 percent for main bus ratings above 1200 amps."

Debbie Broeckling | Square D by Schneider Electric | North America Operations | United States | Quotations
Phone: +317-598-4726 | **Fax:** +859-372-1782 |
Email: debbie.broeckling@schneider-electric.com | **Site:** www.schneider-electric.com | **Address:** 12001 Exit 5 Parkway, Fishers, IN 46037

*** Please consider the environment before printing this e-mail

From: "Dick Cannon" <dickc@vesupply.com>
To: <debbie.broeckling@us.schneider-electric.com>
Date: 08/30/2012 11:17 AM
Subject: Q2C30736399 RICE LAKE SWITCHBOARD

3-Phase, 4-Wire Systems

If the motor control center contains only motor loads, and no future 4-wire loads are anticipated, it is not necessary to bring the neutral conductor into the MCC. As an option, a neutral lug assembly (Figure 1 in "4-Wire Examples" on page 27) can be provided in the incoming main section to terminate a neutral conductor. Additional lugs can be added for connections to the neutral.

When 4-wire loads are present in the MCC, solid neutral bussing (Figure 2 in "4-Wire Examples" on page 27) can be provided in individual sections and connected to provide a continuous neutral bar. A neutral lug termination option must be selected for the incoming main section when selecting solid neutral bus in the MCC. Lugs are not provided when selecting solid neutral bus, but holes are pre-drilled to accommodate user-mounted lugs. As an option, neutral conductors for loads can be connected to the MCC neutral bus via a neutral bus drop located in each vertical wireway for easy access (Figure 2 in "4-Wire Examples" on page 27).

A special 12 in. neutral distribution unit (Figure 3 in "4-Wire Examples" on page 27) can be provided to terminate branch device neutral connections in 15 in. deep sections. Such branches should be located close to the main for easier interconnections. A neutral lug termination option must be selected when selecting a neutral distribution unit.

Description	Application	Space (Inches)
Neutral lug termination [1] (Provides termination for fourth wire on 3-phase, 4-wire systems)	110–150 A main or branch [2]	0
	175–250 A main or branch	0
	300–400 A main or branch [3]	0
	450–600 A top located main breaker	18
	450–600 A	6
	600–800 A main switch or top located branch switch	5 in. added to width
	600–800 A bottom located branch switch	0
	1000–2000 A main or branch switch	5 in. added to width
	800–2500 A main or branch breaker	
	600–2500 A main lugs	See Main Lug Compartments, 3-phase, 4-wire system, page 18
Neutral distribution unit [4]	Neutral rating 1250 A max.	12
Solid neutral bus [5] (20 in. deep sections required)	600–800 A (1) 1.5 in. x 0.25 in. cu	0
	1200–2500 A (2) 1.5 in. x 0.25 in. cu max. 100% rating is 1200 A	
Neutral bus drop [1, 6, 7] (Provides vertical extension of solid neutral bus into vertical wireway to facilitate neutral connections from units)	Provides vertical extension of solid neutral bus into vertical wireway to facilitate neutral connections from units.	0

1 Neutrals in units are factory-connected when the neutral distribution option or neutral bus drop option are chosen.

2 Except for Compac 6 units.

3 When >35 kA SCCR or electronic trip, an additional 6 in. of space is required on top located mains and an additional 3 in. for bottom located mains and branches.

4 Neutral distribution units must go in the next adjacent section on bottom feed full section mains. 12 in. of additional space is not required on top-feed, full section (72 in.) mains.

5 Not available with through-the-back splice.

6 25 in. wide section required when used with a cabled main or branch breaker devices (450–600 A branches and 400–600 A mains). Neutral bus drop is not available in sections with 800 A or larger top main or any branch breakers , or 600 A or larger top main or any branch switches. However, the 4-wire Neutral Lug Termination will be factory-connected to the MCC neutral and additional holes are drilled for unit load neutrals on the main/branch neutral termination.

7 600–1200 A bottom entry, fusible switch main will add 12 in. to unit height.

REV	DESCRIPTION	BY	DATE
-	-----	---	--/--/--

GENERAL NOTES

Class 1 Type B Wiring

PRODUCT DESCRIPTION AND RATINGS

POWER SYSTEM DATA:
480Y/277V 3PH 4W 60Hz
SHORT CIRCUIT RATING: 42kA
POWER ENTERS: Main Breaker Top Section B
CONTROL POWER: 120Vac

BUS SYSTEM DATA:
MAIN HORIZONTAL BUS: 1600 Amp Copper/Tin Plated / 1.5"
BUS BRACING: 42kA
VERTICAL BUS: 600 Amp Tin Plated Copper
NEUTRAL BUS: 50 Percent Neutral
HORIZONTAL GROUND BUS: .25" X 1.0" (6.35mm X 25.4mm) Tin Plated Copper
Units Securely Grounded To Structure

The amperage on the Neutral Bus is rated at 100% at 1200 amps and 50% at 1600 amps. This is in material as there are no neutral loads on the system.

ENCLOSURE DATA:
ENCLOSURE TYPE: 20" DEEP Type 1
EXTERIOR COLOR: Electrodeposition Finish ANSI 49 Medium Light Grey
INTERIOR COLOR: Electrodeposition Finish White

STRUCTURE MODIFICATIONS:
Ground Bus Lug : Main Section
Rodent Barriers 1
Manual Bus Shutters 4,5
Fishtape Barriers 1,2,3,4,5,6
600A Vertical Bus 4,5
Copper Vertical Ground Bus 4,5
Master Nameplate 1
Neutral Bus Drop

EQUIPMENT WEIGHT:
SHIPPING SPLIT # 1: 760.00 Lbs. (344.74 Kg.)
SHIPPING SPLIT # 2: 760.00 Lbs. (344.74 Kg.)
SHIPPING SPLIT # 3: 760.00 Lbs. (344.74 Kg.)
SHIPPING SPLIT # 4: 1500.00 Lbs. (680.40 Kg.)
SHIPPING SPLIT # 5: 720.00 Lbs. (326.59 Kg.)
TOTAL LINEUP WEIGHT (APPROX): 4500.00 Lbs. (2041.20 Kg.)

PRODUCT ACCESSORIES:
See Unit Features

JOB NAME:	ROCK ISLAND SWITCHBOARD	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	WOOD, S MOTOR CONTROL CENTER
DRAWN BY:	JDZC1	DRAWING TYPE:	ELEVATION
ENGR:			[redacted]
DATE:	November 15 2011		
DRAWING STATUS:	QUOTE	ORD#	F30756399-01

PG 3 OF 3 [REV -

REV	DESCRIPTION	BY	DATE
-	-----	--	--/--/--
-	-----	--	--/--/--
-	-----	--	--/--/--
-	-----	--	--/--/--
-	-----	--	--/--/--
-	-----	--	--/--/--

UNIT LOC	NAMEPLATE DESIGNATION (BLACK SURFACE/WHITE LETTERS)	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	FUSE SIZE PRI	FUSE SIZE SEC	INTERLOCKS NO	INTERLOCKS NC	PILOT DEVICE FEATURES 22 mm- XB5 ON LIGHT	PILOT DEVICE FEATURES 22 mm- XB5 OFF LIGHT	PILOT DEVICE FEATURES 22 mm- XB5 ADDL P/L	PILOT DEVICE FEATURES 22 mm- XB5 SS / PB	OTHER UNIT FEATURES	ELEMENTARY #
1A	PUMP NO. 3	MT UNIT															SPL	
2A	PUMP NO. 2	MT UNIT															SPL	
3A	PUMP NO. 1	MT UNIT															SPL	
4A	SPACE	MT UNIT																
4C	SPACE	MT UNIT																
4E	SPACE	MT UNIT																
4M	SPACE	MT UNIT																
4Q	SPACE	MT UNIT																
4U	SPACE	MT UNIT																
5A	MONITORING UNIT FOR MAIN	POWER METER															#14 AWG MTW CONTROL WIRE, PM820 W/DISPLAY	E30736399--04
5C	SURGE PROTECTION DEVICE	SPD			SW 30												SURGE COUNTER	E30736399--01
5E	SPACE	MT UNIT																
5I	SPACE	MT UNIT																
5M	TR1 FEEDER	6" BRANCH BKR			HJ 150	35											#4-3/0AWG 1 LUG/PH	E30736399--02
5O	UNIT HEATER UH-1	6" BRANCH BKR			HJ 150	20											#4-3/0AWG 1 LUG/PH	E30736399--03
5Q	SPARE 20 AMP BREAKER	6" BRANCH BKR			HJ 150	20											#4-3/0AWG 1 LUG/PH	E30736399--03
5S	SPARE 20 AMP BREAKER	6" BRANCH BKR			HJ 150	20											#4-3/0AWG 1 LUG/PH	E30736399--03
5U	SPACE	MT UNIT																
5W	SPACE	MT UNIT																
UNIT LOC	NAMEPLATE DESIGNATION	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	PRI FUSE SIZE	SEC FUSE SIZE	NO INTERLOCKS	NC INTERLOCKS	ON LIGHT PILOT DEVICE FEATURES 22 mm- XB5	OFF LIGHT PILOT DEVICE FEATURES 22 mm- XB5	ADDL P/L PILOT DEVICE FEATURES 22 mm- XB5	SS / PB PILOT DEVICE FEATURES 22 mm- XB5	OTHER UNIT FEATURES	ELEMENTARY #

MCC NAMEPLATE - MCC1
(BLACK SURFACE/WHITE LETTERS)

JOB NAME:	RICE LAKE SWITCHBOARD
JOB LOCATION:	ROCK ISLAND IL
DRAWN BY:	(07C)
ENGR:	
DATE:	November 15 2011
DRAWING STATUS:	QUOTE

EQUIPMENT DESIGNATION:	MCC1
EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWING TYPE:	UNIT INFORMATION
DWG #	E30736399-01

PG 1 OF 2 | REV -

REV	DESCRIPTION	BY	DATE
-	----	--	--/--/--

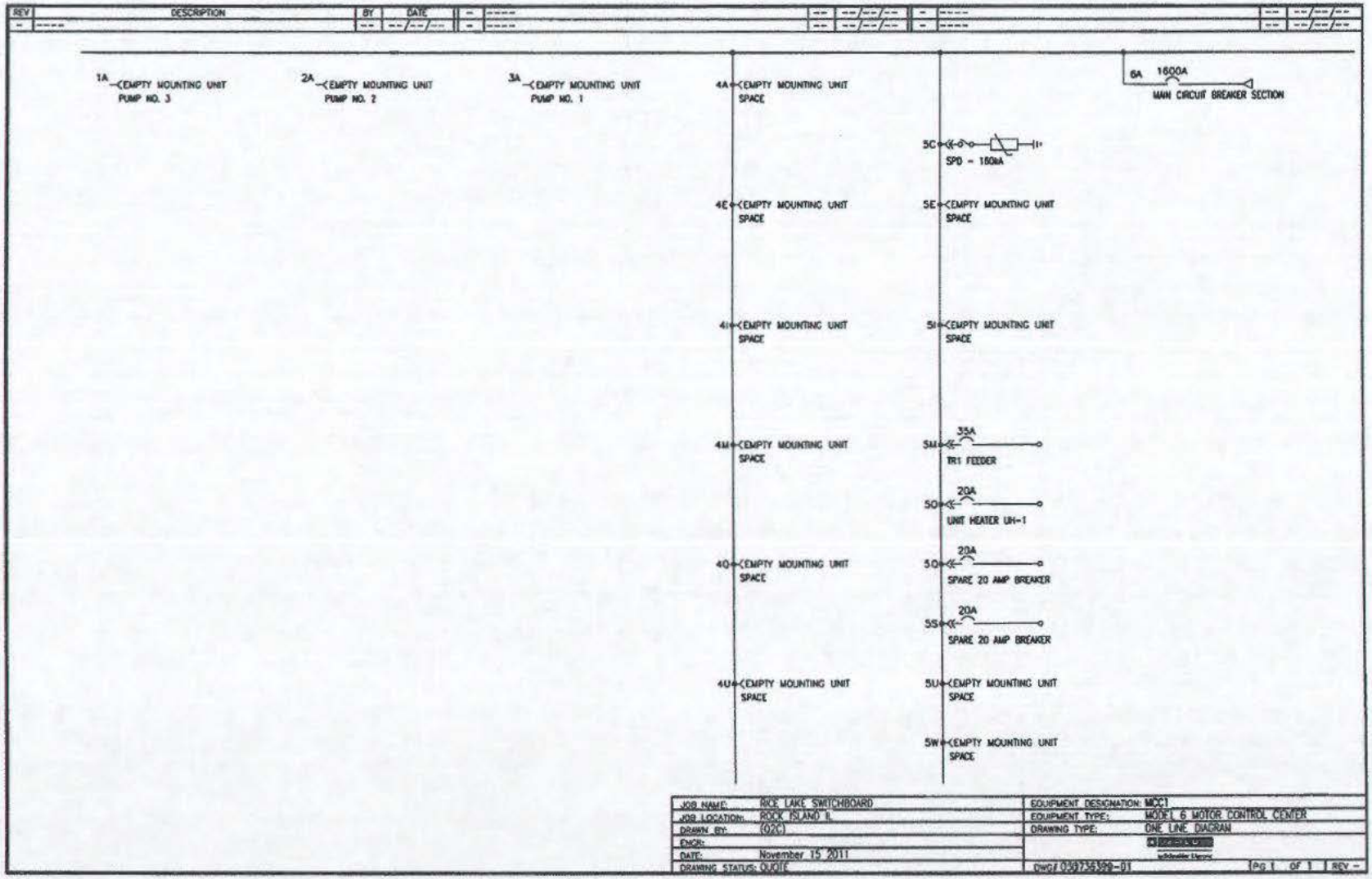
UNIT LOC	NAMEPLATE DESIGNATION	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	FUSE SIZE PRI	FUSE SIZE SEC	INTERLOCKS NO	INTERLOCKS NC	PILOT DEVICE FEATURES 22 mm- XB5 ON LIGHT	PILOT DEVICE FEATURES 22 mm- XB5 OFF LIGHT	ADDL P/L	SS / PB	OTHER UNIT FEATURES	ELEMENTARY #
6A	MAIN CIRCUIT BREAKER SECTION	MAIN BKR			RL 3000	1600											1/0-750KCMIL 6 LUGS/PH. 24VDC TRIP UNIT PWR SUPP, BOX RATED, ELECTRONIC TRIP UNIT WITH AMMETER, I2TP RELAY, LSIG TRIP FUNCTION, SOLID NEUTRAL, UL SERVICE ENT LABEL	E30738398--04

UNIT LOC	NAMEPLATE DESIGNATION	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	PRI FUSE SIZE	SEC FUSE SIZE	NO INTERLOCKS	NC INTERLOCKS	ON LIGHT PILOT DEVICE FEATURES 22 mm- XB5	OFF LIGHT PILOT DEVICE FEATURES 22 mm- XB5	ADDL P/L	SS / PB	OTHER UNIT FEATURES	ELEMENTARY #

JOB NAME:	RICE LAKE SWITCHBOARD
JOB LOCATION:	ROCK ISLAND IL
DRAWN BY:	(DZC)
ENGR:	
DATE:	November 15 2011
DRAWING STATUS:	QUOTE

EQUIPMENT DESIGNATION:	MCC1
EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWING TYPE:	UNIT INFORMATION

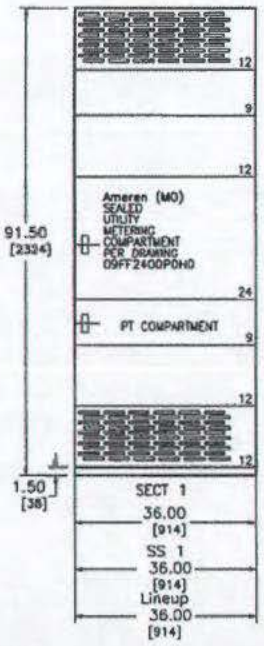
DWG 1130738398-01 | PG 2 OF 2 | REV -


REV
DESCRIPTION
BY
DATE
1A EMPTY MOUNTING UNIT PUMP NO. 3
2A EMPTY MOUNTING UNIT PUMP NO. 2
3A EMPTY MOUNTING UNIT PUMP NO. 1
4A EMPTY MOUNTING UNIT SPACE
6A 1600A MAIN CIRCUIT BREAKER SECTION
5C SPD - 160kA
4E EMPTY MOUNTING UNIT SPACE
5E EMPTY MOUNTING UNIT SPACE
4I EMPTY MOUNTING UNIT SPACE
5I EMPTY MOUNTING UNIT SPACE
4M EMPTY MOUNTING UNIT SPACE
35A
5M TR1 FEEDER
20A
5O UNIT HEATER UH-1
4Q EMPTY MOUNTING UNIT SPACE
20A
5Q SPARE 20 AMP BREAKER
20A
5S SPARE 20 AMP BREAKER
4U EMPTY MOUNTING UNIT SPACE
5U EMPTY MOUNTING UNIT SPACE
5W EMPTY MOUNTING UNIT SPACE
JOB NAME: RICE LAKE SWITCHBOARD
JOB LOCATION: ROCK ISLAND IL
DRAWN BY: (02C)
ENGR:
DATE: November 15 2011
DRAWING STATUS: QUOTE
EQUIPMENT DESIGNATION: MCC1
EQUIPMENT TYPE: MODEL 6 MOTOR CONTROL CENTER
DRAWING TYPE: ONE LINE DIAGRAM
DWG# 0297355B9-01
PG 1 OF 1
REV -

REV	DESCRIPTION	BY	DATE
-	-----	--	--/--/--

T-bus
27.0 in

Utility Entrance Compartment



SWITCHBOARD GENERAL NOTES

PRODUCT DESCRIPTION & RATINGS

Power System Data

480Y/277V 3Ph 4W 60Hz / 3 Phase Wye
Solidly Grounded
System Short Circuit Current Rating: 65kA RMS
Incoming Section 1 Cable Through the Bottom Right of Lineup

Bus System Data

1600A Tin/Aluminum & Silver/Copper Main Bus
(4) .25x2.00 IN/6x51 mm Al Bus Bar Per Phase/Neutral
(1) .25x1.50 IN/6x38 mm Al Ground Bus

Enclosure Data

Type 1 Free Standing
Exterior Paint Color: ANSI 49
Front Accessibility Only Required
Handling: Rollers & Lifting Assemblies
Utility sealing hardware installed for unmetered bus compartments

Estimated Shipping Weight

Shipping Split 1 865.00 lbs / 392.36 kgs
Complete Lineup 865.00 lbs / 392.36 kgs

Code Standards

U.L. Deadfront

Rating Nameplates

ST1- Deadfront- Section Bus 1600A

PRODUCT INFORMATION

Wiring

All wiring to be Machine Tool Wire type

Instruction Bulletins

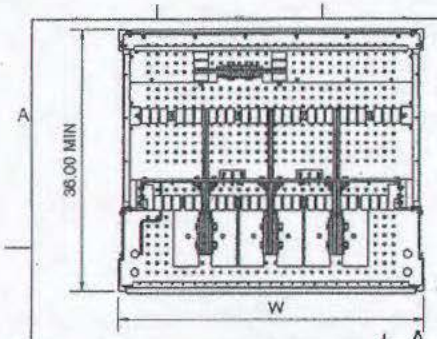
Reference 80043-055 For Handling, Installation, Anchoring, Inspection And Maintenance Information

Product Accessories/Options

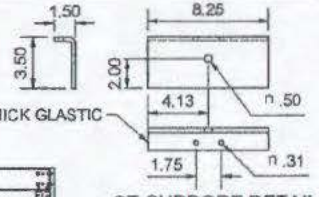
ENGLISH DIMENSIONS: INCHES

JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION:	SWBD
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	QED Switchboard
DRAWN BY:	(QED)	DRAWING TYPE:	ELEVATION VIEW
ENGR:			
DATE:	October 20 2011		
DRAWING STATUS: QUOTE	NOT FOR CONSTRUCTION	DWG # F367636399-01	PG 1 OF 2 REV -

AMPS	BARS PER PH.	BUS SIZE	JMPS PER PH.	JMPR SIZE	WIDTH MIN W	DEPTH MIN W/MAIN	DEPTH MIN W/O MAIN
1600	2	0.25X3.25	2	0.25X3.25	36	36	36
2000	2	0.25X4.0	2	0.25X4.0	36	36	36
2500	2	0.25X5.0	2	0.25X5.0	36	36	36
3000	2	0.25X6.0	3	0.25X5.0	42	48	36
4000	3	0.25X6.0	4	0.25X5.0	42	48	36



B-B SECTION

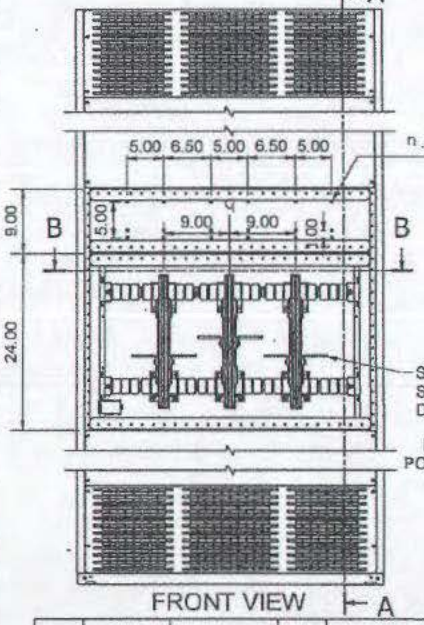


CT SUPPORT DETAIL

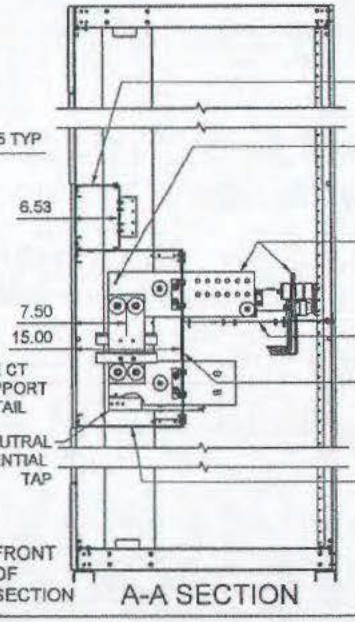
NOTES:

1. FRONT OF 36" WIDE CT AND PT COMPARTMENTS ARE ENCLOSED BY A SINGLE DOOR OR DOUBLE DOORS FOR 42" WIDE COMPARTMENTS. DOORS ARE TO BE HINGED ON THE SIDE AND EQUIPPED WITH A SEALING HASP FOR A PADLOCK TYPE SEAL.
2. CT AND PT COMPARTMENTS ARE FULLY BARRIERED.
3. TOP FEED CT AND PT COMPARTMENTS SHOWN. INVERT FOR BOTTOM FEED.
4. THIS SERVICE SECTION IS FOR USE ON:
   - 120 / 208 Y 3 PH. 4W
   - 277 / 480 Y 3 PH. 4W - PT COMPT REQ'D
   - 240 V Δ 3 PH. 3W
   - 480 V Δ 3 PH. 3W - PT COMPT REQ'D

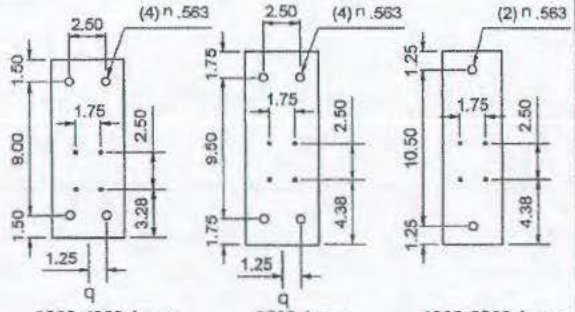
   PT COMPARTMENT REQIRED ONLY FOR 277/480V AND 480V SERVICE. PT COMPARTMENT MUST BE LOCATED DIRECTLY ABOVE OR BELOW THE CT COMPARTMENT.
5. PROVIDE TWO 1" MIN DIAMETER HOLES FOR ROUTING METER WIRING BETWEEN CT AND PT COMPARTMENTS.
6. PROVIDE GROUND LUG IN CT COMPARTMENT TO ACCEPT CUSTOMER #10 COPPER GROUND WIRE. LUG TO BE CONNECTED BY SQUARE D TO THE SWITCHBOARD GROUND.



FRONT VIEW



A-A SECTION



JUMPER DETAIL

REV	AN	DATE	BY	REVISION DESCRIPTION

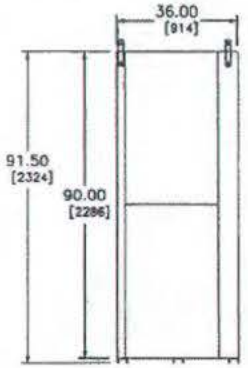
Schneider Electric

POWER STYLE QED SWBD 1600-4000 AMPS
UTILITY COMPARTMENT DRAWING

Number: 09FF2400P0H00 | Revision: | Sheet: 1/2

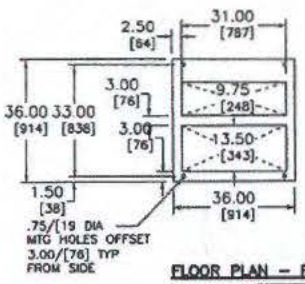
State: Eng: SN July 20, 2010

REV	DESCRIPTION	BY	DATE
-	-----	--	--/--/--



LEFT SIDE VIEW

TOP VIEW – FRONT

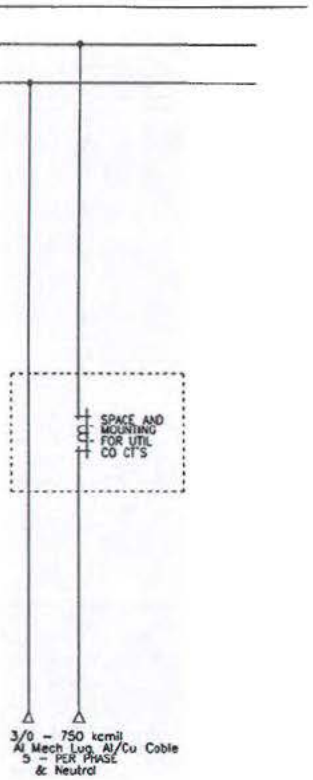


FLOOR PLAN – FRONT

ENGLISH DIMENSIONS: INCHES

JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION:	SWBD
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	QED Switchboard
DRAWN BY:	(DZC)	DRAWING TYPE:	SIDE TOP VIEW & FLOOR PLAN
ENGR:			
DATE:	October 20 2011		
DRAWING STATUS: QUOTE	NOT FOR CONSTRUCTION	DWG # F307J6399-01	PG 2 OF 2 REV -

REV	DESCRIPTION	BY	DATE
-	----	---	--/--/--



SECTION 1

JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION:	SWBD
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	OUTD Switchboard
DRAWN BY:	(QC)	DRAWING TYPE:	ONE LINE
ENGR:			
DATE:	October 20 2011	DWG # 030735399-01	PG 1 OF 2 REV -
DRAWING STATUS:	QUOTE		

REV	DESCRIPTION	BY	DATE
-	----	--	--/--/--

POWER STYLE QED-2 SWITCHBOARD

SECT NO	CKT NO	GMD HEIGHT	DEVICE/FRAME RATING	TRIP AMP	FUSE/ TRIP	#P	DESIGNATION	N/P	LUG INFORMATION				ACCESSORIES
									QTY	PHASE WIRE RANGE	QTY	NEUT. WIRE RANGE	
1	UCT	-	1600A	-	-	-		No	5	3/0 - 750 kcmil	5	3/0 - 750 kcmil	

LEGEND
No Accessories

JOB NAME:	RICE LAKE SWITCHBOARD	EQUIPMENT DESIGNATION:	SWBD
JOB LOCATION:	ROCK ISLAND IL	EQUIPMENT TYPE:	QED Switchboard
DRAWN BY:	(Q2C)	DRAWING TYPE:	SCHEDULE
ENGR:			
DATE:	October 20 2011		
DRAWING STATUS:	QUOTE	DWG #	QD0735399-01

S & K EQUIPMENT COMPANY, Inc.

... When Quality Counts ...

P. O. Box 342
1243 Bayou Street
Vincennes, IN 47591
Ph (812) 886-0245
Fx (812) 886-1211

ITEM ID	DESCRIPTION	MANUFACTURER	PART NUMBER	SHEET
IC-1	INPUT CONTACTOR PUMP #1	Benshaw	RSC-800-U120	X
IC-2	INPUT CONTACTOR PUMP #2	Benshaw	RSC-800-U120	X
IC-3	INPUT CONTACTOR PUMP #3	Benshaw	RSC-800-U120	X
T-1	CONTROL TRANSFORMER PUMP #1	MICRON	B500BTZ13RBF	X
T-2	CONTROL TRANSFORMER PUMP #2	MICRON	B500BTZ13RBF	X
T-3	CONTROL TRANSFORMER PUMP #3	MICRON	B500BTZ13RBF	X
SSRV-1	SOLID STATE STARTER PUMP #1	BENSHAW	RB2-1-S-590A-18C	X
SSRV-2	SOLID STATE STARTER PUMP #2	BENSHAW	RB2-1-S-590A-18C	X
SSRV-3	SOLID STATE STARTER PUMP #3	BENSHAW	RB2-1-S-590A-18C	X
MCP-5A	MAIN CIRCUIT BREAKER PUMP #1	SQUARE D	LIL36600	X
MCP-6A	MAIN CIRCUIT BREAKER PUMP #2	SQUARE D	LIL36600	X
MCP-7A	MAIN CIRCUIT BREAKER PUMP #3	SQUARE D	LIL36600	X
ETM-1	ELAPSED TIME METER PUMP #1	CRAMER	10063	X
ETM-2	ELAPSED TIME METER PUMP #2	CRAMER	10063	X
ETM-3	ELAPSED TIME METER PUMP #3	CRAMER	10063	X
PC-1	PUMP CONTROLLER PUMP #1	ALLEN BRADLEY	1763-L16BWA	X
PCEX-1	ANALOG MODULE PUMP #1	ALLEN BRADLEY	1762-IF4	X
PC-2	PUMP CONTROLLER PUMP #2	ALLEN BRADLEY	1763-L16BWA	X
PCEX-2	ANALOG MODULE PUMP #2	ALLEN BRADLEY	1762-IF4	X
PC-3	PUMP CONTROLLER PUMP #3	ALLEN BRADLEY	1763-L16BWA	X
PCEX-3	ANALOG MODULE PUMP #3	ALLEN BRADLEY	1762-IF4	X
PCM-1	PUMP CONTROLLER MONITOR PUMP #1	EZ AUTOMATION	EZ-T6C-FS	X
PCM-2	PUMP CONTROLLER MONITOR PUMP #2	EZ AUTOMATION	EZ-T6C-FS	X
PCM-3	PUMP CONTROLLER MONITOR PUMP #3	EZ AUTOMATION	EZ-T6C-FS	X
CR1-1	CONTROL RELAY 1 PUMP #1	FINDER	56.34.8.1200040	X
CR1-2	CONTROL RELAY 2 PUMP #1	FINDER	56.34.8.1200040	X
CR1-3	CONTROL RELAY 3 PUMP #1	FINDER	56.34.8.1200040	X
CR1-4	CONTROL RELAY 4 PUMP #1	FINDER	56.34.8.1200040	X
CR1-5	CONTROL RELAY 5 PUMP #1	FINDER	56.34.8.1200040	X
CR1-6	CONTROL RELAY 6 PUMP #1	FINDER	56.34.8.1200040	X
CR1-7	CONTROL RELAY 7 PUMP #1	FINDER	56.34.8.1200040	X
CR1-8	CONTROL RELAY 8 PUMP #1	FINDER	56.34.8.1200040	X
CR2-1	CONTROL RELAY 1 PUMP #2	FINDER	56.34.8.1200040	X
CR2-2	CONTROL RELAY 2 PUMP #2	FINDER	56.34.8.1200040	X
CR2-3	CONTROL RELAY 3 PUMP #2	FINDER	56.34.8.1200040	X
CR2-4	CONTROL RELAY 4 PUMP #2	FINDER	56.34.8.1200040	X
CR2-5	CONTROL RELAY 5 PUMP #2	FINDER	56.34.8.1200040	X
CR2-6	CONTROL RELAY 6 PUMP #2	FINDER	56.34.8.1200040	X
CR2-7	CONTROL RELAY 7 PUMP #2	FINDER	56.34.8.1200040	X
CR2-8	CONTROL RELAY 8 PUMP #2	FINDER	56.34.8.1200040	X
CR3-1	CONTROL RELAY 1 PUMP #3	FINDER	56.34.8.1200040	X
CR3-2	CONTROL RELAY 2 PUMP #3	FINDER	56.34.8.1200040	X
CR3-3	CONTROL RELAY 3 PUMP #3	FINDER	56.34.8.1200040	X
CR3-4	CONTROL RELAY 4 PUMP #3	FINDER	56.34.8.1200040	X
CR3-5	CONTROL RELAY 5 PUMP #3	FINDER	56.34.8.1200040	X
CR3-6	CONTROL RELAY 6 PUMP #3	FINDER	56.34.8.1200040	X
CR3-7	CONTROL RELAY 7 PUMP #3	FINDER	56.34.8.1200040	X

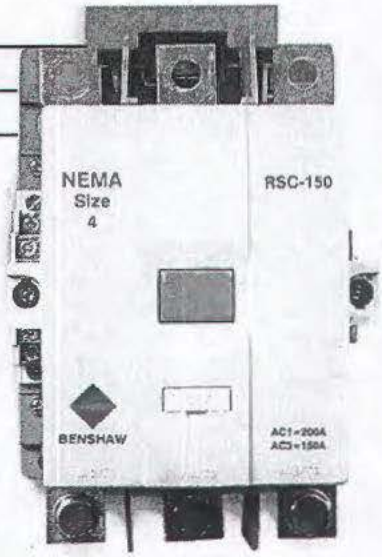
CR3-8	CONTROL RELAY 8 PUMP #3	FINDER	56.34.8.1200040	X
RRC	CONTROL RELAY RETAINING CLIPS	FINDER	094.91.3	X
CRB	CONTROL RELAY COMMON BASE	FINDER	96.04	X
SLR1-1	SEAL LEAK RELAY #1 TOP CHAMBER	FINDER	55.34.9.024.0040	X
SLR1-2	SEAL LEAK RELAY #1 MOTOR CHAMBER	FINDER	55.34.9.024.0040	X
SLR3-3	SEAL LEAK RELAY #1 LOWER CHAMBER	FINDER	55.34.9.024.0040	X
SLR2-1	SEAL LEAK RELAY #2 TOP CHAMBER	FINDER	55.34.9.024.0040	X
SLR2-2	SEAL LEAK RELAY #2 MOTOR CHAMBER	FINDER	55.34.9.024.0040	X
SLR2-3	SEAL LEAK RELAY #2 LOWER CHAMBER	FINDER	55.34.9.024.0040	X
SLR3-1	SEAL LEAK RELAY #3 TOP CHAMBER	FINDER	55.34.9.024.0040	X
SLR3-2	SEAL LEAK RELAY #3 MOTOR CHAMBER	FINDER	55.34.9.024.0040	X
SLR3-3	SEAL LEAK RELAY #3 LOWER CHAMBER	FINDER	55.34.9.024.0040	X
SLR-B	CONTROL RELAY BASE	FINDER	94.04	X
RRC	CONTROL RELAY RETAINING CLIPS	FINDER	094.91.3	X
TD1-1	TIME DELAY RELAY 1 PUMP #1	FINDER	88.02	X
TD1-2	TIME DELAY RELAY 1 PUMP #2	FINDER	88.02	X
TD1-3	TIME DELAY RELAY 1 PUMP #3	FINDER	88.02	X
TDB	TIME DELAY RELAY COMMON BASE	FINDER	90.27	X
PB1-1	START PUSH BUTTON PUMP #1	SQUARE D	9001KR1UH13	X
PB1-2	STOP PUSH BUTTON PUMP #1	SQUARE D	9001KR1UH13	X
PB1-3	RESET PUSH BUTTON PUMP #1	SQUARE D	9001KR1UH13	X
PB2-1	START PUSH BUTTON PUMP #2	SQUARE D	9001KR1UH13	X
PB2-2	STOP PUSH BUTTON PUMP #2	SQUARE D	9001KR1UH13	X
PB2-3	RESET PUSH BUTTON PUMP #2	SQUARE D	9001KR1UH13	X
PB3-1	START PUSH BUTTON PUMP #3	SQUARE D	9001KR1UH13	X
PB3-2	STOP PUSH BUTTON PUMP #3	SQUARE D	9001KR1UH13	X
PB3-3	RESET PUSH BUTTON PUMP #3	SQUARE D	9001KR1UH13	X
PL1-1	CALLED PILOT LIGHT PUMP #1	SQUARE D	9001KM38LL	X
PL2-1	LOW LEVEL PILOT LIGHT PUMP #1	SQUARE D	9001KM38LY	X
PL3-1	RUNNING PILOT LIGHT PUMP #1	SQUARE D	9001KM38LR	X
PL4-1	ENABLED PILOT LIGHT PUMP #1	SQUARE D	9001KM38LW	X
PL5-1	STOPPED PILOT LIGHT PUMP #1	SQUARE D	9001KM38LG	X
PL6-1	FAULT PILOT LIGHT PUMP #1	SQUARE D	9001KM38LY	X
PL1-2	CALLED PILOT LIGHT PUMP #2	SQUARE D	9001KM38LL	X
PL2-2	LOW LEVEL PILOT LIGHT PUMP #2	SQUARE D	9001KM38LY	X
PL3-2	RUNNING PILOT LIGHT PUMP #2	SQUARE D	9001KM38LR	X
PL4-2	ENABLED PILOT LIGHT PUMP #2	SQUARE D	9001KM38LW	X
PL5-2	STOPPED PILOT LIGHT PUMP #2	SQUARE D	9001KM38LG	X
PL6-2	FAULT PILOT LIGHT PUMP #2	SQUARE D	9001KM38LY	X
PL1-3	CALLED PILOT LIGHT PUMP #3	SQUARE D	9001KM38LL	X
PL2-3	LOW LEVEL PILOT LIGHT PUMP #3	SQUARE D	9001KM38LY	X
PL3-3	RUNNING PILOT LIGHT PUMP #3	SQUARE D	9001KM38LR	X
PL4-3	ENABLED PILOT LIGHT PUMP #3	SQUARE D	9001KM38LW	X
PL5-3	STOPPED PILOT LIGHT PUMP #3	SQUARE D	9001KM38LG	X
PL6-3	FAULT PILOT LIGHT PUMP #3	SQUARE D	9001KM38LY	X
TB-1	CONTROL TERMINAL BLOCK PUMP #1	GENERAL ELECTRIC	CR151B2	X
TB-2	CONTROL TERMINAL BLOCK PUMP #2	GENERAL ELECTRIC	CR151B2	X
TB-3	CONTROL TERMINAL BLOCK PUMP #3	GENERAL ELECTRIC	CR151B2	X
PS-1	POWER SUPPLY PUMP #1	LOVATO	PSL1M 060 24	X
PS-2	POWER SUPPLY PUMP #2	LOVATO	PSL1M 060 24	X
PS-3	POWER SUPPLY PUMP #3	LOVATO	PSL1M 060 24	X
FU1-1	CONTROL FUSE PUMP #1	LITTLEFUSE	CCMR-3	X
FU2-1	CONTROL FUSE PUMP #1	LITTLEFUSE	CCMR-3	X
FU3-1	CONTROL FUSE PUMP #1	LITTLEFUSE	CCMR-6	X
FU1-2	CONTROL FUSE PUMP #2	LITTLEFUSE	CCMR-3	X
FU2-2	CONTROL FUSE PUMP #2	LITTLEFUSE	CCMR-3	X

FU3-2	CONTROL FUSE PUMP #2	LITTLEFUSE	CCMR-6	X
FU1-3	CONTROL FUSE PUMP #3	LITTLEFUSE	CCMR-3	X
FU2-3	CONTROL FUSE PUMP #3	LITTLEFUSE	CCMR-3	X
FU3-3	CONTROL FUSE PUMP #3	LITTLEFUSE	CCMR-6	X
CB2A	MAIN MCC CIRCUIT BREAKER	SQUARE D	RJF36160CU44A	X
CB3A	CIRCUIT BREAKER SLOT 3A	SQUARE D		
CB3M	CIRCUIT BREAKER SLOT 3M	SQUARE D	HJA36035	X
CB3O	CIRCUIT BREAKER SLOT 3O	SQUARE D	HJA36020	X
SLM1-1	SEAL LEAK MONITOR	ABS	61240170	X
SLM1-2	SEAL LEAK MONITOR	ABS	61240170	X
SLM1-3	SEAL LEAK MONITOR	ABS	61240170	X
SLM2-1	SEAL LEAK MONITOR	ABS	61240170	X
SLM2-2	SEAL LEAK MONITOR	ABS	61240170	X
SLM2-3	SEAL LEAK MONITOR	ABS	61240170	X
SLM3-1	SEAL LEAK MONITOR	ABS	61240170	X
SLM3-2	SEAL LEAK MONITOR	ABS	61240170	X
SLM3-3	SEAL LEAK MONITOR	ABS	61240170	X
SubT-1	SUBMERSIBLE TRANSDUCER	KPSI	750-14D	X
SubT-2	SUBMERSIBLE TRANSDUCER	KPSI	750-14D	X
SubT-3	SUBMERSIBLE TRANSDUCER	KPSI	750-14D	X
HTR-1	CABINET HEATER w/THERMOSTAT	Electro-Flex	EN2-12-P-040-D	X
HTR-2	CABINET HEATER w/THERMOSTAT	Electro-Flex	EN2-12-P-040-D	X
HTR-3	CABINET HEATER w/THERMOSTAT	Electro-Flex	EN2-12-P-040-D	X
HTR-4	CABINET HEATER w/THERMOSTAT	Electro-Flex	EN2-12-P-040-D	X
HTR-5	CABINET HEATER w/THERMOSTAT	Electro-Flex	EN2-12-P-040-D	X
HTR-6	CABINET HEATER w/THERMOSTAT	Electro-Flex	EN2-12-P-040-D	X
HTR-7	CABINET HEATER w/THERMOSTAT	Electro-Flex	EN2-12-P-040-D	X
	SPARE PARTS			
	CONTACTOR REBUILD KIT	BENSHAW	RSC-800	X
	CONTACTOR COIL	BENSHAW	RSC-C800-U120	X
	AUXILIARY CONTACT BLOCK	BENSHAW	RSC-100-800	X
	CONTROL RELAY 1 PUMP #1	FINDER	56.34.8.1200040	X
	SEAL LEAK RELAY	FINDER	55.34.9.024.0040	X
	TIME DELAY RELAY	FINDER	88.02	X
	CONTROL FUSE	LITTLEFUSE	CCMR-3	X
	CONTROL FUSE	LITTLEFUSE	CCMR-6	X
	SEAL LEAK MONITOR	ABS	61240170	X
	PILOT LIGHT	SQUARE D	9001KM38L	X
	ELAPSED TIME METER	CRAMER	10063	X
	CONTROL TRANSFORMER	MICRON	B500BTZ13RBF	X
	TOUCH UP PAINT AS REQUIRED			

Contactors - UL / IEC / NEMA

RSC SERIES
660 VAC CONTACTORS

RATINGS	
NEMA:	**Size 00 - 7**
IEC:	**9 - 800 AMP**
UL:	**1 - 600 HP**



IEC / NEMA contactor highlights:

Benshaw contactors are used for controlling single and three phase motors and for switching resistive or inductive loads up to 660 VAC.

The RediStart™ contactor line is built and tested to world leading electrical and mechanical standards.

TÜV Rheinland

NEMA IEC 60947

Key Advantages:

- World's longest electrical and mechanical lifespan
- UL/CSA, IEC, NEMA, BS, EN, VDE ratings
- Direct mount thermal overload relays
- Full line of field installable, modularized accessories
- Device marking strip
- AC or DC coil options

Standard features:

- Din rail mountable to 85 amps
- Full product family to 800 amps
- Direct mount overload relays
- Draw out cassette coils above 85 amps
- Integral coil surge suppression above 85 amps
- Low coil power consumption
- Phase barriers supplied standard
- Uni-directional mounting
- Extremely long lifespan
- Compact size
- Unit identification marker

RSC-9~85

- Finger proof design
- DIN rail or screw mountable
- Top/side mount accessories
- Small physical size
- Dual auxiliary contacts above 22A
- Integral voltage barriers

RSC-100~800

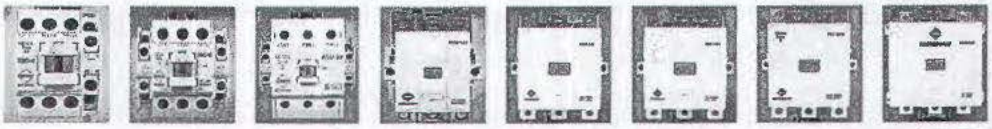
- Draw out cassette type coil
- Wide voltage range coils
- Integral coil surge suppression
- Dual auxiliary contacts

Guaranteed... for two full years.

Only Benshaw has a two year guarantee.
Every Benshaw Contactor is guaranteed for two full years. Other manufacturers limit their warranties to just one year. But at Benshaw, we believe that, because we build them better, we can guarantee them longer. We call that "the Benshaw Promise."

THE BENSHAW PROMISE 2 Year Warranty

Contactor Technical Information



Specification		Contactor Type	RSC 9	RSC 12	RSC 18	RSC 22	RSC 32	RSC 40	RSC 50	RSC 65	RSC 75	RSC 85	RSC 100	RSC 125	RSC 150	RSC 180	RSC 220	RSC 300	RSC 400	RSC 600	RSC 800
IEC-947	AC 1 Duty		20A	25A	30A	32A	50A	60A	80A	100A	110A	135A	160A	160A	210A	230A	275A	350A	450A	660A	840A
	AC 2B Duty	200-240V	11A	13A	18A	22A	32A	40A	55A	65A	75A	85A	100A	125A	150A	180A	220A	300A	400A	630A	800A
		380-440V	9A	12A	18A	22A	32A	40A	50A	60A	75A	85A	100A	120A	150A	180A	220A	300A	400A	630A	800A
		500-550V	7A	12A	13A	22A	28A	32A	43A	60A	64A	75A	80A	90A	140A	180A	200A	250A	350A	500A	720A
	AC 3 Duty	200-240V	11A	13A	18A	22A	32A	40A	55A	65A	75A	85A	105A	125A	150A	180A	250A	300A	400A	630A	800A
		380-440V	9A	12A	18A	22A	32A	40A	50A	65A	75A	85A	105A	120A	150A	180A	250A	300A	400A	630A	800A
		500-550V	7A	12A	13A	22A	28A	32A	43A	60A	64A	75A	85A	90A	140A	180A	200A	250A	350A	500A	720A
		690V	5A	9A	9A	18A	21A	25A	33A	42A	47A	52A	65A	70A	100A	120A	150A	200A	300A	420A	630A
	AC 4 Duty	200-220V	8A	11A	18A	18A	20A	25A	35A	50A	55A	65A	80A	93A	125A	150A	180A	220A	300A	400A	630A
		380-440V	6A	9A	9A	13A	17A	24A	32A	47A	52A	62A	75A	90A	110A	150A	180A	220A	300A	400A	630A
UL-508	MAX. HP	115V (1PH)	0.5	0.5	1	2	2	3	3	5	5	7.5	7.5	10	15	15	15				
		230V (1PH)	1	2	3	3	5	5	7.5	10	15	15	15	20	25	30	40				
		208V (3PH)	2	3	5	7.5	7.5	10	10	15	20	25	30	40	40	60	60	100	125	150	200
		240V (3PH)	2	3	5	7.5	10	10	15	20	25	30	30	40	50	60	75	100	150	200	250
		480V (3PH)	5	7.5	10	10	20	25	30	40	50	50	60	75	100	125	150	200	300	400	600
		600V (3PH)	7.5	10	15	15	20	25	30	40	50	50	60	75	100	125	150	200	300	400	600
	UL (Ith)		20A	25A	30A	32A	45A	50A	70A	80A	90A	100A	160A	160A	210A	230A	275A	350A	450A	660A	840A
NEMA	SIZE		00		0		1	1P	2			3			4			5		6	7
	MAX. HP	115V (1PH)	0.33		1		2	3	3			7.5									
		230V (1PH)	1		3		3	5	7.5			15									
		200V (3PH)	1.5		3		7.5		10			25			40			75		150	250
		230V (3PH)	1.5		3		7.5		15			30			50			100		200	300
		460/575V (3PH)	2		5		10		25			50			100			200		400	600
LIGHTING DUTY		120-690V	11A	13A	18A	22A	32A	40A	50A	65A	75A	85A	105A	120A	150A	180A	250A	300A	400A	630A	800A
RATED LIFE (X10,000)		ELECTRICAL	250	250	250	250	200	200	200	200	200	200	100	100	100	100	100	100	50	50	50
		MECHANICAL	2500	2500	2500	2500	1500	1500	1000	1000	1000	1000	500	500	500	500	500	500	500	500	500
INSULATION RATING			8000V																		
AMBIENT TEMPERATURE RANGE			-5 TO 50°C OPERATION, -40 TO 65°C STORAGE WITHOUT DERATING																		
OPERATING TIMES		CLOSING ms	10~18/50				11~20/50		16~25/25				30~50		37~60	45~60		45~68		65~70	
		OPENING ms	6~9/8~15				6~10/8~15		9~16/13~20				49~67		44~52	41~45		43~52		45~55	
RESISTANCE TO SHOCK			5g/ms OPERATION, 50g/ms MECHANICAL																		
CONDUCTOR SIZE (MAX.)			#10 AWG				#6 AWG		#4	#1 AWG			LIMITED ONLY BY CRIMP SIZE								
SWITCHING FREQUENCY (OP/HR) AC3			1800	1800	1800	1800	1800	1800	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
INTERRUPT CURR. @ 460 VAC			5KA	5KA	5KA	5KA	5KA	5KA	5KA	5KA	10KA	10KA	10KA	10KA	10KA	10KA	10KA	18KA	18KA	30KA	30KA
MAXIMUM MAKE CURRENT (A)	240V, AC3		132	156	216	240	312	420	600	780	900	960	1050	1250	1500	1800	2500	3000	4000	6300	8000
	480V, AC3		90	120	180	240	320	400	576	780	900	960	1050	1200	1500	1800	2500	3000	4000	6300	8000
MAXIMUM BREAK CURRENT (A)	240V, AC3		110	130	180	200	260	350	500	650	750	800	1050	1250	1500	1800	2500	3000	4000	6300	8000
	480V, AC3		70	90	130	200	250	320	480	650	750	800	1050	1200	1500	1800	2500	3000	4000	6300	8000

Contactor Coil Ratings

TYPE	NOMINAL VOLTAGE	COIL CONSUMPTION (VA)		HEAT DISSIPATION	OPERATIONAL VOLTAGE		COIL CURRENT	OPERATING TIME	
		INRUSH	SEALED	(W)	PICK-UP (V)	DROP-OUT (V)	(MA)	CLOSING (MS)	OPENING (MS)
RSC-9~22	110VAC	95	8	2	75~85	55~65	73	11~18	6~9
	220VAC	95	9	2	141~156	105~125	41	10~17	6~9
	110VDC	9	9	-	60~75	15~35	82	45~55	8~15
RSC-32~40	110VAC	95	8	2	75~85	55~65	73	13~20	6~9
	220VAC	95	9	2	150~165	110~130	41	11~19	6~10
	110VDC	9	9	-	60~75	15~35	82	45~55	8~15
RSC-50~85	110VAC	220	17	5.5	68~78	40~50	154	16~25	9~16
	220VAC	220	17	5	145~160	100~120	77	16~25	8~15
	110VDC	220	5	-	65~80	15~35	46	20~30	13~20
RSC-100~125	110VAC	162	9.8	3.1	77	48	89	46~50	49~53
	220VAC	298	12.3	4.4	77	48	56	37~41	47~52
RSC-150	110VAC	162	12.2	3	77	48	111	56~60	44~48
	220VAC	298	12.3	4.4	77	48	56	37~41	47~52
RSC-180~220	110VAC	220	9.1	3.4	77	48	83	60	41
	220VAC	380	11.6	4.7	77	48	53	45	45
RSC-300~400	110VAC	393	14	4.4	77	48	128	64~68	43~47
	220VAC	571	14	5	77	48	64	45~50	48~52
RSC-600~800	110VAC	1000	17	6.3	77	48	155	66~70	45~49
	220VAC	1000	29	7.8	150	91	132	66~69	55

Contactor Part Number Assembler

RSC | 85 | 6AC120

RediStart™ Contactor

Contactor Frame & Rating

Contactor Number	IEC AC3 Rating	NEMA Rating
9	9A	00
12	12A	-
18	18A	0
22	22A	-
32	32A	1
40	40A	-
50	50A	2
65	60A	-
75	75A	-
85	85A	3
100	105A	-
125	120A	-
150	150A	4
180	180A	-
220	250A	-
300	300A	5
400	400A	-
600	630A	6
800	800A	7

	Frames 9 -85		Frames 100+
Coil Voltage	Part # AC 60Hz	Part # AC 50Hz	Part # AC 50 & 60Hz
24	6AC24	5AC24*	NA
48	6AC48	5AC48*	NA
120	6AC110**	6AC110**	U120
208	6AC208	5AC208*	U120
240	6AC240	5AC220	U120
277	6AC277	5AC277*	U300*
380	6AC380	5AC380*	U400*
400	6AC400	5AC400*	U400*
415	6AC415	5AC415*	U400*
480	6AC480	5AC480*	U500
600	6AC600	5AC600*	U500

* These coils are special order.

** Dual rated 50/60Hz

- For DC and other coils not listed consult factory.
- 60 hz coils may be de-rated by 16% for 50 hz operation.
- U120 coils are universal 100 - 240VAC / 100 - 220VDC (100 - 400A frames only).
- U500 coils are universal 440 - 600VAC.
- 600 and 800 frame coils are 100 - 127VAC for U120.
- For 600 and 800 contactors, 240V only, use U200.

Contactors - Ratings and Pricing

c UL us LISTED

Web stocked

RSC SERIES

UL / IEC RATED

MODEL NUMBER	AMP RATINGS				UL HP RATINGS						AUX CONTACTS		LIST PRICE
					ONE-PHASE		THREE-PHASE						
	AC1	AC3	AC4	UL	115V	230V	200V	230V	460V	575V	NO	NC	AC COIL
RSC-9-*	20	9	6	20	0.5	1	2	2	5	7.5	1	1	$34.00
RSC-12-*	25	12	9	25	0.5	2	3	3	7.5	10	1	1	$38.00
RSC-18-*	30	18	9	30	1	3	5	5	10	15	1	1	$61.00
RSC-22-*	32	22	13	32	2	3	7.5	7.5	10	15	1	1	$63.00
RSC-32-*	50	32	17	45	2	5	7.5	10	20	20	2	2	$80.00
RSC-40-*	60	40	24	50	3	5	10	10	25	25	2	2	$97.00
RSC-50-*	80	50	32	70	3	7.5	10	15	30	30	2	2	$133.00
RSC-65-*	100	65	47	80	5	10	15	20	40	40	2	2	$142.00
RSC-75-*	110	75	52	90	5	15	20	25	50	50	2	2	$146.00
RSC-85-*	135	85	62	100	7.5	15	25	30	60	60	2	2	$151.00
RSC-100-*	160	105	75	160	7.5	15	30	30	60	60	2	2	$211.00
RSC-125-*	160	120	90	160	10	20	40	40	75	75	2	2	$251.00
RSC-150-*	210	150	110	210	15	25	40	50	100	100	2	2	$314.00
RSC-180-*	230	180	150	230	15	30	60	60	125	125	2	2	$477.00
RSC-220-*	275	250	180	275	15	40	60	75	150	150	2	2	$574.00
RSC-300-*	350	300	220	350	-	-	100	100	200	200	2	2	$742.00
RSC-400-*	450	400	300	450	-	-	125	150	300	300	2	2	$836.00
RSC-600-*	660	630	400	660	-	-	150	200	400	400	2	2	$1,838.00
RSC-800-*	900	800	630	900	-	-	250	300	600	600	2	2	$1,903.00

NEMA RATED

MODEL NUMBER	NEMA SIZE	NEMA HP RATING THREE PHASE				AUX CONTACTS		LIST PRICE
		200V	230V	460V	575V	N.O.	N.C.	AC COIL
RSC-9-*	00	1.5	1.5	2	2	1	1	$34.00
RSC-18-*	0	3	3	5	5	1	1	$61.00
RSC-32-*	1	7.5	7.5	10	10	2	2	$80.00
RSC-50-*	2	10	15	25	25	2	2	$133.00
RSC-85-*	3	25	30	50	50	2	2	$151.00
RSC-150-*	4	40	50	100	100	2	2	$314.00
RSC-300-*	5	75	100	200	200	2	2	$742.00
RSC-600-*	6	150	200	400	400	2	2	$1,838.00
RSC-800-*	7	250	300	600	600	2	2	$1,903.00

* Add coil suffix. See page 1-7 for CONTACTOR part number assembler.

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Contactor Accessories

Web stocked

(RSC-BT50 & RSC-BT85)

(RSC-BT150 THROUGH RSC-BT800)

OPTIONAL CONTACTOR BOX LUG KITS

MODEL NUMBER	DESCRIPTION	CONTACTOR FRAME RSC	CONDUCTORS PER PHASE	WIRE SIZE	LIST PRICE
RSC-BT50	1 KIT = 3 LUGS FOR LINE OR LOAD	50	1	4 AWG~16 AWG	$6.00
RSC-BT85		65~85	1	2 AWG~14 AWG	$7.00
RSC-BT150		100~150	1	6AWG~250MCM	$38.00
RSC-BT220		180~400	1	1AWG~350MCM	$45.00
~~RSC-BT400~~		~~180~400~~	~~2~~	~~4/0~500MCM~~	~~$100.00~~
RSC-BT800		600~800	2	4/0~600MCM	$125.00

AUXILIARY CONTACT BLOCKS

MODEL NUMBER	DESCRIPTION	CONTACTOR	POLES	LIST PRICE
RSC-A2	TOP MOUNT (HEAD ON)	RSC-9~85	2 (1NO/1NC)	$10.00
RSC-A4	TOP MOUNT (HEAD ON)	RSC-9~85	4 (2NO/2NC)	$20.00
RSC-A1	SIDE MOUNT (SIDE ON)	RSC-9~85	2 (1NO/1NC)	$10.00
RSC-A100	SIDE MOUNT (SIDE ON)	RSC-100~800	2 (1NO/1NC)	$10.00

SURGE SUPPRESSORS

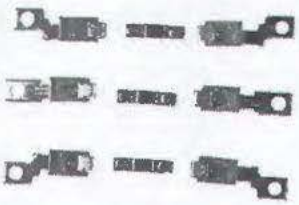
MODEL NUMBER	DESCRIPTION	COIL VOLTAGE	CONTACTOR RANGE	LIST PRICE
RSC-M048	VARISTOR	AC 24-48V	RSC-9~800	$8.00
~~RSC-M0125~~	~~VARISTOR~~	~~AC 100~125V~~	~~RSC-9~800~~	~~$8.00~~
RSC-M0240	VARISTOR	AC 200-240V	RSC-9~800	$8.00
RSC-AS48	RC + VARISTOR	AC 24-48V	RSC-9~85	$12.00
RSC-AS125	RC + VARISTOR	AC 100-125V	RSC-9~85	$12.00
RSC-AS240	RC + VARISTOR	AC 200-240V	RSC-9~85	$12.00

* RSC-100- 800 contactors have built-in surge suppression.

Web stocked

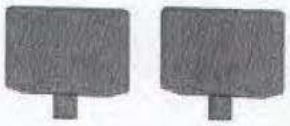
Contactor Replacement Parts

Web stocked



REPLACEMENT CONTACT KITS

MODEL NUMBER	DESCRIPTION	CONTACTOR	LIST PRICE
RSC-T100	EACH KIT INCLUDES: 3 STATIONARY AND 3 MOVABLE CONTACTS (REPLACES ALL THREE PHASES OF ONE CONTACTOR)	RSC-100	$175.00
RSC-T125		RSC-125	$225.00
RSC-T150		RSC-150	$255.00
RSC-T180		RSC-180	$300.00
RSC-T220		RSC-220	$350.00
RSC-T300		RSC-300	$425.00
RSC-T400		RSC-400	$475.00
~~RSC-T600~~		~~RSC-600~~	~~$1,000.00~~
RSC-T800		RSC-800	$1,200.00



REPLACEMENT PHASE BARRIER KITS

MODEL NUMBER	DESCRIPTION	FRAME	LIST PRICE
RSC-B125	EACH KIT INCLUDES: 2 PHASE BARRIERS FOR LINE OR LOAD SIDE OF ONE CONTACTOR	RSC-100~125	$15.00
RSC-B150		RSC-150	$17.50
RSC-B220		RSC-180~220	$20.00
RSC-B400		RSC-300~400	$25.00
RSC-B800		RSC-600~800	$50.00

CONTACTOR COILS

MODEL NUMBER	COIL VOLTAGE	CONTACTOR RANGE	LIST PRICE
RSC-C40-*	AC	RSC-9~40	$18.00
RSC-C22-DC-*	DC	RSC-9~22	$21.00
RSC-C40-DC	DC	RSC-32~40	$22.00
RSC-C85-*	AC	RSC-50~85	$30.00
RSC-C85-DC*	DC	RSC-50~85	$35.00
RSC-C150-*	UNIVERSAL	RSC-100~125~150	$150.00
RSC-C220-*	UNIVERSAL	RSC-180~220	$160.00
RSC-C400-*	UNIVERSAL	RSC-300~400	$250.00
RSC-C800-*	AC	RSC-600~800	$300.00

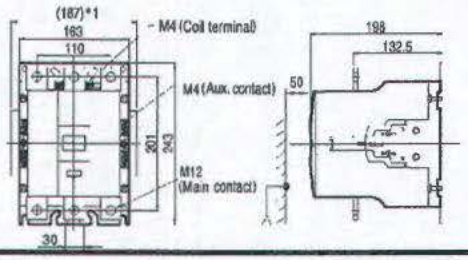
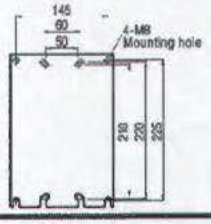
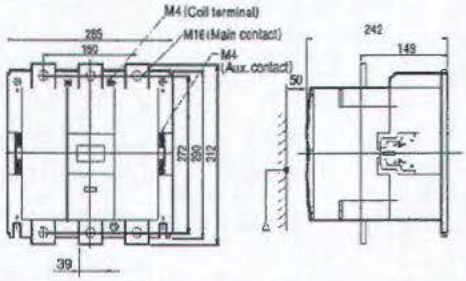
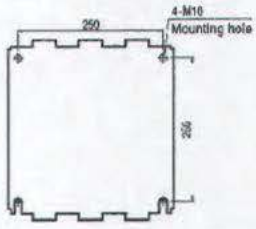
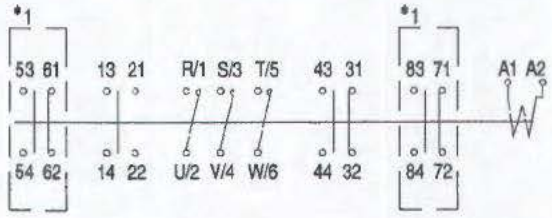
* Refer to coil voltage page 1-7 for complete part number.

* AC and DC coils are not interchangeable.

Web stocked

RSC Mounting Dimensions

RSC-300~800 UNIVERSAL COILS

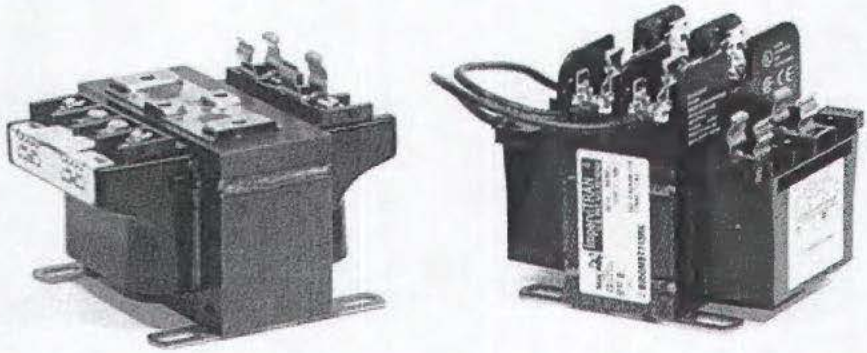
TYPE	EXTERNAL DIMENSIONS	DIMENSIONS
RSC-300 **RSC-400**		RSC-300~400 : 9.20kg 
RSC-600 **RSC-800**		RSC-600~800 : 22.40kg 
Circuit Diagram	**(RSC-300~800)** 	

1 With second auxiliary contact block

• Dimensions are in mm (1 inch = 25.4 mm).

Control Circuit Transformers T-1, T-2 & T-3

IMPERVITRAN



SIMPLY – THE MOST VERSATILE AVAILABLE

ImperviTRAN's feature-laden Series 2 design. Developed to address **ALL** customer needs with a product designed in a highly efficient manner. ImperviTRAN designs span over 35 years of market leadership.

UL/CSA or C-UL Family Listing
- Absolute flexibility of design for 600 volt class product

Fully encapsulated coil
- Tough environment-proof construction
- Eases wire routing around the transformer

Fusion-welded coil terminations instead of solder joints
- Eliminates cold solder joint breakage, improves conductivity
- Provides a lead-free RoHS compliant construction

Face-on terminal labels with large schematic indicators
- Terminal designations clearly visible to the installer and technician
- Indicators aligned with terminal screws for clarity

SEMS screw terminal strips as an integral part of the coil bobbin
- Allows bare wire and terminal connection methods
- Easily adaptable to slot, Phillips and hex driver tools
- Robust physical support instead of "floating" terminal strips

Integral accessory mounting plate on transformer top
- Allows field modification to block-style primary fusing
- Reduces SKU count for fused/non-fused applications
- Provides mounting platform for additional items (DIN Rail)

Standard strap brackets or optional mounting plate
- Features a superior weld result for vibration-resistant stability
- Offers common mounting template across a wide range of voltages
- Alternate plates available for OEM volumes

IP-20 cover kits available
- Quickly convertible to an IP-20 safety level

CONTROL TRANSFORMERS

GENERAL SPECIFICATIONS:

STYLE: SERIES 2 IMPERVITRAN
APPROVALS: UL/Cul FILE# E46323
TEMP CLASS: 105°C/130°C
VA SIZES: 50-1500

STYLE: IMPERVITRAN (NOT SERIES 2)
APPROVALS: UL LISTED FILE# E46323/ CSA APPROVED FILE# LR27533
TEMP CLASS: 105°C/130°C/180°C
VA SIZES: 1000-5000

TERMINAL TORQUE:
ALL IMPERVITRAN PRODUCT

≤30A: 20 INCH-POUNDS
>30A: 30 INCH-POUNDS

SUFFIX DESCRIPTION:

"K" IN SUFFIX DENOTES INSTALLED SECONDARY FUSE CLIPS
"R" IN SUFFIX DENOTES INSTALLED CLASS "CC" PRIMARY FUSE BLOCK
TWO LETTER SUFFIX = TEMP CLASS 105C
THREE LETTER SUFFIX ENDING "F" = TEMP CLASS 130C
THREE LETTER SUFFIX ENDING "H" = TEMP CLASS 180C

GROUP "A"

VOLTAGE:
PRI: 220x440, 230x460, 240x480
SEC: 110/115/120

CATALOG NUMBER	VA	AMPS
B050BTZ13JK	50	0.43
B050BTZ13RB		
B075BTZ13JK	75	0.65
B075BTZ13RB		
B100BTZ13JK	100	0.87
B100BTZ13RB		
B150BTZ13JKF	150	1.30
B150BTZ13RBF		
B200BTZ13JKF	200	1.74
B200BTZ13RBF		
B250BTZ13JKF	250	2.17
B250BTZ13RBF		
B300BTZ13JKF	300	2.61
B300BTZ13RBF		
B350BTZ13JKF	350	3.04
B350BTZ13RBF		
B500BTZ13JKF	500	4.35
B500BTZ13RBF		
B750BTZ13JKF	750	6.52
B750BTZ13RBF		
B1K0BTZ13JKF	1000	8.70
B1K0BTZ13RBF		
B1K5BTZ13JKF	1500	13.04
B1K5BTZ13RBF		
B2K0BTZ13JKH	2000	17.39
B2K0BTZ13RBH		
B3K0BTZ13JXH	3000	26.09
B5K0BTZ13JXH	5000	43.48

GROUP "B"

VOLTAGE:
PRI: 240x480
SEC: 24

CATALOG NUMBER	VA	AMPS
B050PU7JK	50	2.08
B050PU7RB		
B075PU7JK	75	3.13
B075PU7RB		
B100PU7JK	100	4.17
B100PU7RB		
B150PU7JKF	150	6.25
B150PU7RBF		
B200PU7JKF	200	8.33
B200PU7RBF		
B250PU7JKF	250	10.42
B250PU7RBF		
B300PU7JKF	300	12.50
B300PU7RBF		
B350PU7JKF	350	14.58
B350PU7RBF		
B500PU7JKF	500	20.83
B500PU7RBF		
B750PU7JKF	750	31.25
B750PU7RBF		

GROUP "C"

VOLTAGE:
PRI: 120x240
SEC: 24

CATALOG NUMBER	VA	AMPS
B050LP7JK	50	2.08
B050LP7RB		
B075LP7JK	75	3.13
B075LP7RB		
B100LP7JK	100	4.17
B100LP7RB		
B150LP7JKF	150	6.25
B150LP7RBF		
B200LP7JKF	200	8.33
B200LP7RBF		
B250LP7JKF	250	10.42
B250LP7RBF		
B300LP7JKF	300	12.50
B300LP7RBF		
B350LP7JKF	350	14.58
B350LP7RBF		
B500LP7JKF	500	20.83
B500LP7RBF		
B750LP7JKF	750	31.25
B750LP7RBF		

GROUP "E"

VOLTAGE:
PRI: 550/575/600
SEC: 110/115/120

CATALOG NUMBER	VA	AMPS
B050WZ13XK	50	0.43
B050WZ13RK		
B075WZ13XK	75	0.65
B075WZ13RK		
B100WZ13XK	100	0.87
B100WZ13RK		
B150WZ13XKF	150	1.30
B150WZ13RKF		
B200WZ13XKF	200	1.74
B200WZ13RKF		
B250WZ13XKF	250	2.17
B250WZ13RKF		
B300WZ13XKF	300	2.61
B300WZ13RKF		
B350WZ13XKF	350	3.04
B350WZ13RKF		
B500WZ13XKF	500	4.35
B500WZ13RKF		
B750WZ13XKF	750	6.52
B750WZ13RKF		

GROUP "F"

VOLTAGE:
PRI: 208/277
SEC: 120

CATALOG NUMBER	VA	AMPS
B050MQ15XK	50	0.42
B050MQ15RK		
B075MQ15XK	75	0.63
B075MQ15RK		
B100MQ15XK	100	0.83
B100MQ15RK		
B150MQ15XKF	150	1.25
B150MQ15RKF		
B200MQ15XKF	200	1.67
B200MQ15RKF		
B250MQ15XKF	250	2.08
B250MQ15RKF		
B300MQ15XKF	300	2.50
B300MQ15RKF		
B350MQ15XKF	350	2.92
B350MQ15RKF		
B500MQ15XKF	500	4.17
B500MQ15RKF		
B750MQ15XKF	750	6.25
B750MQ15RKF		

GROUP "G"

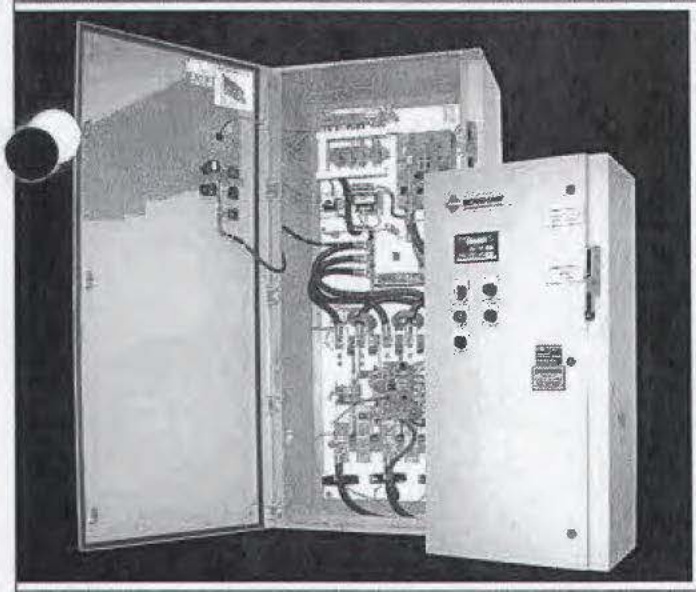
VOLTAGE:
PRI: 208/230/460
SEC: 115

CATALOG NUMBER	VA	AMPS
B050MBT13XK	50	0.43
B050MBT13RK		
B075MBT13XK	75	0.65
B075MBT13RK		
B100MBT13XK	100	0.87
B100MBT13RK		
B150MBT13XKF	150	1.30
B150MBT13RKF		
B200MBT13XKF	200	1.74
B200MBT13RKF		
B250MBT13XKF	250	2.17
B250MBT13RKF		
B300MBT13XKF	300	2.61
B300MBT13RKF		
B350MBT13XKF	350	3.04
B350MBT13RKF		
B500MBT13XKF	500	4.35
B500MBT13RKF		
B750MBT13XKF	750	6.52
B750MBT13RKF		
B1K0MBT13XKF	1000	8.70
B1K0MBT13RKF		
B1K5MBT13XKF	1500	13.04
B1K5MBT13RKF		
B2K0MBT13XKH	2000	17.39
B2K0MBT13RKH		
B3K0MBT13XXH	3000	26.09
B5K0MBT13XXH	5000	43.48

OVERVIEW

Intelligent Low Voltage Solid State Motor Control Products

with next generation MX²/MX³ technology

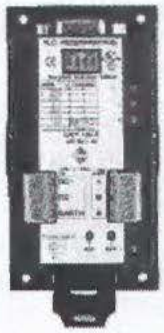


- Mission critical reliability
- Patented soft start technology
- Integral digital protection and metering
- Continuous and integral bypass chassis
- RXE dual redundant configurations
- MXP modular, prepackaged starters
- Reversing, two-speed, wound rotor
- Synchronous, DC injection braking
- 24/7 service and support

BENSHAW

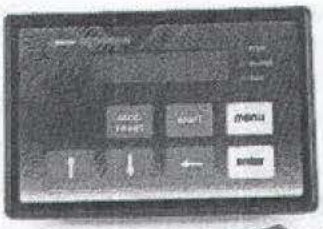
New MX² Control Technology

NEXT GENERATION INTELLIGENT MOTOR CONTROL

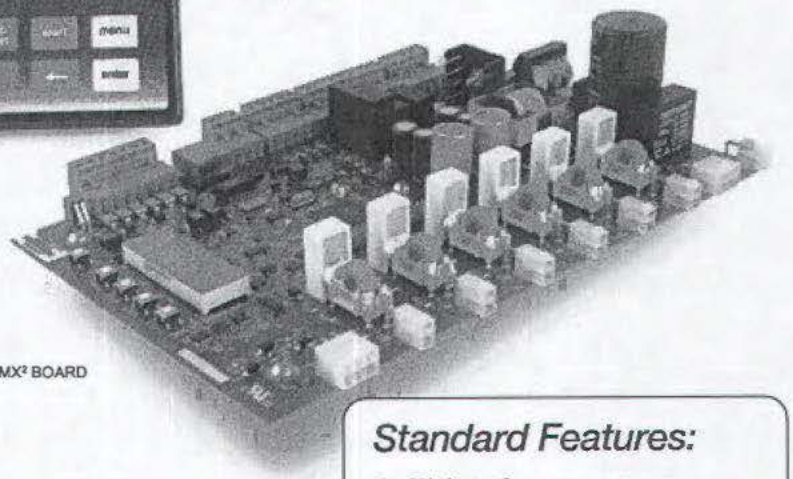


OPTIONAL COMMUNICATIONS BRIDGE

- ModBus/TCP
- EtherNet/IP
- DeviceNet
- LON Works
- ProfiBus-DP



OPTIONAL KEYPAD



MX² BOARD

MX² Control Highlights

The new MX² control technology from Benshaw provides a powerful, flexible, intelligent low voltage motor control platform. MX²-based controls offer multiple, user selectable starting modes, an increased selection of configurable digital and analog I/O's, comprehensive built-in metering capabilities, unprecedented onboard protection and an easy to use, intuitive user interface.

The new control board terminal configuration—coupled with programmable burden CT settings—makes Benshaw's MX² technology an excellent choice for a wide range of intelligent, soft start motor control applications.

With more built-in starting modes ... more built-in protection features ... additional communications capabilities ... improved noise immunity ... a more complete user I/O and CE compliance, Benshaw's new MX²-based low voltage motor controls raise the bar for intelligent, low-cost, soft start motor control.

When you factor in our unique three-year factory warranty and 24/7 comprehensive technical support, we think you'll find Benshaw's MX²-based controls to be the best value on the planet.

Standard Features:

- High performance motor control with multiple starting modes built-in
- Jogging 7 and 14% speed
- 3 user configurable digital inputs
- 2 fixed inputs for start and bypass confirm
- 3 user configurable output relays and 1 fixed bypass confirm
- User configurable analog I/O
- Programmable burden CT settings
- Residual ground fault
- Advanced line / motor metering
- DC braking light duty
- Power stack thermistor
- Data snapshot of each fault
- Power up on start
- 1000V capable
- Energy saver
- Remote keypad ready
- CE, UL, CUL, NEMA compliance
- Built-in self-testing (BIST)
- ModBus 485 plus expanded communications capabilities with optional bridges

MX² Control Features

Multiple Starting Modes:

- Voltage ramp
- Current ramp
  - Adjustable initial current
  - Adjustable maximum current
  - Adjustable ramp time
- Torque ramp (True Torque)
  - Adjustable initial torque
  - Adjustable maximum torque
  - Adjustable ramp time
- Power ramp
  - Adjustable initial torque
  - Adjustable maximum torque
  - Adjustable ramp time
- Linear/tach feedback control
- Jogging 7 and 14% speed

Motor Protection:

- Motor thermal overload
- Independent starting and running OL's
- Up to speed timer exceeded
- Low line voltage
- Low line frequency
- High line frequency
- Phase reversal
- Phase loss
- Instantaneous overcurrent
- Overcurrent
- Undercurrent
- Current imbalance
- Ground fault residual
- Shorted SCR
- Disconnect fault
- Inline contactor fault
- Control power low
- Stack over temperature

Metering:

- +/- 2% accuracy
- Average current
- L1 current
- L2 current
- L3 current
- Current imbalance %
- Ground fault amps/residual
- Average volts

Metering, continued:

- L1 - L2 voltage
- L2 - L3 voltage
- L3 - L1 voltage
- Overload %
- Power factor
- Watts
- VA
- VARS
- KW hours
- MW hours
- Phase order
- Line frequency
- Analog input
- Analog output
- Run time - days
- Run time - hours
- # of starts
- Tru Torque %
- Power %
- Peak starting current
- Last starting duration

3 Digital Inputs Configurable to:

- Stop
- Fault
- Fault reset
- Bypass/confirmation & inline
- OL reset
- Local/remote selection
- Heater enable
- Heater disable
- Dual ramp selection
- 1 dedicated start input
- 1 dedicated bypass

3 Relay Outputs Configurable to:

- Starter off
- Faulted fail safe and non fail safe
- Running
- Up to speed
- Alarm condition
- Ready condition
- Locked out
- Over current trip
- Under current trip
- OL alarm
- Shunt trip fail safe and non fail safe
- Ground fault

Relay Outputs, continued:

- Energy saver indication
- Heating indication
- Slow speed forward/reverse
- DC braking
- Cooling fan
- 1 fixed bypass

1 Analog 4-20mA / 0-10Vdc Input Configurable to:

- Trip high level
- Trip low level

1 Analog 4-20mA / 0-10Vdc Output Configurable to:

- Current (0–200%/0–800%)
- Voltage (0–150%)
- OL (0–150%)
- KW (0–10 Kw/0–100 Kw)
- MW (0–1 Mw)
- Analog input (0–100%)
- Firing (0–100%)
- Calibration

User Interface:

- Standard board-mounted LED interface
- Optional remote mount LCD display
  - Set/examine operating parameters
  - View status information
  - View line current, voltage and frequency in real time
  - Start and stop the solid state starter

1 Communication Port:

- ModBus
- RS485
- Communication bridges:
  - Profibus
  - Ethernet
  - Devicenet
  - LON Works
  - Can Bus

Advanced Functionality:

- Dual ramp selection
- Adjustable kick current
- Programmable decel modes
- LV BIST test (built-in self test)

2 - TECHNICAL SPECIFICATIONS

Technical Specifications

2.1 General Information

The physical specifications of the starter vary depending upon its configuration. The applicable motor current determines the configuration and its specific application requirements.
Specifications are subject to change without notice.

This document covers the control electronics and several power sections:

- MX^2 control card
- RB Power Stacks with Bypass, Integral and Separate
- RC Power Stacks, Continuous operation, NO bypass

Electrical Ratings

2.2 Electrical Ratings

2.2.1 Terminal Points and Functions

Table 1: Terminals

Function	Terminal Block	Terminal Number	Description
Control Power	TB1	G, ground N, 120VAC neutral N, 120VAC neutral L, 120VAC line L, 120VAC line	96 – 144 VAC input, 50/60 Hz 45VA required for control card
Relay 1 (R1)	TB2	NO1:Normally Open Contact RC1:Common NC1: Normally Closed Contact	Relay Output, SPDT form C **NO Contact (resistive)** / **NC Contact(resistive)** 5A at 250VAC / 3A at 250VAC 5A at 125VAC / 3A at 125VAC 5A at 30VDC / 3A at 30VDC 1250VA / 750VA
Relay 2 (R2)	TB2	NO2: Normally Open Contact RC2: Common Contact NC2: Normally Closed Contact	Relay Output, SPDT form C **NO Contact (resistive)** / **NC Contact(resistive)** 5A at 250VAC / 3A at 250VAC 5A at 125VAC / 3A at 125VAC 5A at 30VDC / 3A at 30VDC 1250VA / 750VA
Relay 3 (R3)	TB2	NO3: Normally Open Contact RC3: Common Contact NC3: Normally Closed Contact	10A at 250VAC 10A at 125VAC 10A at 30VDC 2500VA
Digital Inputs	TB3	1: Start 2: DI1 3: DI2 4: DI3 5: Common	120VAC digital input 2500V optical isolation 4mA current draw Off: 0-35VAC On: 60-120VAC
Serial Comm	TB4	1: B+ 2: A- 3: COM	Modbus RTU serial communication port. RS-485 interface 19.2k baud maximum 2500V Isolation
Analog I/O	TB5	1: Ain Power 2: Ain + 3: Ain - 4: Common 5: Aout 6: Common 7: Shield	Input: Voltage or Current Voltage: 0-10VDC, 67KΩ impedance Current: 0-20mA, 500Ω impedance Output: Voltage or Current Voltage: 0-10VDC, 120mA maximum Current: 0-20mA, 500Ω load maximum
Display	RJ45		Door Mounted Display Connector

Table 1: Terminals

Function	Terminal Block	Terminal Number	Description
SCR	J6 to J11	1: Gate 2: Cathode	SCR gate Connections
Phase C.T.	J12	1: CT1 2: CT1 3: CT2 4: CT2 5: CT3 6: CT3	See CT Connector

Wire Gauge: The terminals can support 1- 14 AWG wire or 2-16 AWG wire or smaller.

Torque Rating: The terminals on the control card have a torque rating of 5.0-inch lb. or 0.56Nm. This MUST be followed or damage will occur to the terminals.

Refer to the Control Card Layout on page 39.

2.2.2 Measurements and Accuracies

Table 2: Measurements and Accuracies

Internal Measurements	
CT Inputs	Conversion: True RMS, Sampling @ 1.562kHz Range: 1-6400A
Line Voltage Inputs	Conversion: True RMS, Sampling @ 1.562kHz Range: 100VAC to 1000VAC 23 to 72 Hz
Metering	
Current	0 – 40,000 Amps ± 3%
Voltage	0 – 1250 Volts ± 3%
Watts	0 – 9,999 MW ± 5%
Volts-Amps	0 – 9,999 MVA ± 5%
Watt-Hours	0 – 10,000 MWh ± 5%
PF	-0.01 to +0.01 (Lag & Lead) ± 5%
Line Frequency	23 – 72 Hz ± 0.1 Hz
Ground Fault	5 – 100% FLA ± 5% (Machine Protection)
Run Time	± 3 seconds per 24 hour period
Analog Input	Accuracy ± 3% of full scale (10 bit)
Analog Output	Accuracy ±2% of full scale (12 bit)
	⌘ **NOTE:** Percent accuracy is percent of full scale of the given ranges, Current = Motor FLA, Voltage = 1000V, Watts/Volts-Amps/Watt-Hours = Motor & Voltage range

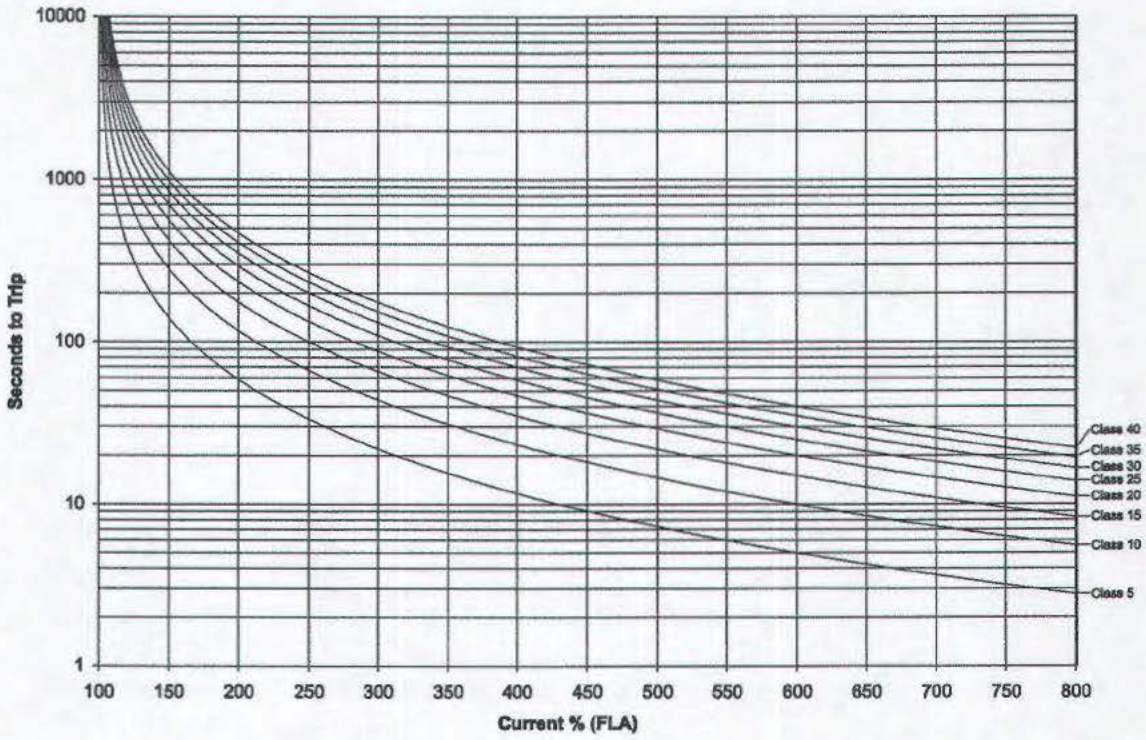
2.2.3 List of Motor Protection Features

- ANSI 19 – Reduced Voltage Start
- ANSI 27 / 59 – Adjustable over/under voltage protection (Off or 1 to 40%, time 0.1 to 90.0 sec. in 0.1 sec. intervals, independent over and under voltage levels)
- ANSI 37 – Undercurrent detection (Off or 5 to 100% and time 0.1 to 90.0 sec. in 0.1 sec. intervals)
- ANSI 46 – Current imbalance detection (Off or 5 to 40%)
- ANSI 47 – Phase rotation (selectable ABC, CBA, Insensitive, or Single Phase)
- ANSI 48 – Adjustable up-to-speed / stall timer (1 to 900 sec. in 1 sec. intervals)
- ANSI 50 – Instantaneous electronic overcurrent trip
- ANSI 51 – Electronic motor overload (Off, class 1 to 40, separate starting and running curves available)
- ANSI 51 – Overcurrent detection (Off or 50 to 800% and time 0.1 to 90.0 sec. in 0.1 sec. intervals)
- ANSI 51G – Residual Ground fault detection (Off or 5 to 100% of motor FLA)
- ANSI 74 – Alarm relay output available
- ANSI 81 – Over / Under Frequency
- ANSI 86 – Overload lockout
- Single Phase Protection
- Shorted SCR detection
- Mechanical Jam

2.2.4 Solid State Motor Overload

The MX^2 control has an advanced I^2t electronic motor overload (OL) protection function. For optimal motor protection the MX^2 control has forty standard NEMA style overload curves available for use. Separate overloads can be programmed, one for acceleration and another for normal running operation. The overloads can be individual, the same or completely disabled if necessary. The MX^2 motor overload function also implements a NEMA based current imbalance overload compensation, user adjustable hot and cold motor compensation and user adjustable exponential motor cooling.

Figure 2: Commonly Used Overload Curves



The motor overload will NOT trip when the current is less than motor Full Load Amps (FLA) * Service Factor (SF).

The motor overload "pick up" point current is at motor Full Load Amps (FLA) * Service Factor (SF).

The motor overload trip time will be reduced when there is a current imbalance present.

⌘ **NOTE:** Refer to Theory of Operation, section 7.1 on page 134 for more motor overload details and a larger graph.

Refer to http://www.benshaw.com/olcurves.html for an automated overload calculator.

2.2.5 CT Ratios

Table 3: CT Ratios

CT Ratio	Minimum FLA (A rms)	Maximum FLA (A rms)
72:1 (4 wraps 288:1)	4	16
96:1 (3 wraps 288:1)	5	21
144:1 (2 wraps 288:1)	8	32
288:1	15	64
864:1	45	190
2640:1	135	590
3900:1	200	870
5760:1	295	1285
8000:1	410	1800
14400:1 (CT-CT combination)	740	3200
28800:1 (CT-CT combination)	1475	6400

⌘ **NOTE:** See P78/FUN 03 (CT Ratio) parameter on page 128 for more information.

2.3 Starter Power Ratings

Each RB2 model starter is rated for three different starting duties. For example, a starter can operate a:

300HP motor for a standard duty start (350% for 30 seconds)

Or

200HP for a heavy duty start (500% for 30 seconds)

Or

150HP motor for a class 30 start (600% for 30 seconds)

Or

450HP motor when connected to the inside delta of a motor for a class 10 start (350% for 30 seconds)

2.3.3 Severe Duty (600% current for 30 sec) Ratings

Table 6: Severe Duty Horsepower Ratings

Severe Duty (600% current for 30 seconds 125% Continuous)						
MODEL NUMBER	NOMINAL AMPS	HORSEPOWER RATING				
		200-208V	230-240V	380-400V	440-480V	575-600V
RB2-1-S-027A-11C	24	5	7.5	10	15	20
RB2-1-S-040A-11C	40	10	10	20	30	40
RB2-1-S-052A-12C	45	10	15	25	30	40
RB2-1-S-065A-12C	45	10	15	25	30	40
RB2-1-S-077A-13C	45	10	15	25	30	40
RB2-1-S-096A-13C	77	25	30	40	60	75
RB2-1-S-125A-14C	105	30	40	60	75	100
RB2-1-S-156A-14C	105	30	40	60	75	100
RB2-1-S-180A-14C	105	30	40	60	75	100
RB2-1-S-180A-15C	180	50	60	100	125	150
RB2-1-S-240A-15C	180	50	60	100	125	150
RB2-1-S-302A-15C	180	50	60	100	125	150
RB2-1-S-361A-16C	210	60	75	125	150	200
RB2-1-S-414A-17C	310	100	125	150	250	300
RB2-1-S-477A-17C	310	100	125	150	250	300
RB2-1-S-515A-17C	310	100	125	150	250	300
RB2-1-S-590A-18C	515	150	200	300	450	500
RB2-1-S-720A-19C	515	150	200	300	450	500
RB2-1-S-838A-20C	515	150	200	300	450	500

⌘ **NOTE:** Do not exceed Class 30 overload setting.

Model Number	Nominal Current (A)	115% Current Rating (A)	Nominal Current (A) Inside Delta	115% Current (A) Inside Delta	Unit Withstand Rating (KA) Std. Fault[5]	Unit Withstand Rating (KA) High. Fault[5]	Connection Type		Allowable Fuse Class	Maximum Fuse Size Current (A)	Maximum Circuit Breaker Trip Rating (A)	Running Watt Loss, After Bypassed (W)
							Line	Load				
RB_1_027A11C	27	31	-	48	5	5	Power Block[1]	Bus Tab[3]	J/T/RK1/RK5	45/70*	60/100*	49
RB_1_040A11C	40	46	-	71	5	5	Power Block[1]	Bus Tab[3]	J/T/RK1/RK5	70/100*	100/150*	49.8
RB_1_052A12C	52	60	-	93	10	10	Power Block[2]	Bus Tab[3]	J/T/RK1/RK5	90/125*	125/200*	51
RB_1_065A12C	65	75	-	116	10	10	Power Block[2]	Bus Tab[3]	J/T/RK1/RK5	110/175*	150/250*	53.7
RB_1_077A13C	77	89	-	137	10	10	Bus Tab[3]	Bus Tab[3]	J/T/RK1/RK5	125/200*	175/300*	56
RB_1_096A13C	96	110	-	171	10	10	Bus Tab[3]	Bus Tab[3]	J/T/RK1/RK5	150/250*	225/350*	59
RB_1_125A14C	125	144	194	223	18	30	Bus Tab[4]	Bus Tab[4]	J/T/RK1/RK5	200/300*	300/450*	62
RB_1_156A14C	156	179	242	278	18	30	Bus Tab[4]	Bus Tab[4]	J/T/RK1/RK5	250/400*	350/600*	66
RB_1_180A14C	180	207	279	321	18	30	Bus Tab[4]	Bus Tab[4]	J/T/RK1/RK5	300/450*	450/700*	71
RB_1_180A15C	180	207	279	321	30	65	Bus Tab[4]	Bus Tab[4]	J/T/RK1/RK5	300/450*	450/700*	71
RB_1_240A15C	240	276	372	428	30	65	Bus Tab[4]	Bus Tab[4]	J/T/RK1/RK5	400/600*	600/900*	75
RB_1_302A15C	302	347	468	538	30	65	Bus Tab[4]	Bus Tab[4]	J/T/RK1/RK5/L	500/800*	700/1100*	82
RB_1_361A16C	361	415	560	643	30	65	Bus Tab[4]	Bus Tab[4]	J/T/RK1/RK5/L	600/900*	900/1300*	92
RB_1_414A17C	414	476	642	738	42	65	Bus Tab[4]	Bus Tab[4]	L/T	700/1100*	1000/1600*	103
RB_1_477A17C	477	549	739	850	42	65	Bus Tab[4]	Bus Tab[4]	L/T	800/1200*	1200/1800*	120
~~RB_1_515A17C~~	~~515~~	~~592~~	~~798~~	~~918~~	~~42~~	~~65~~	~~Bus Tab[4]~~	~~Bus Tab[4]~~	~~L~~	~~900/1300*~~	~~1300/2000*~~	~~140~~
RB_1_590A18C	590	679	915	1052	42	65	Bus Tab[4]	Bus Tab[4]	L	1000/1600*	1400/2000*	165
~~RB_1_720A18C~~	~~720~~	~~828~~	~~1116~~	~~1283~~	~~42~~	~~65~~	~~Bus Tab[4]~~	~~Bus Tab[4]~~	~~L~~	~~1200/1800*~~	~~1800/2500*~~	~~205~~
RB_1_838A19C	838	964	1299	1494	42	65	Bus Tab[4]	Bus Tab[4]	L	1400/2000*	2000/3000*	245

* Rating for Inside Delta Application

1 Power Block wire size #12-#4awg

2 Power Block wire size #10-#1awg

3 Bus Tab with 1 hole ¼" diameter

4 Bus Tab with NEMA 2 hole pattern ½" diameter ¾" apart as defined by NEMA Standard CC1

5 For higher kAIC ratings, consult factory

2.3.8 RB2 Starter Control Power Requirements

Table 8: RB2 Starter CPT VA Requirements

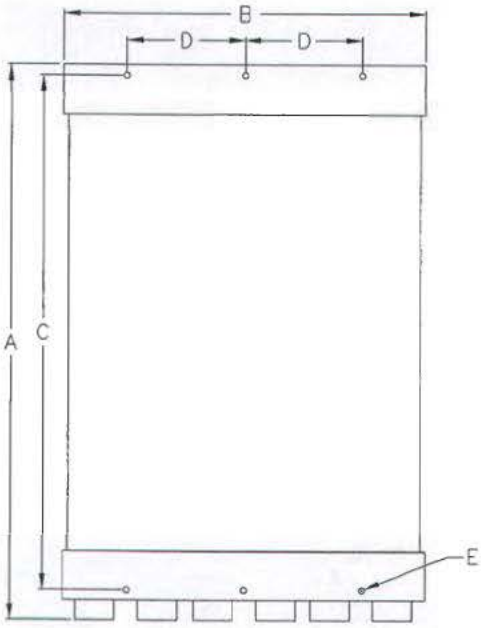
Model Number	Power Required (VA)	Recommended Min. TX size	Model Number	Power Required (VA)	Recommended Min. TX size
RB2-1-S-027A-11C	74	75	RB2-1-S-240A-15C	243	250
RB2-1-S-040A-11C	74	75	RB2-1-S-302A-15C	243	250
RB2-1-S-052A-12C	111	125	RB2-1-S-361A-16C	243	250
RB2-1-S-065A-12C	111	125	RB2-1-S-414A-17C	441	450
RB2-1-S-077A-13C	111	125	RB2-1-S-477A-17C	441	450
RB2-1-S-096A-13C	111	125	RB2-1-S-515A-17C	441	450
RB2-1-S-125A-14C	131	150	RB2-1-S-590A-18C	441	450
RB2-1-S-156A-14C	243	250	RB2-1-S-720A-19C	441	450
RB2-1-S-180A-14C	243	250	RB2-1-S-838A-20C	243	250

2.3.9 RC2 Starter Control Power Requirements

Table 9: RC2 Starter CPT VA Requirements

Model Number	Power Required (VA)	Recommended Min. TX size	Model Number	Power Required (VA)	Recommended Min. TX size
RC2-1-S-027A-31C	45	75	RC2-1-S-240A-35C	123	150
RC2-1-S-040A-31C	45	75	RC2-1-S-302A-35C	123	150
RC2-1-S-052A-31C	45	75	RC2-1-S-361A-35C	201	250
RC2-1-S-065A-32C	45	75	RC2-1-S-414A-35C	150	200
RC2-1-S-077A-32C	45	75	RC2-1-S-477A-35C	225	350
RC2-1-S-096A-33C	45	75	RC2-1-S-590A-35C	225	350
RC2-1-S-124A-33C	45	75	RC2-1-S-720A-36C	225	350
RC2-1-S-125A-34C	123	150	RC2-1-S-840A-19C	225	350
RC2-1-S-156A-34C	123	150	RC2-1-S-960A-20C	225	350
RC2-1-S-180A-34C	123	150	RC2-1-S-1200A-37C	285	350

Figure 5: RB2 414 - 838A



Model	A	B	C	D	E	F
RB2 414-590A	28.29	18.5	26.25	6	N/A	0.31
RB2 720A	30.04	18.5	28	6	N/A	0.31
RB2 838A	27.75	26.6	23.5	8.7	N/A	0.31

Environmental Conditions

2.5 Environmental Conditions

Table 10: Environmental Ratings

Operating Temperatures	-10°C to +40°C (14°F to 104°F)enclosed -10°C to +50°C (14°F to 122°F)open
Storage Temperatures	-20°C to +70°C (-4°F to 155°F)
Humidity	0% to 95% non condensing
Altitude	1000m (3300ft) without derating
Maximum Vibration	5.9m/s^2 (19.2ft/s^2) [0.6G]
Cooling	RC (Natural convection) RB (Bypassed)

Altitude Derating

2.6 Altitude Derating

Benshaw's starters are capable of operating at altitudes up to 3,300 feet (1000 meters) without requiring altitude derating. Table 11 provides the derating percentage to be considered when using a starter above 3,300 feet (1000 meters).

Table 11: Altitude Derating

Altitude		Percent Derating (Amps)
3300 Feet	1006 meters	0.0%
4300 Feet	1311 meters	3.0%
5300 Feet	1615 meters	6.0%
6300 Feet	1920 meters	9.0%
7300 Feet	2225 meters	12.0%
8300 Feet	2530 meters	15.0%
9300 Feet	2835 meters	18.0%

For derating above 10,000 feet consult Benshaw Inc.

Approvals

2.7 Approvals

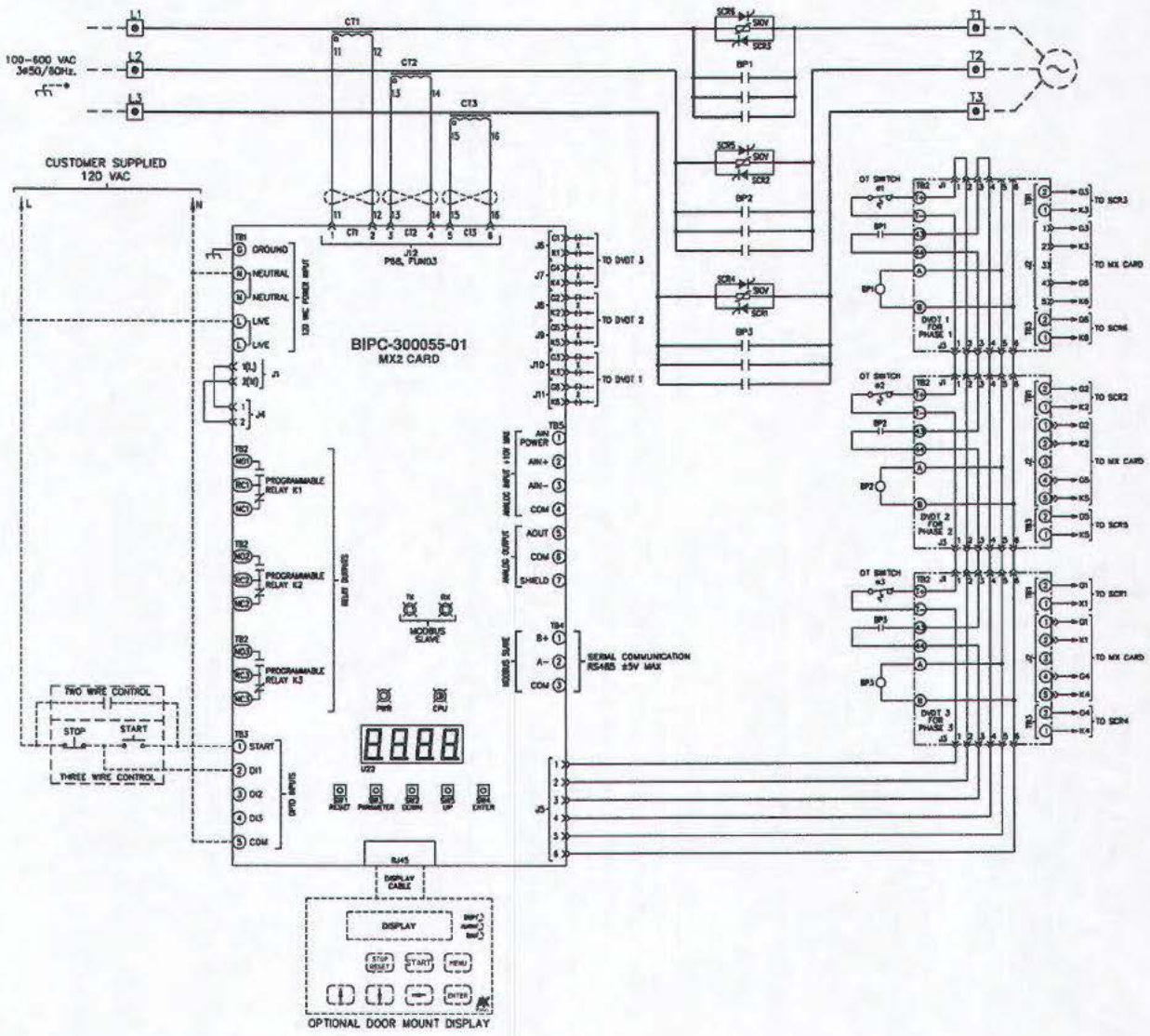
MX^2 Control Card is UL, cUL Recognized

Certificate of Compliance

2.8 Certificate of Compliance

CE Mark, See Appendix D on page 200.

Figure 9: Power Schematic for RB2 High HP



Remote LCD Keypad and Display

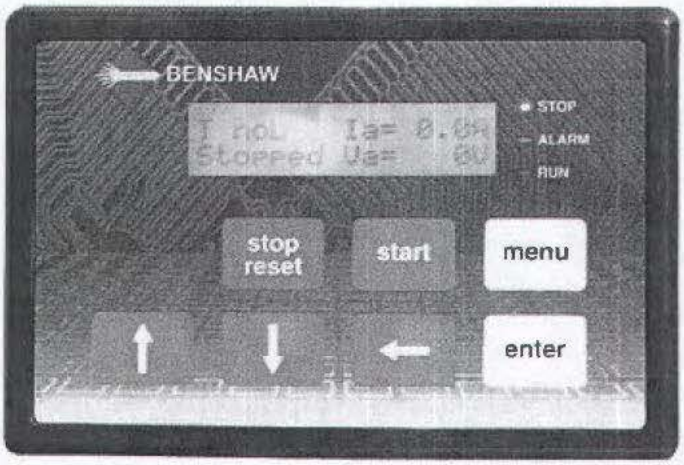
4.10 2x16 Remote LCD Keypad

Like the standard keypad, the remote LCD keypad has the same basic functions with enhancements that allow using plain text instead of codes and a menu structure instead of a straight line of parameters.

Additional keys have been added, such as [START], [STOP], and a [LEFT] arrow for moving the cursor around in the LCD display. Status indicators have been added, providing additional information for the starter operation.

The remote keypad is NEMA 13/IP65 when mounted directly on the door of an enclosure with the correct gasket.

Figure 23: Remote LCD Keypad



Description of the LEDs on the Keypad

4.11 Description of the LEDs on the Keypad

The keypad provides three LED indicators in addition to the 2x16 character display. The LEDs provide starter status information.

Table 17: Remote Keypad LED Functions

LED	State	Indication
STOP	On	Stopped
	Flashing	Faulted
RUN	On	Running and up-to-speed
	Flashing	Running and not up-to-speed (ramping, decelerating, brake etc).
ALARM	Flashing	Alarm condition exists. If condition persists, a fault occurs.

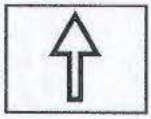
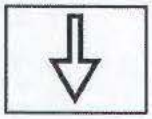
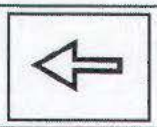
⌘ **NOTE:** By default, the [STOP] key is always active, regardless of selected control source (Local Source and Remote Source parameters). It may be disabled though using the Keypad Stop Disable (P65 / I/O 18) parameter. For more information refer to the Keypad Stop Disable (P65 / I/O 18) parameter on page 121.

Description of the Keys on the Remote LCD Keypad

4.12 Description of the Keys on the Remote LCD Keypad

The [UP] arrow, [DOWN] arrow, [ENTER] and [MENU] keys on the LCD keypad perform the same functions as the [UP], [DOWN], [ENTER] and [PARAM] keys on the standard keypad. Three keys have been added, with one of the keys serving a dual function.

Table 18: Function of the Keys on the LCD Keypad

Key	Function
start	• This key causes the starter to begin the start sequence. The direction is dependent on wiring and phase selection. • In order for this key to work, the Local Source (QST 04) parameter must be set to "Keypad".
	• Increase the value of a numeric parameter. • Select the next value of an enumerated parameter. • It scrolls forward through a list of parameters within a group (when the last parameter is displayed, it scrolls to the beginning of the list). • When a list of faults is displayed, it moves from one fault to the next. • When the starter is in the Operate Mode, pressing [UP] allows you to change which group of meter values is monitored.
	• Decrease the value of a numeric parameter. • Select the previous value of an enumerated parameter. • It scrolls backward through a list of parameters within a group (when the first parameter is displayed, it scrolls to the end of the list). • When a list of faults is displayed, it moves from one fault to the previous fault. • When the starter is in the Operate Mode, pressing [DOWN] allows you to change which group of meter values is monitored.
	• When editing a numeric parameter, the [LEFT] arrow key moves the cursor one digit to the left. If cursor is already at the most significant digit, it returns to the least significant digit on the right. • When in Menu mode, the [LEFT] arrow allows groups to be scrolled through in the opposite direction of the [MENU] Key.
enter	• Stores the change of a value. • When in Fault History, [ENTER] key scrolls through information logged when a fault occurred. • When an alarm condition exists, [ENTER] scrolls through all active alarms.
menu	• [MENU] scrolls between the operate screen and the available parameter groups. • When viewing a parameter, pressing [MENU] jumps to the top of the menu. • When a parameter is being edited and [MENU] is pressed, the change is aborted and the parameter's old value is displayed.
stop reset	• The [STOP/RESET] key halts the operation of the starter (Stop Key). • If a fault has occurred, the [STOP/RESET] key is used to clear the fault. • The [STOP/RESET] key always halts the operation of the starter if the control source is set to "Keypad". If the control source (QST 04/QST 05) is not set to "Keypad", [STOP] key may be disabled using the Keypad Stop Disable (I/O 18) parameter.

Product Data Sheet

LIL36600

MOLDED CASE CIRCUIT BREAKER 600V 600A

SQUARE D
by Schneider Electric

List Price $13,949.00 USD

Availability **Non-Stock Item: This Item is not normally stocked in our distribution facility.**

Technical Characteristics

Pump Power Breakers MCP-1, MCP-2 & MCP-3

Shipping and Ordering

Category	00941 - Circuit Breakers, Thermal Magnetic, 600 Vac, Current Limiting, Type LIL, UL, Unit Mount
Discount Schedule	DE2
GTIN	00785901717171
Package Quantity	1
Weight	28 lbs.
Availability Code	Non-Stock Item: This item is not normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

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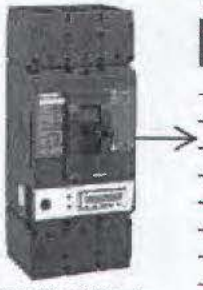
Schneider Electric

New!

Table 7.47: L-Frame 600 A Circuit Breakers with Lugs and Factory-Sealed Electronic Trip Units Suitable for Reverse Connection△✱

Electronic Trip Unit			Sensor Rating	Cat. No.□	Interrupting Rating (2nd Letter of Catalog Number)										Terminal
					D		G		J◊		L◊		R◊		
Type	Function	Trip Unit			$ Price										
					80% Rated	100% Rated	80% Rated	100% Rated	80% Rated	100% Rated	80% Rated	100% Rated	80% Rated	100% Rated	
600 Vac, 50/60 Hz, 3P															
Micrologic Standard	LI	3.3☆	250 A	L( )L36250(C)U31X	4827.00	5648.00	5081.00	5945.00	8478.00	9919.00	9918.00	11604.00	11406.00	13345.00	AL400L61K3▽
			400 A 600 A	L( )L36400(C)U31X L( )L36600U31X	4827.00 7109.00	5648.00 —	5081.00 7484.00	5945.00 —	8478.00 10541.00	9919.00 —	9918.00 11837.00	11604.00 —	11406.00 13613.00	13345.00 —	AL600LS52K3●
Micrologic Standard	LSI	3.3S☆	250 A	L( )L36250(C)U33X	5391.00	6211.00	5674.00	6538.00	9071.00	10513.00	10511.00	12198.00	12088.00	14028.00	AL400L61K3▽
			400 A 600 A	L( )L36400(C)U33X L( )L36600U33X	5391.00 7673.00	6211.00 —	5674.00 8077.00	6538.00 —	9071.00 11134.00	10513.00 —	10511.00 12430.00	12198.00 —	12088.00 14295.00	14028.00 —	AL600LS52K3●
Micrologic Ammeter	LSI	5.3A	400 A 600 A	L( )L36400(C)U43X L( )L36600U43X	6253.00 8535.00	7073.00 —	6582.00 8984.00	7445.00 —	9979.00 12041.00	11420.00 —	11419.00 13337.00	13105.00 —	13132.00 15338.00	15071.00 —	AL600LS52K3●
Micrologic Energy	LSI	5.3E	400 A 600 A	L( )L36400(C)U53X L( )L36600U53X	7200.00 9483.00	8021.00 —	7579.00 9982.00	8443.00 —	10976.00 13039.00	12418.00 —	12416.00 14335.00	14103.00 —	14278.00 16485.00	16218.00 —	
Micrologic Ammeter	LSIG	6.3A	400 A 600 A	L( )L36400(C)U44X L( )L36600U44X	8149.00 10431.00	8969.00 —	8578.00 10980.00	9441.00 —	11975.00 14037.00	13416.00 —	13415.00 15333.00	15101.00 —	15427.00 17633.00	17366.00 —	
Micrologic Energy	LSIG	6.3E	400 A 600 A	L( )L36400(C)U54X L( )L36600U54X	9097.00 11379.00	9917.00 —	9575.00 11978.00	10439.00 —	12972.00 15035.00	14414.00 —	14412.00 16331.00	16099.00 —	16574.00 18781.00	18514.00 —	
600 Vac, 50/60 Hz, 4P															
Micrologic Standard	LI	3.3	250 A	L( )L46250(C)U31X	5327.00	6233.00	5581.00	6530.00	8978.00	10501.00	10418.00	12189.00	11981.00	14017.00	AL400L61K4▽
			400 A 600 A	L( )L46400(C)U31X L( )L46600U31X	6227.00 8509.00	6233.00 —	6481.00 8884.00	7583.00 —	9878.00 11941.00	11557.00 —	11318.00 13237.00	13242.00 —	13016.00 15223.00	15228.00 —	AL600LS52K4●
Micrologic Standard	LSI	3.3S	250 A	L( )L46250(C)U33X	5891.00	6796.00	6174.00	7123.00	9571.00	11098.00	11011.00	12783.00	12663.00	14700.00	AL400L61K4▽
			400 A 600 A	L( )L46400(C)U33X L( )L46600U33X	6791.00 9073.00	7849.00 —	7074.00 9477.00	8176.00 —	10471.00 12534.00	12151.00 —	11911.00 13830.00	13836.00 —	13698.00 15905.00	15911.00 —	AL600LS52K4●
Micrologic Ammeter	LSI	5.3A	400 A 600 A	L( )L46400(C)U43X L( )L46600U43X	7653.00 9935.00	8711.00 —	7982.00 10384.00	9083.00 —	11379.00 13441.00	13058.00 —	12819.00 14737.00	14743.00 —	14742.00 16948.00	16954.00 —	
Micrologic Energy	LSI	5.3E	400 A 600 A	L( )L46400(C)U53X L( )L46600U53X	8600.00 10883.00	9659.00 —	8979.00 11382.00	10081.00 —	12376.00 14439.00	14056.00 —	13816.00 15735.00	15741.00 —	15888.00 18095.00	18102.00 —	
Micrologic Ammeter	LSIG	6.3A	400 A 600 A	L( )L46400(C)U44X L( )L46600U44X	9549.00 11831.00	10607.00 —	9978.00 12380.00	11079.00 —	13375.00 15437.00	15054.00 —	14815.00 16733.00	16739.00 —	17037.00 19243.00	19250.00 —	AL600LS52K4●
Micrologic Energy	LSIG	6.3E	400 A 600 A	L( )L46400(C)U54X L( )L46600U54X	10497.00 12779.00	11555.00 —	10975.00 13378.00	12077.00 —	14372.00 16435.00	16052.00 —	15812.00 17731.00	17791.00 —	18184.00 20391.00	20460.00 —	

△ See Supplemental Digest page 3-4 for circuit breakers with field-interchangeable trip units
□ For 100% rated circuit breakers (250 A and 400 A only), add a "C" in the 9th character place (for example, LGL36400CU31X)
◊ Circuit breakers with J, L, and R interrupting ratings are UL certified as current limiting.
☆ 3P circuit breakers with this trip unit can be used for 2P applications.
▽ AL400L61K3 terminal wire ranges are (1) 2 AWG–600 kcmil Cu or 1) 2 AWG–500 kcmil Al.
● AL600LS52K3 terminal wire range is (2) 2/0 AWG–500 kcmil Al/Cu.
✱ For applications requiring communicatins see page 7-49.



L-Frame Circuit Breaker

Table 7.48: Termination Options

Termination Letter	Termination Option
A	I-Line (See Section 9)
F	No lugs
L	Lugs both ends
M	Lugs ON end, terminal nut kit OFF end
P	Lugs OFF end, terminal nut kit ON end
N◆	Plug In
D◆	Drawout
S◆	Rear Connected

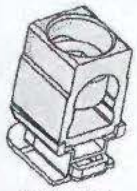
For factory-installed termination, place termination letter in the third block of the circuit breaker catalog number.

LGL36600U44X
└ Termination Letter

◆ For N and D pricing, add termination pricing on page 7-45 to price. For S pricing, add termination pricing on page 7-41 to price.

Table 7.49: Interrupting Ratings

Voltage	Interrupting Rating				
	D	G	J	L	R
240 Vac	25 kA	65 kA	100 kA	125 kA	200 kA
480 Vac	18 kA	35 kA	65 kA	100 kA	200 kA
600 Vac	14 kA	18 kA	25 kA	50 kA	100 kA



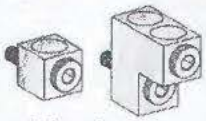
J-Frame Lug

Table 7.87: Mechanical Lug Kits for H-Frame and J-Frame Circuit Breakers▲

Description	Circuit Breaker Application			Ampere Rating	Number of Wires Per Lug and Wire Range	Kit Cat. No.	Qty Per Kit	$ Price Per Kit
	Standard	Ampere Rating	Optional					
Al Lugs for Use with Al or Cu Wire	HD, HG, HJ, HL	15–150 A			(1) 14–3/0 AWG Al or Cu	AL150HD	3	75.00
	JD, JG, JJ, JL	150–175 A			(1) 4-4/0 AWG Al or Cu	AL175JD	3	113.00
	JD, JG, JJ, JL	200–250 A	JD,JG,JJ,JL	150–175 A	(1) 3/0–350 kcmil Al or Cu	AL250JD	3	113.00
Cu Lugs for Use with Cu Wire Only			HD,HG,HJ,HL	15–150 A	(1) 14–3/0 AWG Cu	CU150HD	3	156.00
			JD,JG,JJ,JL	150–250 A	(1) 1/0–300 kcmil Cu	CU250JD	3	314.00
Control Wire Terminal for H-frame lug kit						S37423	2	53.00
Control Wire Terminal for J-frame lug kit						S37424	2	59.00

▲ See page 7-44 for terminal nuts/bus bar connections.

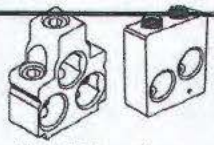
New!



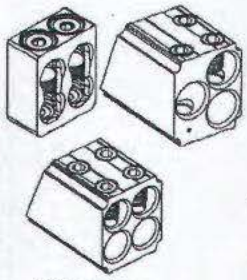
L-Frame Lugs

Table 7.88: Mechanical Lug Kits for L-Frame Circuit Breakers

Description	Circuit Breaker Application				Number of Wires Per Lug and Wire Range	Kit Cat. No.	Qty Per Kit	$ Price Per Kit
	Ampere Rating	Poles	Unit Mount	I-Line				
Al Lugs for Use with Al or Cu Wire	250	3	X	X	(1) 2 AWG–500 kcmil Al (1) 2 AWG–600 kcmil Cu	AL400L61K3	3	143.00
		4	X	—		AL400L61K4	4	176.00
	400/600	3	X	—	(2) 2/0 AWG–500 kcmil Al or Cu	AL600LS52K3	3	341.00
		4	X	—		AL600LS52K4	4	449.00
	400/600	3	X	X	(2) 3/0 AWG–500 kcmil Al or Cu	AL600LF52K3	3	831.00
	250/400	3	X	X	(1) 2 AWG–500 kcmil Al (1) 2 AWG–600 kcmil Cu	CU400L61K3	3	755.00
		4	X	—		CU400L61K4	4	983.00
Cu Lugs for Use with Cu Wire Only	400/600	3	X	—	(1) 2/0 AWG–500 kcmil Al or Cu	CU600LS52K3	3	1832.00
		4	X	—		CU600LS52K4	4	2385.00
	400/600	3	X	X	(1) 3/0 AWG–500 kcmil Al or Cu	CU600LF52K3	3	2395.00



M- and P-Frame Lugs (800 A and below)



P-Frame Lugs (Above 800 A)

Table 7.89: Mechanical Lug Kits for M-Frame, P-Frame and R-Frame Circuit Breakers▼

Description	Circuit Breaker Application				Wires per Lug and Wire Range	Cat. No.	Lugs Per Kit	$ Price Per Kit
	Standard	Rating	Optional	Ampere Rating				
Al Lugs for AL or Cu Wire	M-, P-Frame	800 A	—	800 A	(3) 3/0 AWG-500 kcmil	AL800M23K	3	284.00
						AL800M23K4	4	378.00
		1200 A	PG, PJ, PL, MG, MJ	800 A	(4) 3/0 AWG-500 kcmil	AL1200P24K■	1	155.00
		—	PG, PJ, PL, MG, MJ	800 A	(2) 3/0 AWG-600 kcmil	AL800P6K■	3	416.00
						AL800P6K4■	4	554.00
		—	PG, PJ, PL, MG, MJ	800 A	(2) 3/0 AWG-750 kcmil 750 kcmil, compact AL only	AL800P7K■	3	464.00
						AL800P7K4■	4	602.00
	P-Frame	1200 A	PG ,PJ, PL	800 A	(4) 3/0 AWG-500 kcmil	AL1200P2SK♦	3	378.00
						AL1200P25K4♦	4	504.00
		—	PG, PJ,P L	800–1200 A	(3) 350-600 kcmil	AL1200P6KU♦	3	786.00
						AL1200P6KU4♦	4	1038.00
	PG,PJ,PL	—	PG, PJ, PL	1200 A	(3) 3/0 AWG-750 kcmil 750 kcmil, compact AL only	AL1200P7KU♦	3	1233.00
						AL1200P7KU4♦	4	1635.00
	R-Frame	1200 A	I-Line	—	(4) 3/0 AWG-500 kcmil	AL1200R53K	1	215.00
		2500 A	Unit Mount	—	(1) 3/0 AWG-750 kcmil	AL2500RK★	2	132.00
Cu Lugs for Cu Wire Only	M-, P-Frame	—	PJ	100–150 A	(1) 1-1/0 AWG	CU250P1KΔ	3	990.00
		800 A	MG, MJ, PG, PJ, PL	—	(3) 3/0 AWG-500 kcmil	CU800M23K	3	1647.00
						CU800M23K4	4	2190.00
		1200 A	MG, MJ, PG, PJ, PL	800–1200 A	(4) 3/0 AWG-500 kcmil	CU1200P24K■	1	569.00
	P-Frame	1200 A	PG, PJ, PL	800–1200 A	(4) 3/0 AWG-500 kcmil	CU1200P25K♦	3	4886.00
						CU1200P25K4	4	6503.00
	R-Frame	1200 A	I-Line	—	(4) 3/0 AWG-500 kcmil	CU1200R53K	1	575.00

■ Does not fit onto ON end of unit-mount P-frame circuit breakers.
♦ For unit-mount circuit breaker only.
★ All unit-mount R-frame circuit breakers require terminal pads for mounting lugs of any type. See page 7-44.
▼ For lug with a tapped hole for control wire, add a "T" before the "K" in the catalog number (for example, AL800P6TK).
Δ This lug can only be used on low amp PJ frame breakers where the instantaneous setting must not be turned OFF. The cables must be laced with rope per lug instructions.

Schneider Electric

MANUFACTURER'S DECLARATION OF CONFORMITY

The undersigned, representing the following manufacturer **Document No. md001f**

manufacturer:	**SQUARE D COMPANY**
address:	**3700 6th Street S.W.** **Cedar Rapids, Iowa 52404** **USA**

Herewith declares that the product

Product identification:	*Molded Case Circuit Breakers with thermal-magnetic trip units, together with their associated optional accessories, having the following catalog number prefixes:* *FA, FH, FC, FI, KA, KH, KC, KI, LA, LH, LC, LI, MA, MH, NA, NC, PA, PH, PC*

To which this declaration refers are in conformity with the following:

Standards And/Or Normative Documents:	*General rules: EN 60947-1* *Circuit Breakers: EN 60947-2* *UL 489* *CSA C22.2 No. 5.1*

Subject to installation, maintenance and utilization in accordance with their purpose, regulations, current standards, manufacturer's instructions and industry standards. Meets the provisions of the following EC Directives, including all applicable amendments.

reference n°	title
73/23/CCE	*Low-voltage Directive of February 19, 1973 modified by Directive 93/68/EC of July 22, 1993.*
89/336/CEE	*Electromagnetic Compatibility Directive of May 3, 1989 modified by Directives 92/31/CEE of April 28, 1992 and 93/68/CEE of July 22, 1993.*

The CE marking on the product and/or the packaging signifies that Square D Company holds the technical files.

Cedar Rapids, IA **date: 01 November 1999** **Authorization Signature**

Name: Bruce Lindholm
Position: Director of Engineering, Low Voltage Circuit Breaker Products

Signature: Bruce Lindholm

Schneider Electric North America
Square D Company

Associated Optional Accessories

Circuit Breaker Catalog Prefix	Motor Operator Catalog Prefix	Sub-feed Lug (*) Catalog Number	Electrical Accessory Catalog Prefix
FA	FAMO	SL100	
FH, FC	FAMO	SL100	
FI	KAMO	SL100	
KA	KAMO	SL225	
KH	KAMO	SL225	
KC	KAMO	SL225	
KI	KAMO	SL225	
LA, LH	LAMO	SL400	LA1
LC			LC1
MA	MAMO	SL800	MA1
MH	MAMO	SL800	MA1
NA			NA1
NC			NA1
PA	PAMO		PA1
PH	PAMO		PA1
PC	PAMO		PA1

(*) A subfeed lug is a plug-on panelboard accessory that has the general physical size, shape, and current rating of the corresponding circuit breaker, but has no moving internal parts or circuit-protection features. Its function is to provide an interconnecting means between the panelboard bus structure and wiring that is intended to feed another panelboard.

Class 9421 Door-Mounted Operating Mechanisms (**)

Circuit Breaker Catalog Prefix	Operating Mechanism	Handle	Shaft	Complete Kits	Electrical Interlocks
FAL, FCL, FHL	9421LF1	9421LH3	9421LS8	9421LN1	9999R47
		9421LH6	9421LS12	9421LN3	9999R48
		9421LH43		9421LN4	
		9421LH46			
		9421LC43			
		9421LC46			
KAL, KCL, KHL	9421LK1	9421LH3	9421LS8	9421LP1	9999R47
		9421LH6	9421LS12	9421LP3	9999R48
		9421LH43		9421LP4	
		9421LH46			
		9421LC43			
		9421LC46			
LAL, LHL	9421LL1	9421LH6	9421LS8	9421LR1	9999R47
		9421LH8	9421LS10	9421LR4	9999R48
		9421LH46			
		9421LH48			
		9421LC46			
		9421LC48			
MAL,MHL	9421LM1	9421LH8	9421LS8	9421LT1	9999R47
		9421LH48	9421LS10	9421LT4	9999R48
		9421LC48			
NAL, NCL	9421LX7	9421LH8	9421LS8	9421LX1	N/A
		9421LH48	9421LS10	9421LX4	
		9421LC48			

(**) Information supplied by Square D Raleigh

Schneider Electric North America
Square D Company

Associated Optional Accessories
Class 9422 Flange-Mounted Operating Mechanisms (**)

Circuit Breakers	Op. Mech.	Handle	Shaft	Complete Kits	Bracket Mounted	Cable Operators	Cable Op. w/ 9422A1	Electrical Interlocks	Misc. Op. Mech.
FAL, FCL, FHL	9422RN1	9422A1	9422R1	9422ARN11	9422BN1	9422CFA30	9422CFA31	9999R26	9422D2
		9422A2	9422R2	9422ARN21		9422CFA50	9422CFA51	9999R27	
		9422A3				9422CFA10	9422CFA11		
		9422A4				9422CFAL10			
		9422A9				9422CFAL30			
		9422A10				9422CFAL50			
KAL, KCL, KHL	9422RP1	9422A1	9422R1	9422ARP11	9422BP1	9422CKA30	9422CKA31	9999R26	9422D2
		9422A2	9422R2	9422ARP21		9422CKA50	9422CKA51	9999R27	
		9422A3				9422CKA10	9422CKA11		
		9422A4							
		9422A9							
		9422A10							
LAL, LHL	9422RR1	9422A1	9422R1	9422ARR11	9422BR1	9422CLA30	9422CLA31	9999R26	9422D2
		9422A2	9422R2	9422ARR21		9422CLA50	9422CLA51	9999R27	
		9422A3				9422CLA10	9422CLA11		
		9422A4							
		9422A9							
		9422A10							
MAL, MHL	9422RT1	9422A1	9422R1	9422ART11	N/A	N/A	N/A	9999R26	9422D2
		9422A2	9422R2	9422ART21				9999R27	
		9422A3							
		9422A4							
		9422A9							
		9422A10							
NAL, NCL	9422RX1	9422A1	9422R1	N/A	N/A	N/A	N/A	N/A	9422D2
		9422A2	9422R2						
		9422A3							
		9422A4							
		9422A9							
		9422A10							

(**) Information supplied by Square D Raleigh

H-107

MH RHODES CRAMER COMPANY

Precision Crafted Timers, Motors and Measuring Devices

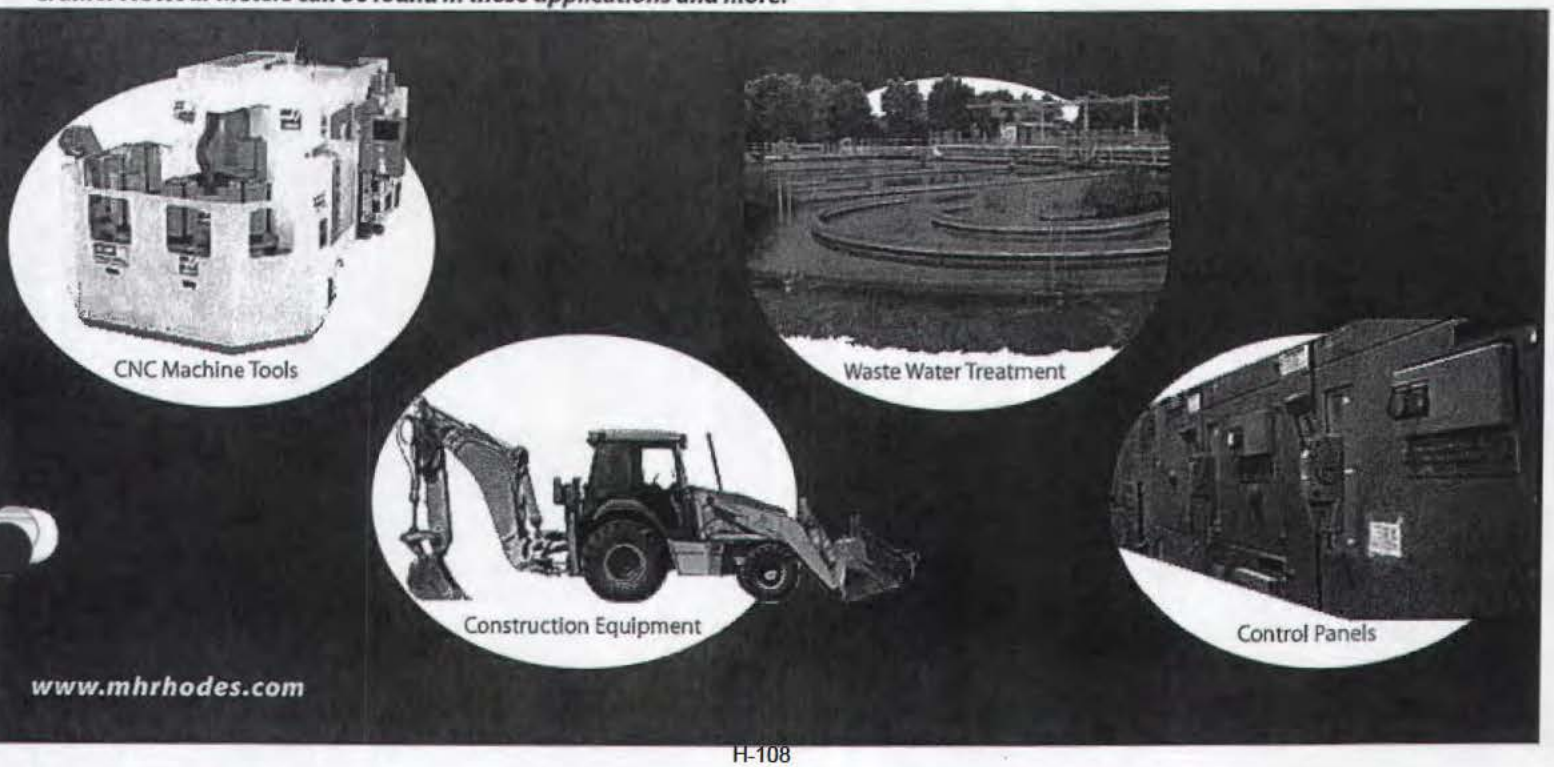
635 & 636 Series
AC Hour Meters (ETI's)

- 24, 115, 220 VAC Operating voltage
- Continuous duty, rugged design
- Tamper resistant
- Permanentaly lubricated
- 6 Figure display: 99999.9
- Round or Square bezel mounting
- UL/cUL Approved

Square Style "Y" Bezel
Model #635 Non-resettable

Round Style "X" Bezel
Model #636 Resettable

Cramer AC Hour Meters can be found in these applications and more:



635 & 636 Series AC Hour Meters (ETI's)

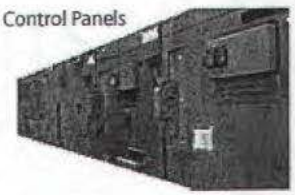
Applications

CNC Machine Tools

Construction Equipment

Waste Water Treatment

Control Panels



Dimensions

Model #635 Non-resettable Round & Square Bezel

Model #636 Resettable Round & Square Bezel

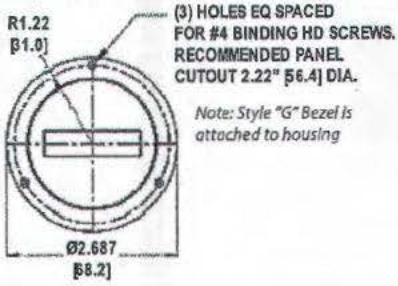
Most Popular Configurations

Model # 635		
Part #	**Bezel type**	**Time Registration**
10055	Round	HRS/TEN 115/60
10063	Square	HRS/TEN 115/60
10069	Round	MIN/TEN 115/60
10071	Round	HRS/TEN 115/60
10186	Square	HRS/TEN 115/60
30850	Square	HRS/TEN 115/60
Model # 636		
10072	Round	SEC/TEN 115/60
10074	Round	MIN/TEN 115/60
10075	Round	HRS/TEN 115/60
10080	Square	SEC/TEN 115/60
10083	Square	HRS/TEN 115/60
10086	Square	MIN/TEN 115/60

Additional configurations available.

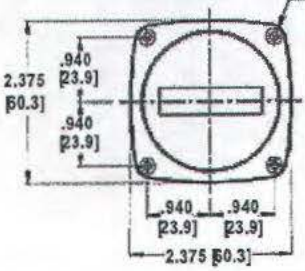
Bezel Styles

Style "X" & "G" Bezel



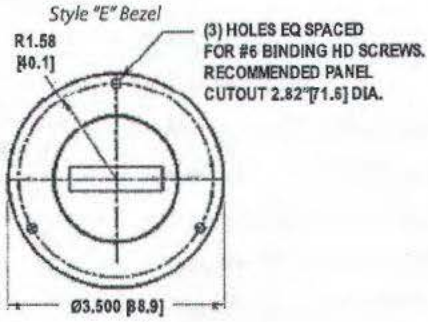
Note: Style "G" Bezel is attached to housing

Style "Y" & "K" Bezel

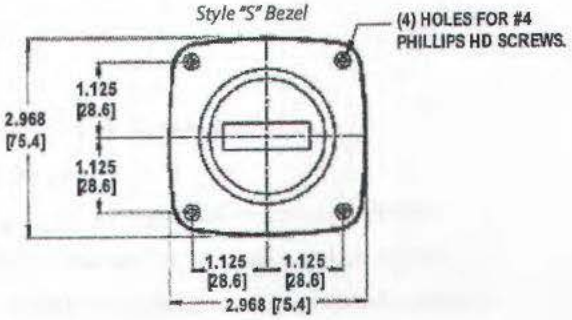


Note: Style "K" Bezel is attached to housing

Style "E" Bezel



Style "S" Bezel



Specifications

Model	635	636
Display	6 Figure; 99999.9	
Time Registration	Minutes or Hours (Seconds Special Order)	Seconds, Minutes or Hours
Resettable	Not available	Push button
Motor Specification	24, 115, 220 VAC; 50 or 60hz	
Power	2.7 Watts	
Operating Temperature Range	-4°F to 131°F (-20°C to 55°C)	
Electrical Connection	6" (15 mm) Leads, 22 gauge wire	
Front Panel Mounting	3 hole Round, 4 hole Square	
Agency Approval	UL/cUL	

Options

- Bezel Style: E, X, S, or Y
- Resettable to "zero"
- Non-resettable: Recommended when tamper proofing is required to record total "on time"

www.mhrhodes.com

MH RHODES CRAMER COMPANY

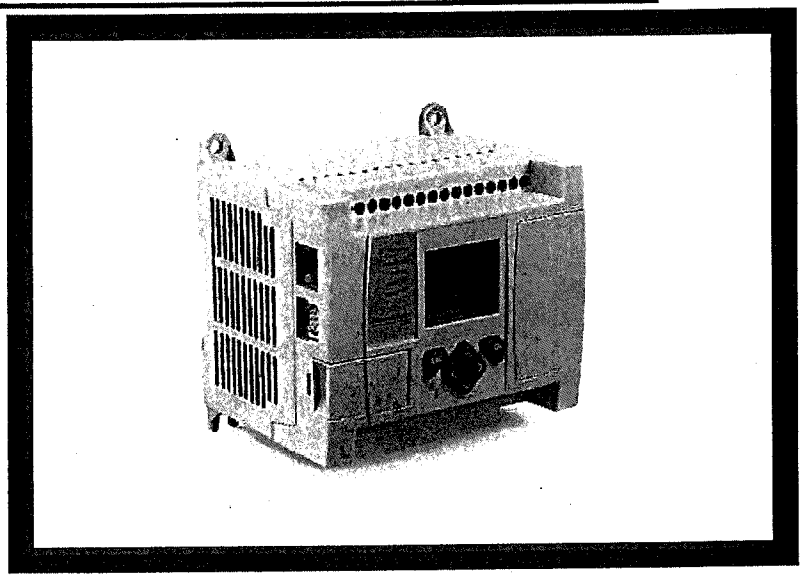
M.H. Rhodes Cramer Company
105 Nutmeg Road South • South Windsor, CT 06074 USA
Toll Free: 877.684.6464 • PH: 860.291.8402 • FX: 860.610.0897

Application Image CNC Machine Tools courtesy of HAAS Automation, Inc.

C-635-636-HM Rev.06.11

MicroLogix 1100 / 1763 Small Logic Controllers

Pump Controller and Monitor PC-1, PC-2 & PC-3



MicroLogix 1100

With online editing and a built-in 10/100 Mbps EtherNet/IP port for peer-to-peer messaging, the MicroLogix 1100 controller adds greater connectivity and application coverage to the MicroLogix™ family of Allen-Bradley controllers. This next generation controller's built-in LCD screen displays controller status, I/O status, and simple operator messages; enables bit and integer manipulation; offers digital trim pot functionality, and a means to make operating mode changes (Prog / Remote / Run).

By combining all the features that have made the existing MicroLogix controllers successful with industrial EtherNet/IP, embedded DH-485 / Modbus™ RTU networking, and the ability for an operator to interface to the control program through the LCD screen, the MicroLogix 1100 controller may be all you need and more.

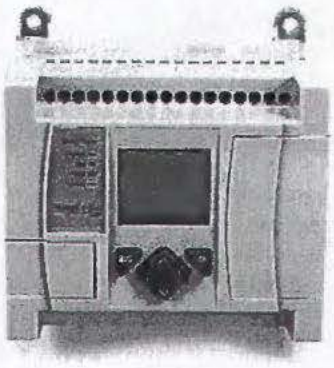
Features:

- Online editing
- Built-in 10/100 Mbps EtherNet/IP port for messaging
- Isolated RS-232/RS-485 combo port
- Ten digital inputs, two analog inputs, six digital outputs on each controller
- One embedded 40kHz high-speed counter (on controllers with dc inputs)
- Two 40kHz high-speed PTO/PWM outputs (on controllers with dc outputs)
- Embedded LCD for controller and I/O status and simple operator interface for messages, and bit/integer monitoring and manipulation
- 4K words user program memory and 4K words user data memory
- Up to 128K bytes for data logging and 64K bytes for recipe
- Embedded Web server
- Email support
- CIP generic messaging support

APPLICATIONS:

The MicroLogix 1100 is particularly well suited to meet the needs of SCADA RTU, packaging, and material handling applications. With even more memory for data logging and recipe than the MicroLogix 1500, the MicroLogix 1100 is great for remote monitoring and for applications that are memory intensive, but require limited I/O.

MicroLogix 1100 Controller



The MicroLogix 1100 combines all the features you demand in a compact controller, with EtherNet/IP messaging, online editing, a built-in LCD screen on every controller and a versatile combination of I/O.

The embedded 10/100 Mbps EtherNet/IP port for peer-to-peer messaging offers users high speed connectivity between controllers and the ability to access, monitor and program from the factory floor to anywhere an Ethernet connection is available. An embedded Web server allows a user to custom configure data from the controller to be displayed as a web page. Furthermore, a second RS-232/RS-485 combo port provides a host of different point-to-point and network protocols.

With online editing, modifications can be made to a program while it is running, making fine tuning of an operating control system possible, including PID loops.

The built-in LCD screen allows the user to monitor data within the controller, optionally modify that data, and interact with the control program. The LCD displays status for embedded digital I/O and controller functions, and acts as a pair of digital trim pots to allow a user to tweak and tune a program. The user program can now use a new LCD instruction to send, and optionally receive, information through the display, providing real time program interaction. A user configurable start up screen allows the user to personalize the controller to identify the machine it is used on, the designer of the control system, or the name of the company that uses it. Communication port status and communication toggle function, operating mode status, and battery status monitoring are among the many features of the LCD screen.

For small applications, the embedded I/O in this controller may represent all of the control required. There are 10 digital inputs, 6 digital outputs, and 2 analog inputs on every controller, with the ability to add digital, analog, RTD, and thermocouple modules to customize the controller for your application. On versions of the controller with dc inputs, there is a high speed counter, and on the dc output version, two PTO/PWM (pulse train outputs and pulse width modulated) outputs, enabling the controller to support simple motion applications.

Communications

The combo Communication Channel 0 port provides isolated RS-232 and RS-485 electrical compatibility (on separate pins). This port supports the same protocols as the MicroLogix 1200 and MicroLogix 1500:

- DF1 Full Duplex / DF1 Half Duplex Master & Slave / DF1 Radio Modem
- DH-485 (supported directly using the 1763-NC01 RS-485 cable on this port; or using the RS-232 port and existing cables, a 1761-NET-AIC and external power is required for networking)
- Modbus™ RTU Master and RTU Slave (supported directly using the 1763-NC01 RS-485 cable on this port, or using the RS-232 port and existing cables, a 1761-NET-AIC and external power is required for networking)
- ASCII

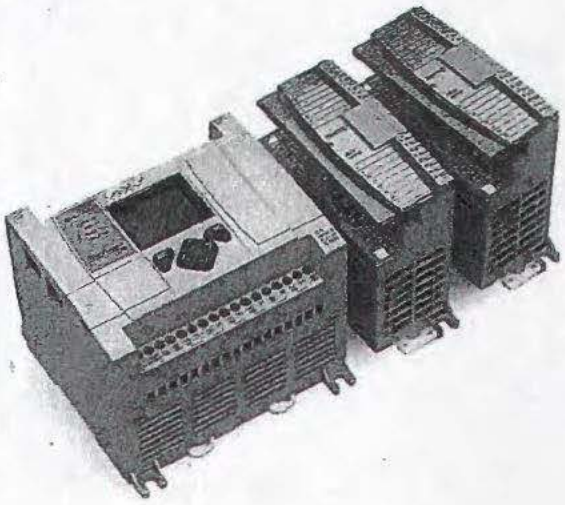
Communication Channel 1 with embedded RJ45 port supports EtherNet/IP for peer-to-peer messaging:

- 10/100 Mbps port with support for BOOTP, DHCP, & SNMP capability directly from the controller
- Automatically assign IP address through DHCP or BOOTP, or configure using RSLogix 500 programming software
- Monitor your IP address through the LCD screen (or use the write-on nameplate)
- Supports CIP
- Allows controllers to exchange data with other controllers through messaging (does not support scanning of I/O on Ethernet adapters)

Expansion

Use up to four 1762 I/O modules (also used to expand the MicroLogix 1200 controllers) to increase your I/O count, as well as provide flexibility of I/O for your application.

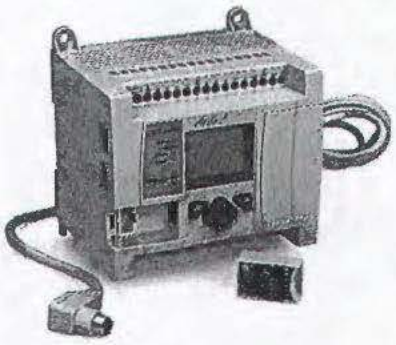
Modules include:
Inputs – 120V ac, 24V dc sink/source, analog, RTD, and thermocouple
Outputs – 120 to 240V ac, 24V dc sourcing, relay (including high current isolated), and analog



RSLogix™ 500 Programming Software

Supporting the Allen-Bradley SLC 500 and MicroLogix families of processors, RSLogix 500 was the first PLC programming software to offer unbeatable productivity with an industry-leading user interface. RSLogix 500 software offers:

- Flexible, easy-to-use editors
- Diagnostics and troubleshooting tools
- Powerful, time-saving features & functionality
- A world-class user interface designed for first time power users



Accessories

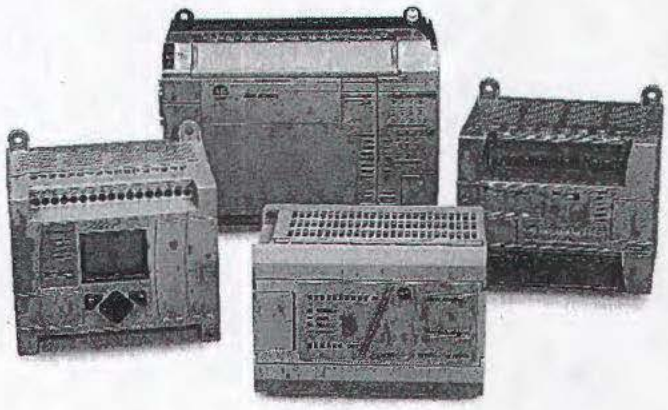
The MicroLogix 1100 accessories include:

- Memory module: 1763-MM1 - provides memory for program backup transport and can be useful to update programs in the field.
- RS-485 cable: 1763-NC01- used on Communication Channel 0 to provide daisy chain connection for DH-485 and Modbus RTU Master/Slave networks.

MicroLogix - A Family of Success

All members of the MicroLogix and SLC™ 500 families share a host of commonalities - from a common instruction set and industry- leading RSLogix 500™ programming software, to compatible network and HMI devices. These systems are designed to work seamlessly - within a single machine or across your entire factory.

All MicroLogix controllers are DIN-rail and panel mountable, as well as UL listed, C-UL Certified, and Class 1, Division 2 and CE compliant for conformity to necessary global standards. Your use of one controller within the family is an investment in the future, as your applications change and grow, allowing you to easily move from one level of control to another.



PRODUCT SPECIFICATIONS

MicroLogix 1100	~~1763-L16AWA~~	1763-L16BWA	~~1763-L16BBB~~	~~1763-L16DWD~~
Input Power	120/~~240V ac~~		24V dc	12V dc - 24V dc
Memory	non-volatile battery backed RAM			
User Program / User Data Space	4K / 4K			
Data Logging / Recipe Storage	Up to 128K bytes for data logging and up to 64K bytes for recipe (recipe memory subtracted from available data logging)			
Battery Back-up	Yes			
Back-up Memory Module	Yes			
Digital Inputs	Ten 120V ac	Six 24V dc, Four fast 24V dc		Six 12V dc / 24V dc, Four fast 12V dc / 24V dc
Analog Inputs	Embedded, two in local, with additional 1762 analog modules			
Digital Outputs	Six relay		Two relay, Two 24V dc FET, Two fast 24V dc FET	Six Relay
Serial Ports	One RS-232 / RS-485 Combo Port			
Serial Protocols	DF1 Full Duplex, DF1 Half Duplex Master/Slave, DF1 Radio Modem, DH-485, Modbus RTU Master/Slave, ASCII			
Ethernet Ports	One 10/100 port			
Ethernet Protocols	EtherNet/IP messaging only			
Trim Potentiometers	Two digital			
High-Speed Inputs (Pulse Catch)		Four @ 40kHz input (1ch)	Four @ 40 kHz input (1ch)	Four @ 40 kHz input (1ch)
Real Time Clock	Yes (embedded)			
PID	Yes (multiple loops only limited by program and stack memory)			
PWM /PTO			Two @ 40 kHz	
Dual Axis Servo control			Through embedded PTO	
Embedded LCD	Yes			
Floating Point Math	Yes			
Online Editing	Yes			
Operating Temperature	-20°C to +65°C (-4°F to +149°F)			
Storage Temperature	-40°C to +85°C (-40°F to +185°F)			

www.rockwellautomation.com

Power, Control and Information Solutions

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation SA/NV, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

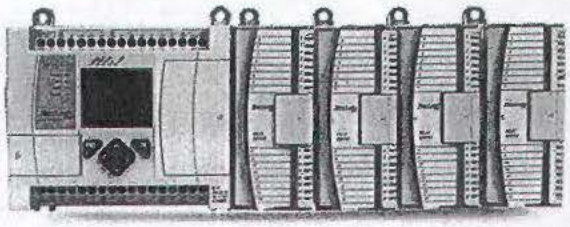
Publication 1763-PP001B-EN-P – March 2007 — Supersedes Publication 1763-PP001A-EN-P – July 2005

Rockwell Automation

Analog Module PCEX-1, PCEX-2 & PCEX-3

1762 MICROLOGIX EXPANSION I/O

Expansion I/O Modules



MicroLogix 1100 controller with four expansion I/O modules

The 1762 MicroLogix expansion I/O modules are compatible with MicroLogix 1100, MicroLogix 1200, and MicroLogix 1400 controllers. If your application requires more I/O than the built-in I/O provided by the controller, add expansion I/O modules.

Install the expansion I/O modules to the right of the controller, either on a panel with two mounting screws or on a DIN rail. You can use digital and analog I/O modules in many combinations, up to the maximum supported by the controller. The current loading capacity of the controller's built-in power supply may limit the actual number of I/O modules that can be connected to the controller.

Features

- Integrated high-performance I/O bus
- Software keying to prevent incorrect positioning within the system
- Finger-safe terminal blocks for I/O wiring
- Label to record I/O terminal designations
- Network support includes EtherNet/IP, DeviceNet, and DH-485 (local only)
- Digital, analog, and specialty I/O modules available

Maximum 1762 Expansion I/O Modules per Controller

Controller	Number I/O Modules, Max.
MicroLogix 1100	4
MicroLogix 1200	6
MicroLogix 1400	7

Environmentals and Certifications

Environmental Specifications

1762 MicroLogix Expansion I/O Modules

Operating Temperature	-20...65 °C (-4...149 °F) (on selected modules)
Operating Humidity	5...95% (without condensation)
Operating Altitude, Max.	2,000 m (6,561 ft)
Vibration, Operating	10...500 Hz, 5 g, 0.015 in peak-to-peak
Vibration, Relay Operation	2 g
Shock, Operating	30 g panel mounted, 20 g DIN-rail mounted
Shock, Relay Operation	7.5 g panel mounted, 5 g DIN rail mounted
Shock, Nonoperating	40 g panel mounted, 30 g DIN rail mounted
Dimensions (HxWxD), Approx.	90 x 40 x 87mm (3.543 x 1.575 x 3.425 in.)*
Radiated and Conducted Emissions	EN50081-2 Class A
ESD Immunity (IEC 1000-4-2)	4 kV contact, 8 kV air, 4 kV indirect
Radiated Immunity (IEC 1000-4-3)	10V/m, 80-1000 MHz, 80% amplitude modulation, +900 MHz keyed carrier
Fast Transient Burst (IEC 1000-4-4)	2 kV, 5 kHz
Surge Immunity (IEC 1000-4-5)	2 kV common mode, 1 kV differential mode
Conducted Immunity (IEC 1000-4-6)	10V, 0.15...80 MHz❄

* Height including mounting tabs is 110 mm (4.33 in.).
❄ Conducted immunity frequency range may be 150 kHz...30 MHz if the radiated immunity frequency range is 30 MHz...1000 MHz.

Certifications

Certifications: C-UL certified (under CSA C22.2 No. 142), UL 508 Listed, CE compliant for all applicable directives.
Hazardous Environment Class: Class I, Division 2, Hazardous Location, Groups A, B, C, D (UL1604, C-UL under CSA C22.2 No. 213).

When product is marked. See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Digital I/O Modules

Digital Output Modules

Cat. No.	Outputs	Voltage Category	Operating Voltage Range	Continuous Current per Output, Max.	Continuous Current per Module, Max.	Off-State Leakage Current, Max.	Bus Current Load, Max.
1762-OA8	8 (4 points/group)	100...240V AC	85...265V AC at 47...63 Hz	0.25 A at 55 °C (131 °F) 0.5 A at 30 °C (86 °F)	2.0 A (1.0 A per common) at 55 °C (131 °F) 4.0 A (2.0 A per common) at 30 °C (86 °F)	2 mA at 132V AC 2.5 mA at 265V AC	115 mA at 5V DC (0.575 W)
1762-OB8	8	24V DC source	20...26.4V DC	0.5 A at 55 °C (131 °F) 1.0 A at 30 °C (86 °F)	4.0 A at 55 °C (131 °F) 8.0 A at 30 °C (86 °F)	1.0 mA	115 mA at 5V DC (0.575 W)

Cat. No.	Inputs/Outputs	Voltage Category	Operating Voltage Range	On-State Current, Max.	Continuous Current per Output, Max.	Off-State Voltage and Current, Max.	Off-State Leakage Current, Max.	Impedance, Nom.
1762-IQ8OW6	8 inputs	24V DC sink/source	10...26.4V DC at 65 °C 10...30V DC at 30 °C	10 mA at 5V DC	—	5V DC 1.5 mA	—	3 kΩ
	6 outputs	AC/DC -N.O. contact	5...265V AC 5...125V DC	—	2.5 A (8.0 A per module, max.)	—	0 mA	—

Analog I/O Modules

Cat. No.	Inputs/Outputs	Analog Ranges	Bus Current Draw, Max.	Overall Accuracy*	Resolution Across Full Range	Typical Update Period
1762-IF4	4 differential inputs (bipolar)	Voltage: ±10V Current: 4...20 mA	40 mA at 5V DC 50 mA at 24V DC	±0.32% full scale at -20...65° C (-4... 149° F)❄ ±0.24% full scale at 25° C (77° F)	15 bits (bipolar) ❄	130, 250, 290, 450, 540 ms (selectable)
1762-OF4	4 single-ended outputs (unipolar)❄	Voltage: 0...10V Current: 4...20 mA	40 mA at 5V DC 165 mA at 24V DC	±1.17% full scale at -20...65° C (-4... 149° F)❄ ±0.5% full scale at 25° C (77° F)	12 bits (unipolar)	2.5 ms
1762-IF2OF2	2 differential inputs (unipolar) 2 single-ended outputs (unipolar)	Voltage: 0...10V Current: 4...20 mA	40 mA at 5V DC 105 mA at 24V DC	±0.55% full scale at -20...65° C (-4... 149° F)❄ ±0.3% full scale at 25° C (77° F)	12 bits (unipolar)	2.5 ms (inputs) 4.5 ms (outputs)

* Includes offset, gain, non-linearity, and repeatability error terms.
❄ Only applicable for series B.

Specialty I/O Modules

Cat. No.	Inputs/Outputs	Accepted Inputs	Bus Current Load, Max.	Accuracy @ 25 ° C (77 °F)*	Resolution Across Full Range	Channel Update Time (Typical)
1762-IR4	4 input channels	• RTDs: Platinum (385 and 3916), Copper (426), Nickel (672 and 618), Nickel-Iron (518) • Resistance Ranges: 0...3000 Ω	40 mA at 5V DC 50 mA at 24V DC	*With autocalibration enabled* • RTD Inputs: ±0.2...±0.6 °C (±0.36...±1.08 °F), depending on RTD type • Resistance Inputs:	Input filter and configuration dependent§	6...303 ms per enabled channel, depending on filter selection

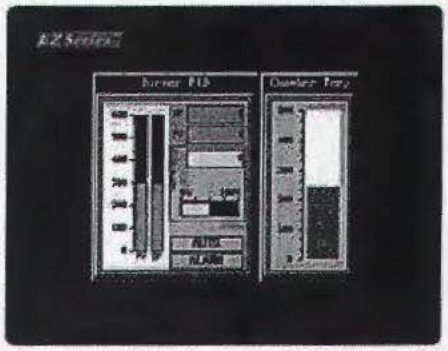
EZSeries 6" TFT Color Panels

Controller Display PCM-1, PCM-2 & PCM-3

6" Color EZSeries (5.7" TFT)

EZSeries 6" panels have a 5.7" diagonal touch screen with 320x240 pixel resolution. This model is a new addition to EZSeries line with a TFT LCD (liquid crystal display).

NOTE: EZSeries CE Touchpanels have built-in Ethernet yet are still available with additional Universal Ethernet option if the application needs multiple processors



EZSeries Touchpanel feature:

- 5.7" diagonal color TFT LCD
- Low-profile slim bezel design
- 128 colors
- NEMA 4, 4X
- 320x240 pixel resolution
- 512K RAM expandable to 1.5MB
- 512K, 1MB or 2MB option flash card for memory backup
- 400 nits brightness
- 75,000 hour expected bulb half-life
- 192 touch cells (16x12)
- 1/4" gasket and four DIN mounting clips for NEMA 4, 4X
- 2.3" (59.0mm) installed depth
- Has all EZSeries objects
- Has all 4,000 Library symbols
- Programmed with EZSeries programming software

See the different communication interface options available in the chart to the right

EZSeries CE Touchpanel

Part Number	Description	Price	Del.
EZC-T6C-E	6" Color TFT, Enhanced CE 4.2 PP, Nema 4, 4X	$769	3DAY
EZC-T6C-ED	6" Color TFT, Enhanced CE 4.2 PP, DeviceNet, Nema 4, 4X	$2,299	3DAY
EZC-T6C-EH	6" Color TFT, Enhanced CE 4.2 PP, DH+, Nema 4, 4X	$1,899	3DAY
EZC-T6C-EM	6" Color TFT, Enhanced CE 4.2 PP, MB+, Nema 4, 4X	$1,899	3DAY
EZC-T6C-EP	6" Color TFT, Enhanced CE 4.2 PP, Profibus, Nema 4, 4X	$2,299	3DAY
EZC-T6C-EC	6" Color TFT, Enhanced CE 4.2 PP, CCLink, Nema 4, 4X	$1,899	3DAY
EZC-T6C-EU	6" Color TFT, Enhanced CE 4.2 PP, Universal Ethernet, Nema 4, 4X	$1,798	3DAY

Enhanced CE Touchpanels with Windows CE Professional Plus offer:

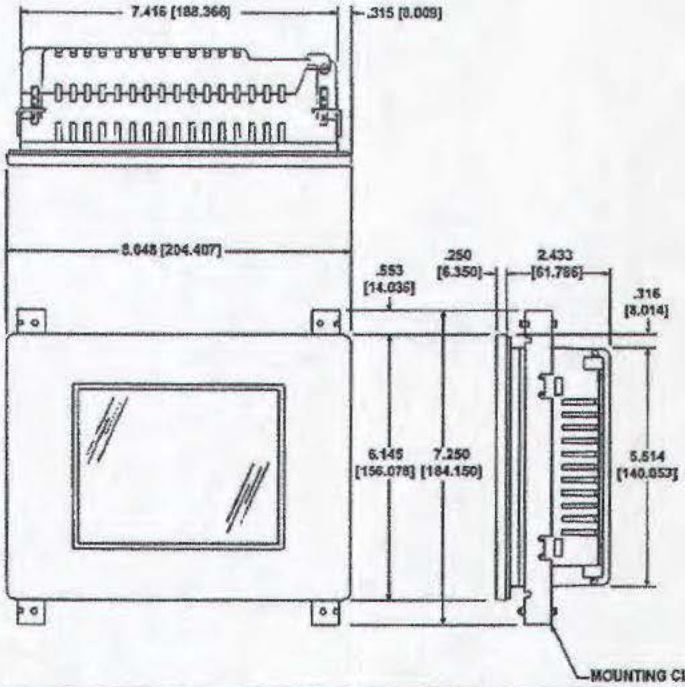
- File viewers such as Acrobat, Excel, Word, PowerPoint, Image and Internet Explorer for Windows CE
- Built-in Ethernet protocols, Ethernet IP, EZ IP, SRTP, Modbus TCP/IP and Koyo ECOM

EZSeries Dedicated OS

Model Number	Interface	Price	Del.
EZ-T6C-ES	EZPLC driver only	$769	STK
EZ-T6C-FS	All serial drivers and accepts Ethernet and network cards	$769	STK
EZ-T6C-FSD	DeviceNet	$1,499	3DAY
EZ-T6C-FSE	AB Ethernet I/P	$1,499	3DAY
EZ-T6C-FSH	DH+, Remote I/O	$1,499	3DAY
EZ-T6C-FSM	Modicon MODBUS Plus	$1,499	3DAY
EZ-T6C-FSP	Profibus	$1,499	3DAY
EZ-T6C-FST	MODBUS TCP/IP	$1,269	3DAY
EZ-T6C-FSC	CCLink	$1,499	3DAY
EZ-T6C-FSU	Universal Ethernet drivers - DF1, I/P, Modbus TCP/IP, SRTP	$1,398	3DAY
EZ-T6C-RMC	RMC card installed	$919	3DAY

EZSeries CE Touchpanel feature:

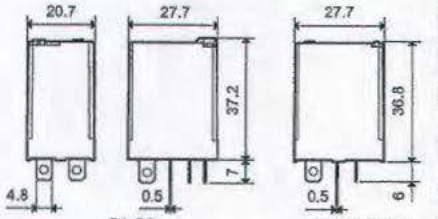
- 5.7" diagonal color TFT LCD
- Low-profile slim bezel design
- 18 bit colors
- NEMA 4, 4X
- 320x240 pixel resolution
- 400 nits brightness
- 75,000 hour expected bulb half-life
- Analog resistive touch screen
- Alchemy 333 MHz Processor
- 32MB Flash, 64MB RAM and 2 MB for HMI
- 1/4" gasket and four DIN mounting clips
- 2.43" installed depth
- Has all EZSeries Touchpanel
- Has all 4,000 Library symbols
- Programmed with EZSeries Programming software



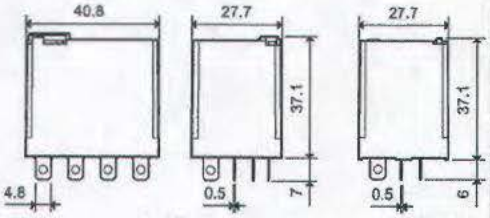
Features

Plug-in - 12 A Power relay, 2 & 4 pole

- Flange mount option - (Faston 187, 4.8x0.5 mm termination)
- AC coils & DC coils
- Lockable test button and mechanical flag indicator
- Cadmium Free contacts (standard version)
- Contact material options
- 96 series sockets
- Coil EMC suppression
- Accessories
- European Patent



56.32 56.32-0300

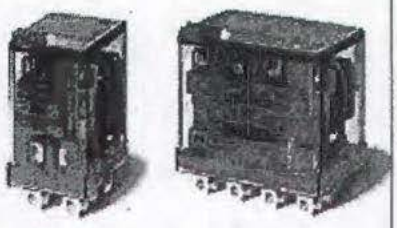


56.34 56.34-0300

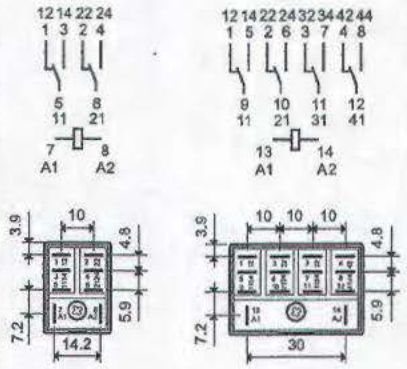
* For 4 CO (4PDT) or 4 NO only.

FOR UL RATINGS SEE:
"General technical information" page V

56.32/56.34



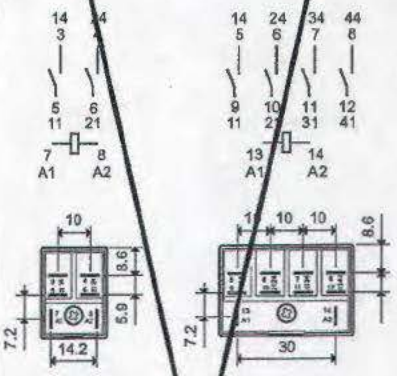
- 2 or 4 pole changeover contact
- Plug-in/Faston 187



56.32 56.34

~~56.32-0300/56.34-0300~~

- 2 or 4 pole normally open contact (≥1.5 mm gap)
- Plug-in/Faston 187



56.32-0300 56.34-0300

Contact specification					
Contact configuration		~~2 CO (DPDT)~~	4 CO (4PDT)	2NO (DPSTNO) - ≥1.5mm gap	4NO (4PSTNO) - ≥1.5mm gap
Rated current/Maximum peak current	A	12/20		12/20	
Rated voltage/Maximum switching voltage	V AC	250/400		250/400	
Rated load AC1	VA	3,000		3,000	
Rated load AC15 (230 V AC)	VA	700		700	
Single phase motor rating (230 V AC)	kW	0.55		0.55	
Breaking capacity DC1: 30/110/220 V	A	12/0.5/0.25		12/1/0.5	
Minimum switching load	mW (V/mA)	500 (10/5)		500 (10/5)	
Standard contact material		AgNi		AgNi	
Coil specification					
Nominal voltage (U_N)	V AC (50/60 Hz)	6 - 12 - 24 - 48 - 60 - 110 - 120 - 230 - 240 - 400*			
	~~V DC~~	6 - 12 - 24 - 48 - 60 - 110 - 125 - 220		–	
Rated power AC/DC	VA (50 Hz)/W	1.5/1	2/1.3	1.5/–	2/–
Operating range	AC	(0.8...1.1)U_N		(0.85...1.1)U_N	
	DC	(0.8...1.1)U_N	(0.85...1.1)U_N	–	
Holding voltage	AC/DC	0.8 U_N/0.6 U_N		0.85 U_N/–	
Must drop-out voltage	AC/DC	0.2 U_N/0.1 U_N		0.2 U_N/–	
Technical data					
Mechanical life AC/DC	cycles	$20 \cdot 10^6/50 \cdot 10^6$		$20 \cdot 10^6$/–	
Electrical life at rated load AC1	cycles	$100 \cdot 10^3$		$100 \cdot 10^3$	
Operate/release time	ms	8/3	10/4	8/4	
Insulation between coil and contacts (1.2/50 µs)	kV	4	5	4	5
Dielectric strength between open contacts	V AC	1,000		2,000	
Ambient temperature range	°C	–40...+70		–40...+70	
Environmental protection		RT I		RT I	
Approvals (according to type)		CE			

1

Ordering information

Example: 56 series plug-in relay, 2 CO (DPDT), 12 V DC coil, lockable test button and mechanical indicator.

5 6	.	3	2	.	9	.	0 1 2	.	A 0	B 0	C 4	D 0

Series

Type
3 = Plug-in
4 = PCB

No. of poles
2 = 2 pole, 12 A
4 = 4 pole, 12 A

Coil version
8 = AC (50/60 Hz)
9 = DC

Coil voltage
See coil specifications

A: Contact material
0 = Standard AgNi
2 = AgCdO
4 = $AgSnO_2$

B: Contact circuit
0 = CO (nPDT)
3 = NO (nPST), ≥ 1.5 mm contact gap

C: Options
0 = None
2 = Mechanicol indicator
3* = LED (AC)
4 = Lockable test button+mechanical indicator
5* = Lockable test button + LED (AC)
54* = Lockable test button + LED (AC) + mechanicol indicator
6* = Double LED (DC non-polarized)
7* = Lockable test button + double LED (DC non-polarized)
74* = Lockable test button + double LED (DC non-polarized) + mechanical indicator
8* = LED + diode (DC, polarity positive to pin 7) for 56.32 only
9* = Lockable test button + LED + diode (DC, polarity positive to pin 7) for 56.32 only
94* = Lockable test button + LED + diode (DC, polarity positive to pin 7) + mechanical indicator for 56.32 only
* Options not available for 220 V DC and 400 V AC versions.

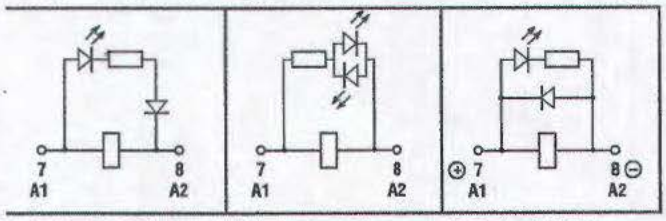
D: Special versions
0 = Standard
1 = Wash tight (RT III) for 56.42 and 56.44 only
6 = Rear flange mount (4 pole only)
8 = Rear 35 mm rail mount (4 pole only)
For other mounting options see page 6

Selecting features and options: only combinations in the same row are possible.
Preferred selections for best availability are shown in **bold**.

Type	Coil version	A	B	C	D
56.32	AC	**0** - 2 - 4	**0**	0 - 2 - 3 - **4** - 5	**0**
	AC	0 - 2 - 4	0	54	/
	AC	0 - 2 - 4	3	0 - 3 - 5	0
	DC	**0** - 2 - 4	**0**	0 - 2 - **4** - 6 - 7 - 8 - 9	**0**
	DC	0 - 2 - 4	0	74 - 94	/
56.34	AC	**0** - 2 - 4	**0**	**0** - 2 - 3 - **4** - 5	**0** - 6 - 8
	AC	0 - 2 - 4	0	54	/
	AC	0 - 2 - 4	0 - 3	0 - 3 - 5	0
	DC	**0** - 2 - 4	**0**	**0** - 2 - **4** - 6 - 7	**0** - 6 - 8
	DC	0 - 2 - 4	0	74	/
56.42	DC	**0** - 2 - 4	**0**	**0**	**0** - 1
	AC	0 - 2 - 4	0 - 3	0	0 - 1
56.44	AC-DC	**0** - 2 - 4	**0**	**0**	**0** - 1
	AC	0 - 2 - 4	0 - 3	0	0 - 1

Special versions for Rail Applications on request

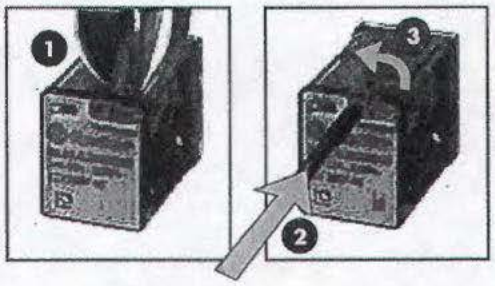
Descriptions: options and special versions



C: Option 3, 5, 54
LED (AC)

C: Option 6, 7, 74
Double LED
(DC non-polarized)

C: Option 8, 9, 94
LED + diode (DC, polarity positive to pin 7) - (56.32 only)



Lockable test button and mechanical flag indicator (0040, 0050, 0054, 0070, 0074, 0090, 0094)
The dual-purpose Finder test button can be used in two ways:
Case 1) The plastic pip (located directly above the test button) remains intact. In this case, when the test button is pushed, the contacts operate. When the test button is released the contacts return to their former state.

Case 2) The plastic pip is broken-off (using an appropriate cutting tool). In this case, (in addition to the above function), when the test button is pushed and rotated, the contacts are latched in the operating state, and remain so until the test button is rotated back to its former position.

In both cases ensure that the test button actuation is swift and decisive.

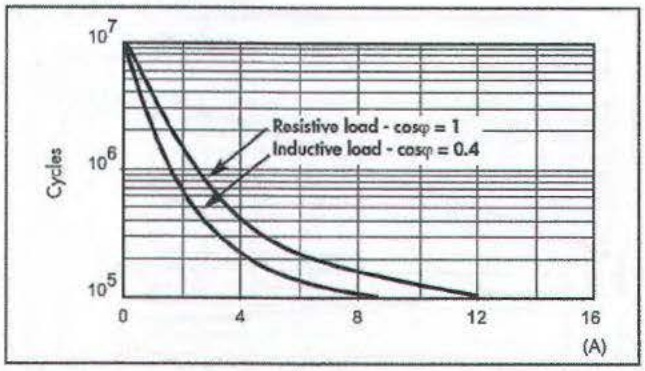
Technical data

*Only in applications where over voltage category II is permitted. In applications of over voltage category III: Micro-disconnection.

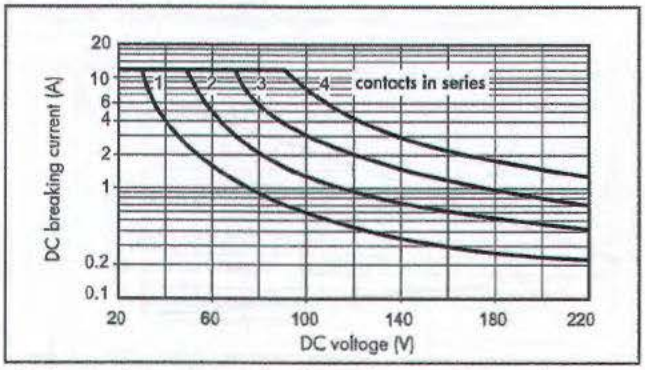
			2 CO - 4 CO		2 NO - 4 NO	
Insulation according to EN 61810-1						
Nominal voltage of supply system		V AC	230/400		230/400	
Rated insulation voltage		V AC	250	400	250	400
Pollution degree			3	2	3	2
Insulation between coil and contact set						
Type of insulation			Basic		Basic	
Overvoltage category			III		III	
Rated impulse voltage		kV (1.2/50 µs)	4		4	
Dielectric strength		V AC	2,500		2,500	
Insulation between adjacent contacts						
Type of insulation			Basic		Basic	
Overvoltage category			III		III	
Rated impulse voltage		kV (1.2/50 µs)	4		4	
Dielectric strength		V AC	2,500		2,500	
Insulation between open contacts						
Type of disconnection			Micro-disconnection		Full-disconnection*	
Overvoltage category			—		II	
Rated impulse voltage		kV (1.2/50 µs)	—		2.5	
Dielectric strength		V AC/(1.2/50 µs)	1,000/1.5		2,000/3	
Conducted disturbance immunity						
Burst (5...50) ns, 5 kHz, on A1 - A2			EN 61000-4-4		level 4 (4 kV)	
Surge (1.2/50 µs) on A1 - A2 (differential mode)			EN 61000-4-5		level 4 (4 kV)	
Other data						
Bounce time: NO/NC		ms	1/4 (changeover)		3/— (normally open)	
Vibration resistance (10...150 Hz): NO/NC		g	17/14			
Shock resistance NO/NC		g	20/14			
Power lost to the environment	without contact current	W	1 (56.32, 56.42)		1.3 (56.34, 56.44)	
	with rated current	W	3.8 (56.32, 56.42)		6.9 (56.34, 56.44)	
Recommended distance between relays mounted on PCB		mm	≥ 5			

Contact specification

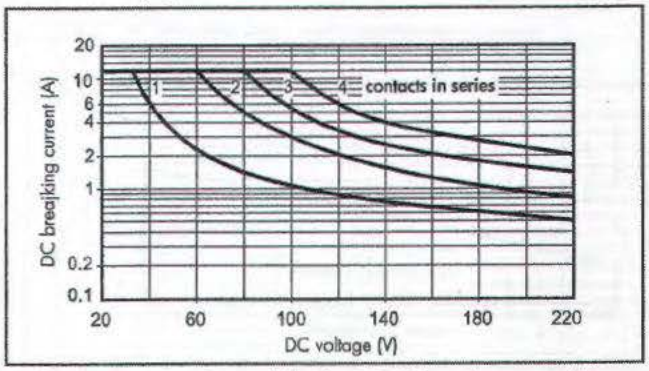
F 56 - Electrical life (AC) v contact current
2 - 4 pole relays



H 56 - Maximum DC1 breaking capacity
Changeover version



H 56 - Maximum DC1 breaking capacity
Normally open version



- When switching a resistive load (DC1) having voltage and current values under the curve, an electrical life of ≥ $100 \cdot 10^3$ can be expected.
- In the case of DC13 loads, the connection of a diode in parallel with the load will permit a similar electrical life as for a DC1 load.
  Note: the release time of the load will be increased.

Coil specifications

DC coil data, 2 pole relay

Nominal voltage U_N V	Coil code	Operating range U_{min} V	U_{max} V	Resistance R Ω	Rated coil consumption I at U_N mA
6	9.006	4.8	6.6	40	150
12	9.012	9.6	13.2	140	86
24	9.024	19.2	26.4	600	40
48	9.048	38.4	52.8	2,400	20
60	9.060	48	66	4,000	15
110	9.110	88	121	12,500	8.8
125	9.125	100	138	17,300	7.2
220	9.220	176	242	54,000	4

AC coil data, 2 pole relay

Nominal voltage U_N V	Coil code	Operating range U_{min}* V	U_{max} V	Resistance R Ω	Rated coil consumption I at U_N (50Hz) mA
6	8.006	4.8	6.6	12	200
12	8.012	9.6	13.2	50	97
24	8.024	19.2	26.4	190	53
48	8.048	38.4	52.8	770	25
60	8.060	48	66	1,200	21
110	8.110	88	121	3,940	12.5
120	8.120	96	132	4,700	12
230	8.230	184	253	17,000	6
240	8.240	192	264	19,100	5.3

* U_{min} = 0.85 U_N for normally open version.

DC coil data, 4 pole relay

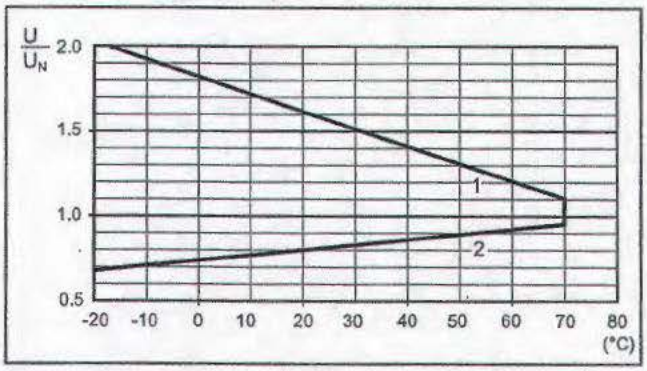
Nominal voltage U_N V	Coil code	Operating range U_{min} V	U_{max} V	Resistance R Ω	Rated coil consumption I at U_N mA
6	9.006	5.1	6.6	32.5	185
12	9.012	10.2	13.2	123	97
24	9.024	20.4	26.4	490	49
48	9.048	40.8	52.8	1,800	27
60	9.060	51	66	3,000	20
110	9.110	93.5	121	10,400	10.5
125	9.125	107	138	14,200	8.8
220	9.220	187	242	44,000	5

AC coil data, 4 pole relay or 4 NO

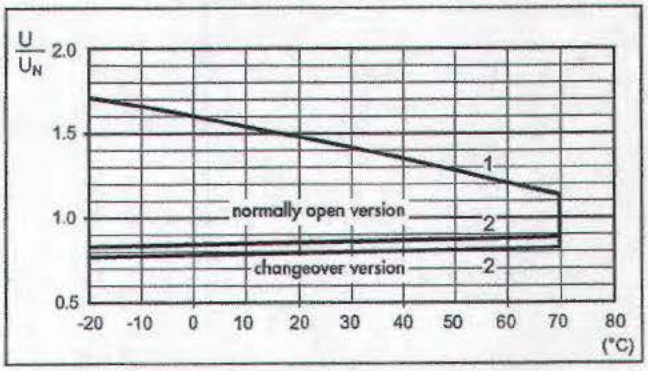
Nominal voltage U_N V	Coil code	Operating range U_{min}* V	U_{max} V	Resistance R Ω	Rated coil consumption I at U_N (50Hz) mA
6	8.006	4.8	6.6	5.7	300
12	8.012	9.6	13.2	22	150
24	8.024	19.2	26.4	81	90
48	8.048	38.4	52.8	380	37
60	8.060	48	66	600	30
110	8.110	88	121	1,900	16.5
120	8.120	96	132	2,560	13.4
230	8.230	184	253	7,700	9
240	8.240	192	264	10,000	7.5
400	8.400	320	440	26,000	4.9

* U_{min} = 0.85 U_N for normally open version.

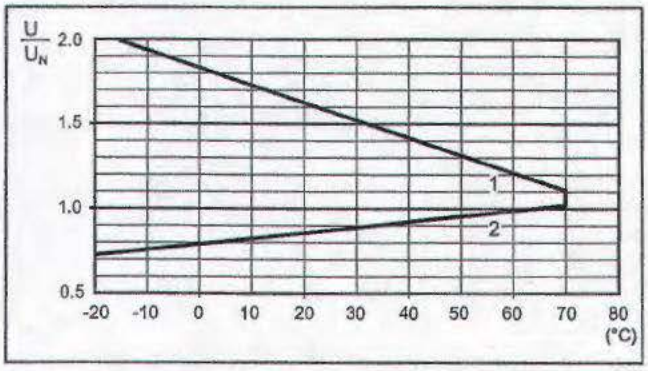
R 56 - DC coil operating range v ambient temperature
2 pole relay



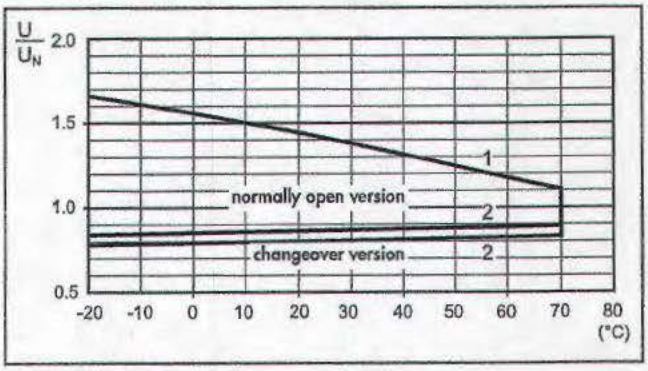
R 56 - AC coil operating range v ambient temperature
2 pole relay



R 56 - DC coil operating range v ambient temperature
4 pole relay



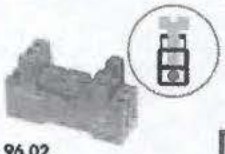
R 56 - AC coil operating range v ambient temperature
4 pole relay or 4 NO



1 - Max. permitted coil voltage.
2 - Min. pick-up voltage with coil at ambient temperature.

1 - Max. permitted coil voltage.
2 - Min. pick-up voltage with coil at ambient temperature.

96 Series - Sockets and accessories for 56 series relays



96.02

Approvals (according to type):

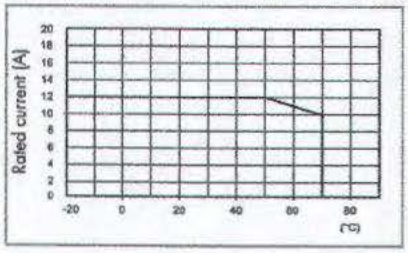
96.04

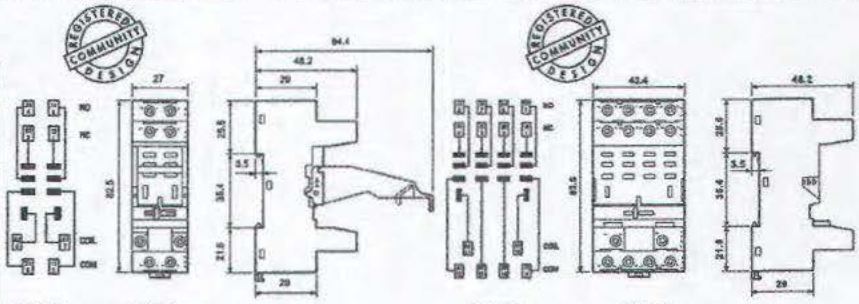
Approvals (according to type):

094.91.3

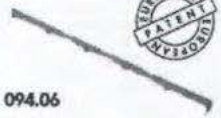
Screw terminal (Box clamp) socket panel or 35 mm **(EN 60715)** rail mount	**96.02 Blue**	**96.02.0 Black**	**96.04 Blue**	**96.04.0 Black**
For relay type	56.32		56.34	
Accessories				
Metal retaining clip (supplied with socket - packaging code SMA)	094.71		096.71	
Plastic retaining and release clip (supplied with socket - packaging code SPA)	094.91.3	094.91.30	–	–
6-way jumper link	094.06	094.06.0	–	–
Identification tag	095.00.4		090.00.2	
Modules (see table below)	99.02			
Timer modules (see table below)	86.30		86.00, 86.30	
Sheet of marker tags for retaining and release clip 094.91.3 plastic, 72 tags, 6x12 mm	060.72		–	
Technical data				
Rated values	12 A - 250 V			
Dielectric strength	2 kV AC			
Protection category	IP 20			
Ambient temperature °C	-40...+70 (see diagram L96)			
Screw torque Nm	0.8			
Wire strip length mm	8			
Max. wire size for 94.02/04 sockets	solid wire		stranded wire	
mm²	1x6 / 2x2.5		1x4 / 2x2.5	
AWG	1x10 / 2x14		1x12 / 2x14	

L 96 - Rated current vs ambient temperature



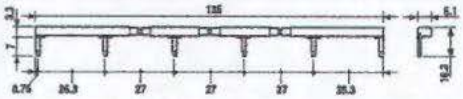


96.02 96.02 96.04 96.04



094.06

6-way jumper link for 96.02 socket	094.06 (blue)	094.06.0 (black)
Rated values	10 A - 250 V	



86.00

86.30

99.02

Approvals (according to type):

DC Modules with non-standard polarity (+A2) on request.

86 series timer modules

Multi-voltage: (12...240)V AC/DC; Multi-functions: AI, DI, SW, BE, CE, DE, EE, FE; (0.05 s...100 h)	86.00.0.240.0000
(12...24)V AC/DC; Bi-function: AI, DI; (0.05 s...100 h)	86.30.0.024.0000
(110...125)V AC; Bi-function: AI, DI; (0.05s...100h)	86.30.8.120.0000
(230...240)V AC; Bi-function: AI, DI; (0.05 s...100 h)	86.30.8.240.0000

Approvals (according to type):

99.02 coil indication and EMC suppression modules for 96.02 and 96.04 sockets

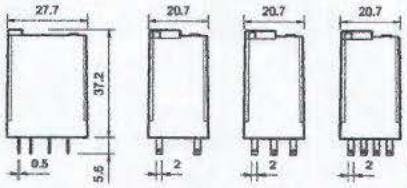
Diode (+A1, standard polarity)	(6...220)V DC	99.02.3.000.00
LED	(6...24)V DC/AC	99.02.0.024.59
LED	(28...60)V DC/AC	99.02.0.060.59
LED	(110...240)V DC/AC	99.02.0.230.59
LED + Diode (+A1, standard polarity)	(6...24)V DC	99.02.9.024.99
LED + Diode (+A1, standard polarity)	(28...60)V DC	99.02.9.060.99
LED + Diode (+A1, standard polarity)	(110...220)V DC	99.02.9.220.99
LED + Varistor	(6...24)V DC/AC	99.02.0.024.98
LED + Varistor	(28...60)V DC/AC	99.02.0.060.98
LED + Varistor	(110...240)V DC/AC	99.02.0.230.98
RC circuit	(6...24)V DC/AC	99.02.0.024.09
RC circuit	(28...60)V DC/AC	99.02.0.060.09
RC circuit	(110...240)V DC/AC	99.02.0.230.09
Residual current by-pass	(110...240)V AC	99.02.8.230.07

Features

Plug-in mount, general purpose
2, 3 & 4 Pole relays

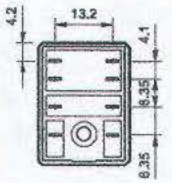
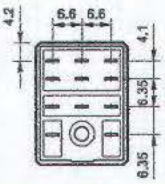
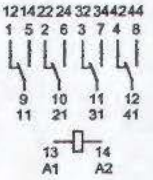
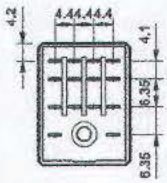
55.32 - 2 Pole 10 A
55.33 - 3 Pole 10 A
55.34 - 4 Pole 7 A

- Lockable test button and mechanical flag indicator as standard on 2 & 4 pole types
- AC coils & DC coils
- UL Listing (certain relay/socket combinations)
- Cadmium Free contacts (preferred version)
- Contact material options
- 94 series sockets
- Coil EMC suppression
- Timer accessories 86 series
- European Potent



55.32 55.33 55.34

FOR UL RATINGS SEE:
"General technical information" page V

	55.32	55.33	55.34
			
	• 2 pole, 10 A • Plug-in 94 series sockets	• 3 pole, 10 A • Plug-in 94 series sockets	• 4 pole, 7 A • Plug-in 94 series sockets
	 	 	 
Contact specification			
Contact configuration	2 CO (DPDT)	3 CO (3PDT)	4 CO (4PDT)
Rated current/Maximum peak current A	10/20	10/20	7/15
Rated voltage/Maximum switching voltage V AC	250/400	250/400	250/250
Rated load AC1 VA	2,500	2,500	1,750
Rated load AC15 (230 V AC) VA	500	500	350
Single phase motor rating (230 V AC) kW	0.37	0.37	0.125
Breaking capacity DC1: 30/110/220 V A	10/0.25/0.12	10/0.25/0.12	7/0.25/0.12
Minimum switching load mW (V/mA)	300 (5/5)	300 (5/5)	300 (5/5)
Standard contact material	AgNi	AgNi	AgNi
Coil specification			
Nominal voltage (UN) V AC (50/60 Hz)	6 - 12 - 24 - 48 - 60 - 110 - 120 - 230 - 240		
V DC	6 - 12 - 24 - 48 - 60 - 110 - 125 - 220		
Rated power AC/DC VA (50 Hz)/W	1.5/1	1.5/1	1.5/1
Operating range AC	(0.8...1.1)U_N	(0.8...1.1)U_N	(0.8...1.1)U_N
DC	(0.8...1.1)U_N	(0.8...1.1)U_N	(0.8...1.1)U_N
Holding voltage AC/DC	0.8 U_N/0.5 U_N	0.8 U_N/0.5 U_N	0.8 U_N/0.5 U_N
Must drop-out voltage AC/DC	0.2 U_N/0.1 U_N	0.2 U_N/0.1 U_N	0.2 U_N/0.1 U_N
Technical data			
Mechanical life AC/DC cycles	20 · 10^6/50 · 10^6	20 · 10^6/50 · 10^6	20 · 10^6/50 · 10^6
Electrical life at rated load AC1 cycles	200 · 10^3	200 · 10^3	150 · 10^3
Operate/release time ms	10/5	10/5	11/3
Insulation between coil and contacts (1.2/50 µs) kV	4	4	4
Dielectric strength between open contacts V AC	1,000	1,000	1,000
Ambient temperature range °C	-40...+85	-40...+85	-40...+85
Environmental protection	RT I	RT I	RT I
Approvals (according to type)	CE ANCE SP D FI PG VDE UL N RINA S cULus DVE		

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Ordering information

Example: 55 series plug-in relay, 4 CO (4PDT), 12 V DC coil, lockable test button and mechanical indicator.

5	5	.	3	4	.	9	.	0	1	2	.	0	0	4	0
												A	B	C	D

Series

Type
1 = PCB
3 = Plug-in

No. of poles
2 = 2 pole, 10 A
3 = 3 pole, 10 A
4 = 4 pole, 7 A

Coil version
8 = AC (50/60 Hz)
9 = DC

Coil voltage
See coil specifications

A: **Contact material**
0 = Standard AgNi
2 = AgCdO
5 = AgNi + Au (5 µm)

B: **Contact circuit**
0 = CO (nPDT)

D: **Special versions**
0 = Standard
1 = Wash tight (RT III)
for 55.12, 55.13 and 55.14 only

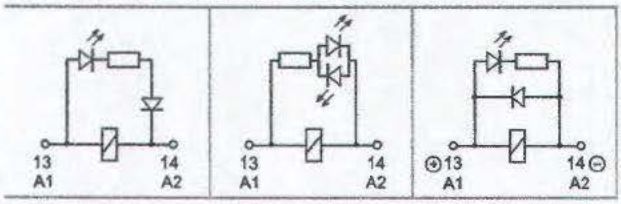
C: **Options**
0 = None
1 = Lockable test button
2 = Mechanical indicator
3 = LED (AC)
4 = Lockable test button+mechanical indicator
5 = Lockable test button + LED (AC)
54 = Lockable test button + LED (AC) + mechanical indicator
6* = Double LED (DC non-polarized)
7* = Lockable test button + double LED (DC non-polarized)
74* = Lockable test button + double LED (DC non-polarized) + mechanical indicator
8* = LED + diode (DC, polarity positive to pin A1/13)
9* = Lockable test button + LED + diode (DC, polarity positive to pin A1/13)
94* = Lockable test button + LED + diode (DC, polarity positive to pin A1/13) + mechanical indicator

* Option not available for the 220 V DC version.

Selecting features and options: only combinations in the same row are possible.
Preferred selections for best availability are shown in **bold.**

Type	Coil version	A	B	C	D
55.32/34	AC-DC	0 - 2 - 5	0	0	0
	AC	**0** - 2 - 5	**0**	2 - 3 - **4** - 5	**0**
	AC	0 - 2 - 5	0	54	/
	DC	**0** - 2 - 5	**0**	2 - **4** - 6 - 7 - 8 - 9	**0**
	DC	0 - 2 - 5	0	74 - 94	/
55.33	AC-DC	**0** - 2 - 5	**0**	**0**	**0**
	AC	0 - 2 - 5	0	1 - 3 - 5	0
	DC	0 - 2 - 5	0	1 - 6 - 7 - 8 - 9	0
55.12/13/14	AC-DC	**0** - 2 - 5	**0**	**0**	**0** - 1

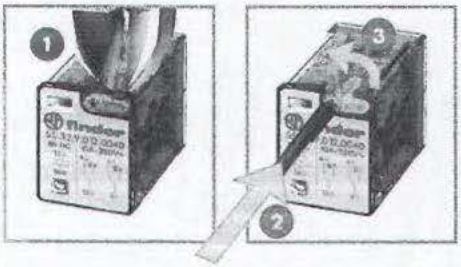
Descriptions: options and special versions



C: **Option 3, 5, 54**
LED (AC)

C: **Option 6, 7, 74**
Double LED
(DC non-polarized)

C: **Option 8, 9, 94**
LED + diode (DC, polarity positive to pin A1/13)



Lockable test button and mechanical flag indicator (0010, 0040, 0050, 0054, 0070, 0074, 0090, 0094)

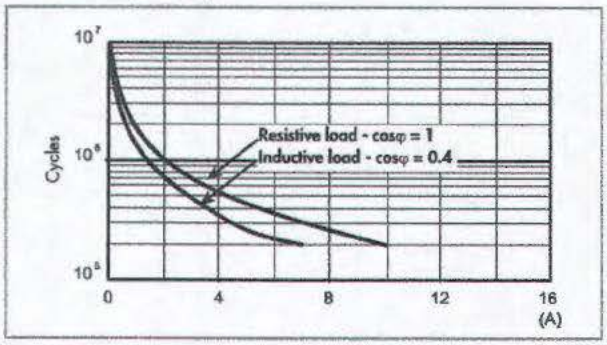
The dual-purpose Finder test button can be used in two ways:
Case 1) The plastic pip (located directly above the test button) remains intact. In this case, when the test button is pushed, the contacts operate. When the test button is released the contacts return to their former state.
Case 2) The plastic pip is broken-off (using an appropriate cutting tool). In this case, (in addition to the above function), when the test button is pushed and rotated, the contacts are latched in the operating state, and remain so until the test button is rotated back to its former position. In both cases ensure that the test button actuation is swift and decisive.

Technical data

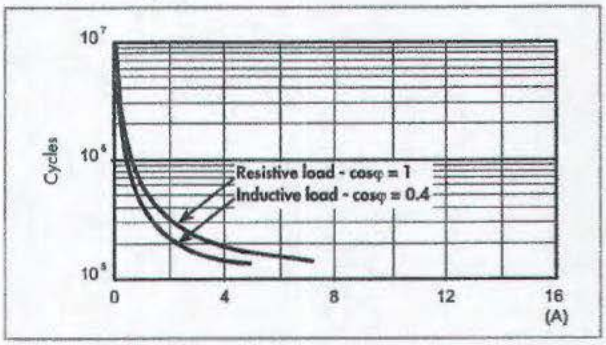
Insulation according to EN 61810-1			2 pole - 3 pole		4 pole
Nominal voltage of supply system		V AC	230/400		230
Rated insulation voltage		V AC	400		250
Pollution degree			2		2
Insulation between coil and contact set					
Type of Insulation			Basic		Basic
Overvoltage category			III		III
Rated impulse voltage		kV (1.2/50 µs)	4		4
Dielectric strength		V AC	2,000		2,000
Insulation between adjacent contacts					
Type of insulation			Basic		Basic
Overvoltage category			III		II
Rated impulse voltage		kV (1.2/50 µs)	4		2.5
Dielectric strength		V AC	2,000		2,000
Insulation between open contacts					
Type of disconnection			Micro-disconnection		Micro-disconnection
Dielectric strength		V AC/kV (1.2/50 µs)	1,000/1.5		1,000/1.5
Conducted disturbance immunity					
Burst (5...50)ns, 5 kHz, on A1 - A2			EN 61000-4-4		level 4 (4 kV)
Surge (1.2/50 µs) on A1 - A2 (differential mode)			EN 61000-4-5		level 4 (4 kV)
Other data					
Bounce time: NO/NC		ms	1/3		
Vibration resistance (5...55)Hz: NO/NC		g	15/15		
Shock resistance		g	16		
Power lost to the environment	without contact current	W	1		
	with rated current	W	3 (2 pole)	4 (3 pole)	3 (4 pole)
Recommended distance between relays mounted on PCB		mm	≥ 5		

Contact specification

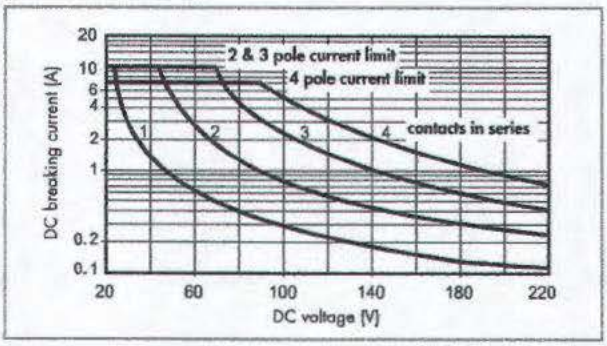
F 55 - Electrical life (AC) v contact current
2 and 3 pole relays



F 55 - Electrical life (AC) v contact current
4 pole relay



H 55 - Maximum DC1 breaking capacity



- When switching a resistive load (DC1) having voltage and current values under the curve, an electrical life of ≥ 100·10³ can be expected.
- In the case of DC13 loads, the connection of a diode in parallel with the load will permit a similar electrical life as for a DC1 load.
Note: the release time for the load will be increased.

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Coil specifications

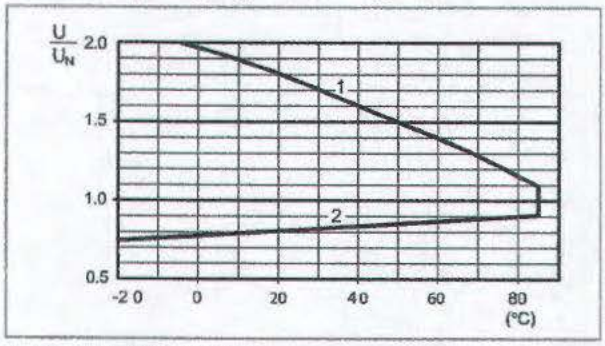
DC coil data

Nominal voltage U_N V	Coil code	Operating range U_{min} V	Operating range U_{max} V	Resistance R Ω	Rated coil consumption I at U_N mA
6	9.006	4.8	6.6	40	150
12	9.012	9.6	13.2	140	86
24	9.024	19.2	26.4	600	40
48	9.048	38.4	52.8	2,400	20
60	9.060	48	66	4,000	15
110	9.110	88	121	12,500	8.8
125	9.125	100	138	17,300	7.2
220	9.220	176	242	54,000	4

AC coil data

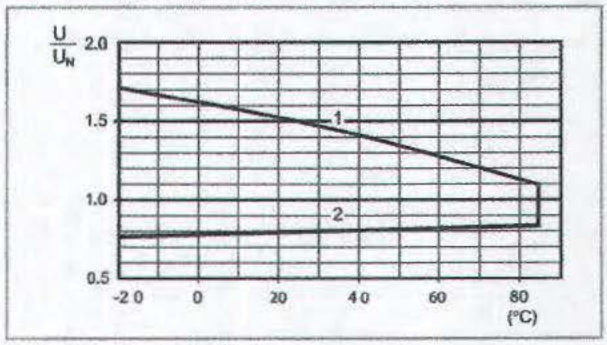
Nominal voltage U_N V	Coil code	Operating range U_{min} V	Operating range U_{max} V	Resistance R Ω	Rated coil consumption I at U_N (50Hz) mA
6	8.006	4.8	6.6	12	200
12	8.012	9.6	13.2	50	97
24	8.024	19.2	26.4	190	53
48	8.048	38.4	52.8	770	25
60	8.060	48	66	1,200	21
110	8.110	88	121	4,000	12.5
120	8.120	96	132	4,700	12
230	8.230	184	253	17,000	6
240	8.240	192	264	19,100	5.3

R 55 - DC coil operating range v ambient temperature



1 - Max. permitted coil voltage.
2 - Min. pick-up voltage with coil at ambient temperature.

R 55 - AC coil operating range v ambient temperature



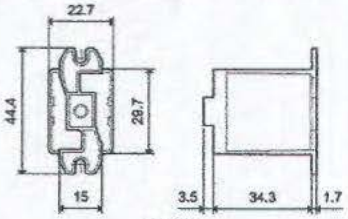
1 - Max. permitted coil voltage.
2 - Min. pick-up voltage with coil at ambient temperature.

Accessories

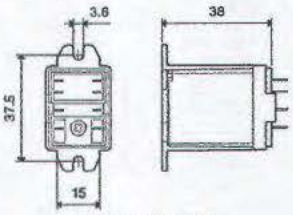
056.25

056.25 with relay

Top flange mount adaptor for 55.32, 55.33, 55.34 | 056.25



056.25

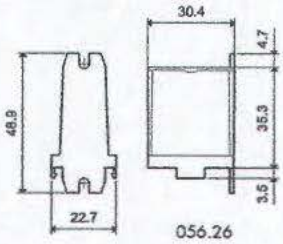


056.25 with relay

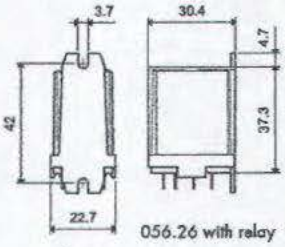
056.26

056.26 with relay

Rear flange mount adaptor for 55.32, 55.33, 55.34 | 056.26



056.26

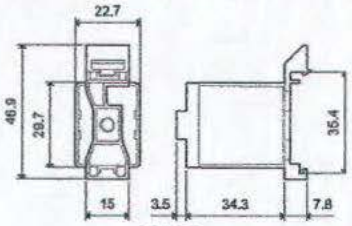


056.26 with relay

056.27

056.27 with relay

Top 35 mm rail (EN 60715) adaptor for 55.32, 55.33, 55.34 | 056.27



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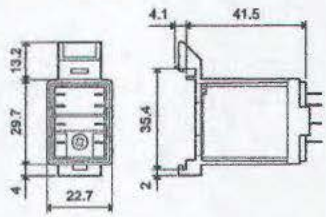


056.27 with relay

finder

94 Series - Socket overview for 55 series relays

94.04
See page 7

Module	Socket	Relay	Description	Mounting	Accessories
99.02	94.02	55.32	**Screw terminal (Box clamp) socket**	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Jumper link - Timer modules - Plastic retaining and release clip
	94.03	55.33	- Top terminals - Contacts		
	94.04	55.32 55.34	- Bottom terminals - Coil		

94.54
See page 8

Module	Socket	Relay	Description	Mounting	Accessories
99.02	94.54	55.32 55.34	**Screwless terminal socket** - For fast cable connections - Top terminals - Contacts - Bottom terminals - Coil	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Jumper link - Timer modules - Plastic retaining and release clip

94.74
See page 9

Module	Socket	Relay	Description	Mounting	Accessories
99.01	94.72	55.32	**Screw terminal (Plate clamp) socket**	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Metal retaining clip
	94.73	55.33			
	94.74	55.32 55.34			

94.82
See page 9

Module	Socket	Relay	Description	Mounting	Accessories
99.01	94.82	55.32	**Screw terminal (Plate clamp) socket** - 23 mm wide for space saving	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Metal retaining clip

94.84.3
See page 10

Module	Socket	Relay	Description	Mounting	Accessories
99.80	94.84.2	55.32 55.34	**Screw terminal (Box clamp) socket**	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Jumper link - Plastic retainig and release clip
	94.82.3	55.32			
	94.84.3	55.32 55.34			

94.94.3
See page 11

Module	Socket	Relay	Description	Mounting	Accessories
99.80	94.92.3	55.32	**Screw terminal (Box clamp) socket**	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Jumper link - Plastic retaining and release clip
	94.94.3	55.32 55.34	- Top terminals - Contacts - Bottom terminals - Coil		

94.14
See page 12

Module	Socket	Relay	Description	Mounting	Accessories
–	94.12	55.32	**PCB sockets**	PCB mounting	- Metal retaining clip
–	94.13	55.33			
–	94.14	55.32 55.34			

94.22
See page 12

Module	Socket	Relay	Description	Mounting	Accessories
–	94.22	55.32	**Panel mount with solder connections**	Panel mount on 1 mm thick panel	- Metal retaining clip
–	94.23	55.33			
–	94.24	55.32 55.34			

94.34
See page 13

Module	Socket	Relay	Description	Mounting	Accessories
–	94.32	55.32	**Panel mount with solder connections**	M3 screw fixing	- Metal retaining clip
–	94.33	55.33			
–	94.34	55.32 55.34			

94 Series - Sockets and accessories for 55 series relays

94.04

Approvals (according to type):

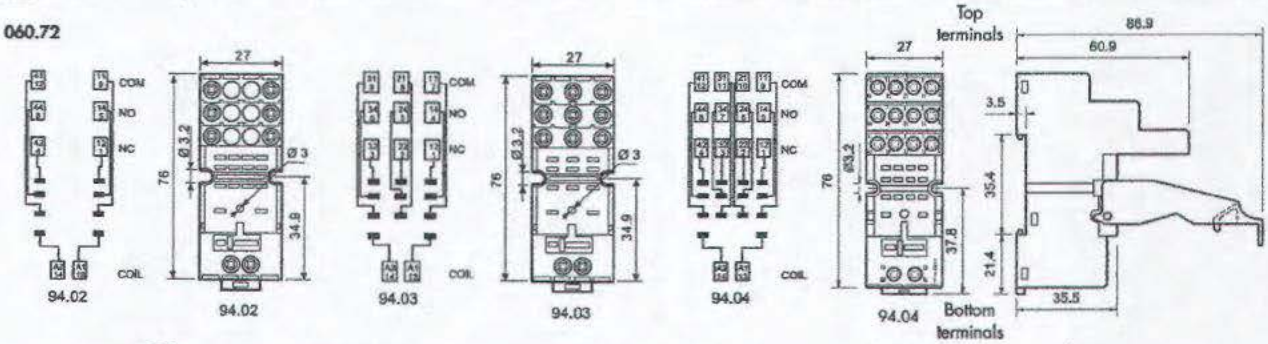
Certain relay/socket combinations

094.91.3

060.72

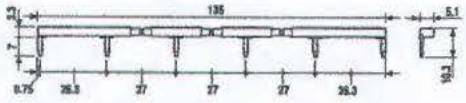
Screw terminal (Box clamp) socket panel or 35 mm (EN 60715) rail mount	94.02 Blue	94.02.0 Black	94.03 Blue	94.03.0 Black	94.04 Blue	94.04.0 Black
For relay type	55.32		55.33		55.32, 55.34	
Accessories						
Metal retaining clip	094.71					
Plastic retaining and release clip (supplied with socket - packaging code SPA)	094.91.3	094.91.30	094.91.3	094.91.30	094.91.3	094.91.30
6-way jumper link	094.06	094.06.0	094.06	094.06.0	094.06	094.06.0
Identification tag	094.00.4					
Modules (see table below)	99.02					
Timer modules (see table below)	86.30					
Sheet of marker tags for retaining and release clip 094.91.3 plastic, 72 tags, 6x12 mm	060.72					

Technical data			
Rated values		10 A - 250 V	
Dielectric strength		2 kV AC	
Protection category		IP 20	
Ambient temperature	°C	-40...+70	
Screw torque	Nm	0.5	
Wire strip length	mm	8	
Max. wire size for 94.02/03/04 sockets		solid wire	stranded wire
	mm²	1x6 / 2x2.5	1x4 / 2x2.5
	AWG	1x10 / 2x14	1x12 / 2x14



094.06

6-way jumper link for 94.02, 94.03 and 94.04 sockets	094.06 (blue)	094.06.0 (black)
Rated values	10 A - 250 V	



86.30

86 series timer modules	
(12...24)V AC/DC; Bi-function: AI, DI; (0.05s...100h)	86.30.0.024.0000
(110...125)V AC; Bi-function: AI, DI; (0.05s...100h)	86.30.8.120.0000
(230...240)V AC; Bi-function: AI, DI; (0.05s...100h)	86.30.8.240.0000

Approvals (according to type):

99.02

Approvals (according to type):

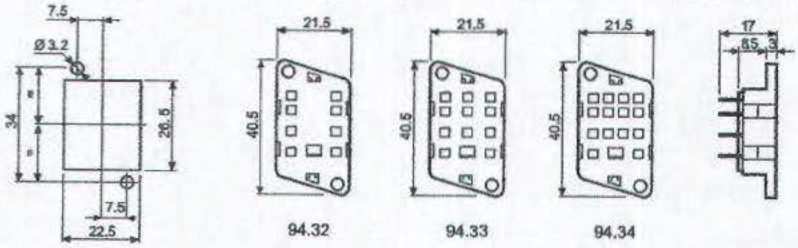
DC Modules with non-standard polarity (+A2) on request.

99.02 coil indication and EMC suppression modules for 94.02, 94.03 and 94.04 sockets		
Diode (+A1, standard polarity)	(6...220)V DC	99.02.3.000.00
LED	(6...24)V DC/AC	99.02.0.024.59
LED	(28...60)V DC/AC	99.02.0.060.59
LED	(110...240)V DC/AC	99.02.0.230.59
LED + Diode (+A1, standard polarity)	(6...24)V DC	99.02.9.024.99
LED + Diode (+A1, standard polarity)	(28...60)V DC	99.02.9.060.99
LED + Diode (+A1, standard polarity)	(110...220)V DC	99.02.9.220.99
LED + Varistor	(6...24)V DC/AC	99.02.0.024.98
LED + Varistor	(28...60)V DC/AC	99.02.0.060.98
LED + Varistor	(110...240)V DC/AC	99.02.0.230.98
RC circuit	(6...24)V DC/AC	99.02.0.024.09
RC circuit	(28...60)V DC/AC	99.02.0.060.09
RC circuit	(110...240)V DC/AC	99.02.0.230.09
Residual current by-pass	(110...240)V AC	99.02.8.230.07

94.34

Approvals (according to type):

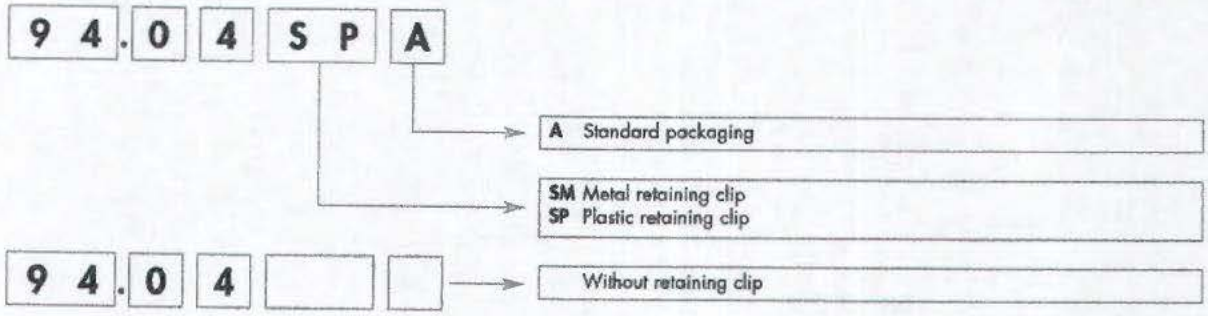
Panel mount socket M3 screw fixing - solder connections	94.32 Blue	94.32.0 Black	94.33 Blue	94.33.0 Black	94.34 Blue	94.34.0 Black
For relay type	55.32		55.33		55.32, 55.34	
Accessories						
Metal retaining clip (supplied with socket - packaging code SMA)	094.51					
Technical data						
Rated values	10 A - 250 V					
Dielectric strength	2 kV AC					
Ambient temperature °C	-40...+70					



Packaging codes

How to code and identify retaining clip and packaging options for sockets.

Example:



Features

Multi-voltage and multi-function timer range
Front panel or socket mount

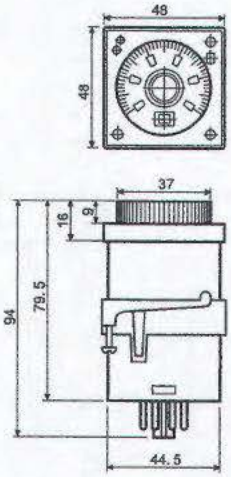
- 8 - 11 pin plug-in version available
- Time scales from 0.05s to 100h
- "1 delayed contact +1 instantaneous contact" version available (type 88.12)
- Front panel mounting fixing included
- 90 series sockets

88.02

- Multi-function
- 11 pin
- Plug-in for use with 90 series sockets

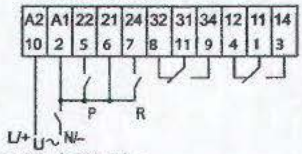
88.12

- Multi-function
- 8 pin, 2 timed contacts or 1 timed + 1 instantaneous contact
- Plug-in for use with 90 series sockets



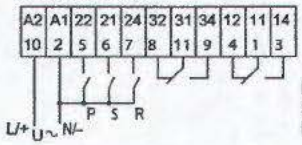
AI: ON delay
DI: ON pulse
GI: Fixed pulse (0.5s) delayed
SW: Symmetrical recycling: ON start

without signal START



BE: Signal OFF delay
CE: Signal ON and OFF delay
DE: Signal ON pulse

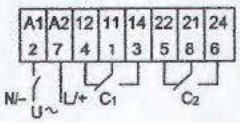
with signal START



P = Pause
S = Start
R = Reset

AI a: ON Delay (2 timed contacts)
AI b: ON Delay (1 timed + 1 instantaneous contact)
DI a: ON Pulse (2 timed contacts)
DI b: ON Pulse (1 timed + 1 instantaneous contact)
GI: Fixed pulse (0.5s) delayed
SW: Symmetrical recycling.

without signal START



Contact specification			
Contact configuration		2 CO (DPDT)	2 CO (DPDT)
Rated current/Maximum peak current	A	8/15	5/10
Rated voltage/Maximum switching voltage	V AC	250/250	250/400
Rated load AC1	VA	2,000	1,250
Rated load AC15 (230 V AC)	VA	400	250
Single phase motor rating (230 V AC)	kW	0.3	0.125
Breaking capacity DC1: 30/110/220 V	A	8/0.3/0.12	5/0.3/0.12
Minimum switching load	mW (V/mA)	300 (5/5)	500 (5/5)
Standard contact material		AgNi	AgCdO
Supply specification			
Nominal voltage (U_N)	V AC (50/60 Hz)	24...230	24...230
	V DC	24...230	24...230
Rated power AC/DC	VA (50 Hz)/W	2.5 (230 V)/1 (24 V)	2.5 (230 V)/1.5 (24 V)
Operating range	V AC	20.4...264.5	20.4...264.5
	V DC	20.4...264.5	20.4...264.5
Technical data			
Specified time range		(0.05 s...5 h) - (0.05 s...10 h) - (0.05 s...50 h) - (0.05 s...100 h)	
Repeatability	%	± 1	± 1
Recovery time	ms	300	200
Minimum control impulse	ms	50	–
Setting accuracy-full range	%	± 3	± 3
Electrical life at rated load AC1	cycles	$100 \cdot 10^3$	$100 \cdot 10^3$
Ambient temperature range	°C	–10...+55	–10...+55
Protection category		IP 40	IP 40
Approvals (according to type)		CE EAC cULus	

Ordering information

Example: 88 series multi-function timer, 2 CO (DPDT) contact 8 A, (24...230)V AC (50/60 Hz) and (24...230)V DC supply.

8 8	. 0	2	. 0	. 2 3 0	. 0 0 0	2

Series

Type
0 = Functions AI, DI, GI, SW, BE, CE, DE, 11 pin
1 = Functions AI a, AI b, DI a, DI b, GI, SW, 8 pin

No. of poles
2 = 2 pole

Supply version
0 = AC (50/60 Hz)/DC

Supply voltage
230 = (24...230)V AC/DC

Special versions
2 = Standard

Technical data

EMC specifications

Type of test		Reference standard	
Electrostatic discharge	contact discharge	EN 61000-4-2	4 kV
	air discharge	EN 61000-4-2	8 kV
Radio-frequency electromagnetic field (80 ÷ 1000 MHz)		EN 61000-4-3	10 V/m
Fast transients (burst) (5-50 ns, 5 kHz) on Supply terminals		EN 61000-4-4	2 kV
Surges (1.2/50 µs) on Supply terminals	common mode	EN 61000-4-5	2 kV
	differential mode	EN 61000-4-5	1 kV
Radio-frequency common mode (0.15 ÷ 80 MHz) on Supply terminals		EN 61000-4-6	3 V

Selection of: function, time scale and units

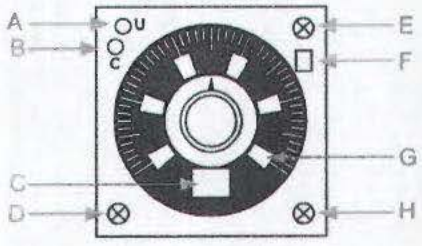
		88.02	88.12
E	**Function selector**	AI, DI, GI, SW, BE, CE, DE	AI a, AI b, DI a, DI b, GI, SW
D	**Time scale selector**	0.5, 1, 5, 10	
H	**Unit of time selector**	s (second), min (minute), h (hour), 10h (10 hour)	

Time scales

Full scale value

D \ H	s	min	h	x10h
0.5	0.5 second	0.5 minute	0.5 hour	5 hour
1	1 second	1 minute	1 hour	10 hour
5	5 second	5 minute	5 hour	50 hour
10	10 second	10 minute	10 hour	100 hour

NOTE: time scales and functions must be set before energising the timer.



LED/visual indication

A	Yellow LED: power ON (U)
B	Red LED: timing in progress (C)
C	Unit of time selected
F	Function selected
G	Time selected

Functions

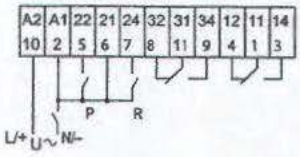
U = Supply Voltage
S = Signal switch
P = Pause
R = Reset
= Output Contact

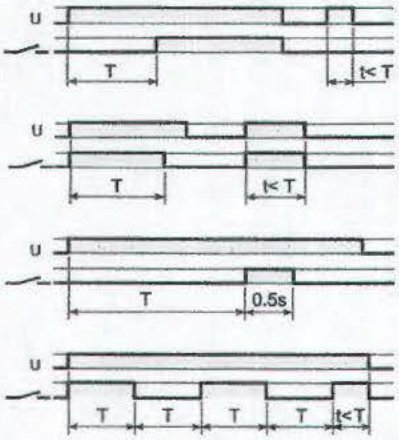
LED (yellow)	LED (red)	Supply voltage	NO output contact	Contact Open	Contact Closed
		OFF	Open	x1 - x4	x1 - x2
		ON	Open	x1 - x4 x1 - x2	x1 - x2 x1 - x4
		ON	Open (timing in progress)	x1 - x4	x1 - x2
		ON	Closed	x1 - x2	x1 - x4

Wiring diagram

Type 88.02

without signal START





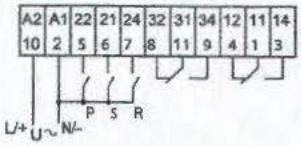
(AI) **ON delay.**
Apply power to timer. Output contacts transfer after preset time has elapsed. Reset occurs when power is removed.

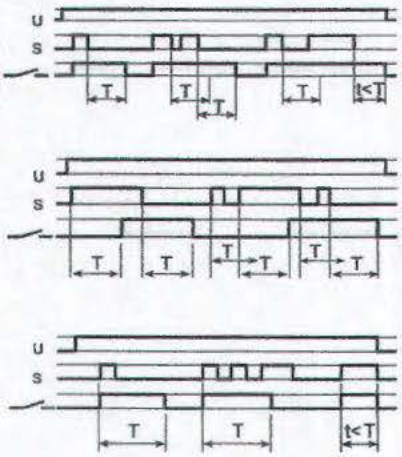
(DI) **ON pulse.**
Apply power to timer. Output contacts transfer immediately. After the preset time has elapsed, contacts reset.

(GI) **Fixed pulse (0.5s) delayed.**
Apply power to timer. Output contacts transfer after preset time has elapsed. Reset occurs after a fixed time of 0.5s.

(SW) **Symmetrical recycling: ON start.**
Apply power to timer. Output contacts transfer immediately and cycle between ON and OFF for as long as power is applied. The ratio is 1:1 (time on = time off).

with signal START





(BE) **Signal OFF delay.**
Power is permenently applied to the timer.
The output contacts transfer immediately on closure of the Signal Switch (S). Opening the Signal Switch initiates the preset delay, after which time the output contacts reset.

(CE) **Signal ON and OFF delay.**
Power is permenently applied to the timer.
Closing the Signal Switch (S) initiates the preset delay, after which time the output contacts transfer. Opening the Signal switch initiates the same preset delay, after which time the output contacts reset.

(DE) **Signal ON pulse.**
Power is permenently applied to the timer.
On momentary or maintained closure of Signal Switch (S), the output contacts transfer, and remain so for the duration of the preset delay, after which they reset.

RESET (R)
A momentary closure of the reset switch (2-7) will reset the timer. Longer term closure of the reset switch will hold the timer in the reset state. This is applicable for all functions.

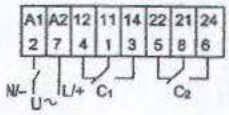
PAUSE (P)
Closure of the pause switch (2-5) will immediately halt the timing process, but the elapsed time will be retained, and the current state of the output contacts will be maintained.
On opening of the pause switch, timing resumes from the retained value. This is applicable for all functions.

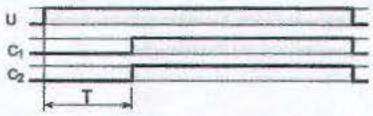
Functions

Wiring diagram

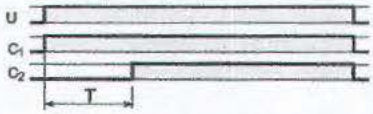
Type 88.12

without signal START

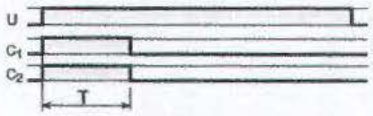




(AI a) **ON Delay (2 timed contacts).**
Apply power to timer.
Contacts (C_1 and C_2) transfer after preset time has elasped.
Reset occurs when power is removed.

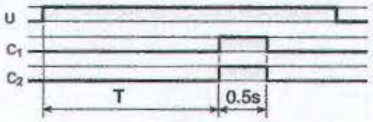


(AI b) **ON Delay**
(1 timed contact + 1 instantaneous contact).
Apply power to timer. Output contact (C_1) transfers immediately.
Contact (C_2) transfers after the preset time has elasped. Reset occurs when power is removed.



(DI a) **ON pulse (2 timed contacts).**
Apply power to timer.
Output contacts (C_1 and C_2) transfer immediately.
After preset time has elasped, the contacts reset.

(DI b) **ON pulse (1 timed contact + 1 instantaneous contact).**
Apply powert to timer. Output contacts (C_1 and C_2) transfer immediately. After preset time has elasped, the contact (C_2) resets. Contact (C_1) resets when power is removed.



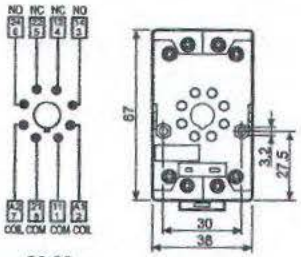
(GI) **Fixed pulse (0.5s) delayed.**
Apply power to timer. Output contacts transfer after preset time has elapsed. Reset occurs after a fixed time of 0.5s.

(SW) **Symmetrical recycling.**
Apply power to timer. Output contacts transfer immediately and cycle between ON and OFF for as long as power is applied.
The ratio is 1:1 (time on = time off).

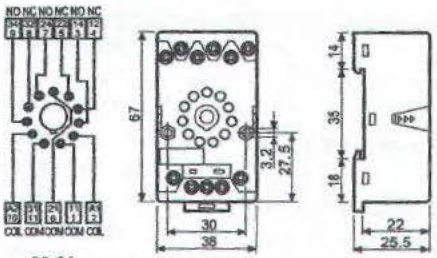
90.21

Approvals (according to type):

Screw terminal (Box clamp) socket		90.20 Blue	90.20.0 Black	90.21 Blue	90.21.0 Black
panel or 35 mm rail (EN 60715) mount					
For timer type		88.12		88.02	
Technical data					
Rated values		10 A - 250 V			
Dielectric strength		2 kV AC			
Protection category		IP 20			
Ambient temperature	°C	-40...+70			
Screw torque	Nm	0.5			
Wire strip length	mm	10			
Max. wire size for 90.20 and 90.21 sockets		solid wire		stranded wire	
	mm²	1x6 / 2x2.5		1x6 / 2x2.5	
	AWG	1x10 / 2x14		1x10 / 2x14	



90.20

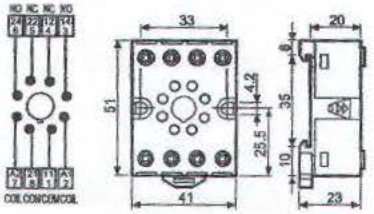


90.21

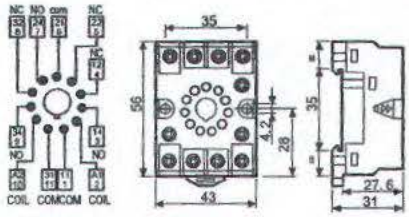
90.26

Approvals (according to type):

Screw terminal (Plate clamp) socket		90.26 Blue	90.26.0 Black	90.27 Blue	90.27.0 Black
panel or 35 mm rail (EN 60715) mount					
For timer type		88.12		88.02	
Technical data					
Rated values		10 A - 250 V			
Dielectric strength		2 kV AC			
Protection category		IP 20			
Ambient temperature	°C	-40...+70			
Screw torque	Nm	0.8			
Wire strip length	mm	10			
Max. wire size for 90.26 and 90.27 sockets		solid wire		stranded wire	
	mm²	1x4 / 2x2.5		1x4 / 2x2.5	
	AWG	1x12 / 2x14		1x12 / 2x14	



90.26

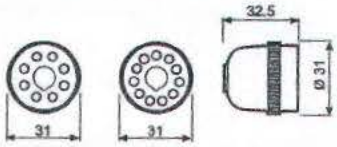


90.27

90.13.4

Approvals (according to type):

Sockets 8-11 pin backwired with solder terminals		90.12.4 (black)	90.13.4 (black)
For timer type		88.12	88.02
Technical data			
Rated values		10 A - 250 V	
Dielectric strength		2 kV AC	
Ambient temperature	°C	-40...+70	



90.12.4 90.13.4

finder

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Series 90 - Sockets for 60/88 series relays

P.C.B., clamp, screw terminal or 35mm Rail (EN 60715) mount.

Accessories:

Coil indicaction and suppression modules

Download: ***STP***

90 – – – – – – – – – –

You can use the modules on the right side of this page to further select/filter the products from this series using their characteristics. Simply click the desiderd value and wait for the page to load the results.

8 product(s) selected

90 02 SMA

-

for relays 60.12, 88.12 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

90 03 SMA

-

for relays 60.13, 88.02 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

90 20 SMA

-

for relays 60.12, 88.12 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

90 21 SMA

-

for relays 60.13, 88.02 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

90 22 SMA

-

for relays 60.12, 88.12 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

90 23 SMA

-

for relays 60.13, 88.02 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

90 26 SMA

-

or relays 60.12, 88.12 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

90 27 SMA

-

for relays 60.13, 88.02 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

Type

02 for relays 60.12, 88.12 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

03 for relays 60.13, 88.02 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

20 for relays 60.12, 88.12 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

21 for relays 60.13, 88.02 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

22 for relays 60.12, 88.12 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

23 for relays 60.13, 88.02 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

26 or relays 60.12, 88.12 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

27 for relays 60.13, 88.02 - Screw terminal (Box clamp) socket panel or 35 mm rail mount

Packaging

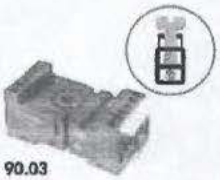
SMA Metal retaing clip

Equivalent to 88 series

finder

90 Series - Sockets and accessories for 60 series relays

metal retaining clip

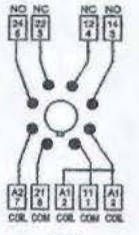


90.03

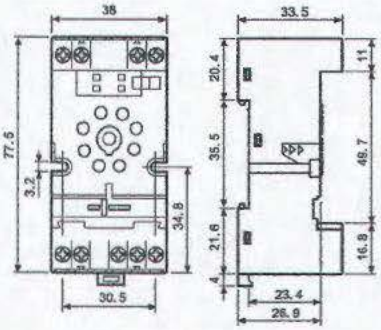
Approvals (according to type):

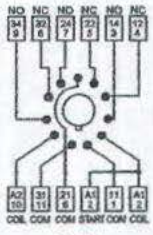
Certain relay/socket combinations

Screw terminal (Box clamp) socket		90.02	90.02.0	90.03	90.03.0
panel or 35 mm rail (EN 60715) mount		Blue	Black	Blue	Black
For relay type		60.12		60.13	
Accessories					
Metal retaining clip			090.33		
6-way jumper link			090.06		
Identification tag			090.00.2		
Modules (see table below)			99.02		
Timer modules (see table below)			86.00, 86.30		
Technical data					
Rated values		10 A - 250 V			
Dielectric strength		2 kV AC			
Protection category		IP 20			
Ambient temperature	°C	-40...+70			
Screw torque	Nm	0.6			
Wire strip length	mm	10			
Max. wire size for 90.02 and 90.03 sockets		solid wire		stranded wire	
	mm²	1x6 / 2x2.5		1x4 / 2x2.5	
	AWG	1x10 / 2x14		1x12 / 2x14	

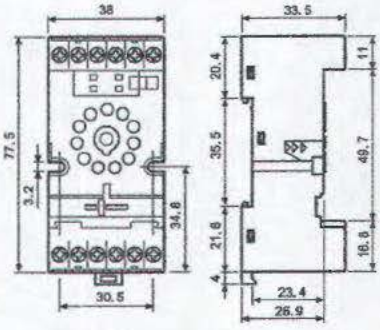


90.02





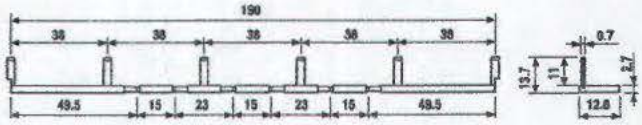
90.03



090.06

6-way jumper link for 90.02 and 90.03 sockets	090.06 (blue)
Rated values	10 A - 250 V

Approvals (according to type):



86.00

86.30

86 series timer modules

Multi-voltage: (12...240)V AC/DC; Multi-functions: AI, DI, SW, BE, CE, DE, EE, FE; (0.05 s...100 h)	86.00.0.240.0000
(12...24)V AC/DC; Bi-function: AI, DI; (0.05 s...100 h)	86.30.0.024.0000
(110...125)V AC; Bi-function: AI, DI; (0.05s...100h)	86.30.8.120.0000
(230...240)V AC; Bi-function: AI, DI; (0.05 s...100 h)	86.30.8.240.0000

Approvals (according to type):

99.02

Approvals (according to type):

99.02 coil indication and EMC suppression modules for 90.02 and 90.03 sockets

Diode (+A1, standard polarity)	(6...220)V DC	99.02.3.000.00
LED	(6...24)V DC/AC	99.02.0.024.59
LED	(28...60)V DC/AC	99.02.0.060.59
LED	(110...240)V DC/AC	99.02.0.230.59
LED + Diode (+A1, standard polarity)	(6...24)V DC	99.02.9.024.99
LED + Diode (+A1, standard polarity)	(28...60)V DC	99.02.9.060.99
LED + Diode (+A1, standard polarity)	(110...220)V DC	99.02.9.220.99
LED + Varistor	(6...24)V DC/AC	99.02.0.024.98
LED + Varistor	(28...60)V DC/AC	99.02.0.060.98
LED + Varistor	(110...240)V DC/AC	99.02.0.230.98
RC circuit	(6...24)V DC/AC	99.02.0.024.09
RC circuit	(28...60)V DC/AC	99.02.0.060.09
RC circuit	(110...240)V DC/AC	99.02.0.230.09
Residual current by-pass	(110...240)V AC	99.02.8.230.07

DC Modules with non-standard polarity (+A2) on request.

Instruction Manual

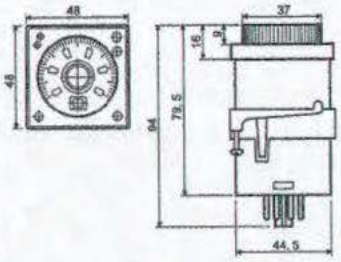
finder
www.findernet.com
88.02

H-137

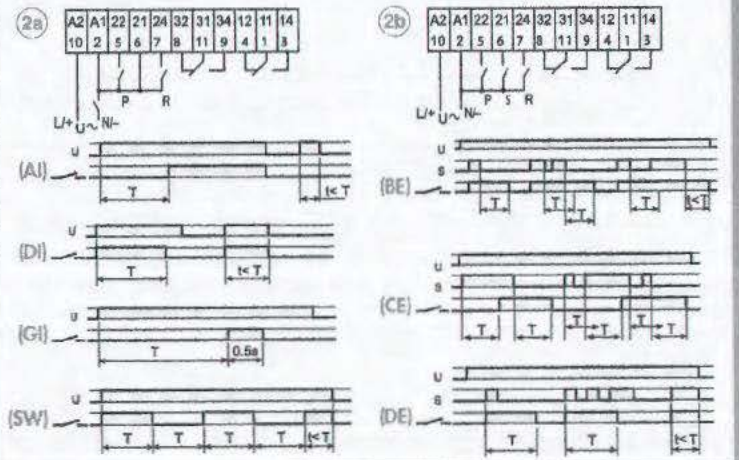
1

D \ H	s	min	h	x10h
0.5	0.5 s	0.5 min	0.5 h	5 h
1	1 s	1 min	1 h	10 h
5	5 s	5 min	5 h	50 h
10	10 s	10 min	10 h	100 h

	88.02.0.230.0002 U_N (24...230) V AC (50/60Hz)/DC Umin: 20.4 V AC/DC Umax: 264.5 V AC/DC
	2 CO (DPDT) 8 A 250 V AC
	AC1 2000 VA AC15 (230 V AC) 400 VA (M) 0.3 kW (230 V AC)
	(-10...+55)°C
IP40	



2



LED A (U_N)	LED B (⏲)	U_N		
		-	x1 - x4	x1 - x2
		√	x1 - x4 x1 - x2	x1 - x2 x1 - x4
		√	⏲ x1 - x4	x1 - x2
		√	x1 - x2	x1 - x4

finder

finder

ENGLISH

88.02 PLUG-IN TIMERS

1 FRONT VIEW

A Yellow LED: power ON (U)
B Red LED: timing in progress (C)
C Unit of time selected
D Time scale selector: 0.5, 1, 5, 10
E Function selector: AI, DI, GI, SW, BE, CE, DE
F Function selected
G Time selected
H Unit of time selector:
s (second), min (minute), h (hour), 10h (10 hour)

2 WIRING DIAGRAM AND FUNCTIONS

2a **Without control signal**
AI = On-delay
DI = Interval
GI = Pulse delayed
SW = Symmetrical flasher (starting pulse on)

2b **With control signal**
BE = Off-delay with control signal
CE = On- and off-delay with control signal
DE = Interval with control signal on

NOTE

RESET (R)
A momentary closure of the reset switch (2-7) will reset the timer. Longer term closure of the reset switch will hold the timer in the reset state. This is applicable for all functions.

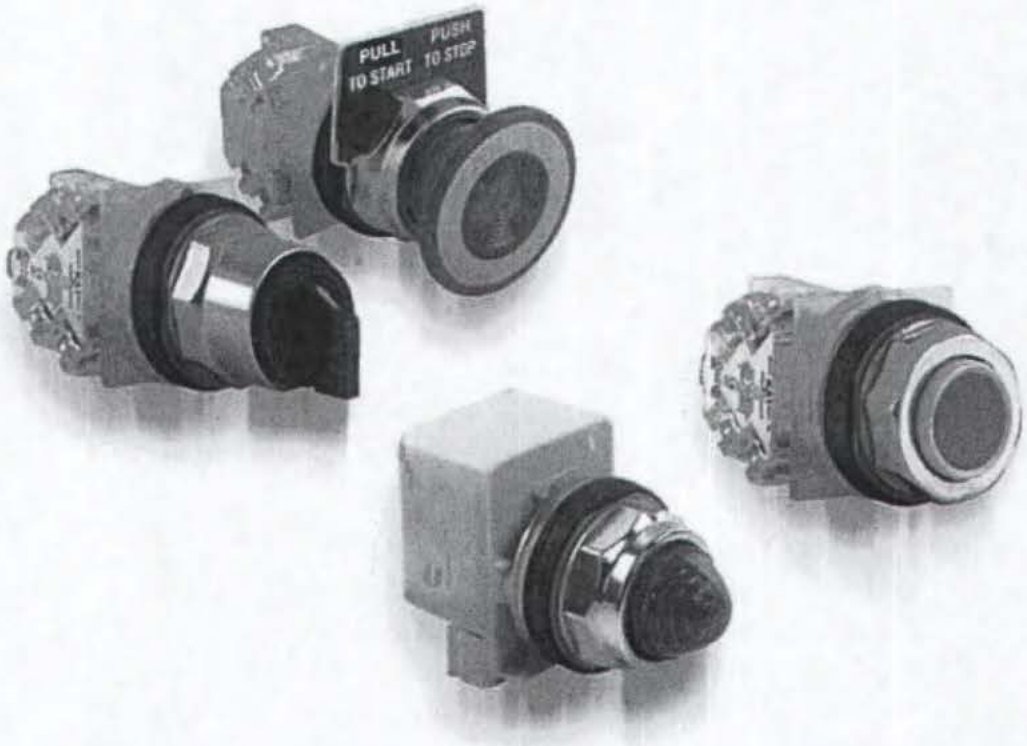
PAUSE (P)
Closure of the pause switch (2-5) will immediately halt the timing process, but the elapsed time will be retained, and the current state of the output contacts will be maintained. On opening of the pause switch, timing resumes from the retained value.
This is applicable for all functions.

WARNING
Time scales and functions must be set before energising the timer.

finder

Harmony™ 9001K/SK/KX 30 mm push buttons

Catalog
2011



Schneider Electric™

30 mm push buttons

Introduction

Schneider Electric's Harmony™ 9001 30 mm push buttons, pilot lights, selector switches and mushroom head operators provide robust and reliable solutions for a wide range of heavy industry applications.

- **9001K** operators are rugged and include chrome-plated bezels. (See page 5.)
- **9001SK** operators include black plastic bezels for corrosion-resistant applications. (See page 36.)
- **9001KX** operators include chrome-plated square bezels and provide multi-function operation. (See page 66.)

Product features:

- Heavy duty, oil-tight, dust-tight, and water-tight without boots. Most units are IP66 rated and are UL types 4, 4X and 13.
- FINGERSAFE™ contact blocks and light modules for improved safety
- Interchangeable light modules, contact blocks, color caps, pilot light lenses and mushroom heads reduce inventory
- Integrated earth ground connection (no ground wires required)
- Easy installation with octagonal ring nut
- Metal or plastic legend plates

Contact block features:

- Clear window for status of contact operation and troubleshooting
- Color coded for easy identification
- Single screw mounting for quick installation
- Side-by-side and/or stacked mounting to minimize enclosure space requirements

Light module features:

- Low-cost incandescent lamps or energy-efficient, long-life LED lamps
- Wide range of voltages from 24V to 600V

All products are:

- UL listed and CSA certified
- CE declaration of conformity
- RoHS compliant

Complete units

Contact functions

Push buttons, spring return

Full guard
9001KR1●●● See page 10

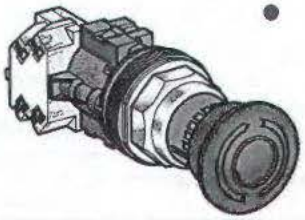
No guard
9001KR3●●● See page 10

Extended guard
9001KR2●●● See page 10

Mushroom head push buttons

Spring return 1-3/8 or 2-1/4 in (35 or 57 mm)
9001KR2●●H13 See page 10

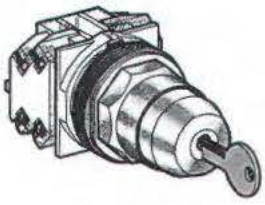
Push-pull 1-5/8 in (41 mm)
9001KR●●● See page 10



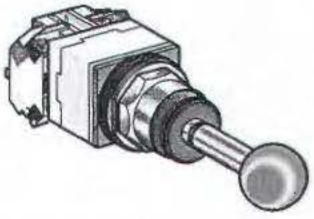
Turn-to-release, trigger action
9001KR16 *(1)* See page 12

Selector switches, key switches and joystick controllers

Selector switches
9001KS●●FBH●● See pages 13 to 15



Key switches
9001KS●●K●H●● See pages 13 to 15

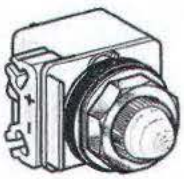


Joystick controllers
9001K●●H● See page 18

Light functions

Pilot lights

BA 9s base mounted super bright LED
9001KP●●● See page 17



BA 9s incandescent bulb
9001KP●●● See page 17

(1) Complies with EN418/ISO13850 standards for Emergency Stop push buttons when used with circular Legend Plate 9001KN8330 (90 mm diameter) or 9001KN9330 (60 mm diameter). See page 26.

9001K Operator Materials:

Push Button and Push-to-test Pilot Light (9001KR and 9001KT)

- Gasket – Nitrile
- Seal – Nitrile
- Seal Cap – Amorphous Acetal
- Decorative Ring – Polyester Film
- Compensating Washer – Polypropylene
- Lock Ring – Amorphous Nylon
- Stem – Thermoplastic Polyester
- Base Cap – Thermoplastic Polyester
- Knob – Polycarbonate
- Liner – Polypropylene
- Hold Down Spring for 9001K-15 – Neoprene
- Operator Base – Zinc
- Operator Base (9001KR8) – Polyester
- Return Spring – Music Wire or Stainless Steel (9001KT only)
- Ring Nuts – Aluminum or Zinc
- Springkeeper – Steel
- Locking Thrust Washer – Zinc
- Color Insert – Polyethylene
- Boots – Silicone

Selector Switch (9001KS)

- Gasket – Nitrile
- Seal – Nitrile
- Bearing Washer – Polyester Film
- Compensating Washer – Polypropylene
- Cam Follower – Delrin 100
- Liner – Polypropylene
- Knob – Polycarbonate
- Cam Carrier – Amorphous Nylon
- Cam Rotor – Celenex 3300
- Cam Profile– Delrin 100
- Operator Base – Zinc
- Detent Spring – Stainless Steel
- Ring Nuts – Aluminum or Zinc
- Seal keeper – Stainless Steel
- Locking Thrust Washer – Zinc

Pilot Light (9001KP)

- Gasket – Nitrile
- Compensating Washer – Polypropylene
- Lens – Glass or Polycarbonate
- Light Module Housing – Thermoplastic Polyester
- Operator Base – Zinc
- Glass Lens Ring – Anodized Aluminum

Contact Block And Light Module Materials:

Contact Block (9001KA)

- Housing – Amorphous Nylon
- Contact Slider – Phenolic, Nylon or Acetal
- Terminal – Steel
- Saddle Clamp – Steel
- Spring – Stainless Steel
- Contacts – Silver and Copper
- Blade – Beryllium Copper
- Mounting Screw – Steel
- Label – Paper

Light Module (9001KM)

- Housing – Thermoplastic Polyester
- Socket – Steel
- Terminal – Steel with Tin Plate
- Saddle Clamp – Steel
- Translating Pin – Polycarbonate
- Transformer – Thermoplastic Polyester, Steel, Copper, Polyvinyl Chloride, Polytetrafluorethylene, Acetate, Paper
- Lamp Spring – Tin Plated Music Wire

30 mm push buttons

9001K – Push buttons and mushroom operators

Note: When ordering, add prefix "9001" to the reference.

Non-Illuminated Momentary Push Button Operators
For use in hazardous locations, see page 23.
Contact blocks and legend plate not included unless otherwise noted.

Description		Color	Operator with 1 N.O. and 1 N.C. Contact (KA1)	Operator with 1 N.O. Contact (KA2)	Operator with 1 N.C. Contact (KA3)	Operator Only with No Contacts
 9001KR1B	Full Guard	Black	KR1BH13	KR1BH5	KR1BH6	KR1B
		Red	KR1RH13	KR1RH5	KR1RH6	KR1R
		Green	KR1GH13	KR1GH5	KR1GH6	KR1G
		Universal (1)	KR1UH13	KR1UH5	KR1UH6	KR1U
		Other (2)	KR1■H13	KR1■H5	KR1■H6	KR1■
 9001KR3B	No Guard	Black	KR3BH13	KR3BH5	KR3BH6	KR3B
		Red	KR3RH13	KR3RH5	KR3RH6	KR3R
		Green	KR3GH13	KR3GH5	KR3GH6	KR3G
		Universal (1)	KR3UH13	KR3UH5	KR3UH6	KR3U
		Other (2)	KR3■H13	KR3■H5	KR3■H6	KR3■
 9001KR2B	Extended Guard	Black	KR2BH13	KR2BH5	KR2BH6	KR2B
		Red	KR2RH13	KR2RH5	KR2RH6	KR2R
		Green	KR2GH13	KR2GH5	KR2GH6	KR2G
		Universal (1)	KR2UH13	KR2UH5	KR2UH6	KR2U
		Other (2)	KR2■H13	KR2■H5	KR2■H6	KR2■
 9001KR4B	1-3/8 in (35 mm) Diameter Mushroom Button	**Snap-In Plastic Mushroom Button**				
		Black	KR4BH13	KR4BH5	KR4BH6	KR4B
		Red	KR4RH13	KR4RH5	KR4RH6	KR4R
		Red (3)	KR4R05H13	KR4R05H5	KR4R05H6	KR4R05
		Green	KR4GH13	KR4GH5	KR4GH6	KR4G
		Other (4)	KR4★H13	KR4★H5	KR4★H6	KR4★
		Screw-On Plastic Mushroom Button with Set Screw				
		Black	KR24BH13	KR24BH5	KR24BH6	KR24B
		Red	KR24RH13	KR24RH5	KR24RH6	KR24R
		Green	KR24GH13	KR24GH5	KR24GH6	KR24G
		Other (4)	KR24★H13	KR24★H5	KR24★H6	KR24★
 9001KR24BM	1-1/2 in (40 mm) Diameter Mushroom Button	**Screw-in Metal Mushroom Button with Set Screw**				
		Black	—	—	—	KR24BM
		Red	—	—	—	KR24RM
		Green	—	—	—	KR24GM
 9001KR5B	2-1/4 in (57 mm) Diameter Mushroom Button	**Snap-In Plastic Mushroom Button**				
		Black	KR5BH13	KR5BH5	KR5BH6	KR5B
		Red	KR5RH13	KR5RH5	KR5RH6	KR5R
		Red (3)	KR5R05H13	KR5R05H5	KR5R05H6	KR5R05
		Green	KR5GH13	KR5GH5	KR5GH6	KR5G
		Other (4)	KR5★H13	KR5★H5	KR5★H6	KR5★
		Screw-On Plastic Mushroom Button with Set Screw				
		Black	KR25BH13	KR25BH5	KR25BH6	KR25B
		Red	KR25RH13	KR25RH5	KR25RH6	KR25R
		Green	KR25GH13	KR25GH5	KR25GH6	KR25G
		Other (4)	KR25★H13	KR25★H5	KR25★H6	KR25★
 9001KR25BM	2-3/8 in (60 mm) Diameter Mushroom Button	**Screw-in Metal Mushroom Button with Set Screw**				
		Black	—	—	—	KR25BM
		Red	—	—	—	KR25RM
		Green	—	—	—	KR25GM

(1) The universal push button operators contain one each of the following color inserts: black, red, green, yellow, orange, blue and white.
(2) Replace ■ with the color code as chosen from the color code table below.
(3) Knob has the words "Emergency Stop" in raised letters highlighted in white for readability.
(4) Replace ★ with the color code as chosen from the color code table below.

Color Codes

Color	KR1, 2, 3 Place Color Code in Reference ■	KR4, 5, 24, 25 Place Color Code in Reference ★
Blue	L	L
Yellow	Y	Y
White	W	—
Orange	S	S
Gray	E	—

To select and order Contact Blocks, Light Modules, Knobs, and Accessories, see pages 20 to 29.

Product range: page 5 | Specifications: page 7 | Dimensions: page 30 | Mounting: page 31

Harmony™ 9001K/SK/KX 30 mm push buttons

9001K – Contact blocks

Note: When ordering, add prefix "9001" to the reference.

The 9001KA contact blocks are Fingersafe™ contact blocks (meeting VDE 0106 Part 100). They have one screw mounting and captive (backed out) plus/minus terminal screws. These contact blocks are double-break, direct-acting contacts. Because of the wiping action of these contacts, they are suitable for use with programmable controllers. All contact blocks listed below accept up to 2 #12–#24 AWG solid or stranded wires. Recommended tightening torque for screw terminals is 7 lb-in

Standard Contact Blocks

Description	Symbol	Reference
(Clear Cover)	Direct-Acting	KA1
(Green Cover)		KA2
(Red Cover)	Direct-Acting	KA3
(Clear Cover)	N.O. Contact Early Closing	KA4
(Red Cover)	N.C. Contact Late Opening	KA5
(Green Cover)	N.O. Contact Early Closing	KA6

Additional Circuit Arrangements

Sequencing *(1)* N.O. Contact of KA4 closes before N.O. Contact on KA1	KA4 KA1	Order One9001KA4 and One 9001KA1
Overlapping *(1)* N.O. Contact of KA4 closes before N.C. Contact of KA5 Opens	KA4 KA5	Order One9001KA4 and One 9001KA5

(1) For push buttons or two-position selector switches only. For sequencing or overlapping contacts on other operators, refer to catalog 9001CT0001.

Symbol	Contact Blocks with Binder Head Screws (not Fingersafe) Reference	Quantity *(2)*	Gold Flashed Contacts with Standard Pressure Wire Terminals Reference
	KA21	25–Up	KA31
	KA22	25–Up	KA32
	KA23	25–Up	KA33
N.O. Early Closing	KA24	25–Up	KA34
N.C. Contact Late Opening	KA25	25–Up	KA35

(2) Minimum order quantity is 25.

Contact blocks listed below are not Fingersafe, but provide:

- Terminals that accept ring tongue/fork tongue connectors
- Short single circuit contact blocks (0.75" deep vs. 0.97" deep on the Fingersafe)
- For assembled operators, use form Y238 (add to reference as suffix, for example: 9001KRU1H13Y238)

Contact blocks (not Fingersafe)

Symbol	Reference	Symbol	Reference
	KA1G	N.O. Contact Early Closing	KA4G
	KA2G	N.C. Contact Late Opening	KA5G
	KA3G	N.O. Contact Early Closing	KA6G

Contact blocks with Quick-Connect terminals (not Fingersafe)

Symbol	Reference
	KA12
	KA13

For dimensions, refer to catalog 9001CT0001

Maximum Current Ratings for Control Circuit Contacts—9001KA1–KA6, KA21–KA25, KA31–KA35, KA1G–KA6G

V	AC						V	DC				
	Inductive (NEMA / UL Type A600) 35% Power Factor					Resistive 75% Power Factor Make, Break and Continuous Amperes		Inductive and Resistive (NEMA Q600)				
	Make		Break		Continuous Carrying Amperes			Make and Break				Continuous Carrying Amperes
	Amperes	VA	Amperes	VA				KA1	KA2 KA3	KA4	KA5 KA6	
120	60	7200	6.0	720	10	10	125	0.55	0.55	—	—	2.5
240	30		3.0				250	0.27	0.27	—	—	
480	15		1.5				600	0.10	0.10	—	—	
600	12		1.2									

To select and order Contact Blocks, Light Modules, Knobs, and Accessories, see pages 50 to 59.

Product range: page 5 | Specifications: page 7 | Dimensions: page 30 | Mounting: page 31

Harmony™ 9001K/SK/KX
30 mm push buttons
9001K – Pilot lights

Note: When ordering, add prefix "9001" to the reference.

Pilot Lights—UL Types 4, 13/NEMA 4 & 13
For use in hazardous locations, see page 23.
Legend plates not included.

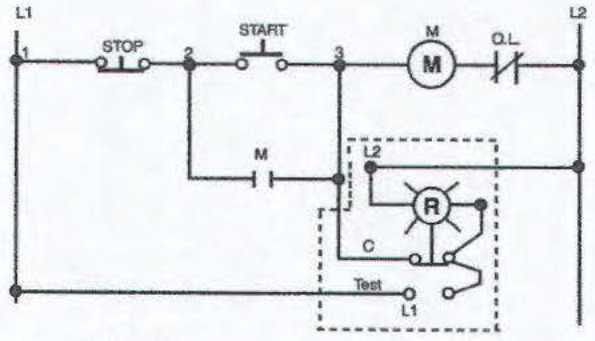
Description	Voltage	Style	With Red Fresnel Color Cap (1)	With Green Fresnel Color Cap (1)	With Other Color Cap (1) (2)	Without Color Cap (1)
 *Standard Pilot Light (Plastic Fresnel Color Cap Shown)*	110–120 V, 50–60 Hz	Transformer	KP1R31	KP1G31	KP1■	KP1
	220–240 V, 50–60 Hz	Transformer	KP7R31	KP7G31	KP7■	KP7
	24–28 Vac/Vdc	Full Voltage	KP35R31	KP35G31	KP35■	KP35
	For other voltages see page 24.	Transformer, Flashing or LED (3)	KP▲R31	KP▲G31	KP▲■	KP▲
		Full Voltage, Neon or Resistor (4)	KP▲R31	KP▲G31	KP▲■	KP▲
 *Push-To-Test Pilot Light (Glass Color Cap Shown)*	110–120 V, 50–60 Hz	Transformer	KT1R31	KT1G31	KT1■	KT1
	220–240 V, 50–60 Hz	Transformer	KT7R31	KT7G31	KT7■	KT7
	24–28 Vac/Vdc	Full Voltage	KT35R31	KT35G31	KT35■	KT35
	For other voltages see page 24.	Transformer, Flashing or LED (3)	KT▲R31	KT▲G31	KT▲■	KT▲
		Full Voltage, Neon or Resistor (4)	KT▲R31	KT▲G31	KT▲■	KT▲
 *Remote Test Pilot Light (Glass Color Cap Shown)*	120 Vac Only	Resistor (5)	KTR38R31	KTR38G31	KTR38■	KTR38
	24–28 Vac Only for other voltages	Full Voltage (5)	KTR35R31	KTR35G31	KTR35■	KTR35
	For other voltages see page 24.	Full Voltage or Resistor (5)	KTR▲R31	KTR▲G31	KTR▲■	KTR▲

(1) Replace ▲ with the voltage assembly code as chosen from the tables on page 24. Example: KT▲R31 with 208 Vac red LED = KT37LRR31
(2) Replace ■ with the color code as chosen from the color code table below. Example: KP1■ with a blue fresnel cap = KP1L31
(3) The cap must be the same color as the LED light module chosen, e.g., for green LED, use green color cap.
(4) On neon light modules, use clear color caps only.
(5) On remote test pilot lights use only full voltage or resistor voltage assembly codes. Do not choose LED, neon or transformer codes. For AC use only.

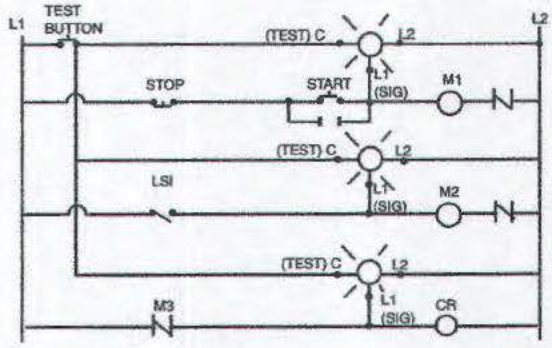
Color Caps

Color	■ Plastic Fresnel	■ Plastic Domed	■ Glass
Amber	A31	A9	A6
Blue	L31	L9	L6
Clear	C31	C9	C6
Green	G31	G9	G6
Red	R31	R9	R6
White	W31	W9	W6
Yellow	Y31	Y9	Y6

Typical Wiring Diagrams



Push-to-test Pilot Light



Remote Test Pilot Light

30 mm push buttons
9001K – Light modules

Note: When ordering, add prefix "9001" to the reference.

Standard Light Modules for 9001K Control Units *(1)*

Voltage	Description	Light Module Reference	Voltage Assembly Code	Rating	Replacement Lamp Reference
All	Full Voltage (without Bayonet Base Lamp)	**KM40**	40	—	**no lamp included**
6 Vac/Vdc	Full Voltage	**KM31**	31	.9 VA	**2550101020**
6 Vac/Vdc	LED Red	**KM31LR**	31LR		**6508805201**
6 Vac/Vdc	LED Green	**KM31LG**	31LG		**6508805203**
6 Vac/Vdc	LED Yellow	**KM31LY**	31LY		**6508805202**
12–14 Vac/Vdc	Full Voltage	**KM32**	32	1.2 VA	**2550101037**
12–14 Vac/Vdc	LED Red	**KM32LR**	32LR		**6508805201**
12–14 Vac/Vdc	LED Green	**KM32LG**	32LG		**6508805203**
12–14 Vac/Vdc	LED Yellow	**KM32LY**	32LY		**6508805202**
18 Vac/Vdc	Resistor	**KM33**	33	1.4 VA	**2550101037**
24–28 Vac/Vdc	Full Voltage	**KM35**	35	1.2 VA	**2550101002**
24–28 Vac/Vdc	LED Red	**KM35LR**	35LR	.28 VA	**6508805210**
24–28 Vac/Vdc	LED Green	**KM35LG**	35LG	.28 VA	**6508805212**
24–28 Vac/Vdc	LED Yellow	**KM35LY**	35LY	.28 VA	**6508805211**
24–28 Vac/Vdc	LED White	**KM35LW**	35LW	.28 VA	**6508805214**
24–28 Vac/Vdc	LED Blue	**KM35LL**	35LL	.28 VA	**6508805213**
~~48 Vac/Vdc~~	~~Full Voltage~~	~~**KM36**~~	~~36~~	~~2.6 VA~~	~~**2550101025**~~
110–120 V, 50–60 Hz	LED Red	**KM1LR**	1LR		**6508805201**
110–120 V, 50–60 Hz	LED Green	**KM1LG**	1LG		**6508805203**
110–120 V, 50–60 Hz	LED Yellow	**KM1LY**	1LY		**6508805202**
110–120 V, 50–60 Hz	Transformer	**KM1**	1	2.4 VA	**2550101020**
110–120 V, 50–60 Hz	Flashing	**KMF1**	F1	.85 VA	**2550101036**
~~120 Vac/Vdc~~	~~Resistor~~	~~**KM30**~~	~~30~~	~~3.0 VA~~	~~**2550101027**~~
120 Vac/Vdc	Full Voltage	**KM38**	38	3.0 VA	**2550101027**
120 Vac/Vdc	Neon	**KM11**	11	0.2 VA	**2550101013**
120 Vac/Vdc	LED Red	**KM38LR**	38LR	1.4 VA	**6508805210**
120 Vac/Vdc	LED Green	**KM38LG**	38LG	1.4 VA	**6508805212**
120 Vac/Vdc	LED Yellow	**KM38LY**	38LY	1.4 VA	**6508805211**
120 Vac/Vdc	LED White	**KM38LW**	38LW	1.4 VA	**6508805214**
120 Vac/Vdc	LED Blue	**KM38LL**	38LL	1.4 VA	**6508805213**
208–220 V, 50–60 Hz	Transformer	**KM3**	3	2.5 VA	**2550101020**
208–220 V, 50–60 Hz	LED Red	**KM3LR**	3LR		**6508805201**
208–220 V, 50–60 Hz	LED Green	**KM3LG**	3LG		**6508805203**
208–220 V, 50–60 Hz	LED Yellow	**KM3LY**	3LY		**6508805202**
208–220 V, 50–60 Hz	LED White	**KM3LW**	3LW		**6508805215**
208–220 V, 50–60 Hz	LED Blue	**KM3LL**	3LL		**6508805216**
220–240 V, 50–60 Hz	Transformer	**KM7**	7	2.0 VA	**2550101020**
220–240 V, 50–60 Hz	LED Red	**KM7LR**	7LR		**6508805201**
220–240 V, 50–60 Hz	LED Green	**KM7LG**	7LG		**6508805203**
220–240 V, 50–60 Hz	LED Yellow	**KM7LY**	7LY		**6508805202**
220–240 V, 50–60 Hz	LED White	**KM7LW**	7LW		**6508805215**
220–240 V, 50–60 Hz	LED Blue	**KM7LL**	7LL		**6508805216**
240 Vac/Vdc	Resistor	**KM25**	25	6.0 VA	**2550101027**
240 Vac/Vdc	Neon	**KM12**	12	0.3 VA	**2550101013**
277 V, 50–60 Hz	Transformer	**KM8**	8	2.4 VA	**2550101020**
380–480 V, 50–60 Hz	Transformer	**KM5**	5	2.8 VA	**2550101020**
480 Vac/Vdc	Neon	**KM14**	14	0.5 VA	**2550101013**
550–600 V, 50–60 Hz	Transformer	**KM6**	6	2.5 VA	**2550101020**

(1) For use with all operators except KX and remote test pilot.

Notes: Light modules are available in other voltages, as shown above. For use in hazardous locations, see page 23. With neon type light modules, use a clear color cap only. With LED light modules, use either a clear color cap or a cap the same color as the LED.

Shallow Depth Light Modules for 9001K Control Units *(2)*

Voltage	Description	Light Module Reference	Voltage Assembly Code	Rating	Replacement Lamp Reference
24–28 Vac/Vdc	Full Voltage	**KM55**	55	1.2 VA	**2550101002**
	LED Red	**KM55LR**	55LR	0.5 VA	**6508805204**
	LED Green	**KM55LG**	55LG		**6508805206**
	LED Yellow	**KM55LY**	55LY		**6508805205**
110–120 Vac/Vdc	Full Voltage	**KM58**	58	3.0 VA	**2550101027**
	LED Red	**KM58LR**	58LR	0.5 VA	**6508805204**
	LED Green	**KM58LG**	58LG		**6508805206**
	LED Yellow	**KM58LY**	58LY		**6508805205**

(2) For use with all operators except KX and remote test pilot.

Notes: For use in hazardous locations, see page 23. Reduces the depth of illuminated push buttons with contact blocks by over 33%. With LED light modules, use a cap that is the same color as the LED.

File CCN NKCR E42259 — File Class 3211 03 LR25490 — CE marked

Product range: page 5 | Specifications: page 7 | Dimensions: page 30 | Mounting: page 31

Legend Plates as Required per Contract

30 mm push buttons
9001K – Legend plates

Note: When ordering, add prefix "9001" to the reference.

Legend Plates

Standard Markings	Plastic Legend Plates for use with 9001K Operators									Aluminum Legend Plates for use with 9001K Operators		
	1-3/4" Square			2-1/4" Square			2-1/2" Square			Black Legend	Black Legend	Blue Legend
	Silver Legend w/ Black Letters	White Legend w/ Black Letters	Black Legend w/ White Letters	Silver Legend w/ Black Letters	White Legend w/ Black Letters	Black Legend w/ White Letters	Silver Legend w/ Black Letters	White Legend w/ Black Letters	Black Legend w/ White Letters			
For Push Button or Pilot Light												
Blank	KN200SP	KN200WP	KN200BP	KN100SP	KN100WP	KN100BP	KN700SP	KN700WP	KN700BP	KN200	KN300	KN800
Blank (red)	KN200RP (2)	KN200RP (2)	KN200RP (2)	KN100RP (2)	KN100RP (2)	KN100RP (2)	KN700RP (2)	KN700RP (2)	KN700RP (2)	KN200R (1)	KN300R (1)	KN800R (1)
Start	KN201SP	KN201WP	KN201BP	KN101SP	KN101WP	KN101BP	KN701SP	KN701WP	KN701BP	KN201	KN301	KN801
Stop	KN202RP (2)	KN202RP (2)	KN202RP (2)	KN102RP (2)	KN102RP (2)	KN102RP (2)	KN702RP (2)	KN702RP (2)	KN702RP (2)	KN202 (1)	KN302 (1)	KN802 (1)
On	KN203SP	KN203WP	KN203BP	KN103SP	KN103WP	KN103BP	KN703SP	KN703WP	KN703BP	KN203	KN303	KN803
Off	KN204RP (2)	KN204RP (2)	KN204RP (2)	KN104RP (2)	KN104RP (2)	KN104RP (2)	KN704RP (2)	KN704RP (2)	KN704RP (2)	KN204 (1)	KN304 (1)	KN804 (1)
Emerg. Stop	KN205RP (2)	KN205RP (2)	KN205RP (2)	KN105RP (2)	KN105RP (2)	KN105RP (2)	KN705RP (2)	KN705RP (2)	KN705RP (2)	KN205 (1)	KN305 (1)	KN805 (1)
Forward	KN206SP	KN206WP	KN206BP	KN106SP	KN106WP	KN106BP	KN706SP	KN706WP	KN706BP	KN206	KN306	KN806
Reverse	KN207SP	KN207WP	KN207BP	KN107SP	KN107WP	KN107BP	KN707SP	KN707WP	KN707BP	KN207	KN307	KN807
Close	KN208SP	KN208WP	KN208BP	KN108SP	KN108WP	KN108BP	KN708SP	KN708WP	KN708BP	KN208	KN308	KN808
Open	KN209SP	KN209WP	KN209BP	KN109SP	KN109WP	KN109BP	KN709SP	KN709WP	KN709BP	KN209	KN309	KN809
Down	KN210SP	KN210WP	KN210BP	KN110SP	KN110WP	KN110BP	KN710SP	KN710WP	KN710BP	KN210	KN310	KN810
Up	KN211SP	KN211WP	KN211BP	KN111SP	KN111WP	KN111BP	KN711SP	KN711WP	KN711BP	KN211	KN311	KN811
Fast	KN212SP	KN212WP	KN212BP	KN112SP	KN112WP	KN112BP	KN712SP	KN712WP	KN712BP	KN212	KN312	KN812
Slow	KN213SP	KN213WP	KN213BP	KN113SP	KN113WP	KN113BP	KN713SP	KN713WP	KN713BP	KN213	KN313	KN813
High	KN214SP	KN214WP	KN214BP	KN114SP	KN114WP	KN114BP	KN714SP	KN714WP	KN714BP	KN214	KN314	KN814
Low	KN215SP	KN215WP	KN215BP	KN115SP	KN115WP	KN115BP	KN715SP	KN715WP	KN715BP	KN215	KN315	KN815
Inch	KN216SP	KN216WP	KN216BP	KN116SP	KN116WP	KN116BP	KN716SP	KN716WP	KN716BP	KN216	KN316	KN816
In	KN217SP	KN217WP	KN217BP	KN117SP	KN117WP	KN117BP	KN717SP	KN717WP	KN717BP	KN217	KN317	KN817
Jog	KN218SP	KN218WP	KN218BP	KN118SP	KN118WP	KN118BP	KN718SP	KN718WP	KN718BP	KN218	KN318	KN818
Jog For.	KN219SP	KN219WP	KN219BP	KN119SP	KN119WP	KN119BP	KN719SP	KN719WP	KN719BP	KN219	KN319	KN819
Jog Rev.	KN220SP	KN220WP	KN220BP	KN120SP	KN120WP	KN120BP	KN720SP	KN720WP	KN720BP	KN220	KN320	KN820
Lower	KN221SP	KN221WP	KN221BP	KN121SP	KN121WP	KN121BP	KN721SP	KN721WP	KN721BP	KN221	KN321	KN821
Out	KN222SP	KN222WP	KN222BP	KN122SP	KN122WP	KN122BP	KN722SP	KN722WP	KN722BP	KN222	KN322	KN822
Reset	KN223SP	KN223WP	KN223BP	KN123SP	KN123WP	KN123BP	KN723SP	KN723WP	KN723BP	KN223	KN323	KN823
Run	KN224SP	KN224WP	KN224BP	KN124SP	KN124WP	KN124BP	KN724SP	KN724WP	KN724BP	KN224	KN324	KN824
Start Jog	KN225SP	KN225WP	KN225BP	KN125SP	KN125WP	KN125BP	KN725SP	KN725WP	KN725BP	KN225	KN325	KN825
Test	KN226SP	KN226WP	KN226BP	KN126SP	KN126WP	KN126BP	KN726SP	KN726WP	KN726BP	KN226	KN326	KN826
Raise	KN227SP	KN227WP	KN227BP	KN127SP	KN127WP	KN127BP	KN727SP	KN727WP	KN727BP	KN227	KN327	KN827
Decrease	KN228SP	KN228WP	KN228BP	KN128SP	KN128WP	KN128BP	KN728SP	KN728WP	KN728BP	KN228	KN328	KN828
Increase	KN229SP	KN229WP	KN229BP	KN129SP	KN129WP	KN129BP	KN729SP	KN729WP	KN729BP	KN229	KN329	KN829
Left	KN230SP	KN230WP	KN230BP	KN130SP	KN130WP	KN130BP	KN730SP	KN730WP	KN730BP	KN230	KN330	KN830
Right	KN231SP	KN231WP	KN231BP	KN131SP	KN131WP	KN131BP	KN731SP	KN731WP	KN731BP	KN231	KN331	KN831
Cycle Start	KN232SP	KN232WP	KN232BP	KN132SP	KN132WP	KN132BP	KN732SP	KN732WP	KN732BP	KN232	KN332	KN832
Feed Start	KN233SP	KN233WP	KN233BP	KN133SP	KN133WP	KN133BP	KN733SP	KN733WP	KN733BP	KN233	KN333	KN833
Cycle Stop	KN234SP	KN234WP	KN234BP	KN134SP	KN134WP	KN134BP	KN734SP	KN734WP	KN734BP	KN234	KN334	KN834
Motor Run	KN236SP	KN236WP	KN236BP	KN136SP	KN136WP	KN136BP	KN736SP	KN736WP	KN736BP	KN236	KN336	KN836
Motor Stop	KN237SP	KN237WP	KN237BP	KN137SP	KN137WP	KN137BP	KN737SP	KN737WP	KN737BP	KN237	KN337	KN837
Power On	KN238SP	KN238WP	KN238BP	KN138SP	KN138WP	KN138BP	KN738SP	KN738WP	KN738BP	KN238	KN338	KN838
Pull To Start Push To Stop	N/A	N/A	N/A	KN179SP	KN179WP	KN179BP	KN779SP	KN779WP	KN779BP	N/A	KN379	N/A
For Selector Switch or Selector Push Button												
For.-Rev.	KN239SP	KN239WP	KN239BP	KN139SP	KN139WP	KN139BP	KN739SP	KN739WP	KN739BP	KN239	KN339	KN839
Hand-Auto.	KN240SP	KN240WP	KN240BP	KN140SP	KN140WP	KN140BP	KN740SP	KN740WP	KN740BP	KN240	KN340	KN840
High-Low	KN241SP	KN241WP	KN241BP	KN141SP	KN141WP	KN141BP	KN741SP	KN741WP	KN741BP	KN241	KN341	KN841
Jog-Run	KN242SP	KN242WP	KN242BP	KN142SP	KN142WP	KN142BP	KN742SP	KN742WP	KN742BP	KN242	KN342	KN842
Man.-Auto.	KN243SP	KN243WP	KN243BP	KN143SP	KN143WP	KN143BP	KN743SP	KN743WP	KN743BP	KN243	KN343	KN843
Off-On	KN244SP	KN244WP	KN244BP	KN144SP	KN144WP	KN144BP	KN744SP	KN744WP	KN744BP	KN244	KN344	KN844
On-Off	KN245SP	KN245WP	KN245BP	KN145SP	KN145WP	KN145BP	KN745SP	KN745WP	KN745BP	KN245	KN345	KN845
Open-Close	KN246SP	KN246WP	KN246BP	KN146SP	KN146WP	KN146BP	KN746SP	KN746WP	KN746BP	KN246	KN346	KN846
Raise-Lower	KN247SP	KN247WP	KN247BP	KN147SP	KN147WP	KN147BP	KN747SP	KN747WP	KN747BP	KN247	KN347	KN847
Run-Jog	KN248SP	KN248WP	KN248BP	KN148SP	KN148WP	KN148BP	KN748SP	KN748WP	KN748BP	KN248	KN348	KN848
Slow-Fast	KN250SP	KN250WP	KN250BP	KN150SP	KN150WP	KN150BP	KN750SP	KN750WP	KN750BP	KN250	KN350	KN850
Start-Stop	KN251SP	KN251WP	KN251BP	KN151SP	KN151WP	KN151BP	KN751SP	KN751WP	KN751BP	KN251	KN351	KN851
Up-Down	KN253SP	KN253WP	KN253BP	KN153SP	KN153WP	KN153BP	KN753SP	KN753WP	KN753BP	KN253	KN353	KN853
Low-High	KN254SP	KN254WP	KN254BP	KN154SP	KN154WP	KN154BP	KN754SP	KN754WP	KN754BP	KN254	KN354	KN854
Stop-Start	KN255SP	KN255WP	KN255BP	KN155SP	KN155WP	KN155BP	KN755SP	KN755WP	KN755BP	KN255	KN355	KN855
Left-Right	KN256SP	KN256WP	KN256BP	KN156SP	KN156WP	KN156BP	KN756SP	KN756WP	KN756BP	KN256	KN356	KN856
On-Auto	KN276SP	KN276WP	KN276BP	KN176SP	KN176WP	KN176BP	KN776SP	KN776WP	KN776BP	KN276	KN376	KN876
Auto-Off-Hand	KN258SP	KN258WP	KN258BP	KN158SP	KN158WP	KN158BP	KN758SP	KN758WP	KN758BP	KN258	KN358	KN858
For.-Off-Rev.	KN259SP	KN259WP	KN259BP	KN159SP	KN159WP	KN159BP	KN759SP	KN759WP	KN759BP	KN259	KN359	KN859
Hand-Off-Auto.	KN260SP	KN260WP	KN260BP	KN160SP	KN160WP	KN160BP	KN760SP	KN760WP	KN760BP	KN260	KN360	KN860
Man.-Off-Auto.	KN262SP	KN262WP	KN262BP	KN162SP	KN162WP	KN162BP	KN762SP	KN762WP	KN762BP	KN262	KN362	KN862
Open-Off-Close	KN263SP	KN263WP	KN263BP	KN163SP	KN163WP	KN163BP	KN763SP	KN763WP	KN763BP	KN263	KN363	KN863
Up-Off-Down	KN264SP	KN264WP	KN264BP	KN164SP	KN164WP	KN164BP	KN764SP	KN764WP	KN764BP	KN264	KN364	KN864
Low-Off-High	KN265SP	KN265WP	KN265BP	KN165SP	KN165WP	KN165BP	KN765SP	KN765WP	KN765BP	KN265	KN365	KN865
Jog-Stop-Run	KN267SP	KN267WP	KN267BP	KN167SP	KN167WP	KN167BP	KN767SP	KN767WP	KN767BP	KN267	KN367	KN887
High-Low-Off	KN270SP	KN270WP	KN270BP	KN170SP	KN170WP	KN170BP	KN770SP	KN770WP	KN770BP	KN270	KN370	KN870
High-Off-Low	KN277SP	KN277WP	KN277BP	KN177SP	KN177WP	KN177BP	KN777SP	KN777WP	KN777BP	KN277	KN377	KN877
Auto-Man.-Off	KN278SP	KN278WP	KN278BP	KN178SP	KN178WP	KN178BP	KN778SP	KN778WP	KN778BP	KN278	KN378	KN878

(1) Legend plate has red background with silver letters.
(2) Legend plate has red background with black letters.

Product range: page 5 | Specifications: page 7 | Dimensions: page 30 | Mounting: page 31

30 mm push buttons
9001K – Legend plates

Note: When ordering, add prefix "9001" to the reference.

Legend Plates–Special Marking

Legend Plate	Description		Reference
KN100●P (Plastic) *(1)* 2.25 in Square	Standard Markings		See page 25
	Special Marking *(2)*	Silver Field, Black Letters	KN199SP
		White Field, Black Letters	KN199WP
		Red Field, Black Letters	KN199RP
		Black Field, White Letters	KN199BP
KN200 Aluminum	Standard Markings		See page 25
	Special Marking *(2)*	Black Field	KN299
		Red Field	KN299R
KN200●P (Plastic) *(1)* 1.7 in Square	Standard Markings		See page 25
	Special Marking *(2)*	Silver Field, Black Letters	KN299SP
		White Field, Black Letters	KN299WP
		Red Field, Black Letters	KN299RP
		Black Field, White Letters	KN299BP
KN300 Aluminum	Standard Markings		See page 25
	Special Marking *(2)*	Black Field	KN399
		Red Field	KN399R
KN400 Aluminum	Blank		KN400
	Any Marking *(2)*		KN499
KN500 Aluminum	Standard Markings		Select from page 25
	Special Marking *(2)*	Black Field	KN599
		Green Red Field	KN519
KN600 Aluminum	Blank	Black Field	KN600
		Red Field	KN600R
	Any Marking *(2)*	Black Field	KN699
		Red Field	KN699R
KN700●P (Plastic) *(1)* 2.5 in Square	Standard Markings		Select from page 25
	Special Marking *(2)*	Silver Field, Black Letters	KN799SP
		White Field, Black Letters	KN799WP
		Red Field, Black Letters	KN799RP
		Black Field, White Letters	KN799BP
KN800 Aluminum	Standard Markings		Select from page 25
	Special Marking *(2)*	Blue Field	KN899
		Red Field	KN899R
KN900 Aluminum	Blank		KN900
	Any Marking *(2)*		KN999

(1) Other colors available (see table below).
(2) Specify marking required.

Plastic Legend Plates—Other Colors

	Plate Color	Letter Color	1.7 in Square	2.25 in Square	2.5 in Square
Blank Legend Plates	Yellow	Black	KN200YP	KN100YP	KN700YP
	Green	White	KN200GP	KN100GP	KN700GP
	Blue		KN200LP	KN100LP	KN700LP
	Red		KN200CP	KN100CP	KN700CP
	Orange		KN200AP	KN100AP	KN700AP
	Burnt Orange	Black	KN200HP	KN100HP	KN700HP
Special Engraved Legend Plates	Yellow	Black	KN299YP	KN199YP	KN799YP
	Green	White	KN299GP	KN199GP	KN799GP
	Blue		KN299LP	KN199LP	KN799LP
	Red		KN299CP	KN199CP	KN799CP
	Orange		KN299AP	KN199AP	KN799AP
	Burnt Orange	Black	KN299HP	KN199HP	KN799HP

Maximum Number of Lines and Characters for 9001KN Legend Plates

Reference	KN100	KN200	KN300	KN400	KN500	KN600	KN700	KN800	KN900
Max. No. of Char. per Line	16	14	18	18	8 per field	22	17	18	18 per pos.
Max. No. of Lines	2	1	3	2	2 per field	4	2	2	1 per pos.

Note: The maximum number of characters and lines is a practical maximum, based on a minimum size of characters to facilitate easy reading.

Circular Legends for Emergency Stop Mushroom Heads (yellow background)

Diameter	Text	Reference
60 mm	—	KN9100
	EMERGENCY STOP	KN9330
90 mm	—	KN8100
	EMERGENCY STOP	KN8330

Legend Plate Position #1

Min. Centerline Spacing, 9001K Control Units

Legend Plate	Operator	Centerline Spacing (in) A	B	C	D	E	F
Legend Plate Orientation Position #1							
KN2 KN5	Standard Push Button	1.75	1.31	1.44	2.25	1.69	0.88
	1.375 in Dia. Mushroom	1.75	1.31	1.44	2.25	1.69	0.88
	2.25 in Dia. Mushroom	2.25	1.31	1.44	2.25	2.25	1.12
	Selector Switch Knobs	1.75	1.31	1.44	2.25	1.69	0.88
KN3	Standard Push Button	2.00	1.31	1.44	2.25	1.75	0.88
	1.375 in Dia. Mushroom	2.00	1.31	1.44	2.25	1.75	0.88
	2.25 in Dia. Mushroom	2.25	1.31	1.44	2.25	2.25	1.12
	Selector Switch Knobs	2.00	1.31	1.44	2.25	1.75	0.88
KN4	Standard Push Button	1.94	1.31	1.44	2.25	1.62	0.88
	1.375 in Dia. Mushroom	1.94	1.31	1.44	2.25	1.62	0.88
	2.25 in Dia. Mushroom	2.25	1.31	1.44	2.25	2.25	1.12
	Selector Switch Knobs	1.74	1.31	1.44	2.25	1.62	0.88
KN6	Standard Push Button	2.38	1.62	1.44	2.25	2.25	1.12
	1.375 in Dia. Mushroom	2.38	1.62	1.44	2.25	2.25	1.12
	2.25 in Dia. Mushroom	2.38	1.62	1.44	2.25	2.25	1.12
	Selector Switch Knobs	2.38	1.62	1.44	2.25	2.25	1.12

Legend Plate Position #2

Legend Plate Orientation Position #2							
KN2 KN5	Standard Push Button	1.62	1.31	1.44	2.25	1.75	0.88
	1.375 in Dia. Mushroom	1.62	1.31	1.44	2.25	1.75	0.88
	2.25 in Dia. Mushroom	2.25	1.31	1.44	2.25	2.25	1.12
	Selector Switch Knobs	1.62	1.31	1.44	2.25	1.75	0.88
KN3	Standard Push Button	1.75	1.31	1.44	2.25	2.00	0.88
	1.375 in Dia. Mushroom	1.75	1.31	1.44	2.25	2.00	0.88
	2.25 in Dia. Mushroom	2.25	1.31	1.44	2.25	2.25	1.12
	Selector Switch Knobs	1.75	1.31	1.44	2.25	2.00	0.88
KN4	Standard Push Button	1.62	1.31	1.44	2.25	1.94	1.00
	1.375 in Dia. Mushroom	1.62	1.31	1.44	2.25	1.94	1.00
	2.25 in Dia. Mushroom	2.25	1.31	1.44	2.25	2.25	1.12
	Selector Switch Knobs	1.62	1.31	1.44	2.25	1.94	1.00
KN6	Standard Push Button	2.25	1.31	1.62	2.38	2.38	0.88
	1.375 in Dia. Mushroom	2.25	1.31	1.62	2.38	2.38	0.88
	2.25 in Dia. Mushroom	2.25	1.31	1.62	2.38	2.38	1.12
	Selector Switch Knobs	2.25	1.31	1.62	2.38	2.38	0.88

Special Legend Plates

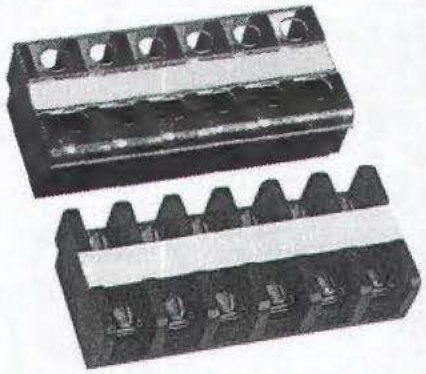
9001KN500
(For Use with Dual Function Operators: KR6, KR7 and KR67)
Standard Markings

Reference	Green	Red
KN500	Blank	Blank
KN501	Start	Stop
KN502	On	Off

Reference	Black	Black
KN520	Blank	Blank
KN521	Start	Stop
KN522	On	Off
KN523	Forward	Reverse
KN524	Up	Down
KN525	High	Low
KN526	Open	Close

CR151B

One Piece Terminal Boards for Control Circuit
600 Volts
30 Amps



CR151B, 6-Point Terminal Board

Application

These molded terminal boards are for use in wiring of control panels.

A write-on marking strip markable with ink or pencil is included. Terminal boards may be mounted end-to-end without spacing.

Features

—Electrical rating—30 amperes, 600 volts.
—Rugged material—phenolic.
—Number of points per board—4, 6, 12, or 13.
—Mounting—may be mounted end-to-end without spacing
—Terminal identification—15/32-inch wide marking strip; markable with ink or pencil.
—Wiring—terminals accept wire sizes through AWG # 10

Product Number Selection Instructions

1. Order one piece terminal boards by complete Product Number and by package quantity. Example: Eight (8) six-point, one-piece boards are required, rated 30 amperes, 600 volts with screw-type terminals both sides: order ten CR151B6 at **$7.20 each, GO-10G5.**

Agency Certifications

—UL Recognized, File E40800, Vol. 3, Sec. 2 (Category XCFR2 Terminal Blocks - Component)
—CSA Certified, File LR-15492-157 (Class 3211 07 Industrial Control Equipment - Miscellaneous Apparatus)

Ratings for all Binding Screw and Round Washer Head Screw Terminals

—Suitable for #18 - #10 AWG stranded or solid copper wire, single conductor only.
—Torque 20 in-lb.

Ratings for all Wire Clamp Terminals

—Suitable for #18 - #10 AWG stranded or solid copper wire, single or parallel conductors of same size and type (stranded/stranded or solid/solid only).
—Torque 20 in-lb.

Parallel two conductor size combinations

Wire Size (AWG)	Torque
#10 with #12	20 in-lb (stranded/stranded or solid/solid wire only)
#12 with #14	20 in-lb (stranded/stranded wire only)
#14 with #16	20 in-lb (stranded/stranded or solid/solid wire only)
#14 with #18	20 in-lb (stranded/stranded wire only)
#16 with #18	20 in-lb (stranded/stranded or solid/solid wire only)

Parallel three conductor size combinations

Wire Size	Torque
#14 with #14 with #14	20 in-lb (stranded/stranded/stranded wire only)
#16 with #16 with #16	20 in-lb (stranded/stranded/stranded wire only)
#18 with #18 with #18	20 in-lb (stranded/stranded/stranded wire only)

Panel or Mounting Track Terminal Boards

Termination Type	Terminal Cover	Points Per Board[1]	Product Number[2]	List Price GO-10G5
Screw-Type Both Sides	None	4	CR151B4	$4.80
Screw-Type Both Sides	None	6	CR151B6	$7.20
Screw-Type Both Sides	None	12	CR151B2	$12.90
Screw-Type Both Sides	None	13	CR151B213R	$14.00
Screw-Type Both Sides	Clear Cover	4	CR151B41AF	$5.60
Screw-Type Both Sides	Clear Cover	6	CR151B61AF	$8.20
Screw-Type Both Sides	Clear Cover	12	CR151B21AF	$14.10
Screw-Type One Side, Wire Clamp Other Side	None	4	CR151B45	$6.30
Screw-Type One Side, Wire Clamp Other Side	None	6	CR151B65	$8.10
Screw-Type One Side, Wire Clamp Other Side	None	12	CR151B25	$15.00
Screw-Type One Side, Wire Clamp Other Side	Clear Cover	4	CR151B45AF	$7.10
Screw-Type One Side, Wire Clamp Other Side	Clear Cover	6	CR151B65AF	$9.10
Screw-Type One Side, Wire Clamp Other Side	Clear Cover	12	CR151B25AF	$16.20
Screw With Wire Clamp Both Sides	None	4	CR151B46	$7.20
Screw With Wire Clamp Both Sides	None	6	CR151B66	$9.00
Screw With Wire Clamp Both Sides	None	12	CR151B26	$16.80
Screw With Wire Clamp Both Sides	None	13	CR151B213B	$19.00
Screw With Wire Clamp Both Sides	Clear Cover	4	CR151B46AF	$8.00
Screw With Wire Clamp Both Sides	Clear Cover	6	CR151B66AF	$10.00
Screw With Wire Clamp Both Sides	Clear Cover	12	CR151B26AF	$18.00
Washer Head Screw Both Sides	None	4	CR151B40	$5.40
Washer Head Screw Both Sides	None	6	CR151B60	$7.80
Washer Head Screw Both Sides	None	12	CR151B20	$14.10
Washer Head Screw Both Sides	Clear Cover	4	CR151B40AF	$6.20
Washer Head Screw Both Sides	Clear Cover	6	CR151B60AF	$8.80
Washer Head Screw Both Sides	Clear Cover	12	CR151B20AF	$15.30

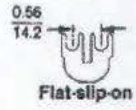
[1]Where number of points desired is not listed use combination of boards.

[2]Product Number and price represent one piece. Sold only in packages of 10. Order in multiples of 10 pieces. Minimum order quantity is 10.

Accessories

Accessory Type	Description	Product Number	List Price GO-10G5
Jumper	For customer connection of adjacent screw-type terminal board	CR151X301[3]	$0.55

[3]Product Number and price represent one piece. Sold only in packages of 100. Order in multiples of 100 pieces. Minimum order quantity is 100.

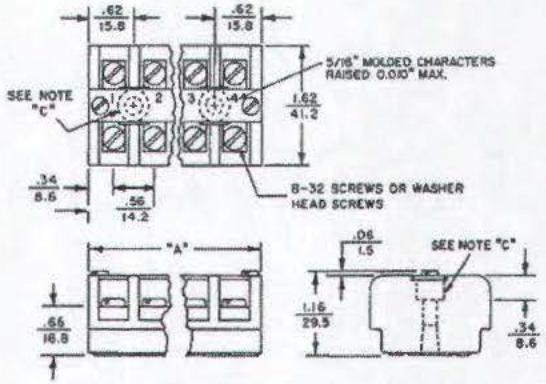


CR151X301 Diagram

Outlines and Dimensions in. (mm) For Estimating Only

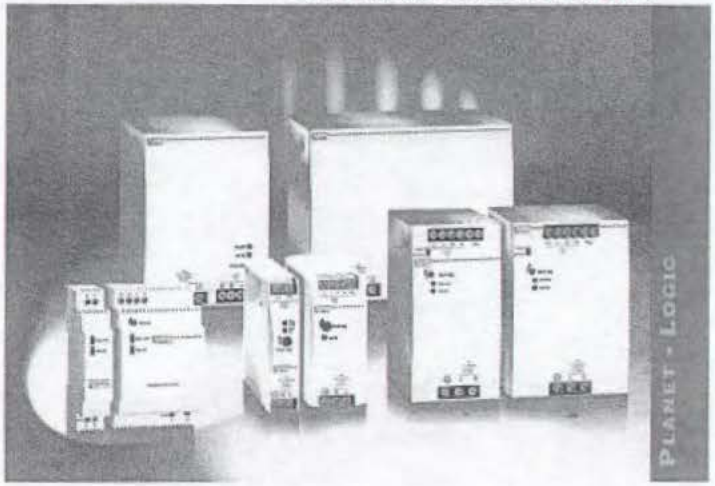
Panel or Mounting Track Terminal Boards

Points Per Board	Dimension A	Distance Between Mounting Hole Centers in (mm)	Package (10 units) Shipping Weight, Pounds
4	2.38 (60.4)	1.12 (28.5)	2
6	3.50 (88.9)	2.25 (57.2)	3
12	6.88 (174.8)	5.62 (142.8)	6
13	7.50 (190.5)	6.19 (157.2)	7

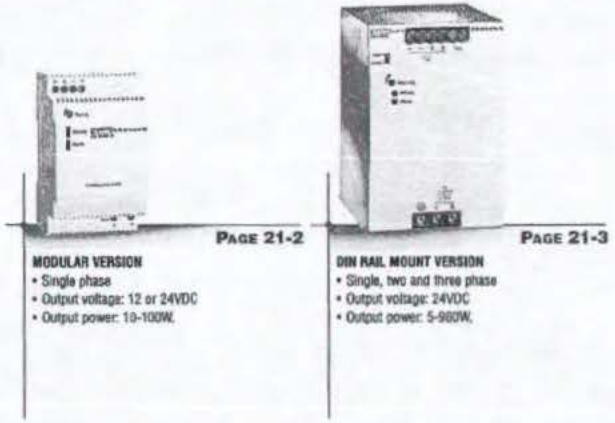


Note C: Terminal boards mount with two #8 screws. Mounting holes are located under Marking Strip.

SWITCHING POWER SUPPLIES



- *Versions: modular and 35mm DIN rail mount*
- *Output voltage adjustment by front potentiometer*
- *Short-circuit protection*
- *Built-in input voltage surge suppressor*
- *Used as power supply for DC electromechanical and electronic equipment.*



PAGE 21-2

MODULAR VERSION
- Single phase
- Output voltage: 12 or 24VDC
- Output power: 10-100W.

PAGE 21-3

DIN RAIL MOUNT VERSION
- Single, two and three phase
- Output voltage: 24VDC
- Output power: 5-960W.

Lovato electric

Switching power supplies
Modular power supplies

PSL1M 010...

PSL1M 033 12
PSL1M 036 24

Order code	Rated output voltage	Rated output current	Output power	Qty per pkg	Wt
	[V]	[A]	[W]	n°	[kg]
Single phase.					
PSL1M 010 12	12VDC	0.83	10	1	0.060
PSL1M 024 12		2	24	1	0.130
PSL1M 033 12		2.75	33	1	0.185
PSL1M 054 12		4.5	54	1	0.250
PSL1M 072 12		6	72	1	0.320
PSL1M 010 24	24VDC	0.42	10	1	0.060
PSL1M 024 24		1	24	1	0.130
PSL1M 036 24		1.5	36	1	0.185
PSL1M 060 24		2.5	60	1	0.250
PSL1M 100 24		4.2	100	1	0.320

General characteristics
Switching power supplies transform an AC input voltage into a DC output one. This type of equipment is used in industrial and domestic automation fields. The power supplies are equipped with switching technology offering very high efficiency in an extremely compact size.
Dimensions are compatible with modular consumer panels and its plastic housing is suitable for building automation installations as well as industrial automation applications.
The wide range of power supply voltages and the choice of DC current outputs provide for the best adaptability to supply voltage needs of the most common electromechanical and electronic devices.

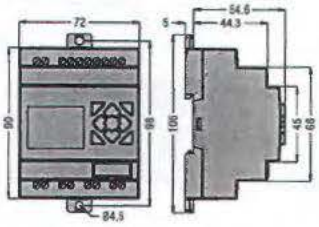
Protections:
- Short circuit
- Overload
- Input voltage surge suppressor.

Indications:
- LED indicator for low voltage conditions
- LED indicator for power on.

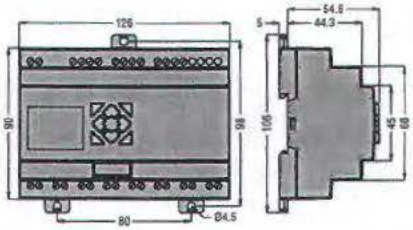
Operational characteristics
- Rated supply voltage: 100-240VAC
- Rated output voltage: 12VDC for PSL1M...12 types; 24VDC for PSL1M...24 types
- Mains frequency: 50/60Hz
- Output voltage adjustment by front potentiometer
- High efficiency up to 89%
- 35mm DIN rail (IEC/EN 60715) mounting
- Screw connection terminals
- Modular DIN 43880 housing; number of modules:
  - 1 for PSL1M 010...
  - 2 for PSL1M 024...
  - 3 for PSL1M 033 12 and PSL1M 036 24
  - 4 for PSL1M 054 12 and PSL1M 060 24
  - 5 for PSL1M 072 12 and PSL1M 100 24
- Degree of protection: IP20 on terminals.

Certifications and compliance
Certifications obtained: cULus, GOST.
Compliant with standards: IEC/EN 60950-1, IEC/EN 61000-6-3, IEC/EN 61000-6-2, UL508, CSA C22.2 n° 14.

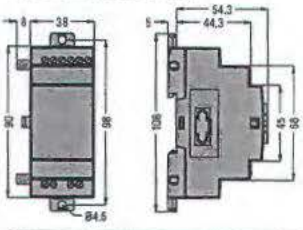
Base units LRD10...
LRD12...



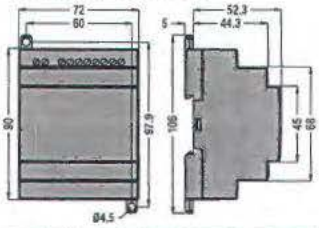
LRD20...



Expansion module LRE...

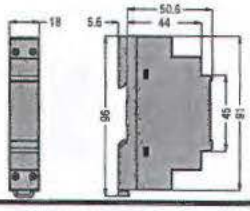


Power supply LRX1V3 D024

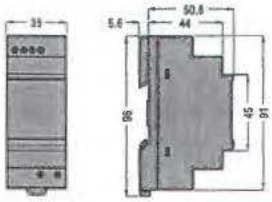


Automatic power supplies

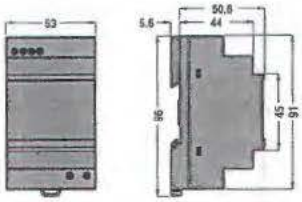
PSL1M 010...



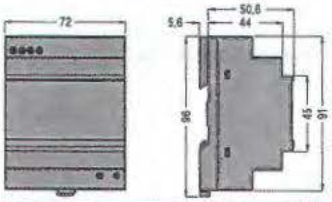
PSL1M 024...



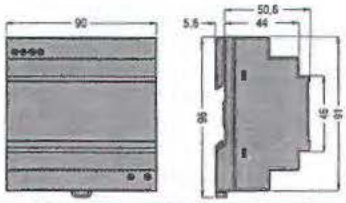
PSL1M 033 12 - PSL1M 036 24



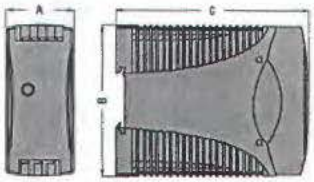
PSL1M 054 12 - PSL1M 060 24



PSL1M 72 12 - PSL1M 100 24

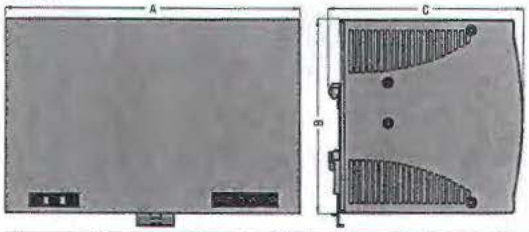


PSL1 005 24 - PSL1 100 24
PSL2 100 24



TYPE	A	B	C
PSL1 005 24	22.5	90	115
PSL1 010 24	22.5	90	115
PSL1 018 24	22.5	90	115
PSL1 030 24	40.5	90	115
PSL1 060 24	40.5	90	115
PSL1 100 24	54	90	115
PSL2 100 24	54	90	115

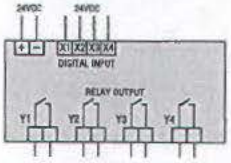
PSL1 120 24 - PSL1 480 24
PSL3...



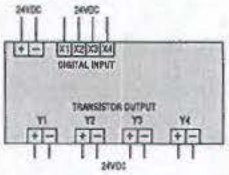
TYPE	A	B	C
PSL1 120 24	94	124.5	123.6
PSL1 240 24	83.5	124.5	123.6
PSL1 300 24	83.5	124.5	123.6
PSL1 480 24	175.5	124.5	123.6
PSL3 120 24	74.3	124	118.8
PSL3 240 24	89	124	118.8
PSL3 480 24	150	124	118.8
PSL3 960 24	275.8	126.2	118.8

Expansion modules

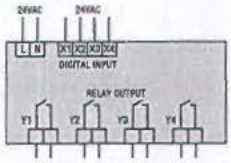
LRE08R D024



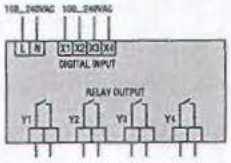
LRE08T D024



LRE08R A024



LRE08R A240



Power supply unit

LRX 1V3 D024

Communication modules

LRE P00

Switching power supplies

MODULAR SWITCHING POWER SUPPLIES

PSL1M 010 12

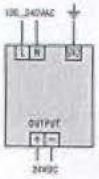
PSL1M 010 24

PSL1M 024 12 - PSL1M 033 12
PSL1M 054 12 - PSL1M 072 12

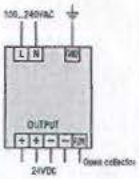
PSL1M 024 24 - PSL1M 035 24
PSL1M 060 24 - PSL1M 100 24

DIN RAIL MOUNT SWITCHING POWER SUPPLIES

PSL1 005 24
PSL1 010 24
PSL1 018 24



PSL1 030 24
PSL1 060 24



PSL1 100 24 - PSL1 120 24
PSL1 240 24
PSL1 396 24
PSL1 480 24

PSL2 100 24

PSL3 120 24 - PSL3 240 24
PSL3 480 24 - PSL3 900 24

Technical characteristics

Lovato electric

TYPE	Single phase	PSL1M 010 12 - PSL1M 010 24	PSL1M 024 12 - PSL1M 024 24	PSL1M 033 12 - PSL1M 036 24	PSL1M 054 12 - PSL1M 060 24	PSL1M 072 12 - PSL1M 100 24
	Two phase	—	—	—	—	—
	Three phase	—	—	—	—	—
INPUT CHARACTERITICS						
Rated supply voltage		Multivoltage 100-240VAC				
Operating range		90-264VAC / 120-375VDC				
Consumption		—				
Frequency range		47-63Hz				
PFC		—				
Insulation voltage Input/output		3000VAC (4242VDC)				
Internal fuse (250VAC) ❶		T1A	T2A			T3A
OUTPUT CHARACTERISTICS						
Voltage		12VDC (PSL1M...12); 24VDC (PSL1M...24)				
Voltage trimming (potentiometer)		—	12-14VDC (PSL1M...12) 24-28VDC (PSL1M...24)			
Current		0.83A (PSL1M...12) 0.42A (PSL1M...24)	2A (PSL1M...12) 1A (PSL1M...24)	2.7A (PSL1M...12) 1.5A (PSL1M...24)	4.5A (PSL1M...12) 2.5A (PSL1M...24)	6A (PSL1M...12) 4.2A (PSL1M...24)
Temperature coefficient		±0.03%/°C				
Line adjustment		±1%				
Load adjustment		±1%				
Efficiency		78 (PSL1M...12) 80 (PSL1M...24)	84 (PSL1M...12) 85 (PSL1M...24)	83 (PSL1M...12) 84 (PSL1M...24)	84 (PSL1M...12) 86 (PSL1M...24)	86 (PSL1M...12) 89 (PSL1M...24)
Overload protection		110-165%	120-160%	110-150%	110-150%	110-150%
Short-circuit protection		Fold forward	Hiccup	Fold forward		
Ripple noise		50mV				
Parallel connection (n° of units)		—				
INDICATIONS						
LED indicator for power on		Yes				
LED indicator for low voltage		Yes				
Power Rdy (Ready) (minimum limit)		—				
CONNECTIONS						
Type of terminal		Screw				
Conductor section (min-max)		0.4-3.3mm² (26-12AWG)	0.2-3.3mm² (24-12AWG)			
Stripping length		4-5mm	7mm			
Tightening torque maximum	Input	0.5Nm/0.42lbft	0.6Nm/0.5lbft			
	Output	0.5Nm/0.42lbft	0.6Nm/0.5lbft			
AMBIENT CONDITIONS						
Operating temperature ❸		-25...+71°C				
Storage temperature		-25...+85°C				
Derating >60°C		2.5%/°C				
HOUSING						
Material		Plastic				

❶ No replacement by user.
❷ Two-phase connection is possible with 25% power derating.
❸ Maximum surrounding temperature of 50°C for use according to UL508.

CCMR Series POWR-PRO® Fuses

POWR-PRO® 600 VAC • Dual Element • Time-Delay • 2/10-60 Amperes

Specifications

Voltage Ratings:	AC:	600 V
	DC:	250 V (CCMR 2/10–2 A) (CCMR 4 1/2–10 A) (CCMR 35–60 A)
		300 V (CCMR 2 1/4–4 A)
		500 V (CCMR 12–30 A)
Interrupting Ratings:	AC:	200 kA rms symmetrical 300 kA Littelfuse self-certified
	DC:	20 kA
Ampere Range:		2/10 – 60 A
Approvals:	AC:	Standard 248-4, Class CC UL Listed 1/10-30 A (File No. E81895) Standard 248, Class CD UL Listed 35-60 A (File No. E81895) CSA Certified 1/10-30 A (File No. LR29862)
	DC:	Littelfuse self-certified

Description

The CCMR series is ideal for space saving protection of motors up to 40 hp*. It was designed specifically to withstand sustained starting currents of small motors. The CCMR 60 fuse is the smallest 60 A fuse available rated at 600 V. Compared to other UL Listed fuses, Class CC fuses are the most current-limiting, rating for rating.

Applications

- Motor and motor branch circuit protection

Features/Benefits

- POWR-PRO Performance
- Extremely current-limiting
- Ratings up to 60 Amps
- 300 kA Interrupting Rating (self-certified)

Ordering Information

AMPERE RATINGS						
2/10	1	2	3 1/2	6 1/4	12	35
1/4	1 1/4	2 1/4	4	7	15	40
3/10	1 4/10	2 1/2	4 1/2	7 1/2	17 1/2	45
1/2	1 1/2	2 8/10	5	8	20	50
6/10	1 6/10	3	5 6/10	9	25	60
8/10	1 8/10	3 2/10	6	10	30	

SERIES	AMPERAGE	CATALOG NUMBER	SYSTEM NUMBER
CCMR	45	CCMR045	CCMR045.T

Web Resources

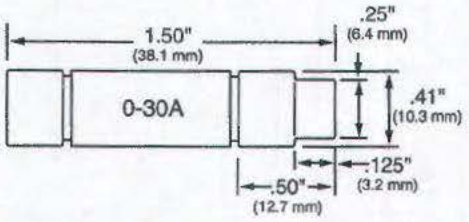
TC Curves, downloadable CAD drawings and other technical information: **www.littelfuse.com/ccmr**

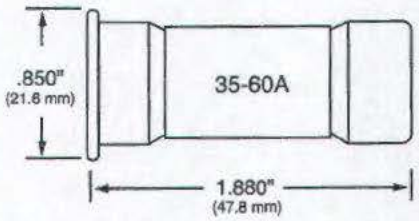
Recommended Fuseholders

LPSC Series
L60030C Series
L60060C Series

CCMR Series POWR-PRO® Fuses

Dimensions in inches (mm)



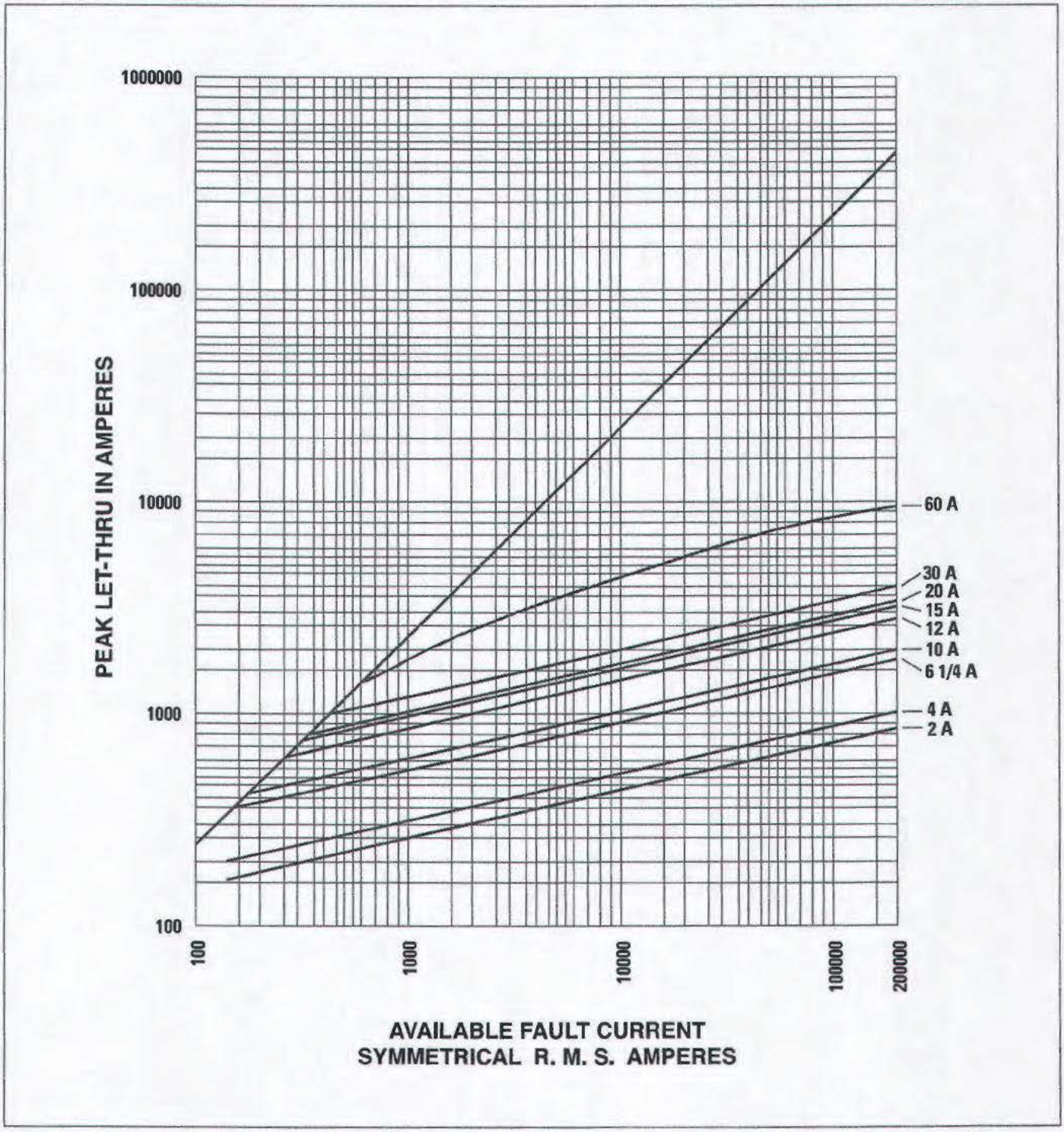


Current-Limiting Effects of CCMR (600 V) fuses

SHORT CIRCUIT CURRENT*	APPARENT RMS SYMMETRICAL CURRENT FOR VARIOUS FUSE RATINGS							
	2 A	4 A	6¼ A	10 A	12 A	15 A	20 A	30 A
5,000	160	190	330	370	525	600	625	750
10,000	180	220	400	440	600	700	725	875
15,000	200	250	430	480	675	775	800	950
20,000	220	260	460	520	720	825	850	1,000
25,000	230	280	480	550	750	850	900	1,050
30,000	240	290	500	570	800	900	950	1,125
35,000	245	300	520	590	825	925	975	1,175
40,000	255	310	550	600	850	975	1,000	1,200
50,000	260	330	570	640	875	1,000	1,100	1,300
60,000	280	340	600	670	900	1,050	1,125	1,350
80,000	300	360	625	700	1,000	1,125	1,200	1,400
100,000	310	380	650	750	1,050	1,200	1,250	1,500
150,000	340	420	700	800	1,150	1,300	1,400	1,600
200,000	350	440	750	850	1,200	1,400	1,450	1,750

*Prospective RMS Symmetrical Amperes Short-Circuit Current
Note: Data Derived from Peak Let-Thru Curves

Peak Let-Thru Curve CCMR



OPERATION

The ABS Sealminder system is a solid state device that provides a warning signal when the oil in the individual chamber (oil, motor, connection) reaches a certain level of contamination by water. The contamination level is determined by measuring the resistivity of the oil bath. The resistivity is measured from a probe (di-electrode), installed to extend into the oil, to ground or the motor case. The probe is connected to a lead which runs back through the motor cables and is connected to the #3 sensing lead from the Sealminder relay. The relay will "trip" at a resistance of 90K to 100K ohms or lower, activating a 24 volt DC output on the M (white) lead of the relay. This output can be used to activate a 24 volt DC pilot light or a 24 volt DC auxiliary relay, which in turn can provide multiple output signals. The auxiliary relay is shown below.

MOUNTING

The ABS Sealminder relay can be mounted in any position by means of the mounting lugs on either side. Approximate dimensions are shown below.

ELECTRICAL CONNECTIONS

The ABS Sealminder relay comes in 115 volt, 208/230 volt, 460 volt, or 575 volt models. The relay is CSA approved. A ground fault master unit is required for UL approval. The power (input) leads are the two black leads and are labeled on the package as to the correct line voltage, i.e. labeled as 460V at point where leads enter relay. The output lead (24 volt DC) is white and labeled (M). This should be connected to the line side of a pilot light or the (-) side of a 24 volt DC relay. The common lead is yellow and is labeled (+). The ground lead is green. The probe or sensing input lead is blue and is labeled as (3). This lead should be connected to the probe lead (#3) of the motor cable.

NOTE: The input power leads DO NOT require a transformer connection, using power from any two leads.

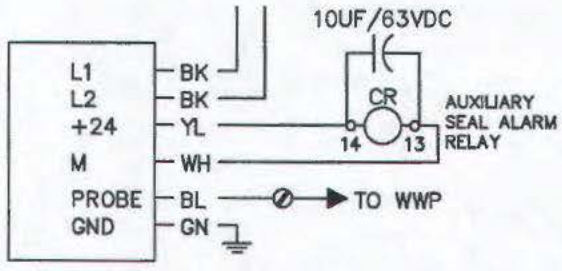
VOLTAGE	PART NUMBER
115V	61240170
208/230V	61240171
460V	61240172
575V	61240173

NOTE:

When coupling the output to a relay, use an IDEC DC relay, part number RH2B-U-DC24V, base part number SH2B-05 or equivalent.

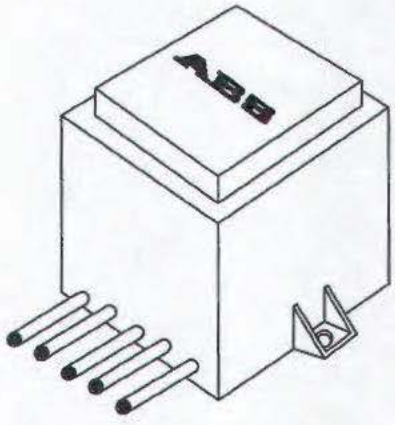
SPECIFICATIONS

Signal strength: 24 volt DC, 5VA
Temperature range: -20° to +60° C



SEALMINDER AMPLIFIER
ABS WATER SENSING DEVICE

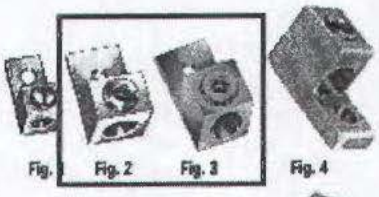
Capicitor supplied by others.

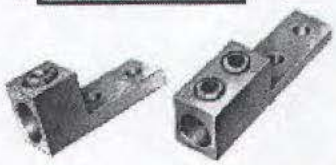


UNIT MEASURES 2.00" WIDE X 2.00" DEEP X 1.88" HIGH

TA 1 CONDUCTOR AL/CU

- Manufactured from high strength 6061-T6 aluminum alloy.
- Electro-Tin plated.
- UL 486B 90° C Listed and is CSA certified for 600 Volts.
- Suitable for use with either copper or aluminum conductors.
- Chamfered wire entry provides ease of installation.
- UL File E6207





* Catalog Numbers link to CAD files (if available)

Catalog No.	Fig. No.	Wire Range	Bolt Size	Length	Width	Hex Size	N.A.E.D. No.
TA-6-S	1	4-14 STR.	1/4	1-1/16	1/2	S	78366988838
TA-2	1	2-14 STR.	1/4	1-5/32	1/2	S	78366988774
TA-0	1	1/0-14 STR.	1/4	1-15/32	5/8	S	78366988715
TA-2/0	2	2/0-14 STR.	1/4	1-15/32	5/8	3/16	78366917749
TA-250	2	250 MCM-6 STR.	5/16	2	1	5/16	78366988942
TA-300	2	300 MCM-6 STR.	1/4	2	55/64	5/16	78366918741
TA-350	2	350 MCM-6 STR.	3/8	2-1/4	1-1/8	3/8	78366988993
TA-500	2	500 MCM-4 STR.	3/8	2-13/16	1-1/2	1/2	78366989101
TA-500-S	3	ONE 600 MCM-4 STR. or TWO EQUAL 250 MCM-1/0 STR.	3/8	2-13/16	1-5-16	1/2	78366989144
TA-600	2	600 MCM-2 STR.	3/8	3-3/16	1-1/2	1/2	78366989216
TA-800	2	800 MCM-300 MCM	5/8	3-3/8	1-3/4	1/2	78366989320
TA-800-S	4	800 MCM-3/0 STR. CU, 800 MCM-250 MCM STR. AL	5/8	3-1/4	1-5/16	1/2	78366989312
TA-1000	2	1000 MCM-350 MCM	5/8	3-3/8	1-3/4	9/16	78366989558
TA-1000-S	4	1000 MCM-500 MCM	5/8	3-1/4	1-7/16	9/16	78366989566
TA-350-2NS	5	350 MCM-6 STR.	1/2	4-5/16	1-1/8	3/8	78366989222
TA-600-2NS	5	600 MCM-2 STR.	1/2	4-11/16	1-1/2	1/2	78366989217
TA-800-2NS	5	800 MCM-300 MCM	1/2	4-3/4	1-3/4	1/2	78366989218
TA-1000-2NS	5	1000 MCM-500 MCM	1/2	4-3/4	1-3/4	9/16	78366989219
TA-350-2N	6	350 MCM-6 STR.	1/2	5-1/2	1-1/4	(2)3/8	78366989223
TA-600-2N	6	600 MCM-2 STR.	1/2	5-1/2	1-3/8	(2)3/8	78366989225
TA-800-2N	6	800 MCM-300 MCM	1/2	6-3/16	1-3/4	(2)1/2	78366989340
TA-1000-2N	6	1000 MCM-500 MCM	1/2	6-3/16	1-5/8	(2)1/2	78366989486

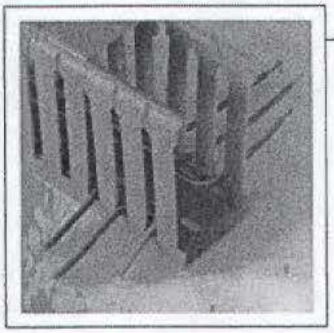
Technical Specifications

Betaduct

Beta Cable Management Systems Ltd
Newtown Trading Estate,
Northway Lane, Tewkesbury,
Gloucestershire
GL20 8JG

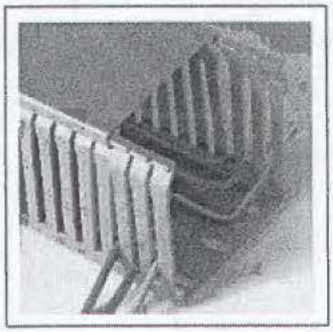
PRODUCT	**BETADUCT**
PART NUMBER	09136000 to 10006000
SIZE	Nominal internal mm (width x height) 25x50 37.5x50 50x50 75x75 100x75 100x125 25x75 37.5x75 50x75 75x100 100x100 25x100 37.5x100 125x75 All supplied in standard 2 metre lengths with lids
SLOTTING	Open, Narrow, Closed and Solid
CAPACITY	Recommended 55% maximum (See Betaduct Capacity Chart)
MATERIAL	Self extinguishing lead free PVC
COLOUR	Grey, Black, White and Blue for Intrinsically Safe Circuits
SERVICE TEMPERATURE RANGE	- 15°C to +65°C
APPLICATION	Control panel trunking for speedy lead out of wiring through open side slots.
FIRE HAZARD PERFORMANCE FLAMMABILITY	UL94V-0 rated material.
CHEMICAL RESISTANCE	Ammonium Hydroxide, Chlorine, Diesel, Detergents, Ethanol, Hydrochloric acid, Inorganic solvents, Mineral oils, White spirit.
APPROVALS	UL, CSA, Lloyds Register, NQA ISO 9001 and Rolls-Royce
STANDARDS	Base slots to DIN 43659

H1160



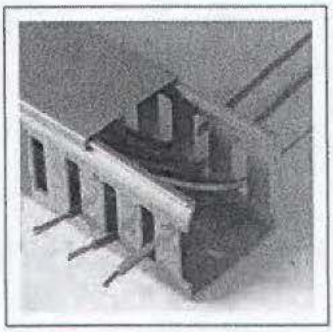
Open slot

- Wide fingers give additional cable support
- Terminated wires can be re-routed easily
- 20mm slot pitch
- 8mm slot width
- 23 sizes available in grey, white, black or blue
- UL, CSA and Lloyds Register approved.
- RoHS compliant



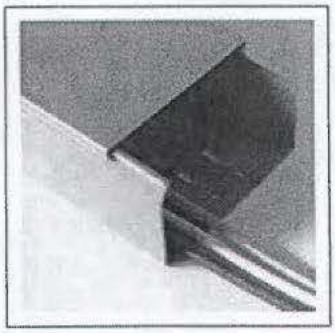
Narrow Slot

- Ideal for use with slimmer terminal blocks where more access is required
- Improves appearance of panels with cables out in best position
- 10mm slot pitch
- 4mm slot width
- 20 sizes available in grey, white or black
- UL, CSA and Lloyds Register approved
- RoHS compliant



Closed Slot

- Excellent cable retention
- Enhanced protection for installers
- 20mm slot pitch
- 8mm slot width
- 25 sizes available in grey, white or black.
- UL, CSA and Lloyds Register approved.
- RoHS compliant



Solid Wall

- Ideal where no break-outs are required or side wall access is infrequent
- Complete cable protection
- 25 sizes in either grey, white or black
- UL, CSA and Lloyds Register approved.
- RoHS compliant

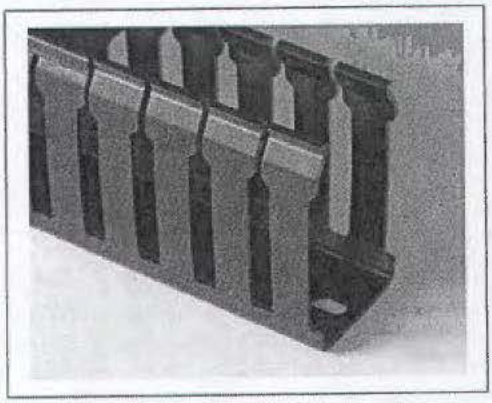
Standard Wiring Duct

Betaduct PVC provides a lightweight self extinguishing wiring duct with excellent rigidity and performance characteristics.

Noryl Wiring Duct

Toxic fumes and smoke generated from plastics in fire situations are a real danger to life. The increased awareness of this threat has lead to a corresponding demand for 'Low Fire Hazard' products. The Noryl Betaduct range is free from toxic halogens, has excellent low smoke characteristics and high operating temperatures. Noryl Betaduct is recommended for areas where human life or electronic components are at risk.

Betaduct Noryl is approved and specified by London Underground, Rolls Royce and most rail industry manufacturers.



Slotted & Solid Wall

- Choice of Open Slot, Closed Slot or Solid Wall
- 19mm slot pitch
- 8mm slot width
- Zero Halogen
- Low smoke
- Wide range of sizes
- Available in black
- RoHS compliant

Open Slot

Supplied with lid

nominal size	external dimensions		part no. selection				carton quantity	
w x h (mm)	width (mm)	height (mm)	grey RAL 7030PVC	white PVC	black PVC	blue PVC	no. of lengths 2m each	total metres
19 x 50	25	53	10450018	23610110	09800000	-	12	24
25 x 37.5	29	41	10450022	23610400	09810000	-	12	24
25 x 50	29	54	10450023	23610500	09130000	09136000	12	24
25 x 75	29	79	10450024	23610600	09140000	09146000	8	16
25 x 100	30	105	10450025	23610700	09830000	09836000	8	16
37.5x37.5	41	41	10450032	23610900	09840000	-	12	24
37.5 x 50	41	54	10450033	23610900	09850000	09856000	8	16
37.5 x 75	39	79	10450034	23611100	09860000	09866000	8	16
37.5x100	43	105	10450035	23611200	09870000	09876000	8	16
50 x 25	54	28	10450051	23611300	09880000	-	12	24
50 x 37.5	54	41	10450052	23611400	09890000	-	8	16
50 x 50	54	54	10450053	23611500	09160000	09166000	8	16
50 x 75	55	79	10450054	23611600	09170000	09176000	8	16
50 x 100	56	105	10450055	23611700	09920000	-	4	8
75 x 37.5	80	41	10450072	23611800	09930000	-	8	16
75 x 50	78	54	10450073	23611900	09940000	-	8	16
75 x 75	80	80	10450074	23612000	09190000	09196000	8	16
75 x 100	80	105	10450075	23612100	09960000	09966000	4	8
100 x 50	107	54	10450103	23612400	09980000	-	4	8
100 x 75	107	80	10450104	23612500	09990000	09996000	4	8
100x100	107	104	10450105	23612600	10000000	10006000	4	8
100x125	107	130	10450106	23613000	10010000	-	4	8
125 x 75	131	78	10450124	23612900	09410000	-	4	8

*Other sizes may be available upon request, please contact the sale office for minimum quantities and lead times.

MATERIALS
Self extinguishing PVC

SERVICE TEMPERATURE
-15 0c to + 60oc(+50f to +1400f)

STANDARDS
Base slots to DIN 43659

STANDARD COLOURS
Grey RAL 703, white black blue

FLAMIBILITY
UL90 V-0 rated material

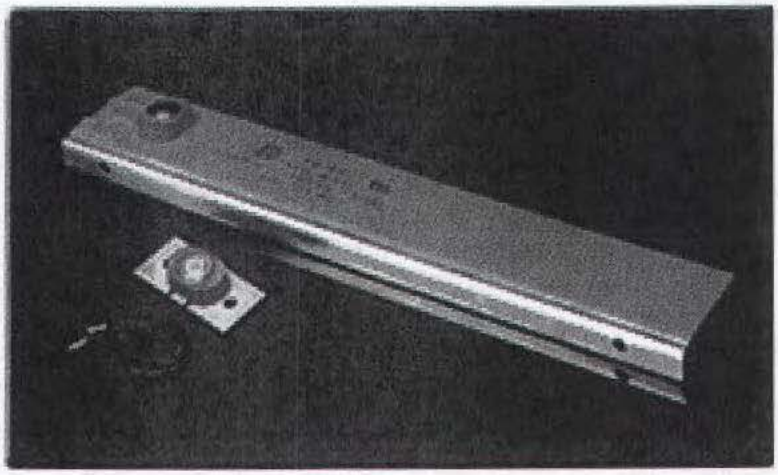
APPROVALS
UL, CSA & Lloyds Register

RoHS COMPLIANT

These are non-stock items and may require minimum order quantities. Please contact our sales office for availability and price.

Part Number: EN2-12-P-040-D
UL File Number: E301520

Electro-Flex Heat, Inc.
5 Northwood Road
Northwood Ind. Park
Bloomfield, CT 06002
Phone-860-242-6287
Toll Free-800-585-4213
Fax-860-242-7298



Enclosure Heaters

Enclosure heaters feature etched foil elements encapsulated between layers of fiberglass reinforced silicone rubber and are factory vulcanized to an aluminum mounting plate. Mounting plates come with 7/32" holes for mounting to sub panels and other mounting surfaces.

Built-in air sensing thermostat maintains the temperature to prevent freezing or condensation within the enclosure. Enclosure heaters can be mounted vertically or horizontally using the mounting plate. Optional temperature control is achieved when the heater is mounted vertically.

TURN ON TEMPERATURE IS 40°F (±8°F)
TURN OFF TEMPERATURE IS 60°F (±5°F)

Features

- Durable Silicone Rubber Construction
- Factory Vulcanized to a 0.040" thick Aluminum Plate
- Operating temperatures -40° to +350° F (-40° to +176° C)
- Voltage 115 VAC
- 5 W/in^2
- 60 and 120-Watt Models
- Preset Thermostat (40°, 105°, and 150° available) Mounted on Heater Assembly or Supplied Separately for Remote Mounting
- Width: 2.128" (53.98mm)
- Thickness: 0.04" (1.016mm)
- Flange Width: 0.5" (12.7mm)
- Mounting Holes: 0.25" (6.35mm) ID, located 1" (25mm) from each end
- Leads: 48" (1219mm) long, 22 AWG Teflon insulated UL/CSA
- UL/CSA Recognized

Detailed Specifications & Technical Data

ENGLISH MEASUREMENT VERSION

BELDEN
SENDING ALL THE RIGHT SIGNALS

8760 Multi-Conductor - Shielded Twisted Pair Cable

For more Information
please call

1-800-Belden1

Analog & Sensor Wiring

Description:

18 AWG stranded (16x30) tinned copper conductors, polyethylene insulation, twisted pair, overall Beldfoil® shield (100% coverage), 20 AWG stranded tinned copper drain wire, PVC jacket.

Physical Characteristics (Overall)

Conductor

AWG:

# Pairs	AWG	Stranding	Conductor Material
1	18	16x30	TC - Tinned Copper

Insulation

Insulation Material:

Insulation Material	Wall Thickness (in.)
PE - Polyethylene	0.018

Outer Shield

Outer Shield Material:

Outer Shield Trade Name	Type	Outer Shield Material	Coverage (%)
Beldfoil®	Tape	Aluminum Foil-Polyester Tape w/Shorting Fold	100

Outer Shield Drain Wire AWG:

AWG	Stranding	Drain Wire Conductor Material
20	7x28	TC - Tinned Copper

Outer Jacket

Outer Jacket Material:

Outer Jacket Material	Nom. Wall Thickness (in.)
PVC - Polyvinyl Chloride	.028

Overall Cable

Overall Nominal Diameter:	0.222 in.

Pair

Pair Color Code Chart:

Number	Color
1	Black & Clear

Pair Lay Length & Direction:

Lay Length (in.)	Twists (twist/ft)
2.500	4.800

Mechanical Characteristics (Overall)

Operating Temperature Range:	-20°C To +60°C
UL Temperature Rating:	60°C (UL AWM Style 2092)
Bulk Cable Weight:	23 lbs/1000 ft.
Max. Recommended Pulling Tension:	62 lbs.
Min. Bend Radius (Install)/Minor Axis:	2.250 in.

Detailed Specifications & Technical Data

ENGLISH MEASUREMENT VERSION

BELDEN
SENDING ALL THE RIGHT SIGNALS

8760 Multi-Conductor - Shielded Twisted Pair Cable

Applicable Specifications and Agency Compliance (Overall)

Applicable Standards & Environmental Programs

NEC/(UL) Specification:	CM
CEC/C(UL) Specification:	CM
AWM Specification:	UL Style 2092 (300 V 60°C)
EU CE Mark:	Yes
EU Directive 2000/53/EC (ELV):	Yes
EU Directive 2002/95/EC (RoHS):	Yes
EU RoHS Compliance Date (mm/dd/yyyy):	01/01/2004
EU Directive 2002/96/EC (WEEE):	Yes
EU Directive 2003/11/EC (BFR):	Yes
CA Prop 65 (CJ for Wire & Cable):	Yes
MII Order #39 (China RoHS):	Yes

Flame Test

UL Flame Test:	UL1685 UL Loading

Plenum/Non-Plenum

Plenum (Y/N):	No
Plenum Number:	88760, 87760 or 82760

Electrical Characteristics (Overall)

Nom. Characteristic Impedance:

Impedance (Ohm)
57

Nom. Inductance:

Inductance (µH/ft)
.18

Nom. Capacitance Conductor to Conductor:

Capacitance (pF/ft)
29.8

Nom. Capacitance Cond. to Other Conductor & Shield:

Capacitance (pF/ft)
53.500

Nom. Conductor DC Resistance:

DCR @ 20°C (Ohm/1000 ft)
6.5

Max. Operating Voltage - UL:

Voltage
300 V RMS (UL AWM Style 2092)

Max. Recommended Current:

Current
5.2 Amps per conductor @ 25°C

Put Ups and Colors:

Item #	Putup	Ship Weight	Color	Notes	Item Desc
8760 060U1000	1,000 FT	27.000 LB	CHROME		2 #18 LDPE SH PVC
8760 060U500	500 FT	14.000 LB	CHROME		2 #18 LDPE SH PVC
8760 0601000	1,000 FT	27.000 LB	CHROME		2 #18 LDPE SH PVC
8760 06010000	10,000 FT	270.000 LB	CHROME	C Y	2 #18 LDPE SH PVC

8760 Multi-Conductor - Shielded Twisted Pair Cable

8760 0602000	2,000 FT	54.000 LB	CHROME	C	2 #18 LDPE SH PVC
8760 060250	250 FT	7.000 LB	CHROME		2 #18 LDPE SH PVC
8760 060500	500 FT	14.000 LB	CHROME	C	2 #18 LDPE SH PVC
8760 0605000	5,000 FT	145.000 LB	CHROME	C	2 #18 LDPE SH PVC
8760 0609999	1,000 FT	28.000 LB	CHROME		2 #18 LDPE SH PVC

Notes:
C = CRATE REEL PUT-UP.
Y = FINAL PUT-UP LENGTH MAY VARY -10% TO +20% FROM LENGTH SHOWN.MAY CONTAIN 2 PIECES. MINIMUM LENGTH OF ANY ONE PIECE IS 1500'.

Revision Number: 2 Revision Date: 05-03-2012

Pilot Control Wiring

MTW, AWM, TEW

Thermoplastic Insulated Heat, Moisture & Oil Resistant 600 Volt Copper

Product Description:

Alan Wire Type MTW/AWM/TEW is primarily used as wiring in machine tools, appliances, and in various building applications as specified by the National Electrical Code. MTW/AWM/TEW conductors are stranded, soft-annealed copper. The conductors are then insulated with a tough polyvinyl chloride (PVC), making the wire heat, moisture, and oil-resistant.

Specifications:

Type MTW/AWM/TEW wire meets the requirements of the National Electrical Code and is Listed by Underwriters Laboratories, Inc. and Canadian Standards Association. Type MTW or AWM is U.L. Listed for machine tool wire and appliance wiring material. TEW is CSA rated for thermoplastic equipment wire. MTW & AWM have a VW-1 flame rating. TEW has an FT1 rating. Voltage rating for all applications is 600 volts. 18-10 AWG is made in accordance with style 1032 (1,000 volt rating).

MTW/AWM meets U.L. Standards 758 & U.L. Standard 1063, Style No. 1344 (8 AWG), Style No. 1345 (18-10 AWG), Style 1032 (18-10 AWG) Style No. 1283 (6-2 AWG), Style No. 1232 (6-2 AWG), & Style No. 1346 (6-2 AWG).
18-10 awg are flexible stranding (class K).

Size AWG	Color Code	Insulation Thickness (Mils)	No. of Strands	Nominal O.D. (Inches)	Approx. Weight (LBS/MFT)	Standard Package
18	2	.030	16	.113	11	A
16	1	.030	26	.125	14	A
14	1	.030	41	.139	20	A
12	2	.030	65	.158	28	A
10	3	.030	104	.182	43	B
8	4	.045	19	.246	74	C D
6	4	.060	19	.315	114	C D
4	4	.060	19	.365	167	C D
2	4	.060	19	.430	252	C D
Larger sizes of MTW are available when minimum quantities are met. Call for Availability.						

	Colors Available:

Package Code	Color Code #1) Black, White, Red, Blue, Green, Orange, Yellow, Brown, Purple, Gray, Pink, Tan
A 2000' Carton, Four 500' Spools Per Ctn.	Color Code #2) Black, White, Red, Blue, Green, Orange, Yellow, Brown, Purple, Gray, Pink
B 1000' Carton, Two 500' Spools Per Ctn.	Color Code #3) Black, White, Red, Blue, Green
C 500' Reel	Color Code #4) Black
D 1000' Reel	
Other lengths & packaging available upon request.	

Wire Type	Dry	Oil	Wet
MTW	90□C	60□C	60□C
AWM	105□C	60□C	75□C
TEW	105□C	60□C	-

Alan Wire Company

Telephone: (573) 471-9548
Fax: (573) 471-1317

Hypalon®

Power Wiring

UL AWM Style 3191 600V, 105°C
(CSA Type CL1053)

Product Description

This insulation is chlorosulfonated polyethylene. Hypalon insulation has excellent heat resistance, color stability and electrical properties. Hypalon is recommended for motor leads for Class 130(B) insulation systems. It may be considered as an alternative to Silicone rubber to withstand 155°C varnish baking temperatures, but is not suitable for operating temperatures above Class 130(B).

Recommended maximum baking cycles:
24 hours @ 300°F (149°C)

Stranded tinned copper conductor

Part No.	AWG (stranding) [sq.mm] (stranding in mm)	Insulation Thickness Inch	Insulation Thickness mm	Nominal OD Inch	Nominal OD mm	Standard Lengths Ft.	Standard Lengths m	Standard Unit Weight Lbs.	Standard Unit Weight kg	Stock Colors (See Color Codes Chart on Page 3.29)
600V, 105°C (UL & CSA)										
UL AWM Style 3191 • CSA Type CL1053										
34418	18 (16x30) [.81 (16x.25)]	.045	1.14	.142	3.61	100†	30.5	2.3	1.0	2, 10
						500††	152.4	8.0	3.6	2, 4, 5, 8–10, 13
						5000▼	1524.0	75.0	34.1	2, 5, 8, 10
34416	16 (26x30) [1.32 (26x.25)]	.045	1.14	.155	3.94	100†	30.5	2.8	1.3	2, 10
						500††	152.4	10.5	4.8	2, 4, 5, 8–10, 13
						4000▼	1219.2	84.0	38.1	8, 10
34414	14 (41x30) [2.08 (41x.25)]	.045	1.14	.170	4.32	100†	30.5	3.7	1.7	2, 8, 10
						500††	152.4	14.0	6.4	2, 5, 8, 10
						4000▼	1219.2	108.0	49.1	8, 10
34412	12 (65x30) [3.29 (65x.25)]	.045	1.14	.190	4.83	100†	30.5	4.6	2.1	2, 8, 10
						500††	152.4	17.5	7.9	2, 5, 8, 10, 13
						3000▼	914.4	114.0	51.8	10

†100 ft. put-ups are one piece, exact. ††250 ft. and 500 ft. put-ups are exact, may contain 2 pieces max. Min. length 50 ft.
▼May contain more than one piece. Minimum length of any one piece is 200 ft.

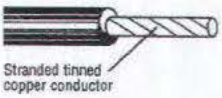
UL AWM Style 3191, 3192, 3193 600V, 105°C
(CSA Type CL1052, 300V)

Product Description

This insulation is chlorosulfonated polyethylene. Hypalon insulation has excellent heat resistance, color stability and electrical properties. Hypalon is recommended for motor leads for Class 130(B) insulation systems. It may be considered as an alternative to Silicone rubber to withstand 155°C varnish baking temperatures, but is not suitable for operating temperatures above Class 130(B).

Recommended maximum baking cycles:
24 hours @ 300°F (149°C)

Stranded Conductor



Stranded tinned copper conductor

Separator Over Conductor

Separator

Hypalon is a DuPont trademark.

600V, 105°C (UL) • **300V, 105°C** (CSA)

UL AWM Style 3191 • CSA Type CL1052**										
34410	10 (65x28) [5.23 (65x.32)]	.045	1.14	.209	5.31	100†	30.5	6.0	2.7	8, 10
						500††	152.4	24.5	11.2	8, 10
						2000▼	609.6	102.0	46.3	8, 10
UL AWM Style 3192 • CSA Type CL1052**										
34408*	8 (84x27) [8.60 (84x.36)]	.060	1.52	.290	7.37	100†	30.5	9.4	4.3	8, 10
						250††	76.2	24.8	11.2	8, 10
34406*	6 (84x25) [13.66 (84x.46)]	.060	1.52	.343	8.71	100†	30.5	13.7	6.2	8, 10
						250††	76.2	32.3	14.7	10
						1000▲	304.8	136.0	61.8	10
34404*	4 (105x24) [21.53 (105x.51)]	.060	1.52	.399	10.14	100†	30.5	19.1	8.7	8, 10
						250††	76.2	51.0	23.2	10
						500††	152.4	97.0	44.1	10
34403*	3 (133x24) [27.28 (133x.51)]	.060	1.52	.420	10.69	500††	152.4	118.0	53.6	10
34402*	2 (163x24) [33.43 (163x.51)]	.060	1.52	.454	11.53	100†	30.5	30.3	13.8	8, 10
						250††	76.2	70.8	32.2	10
						500††	152.4	139.0	63.2	10
UL AWM Style 3193 • CSA Type CL1052**										
34401*	1 (210x24) [43.07 (210x.51)]	.080	2.03	.557	14.15	50†	15.2	18.4	8.4	10
						100†	30.5	43.0	19.5	8, 10
						250††	76.2	97.0	44.1	10
34490*	1/0 (262x24) [53.73 (262x.51)]	.080	2.03	.607	15.42	50†	15.2	22.5	10.3	8, 10
						100†	30.5	48.9	22.2	10
						250††	76.2	114.8	52.2	10
34400*	2/0 (504x26) [67.85 (504x.41)]	.080	2.03	.668	16.97	50†	15.2	27.6	12.6	8
						100†	30.5	57.9	26.3	10
						250††	76.2	139.5	63.4	10
34430*	3/0 (630x26) [84.81 (630x.41)]	.080	2.03	.732	18.59	50†	15.2	38.5	17.5	10
						250††	76.2	175.8	79.9	10
34440*	4/0 (805x26) [108.37 (805x.41)]	.080	2.03	.819	20.80	50†	15.2	47.5	21.5	8, 10
						250††	76.2	215.0	97.7	10

*Separator over conductor. **CSA requires additional wall thickness in sizes 10 AWG and larger to meet CL1053 requirements.

†50 and 100 ft. put-ups are one piece, exact. ††250 and 500 ft. put-ups are exact, may contain 2 pieces max. Min. length 50 ft.
▲1000 ft. put-ups exact, may contain 3 pieces max. Minimum length of any one piece is 50 ft.
▼May contain more than one piece. Minimum length of any one piece is 200 ft.

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABITAT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

DRAWING NO.	DESCRIPTION
E01	TITLE PAGE
E02	MCC 1 EXTERIOR LAYOUT
E03	MCC 1 INTERIOR LAYOUT
E04	BLANK SHEET
E05	PUMP #1 POWER & 120 VOLT SCHEMATIC
E06	PUMP #1 24 VOLT DC SCHEMATIC
E07	PUMP #2 POWER & 120 VOLT SCHEMATIC
E08	PUMP #2 24 VOLT DC SCHEMATIC
E09	PUMP #3 POWER & 120 VOLT SCHEMATIC
E10	PUMP #3 24 VOLT DC SCHEMATIC

H-170

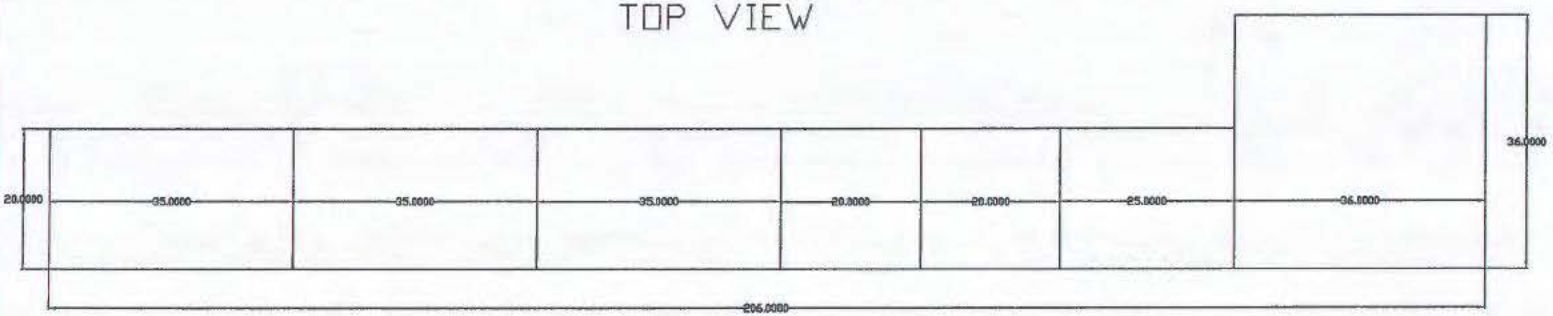
S&K EQUIPMENT COMPANY, Inc.
.. Vision Quality Counts ..
P.O. BOX 345, 2045 26TH ST. VINCENNES, IN. 47591

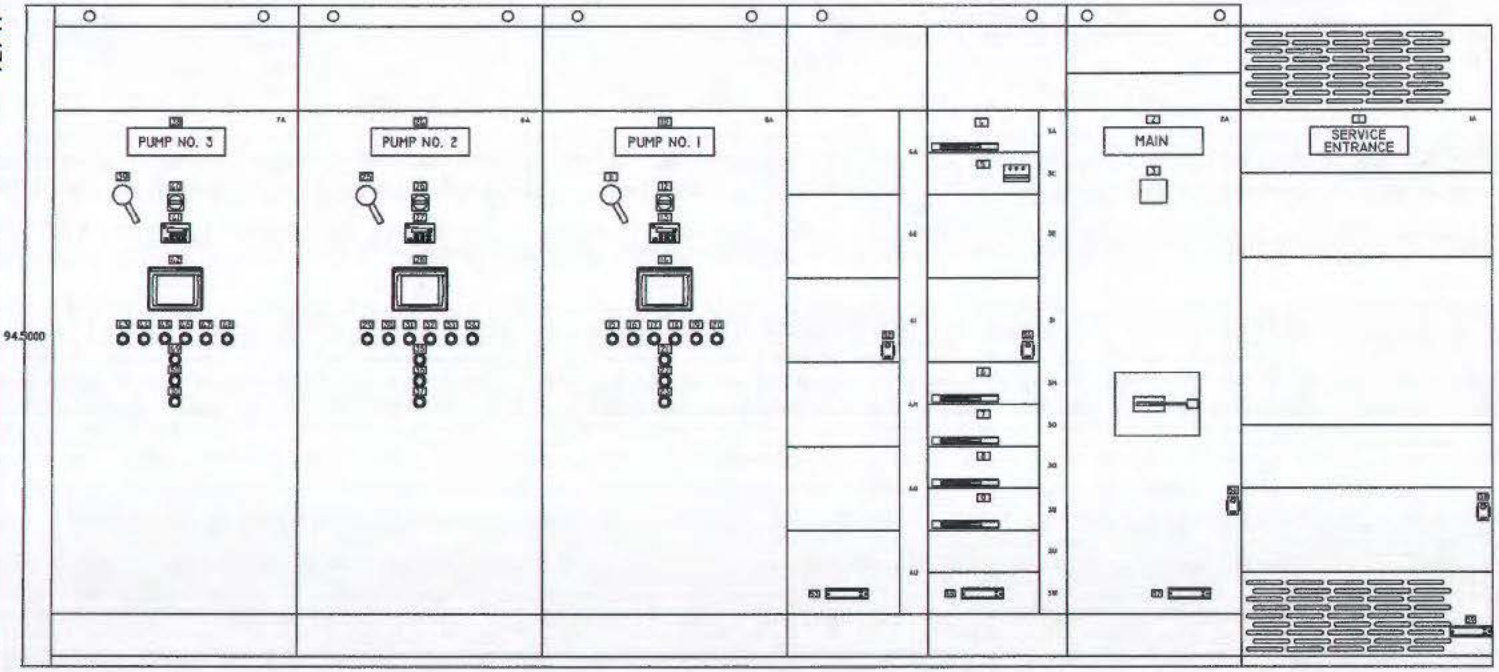
ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

TITLE PAGE

JOB #	501-11
DRAWN BY	K.K.
CHKD BY	N/A
DATE	11/15/11
DWG #	DC11111201E01
REV.	NONE 0
SHEET	K.K.
SHT.	1 10

TOP VIEW



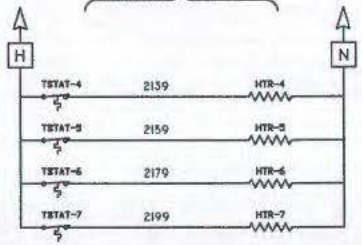


NOTE: SEE MCC MANUFACTURER DRAWINGS FOR DETAILED INFORMATION ON CONSTRUCTION

NAMEPLATE LIST

NO.	NAMEPLATE	SCHEMATIC COMPONENT
1	SERVICE ENTRANCE	N/A
2	MAIN BREAKER	CB2A
3	POWER MONITOR	PM
4	TVSS CB	TVSS CB
5	TVSS	TVSS
6	TRI	N/A
7	UNIT HEATER	N/A
8	BLANK	N/A
9	BLANK	N/A
10	PUMP NO. 1	N/A
11	MCP 1A	MCP1A
12	ETH-1	ETH-1
13	SSRV 1	SSRV 1
14	PCH 1	PCH 1
15	ENABLED	PL1-4
16	LOW LEVEL	PL1-2
17	STOPPED	PL1-5
18	RUNNING	PL1-3
19	CALLED	PL1-1
20	FAULT	PL1-6
21	START	PB1-1
22	STOP	PB1-2
23	RESET	PB1-3
24	PUMP NO. 2	N/A
25	MCP 2A	MCP2A
26	ETH-2	ETH-2
27	SSRV 2	SSRV 2
28	PCH 2	PCH 2
29	ENABLED	PL2-4
30	LOW LEVEL	PL2-2
31	STOPPED	PL2-5
32	RUNNING	PL2-3
33	CALLED	PL2-1
34	FAULT	PL2-6
35	START	PB2-1
36	STOP	PB2-2
37	RESET	PB2-3
38	PUMP NO. 3	N/A
39	MCP 3A	MCP3A
40	ETH-3	ETH-3
41	SSRV 3	SSRV 3
42	PCH 3	PCH 3
43	ENABLED	PL3-4
44	LOW LEVEL	PL3-2
45	STOPPED	PL3-5
46	RUNNING	PL3-3
47	CALLED	PL3-1
48	FAULT	PL3-6
49	START	PB3-1
50	STOP	PB3-2
51	RESET	PB3-3
52	T-STAT	TSTAT-4
53	HEATER	HTR-4
54	T-STAT	TSTAT-5
55	HEATER	HTR-5
56	T-STAT	TSTAT-6
57	HEATER	HTR-6
58	T-STAT	TSTAT-7
59	HEATER	HTR-7

SPACE HEATER CIRCUIT
FED FROM PNL LP-1



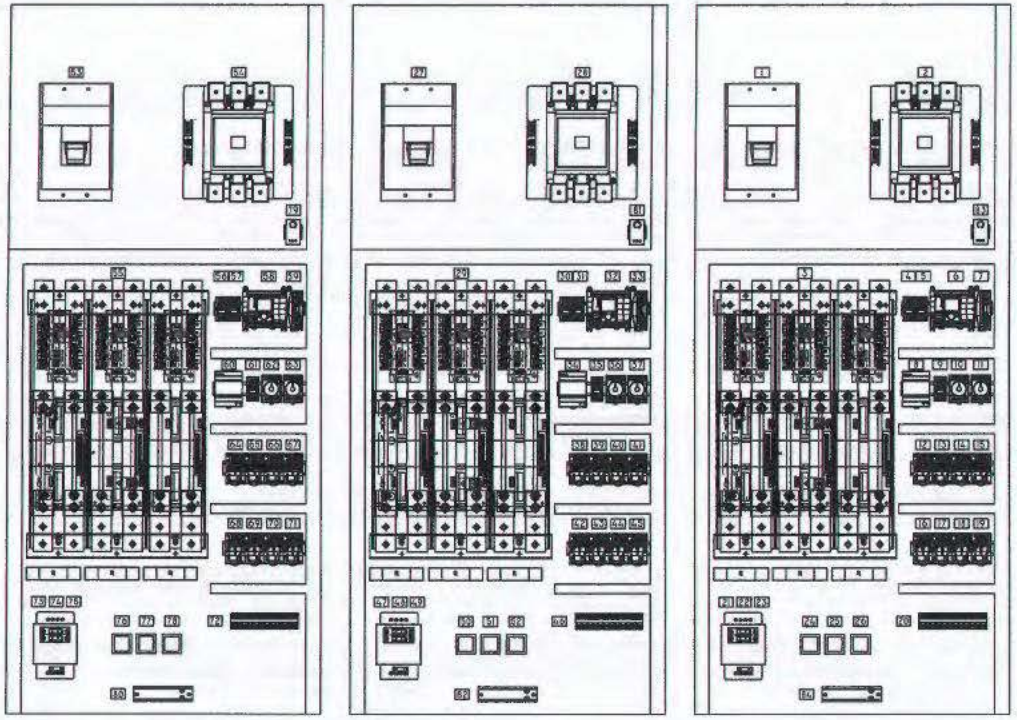
S&K EQUIPMENT COMPANY, Inc.
"Vision Quality Counts"
P.O. BOX 342, 1243 BAYOU ST. VINCENNES, IN 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

MOTOR CONTROL CENTER "MCC 1"
EXTERIOR LAYOUT

JOB #	501-11	DWG NO.	DC111121E02
DRAWN BY	K.K	SCALE	NONE D
LAYOUT BY	N/A	CHECKED	K.K.
REVISION DATE		REV.	

H-171



NAMEPLATE LIST

NO.	NAMEPLATE	SCHEMATIC COMPONENT	NO.	NAMEPLATE	SCHEMATIC COMPONENT
1	MCP-5A	MCP-5A	57	TR2-2	TR2-2
2	IC-1	IC-1	58	CR2-1	CR2-1
3	SSRV-1	SSRV-1	59	CR2-2	CR2-2
4	SLRI-1	SLRI-1	60	CR2-3	CR2-3
5	SLRI-2	SLRI-2	61	CR2-4	CR2-4
6	PC-1	PC-1	62	CR2-5	CR2-5
7	PCEX-1	PCEX-1	63	CR2-6	CR2-6
8	PS-1	PS-1	64	CR2-7	CR2-7
9	SLRI-3	SLRI-3	65	CR2-8	CR2-8
10	TRI-1	TRI-1	66	TB-2	TB-2
11	TRI-2	TRI-2	67	T-2	T-2
12	CRI-1	CRI-1	68	FU2-1,2	FU2-1,2
13	CRI-2	CRI-2	69	FU2-3	FU2-3
14	CRI-3	CRI-3	70	SLM2-1	SLM2-1
15	CRI-4	CRI-4	71	SLM2-2	SLM2-2
16	CRI-5	CRI-5	72	SLM2-3	SLM2-3
17	CRI-6	CRI-6	73	MCP-7A	MCP-7A
18	CRI-7	CRI-7	74	IC-3	IC-3
19	CRI-8	CRI-8	75	SSRV-3	SSRV-3
20	TB-1	TB-1	76	SLR3-1	SLR3-1
21	T-1	T-1	77	SLR3-2	SLR3-2
22	FU1-1,2	FU1-1,2	78	PC-3	PC-3
23	FU1-3	MCP-6A	79	PCEX-3	PCEX-3
24	SLM1-1	SLM1-1	80	PS-3	PS-3
25	SLM1-2	SLM1-2	81	SLR3-3	SLR3-3
26	SLM1-3	SLM1-3	82	TR3-1	TR3-1
27	MCP-6A	MCP-6A	83	TR3-2	TR3-2
28	IC-2	IC-2	84	CR3-1	CR3-1
29	SSRV-2	SSRV-2	85	CR3-2	CR3-2
30	SLR2-1	SLR2-1	86	CR3-3	CR3-3
31	SLR2-2	SLR2-2	87	CR3-4	CR3-4
32	PC-2	PC-2	88	CR3-5	CR3-5
33	PCEX-2	PCEX-2	89	CR3-6	CR3-6
34	PS-2	PS-2	90	CR3-7	CR3-7
35	SLR2-3	SLR2-3	91	CR3-8	CR3-8
36	TR2-1	TR2-1	92	TB-3	TB-3
			93	T-3	T-3
			94	FU3-1,2	FU3-1,2
			95	FU3-3	FU3-3
			96	SLM3-1	SLM3-1
			97	SLM3-2	SLM3-2
			98	SLM3-3	SLM3-3
			99	T-STAT	TSTAT-1
			80	HEATER	HTR-1
			81	T-STAT	TSTAT-2
			82	HEATER	HTR-2
			83	T-STAT	TSTAT-3
			84	HEATER	HTR-3

NOTE: SEE MCC MANUFACTURER DRAWINGS FOR DETAILED INFORMATION ON CONSTRUCTION

S&K EQUIPMENT COMPANY, Inc.
- When Quality Counts -
P.O. BOX 342, 1243 BARTH ST. VINCENNES, IN 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

MOTOR CONTROL CENTER "MCC 1"
INTERIOR LAYOUT

501-11 | DC1111121E03
K.K | NONE | D
N/A | K.K.
2 of 10

H-173

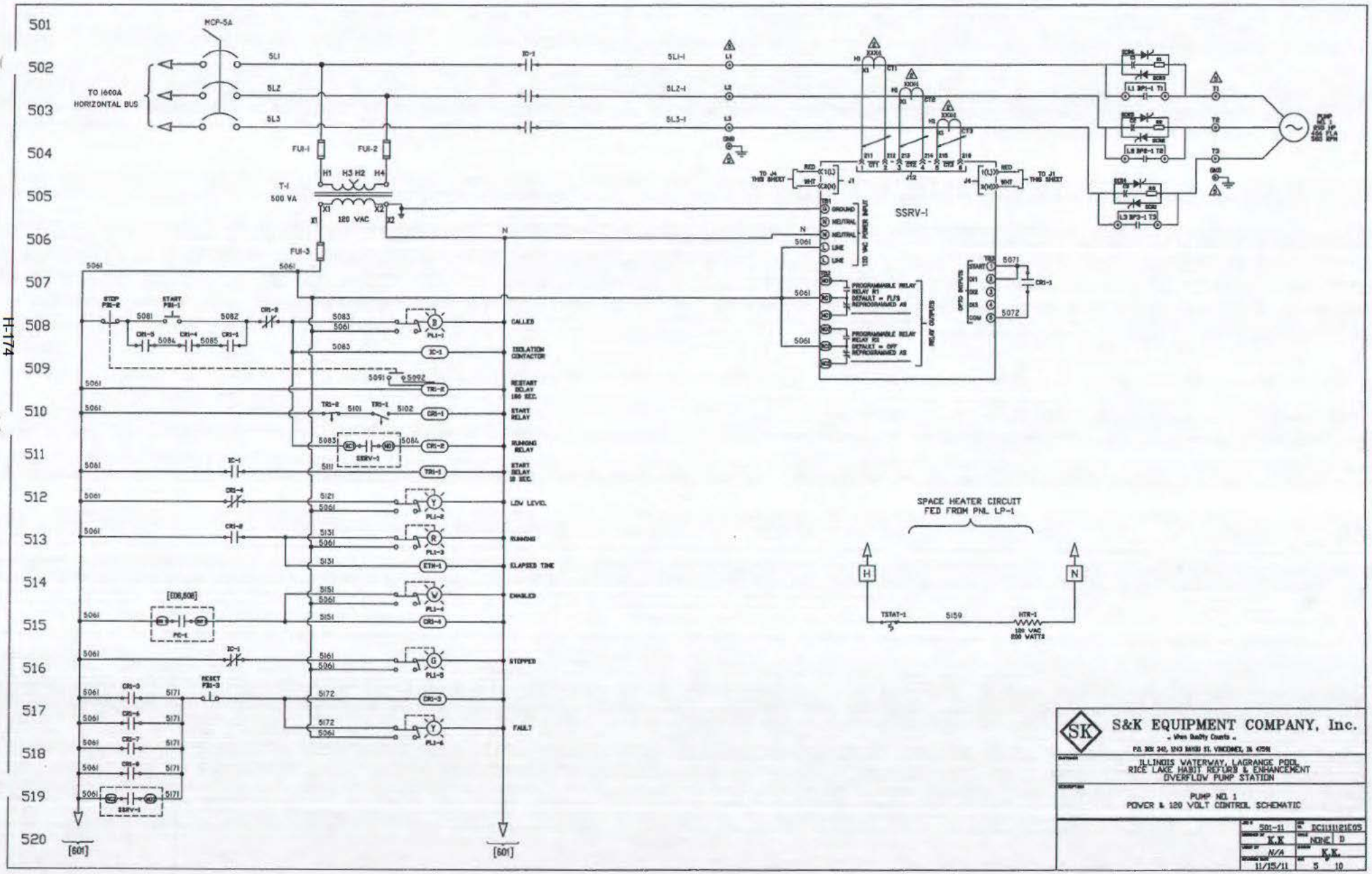
THIS SHEET IS INTENTIONALLY BLANK

S&K EQUIPMENT COMPANY, Inc.
- When Quality Counts -
P.O. BOX 342, 1243 MAIN ST. VINCENNES, IN 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REHAB & ENHANCEMENT
OVERFLOW PUMP STATION

BLANK SHEET

JOB #	501-11
DRAWN BY	K.K
CHKD BY	N/A
REVISED DATE	11/15/11
DWG. NO.	DC1111121C04
SCALE	NONE
REV.	D
SHEET	K.K.
	4 10



H-174

S&K EQUIPMENT COMPANY, Inc.
- When Quality Counts -
P.O. BOX 340, 1243 BAYOU ST. VINCENNES, IN 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT RETURN & ENHANCEMENT
OVERFLOW PUMP STATION

PUMP NO. 1
POWER & 120 VOLT CONTROL SCHEMATIC

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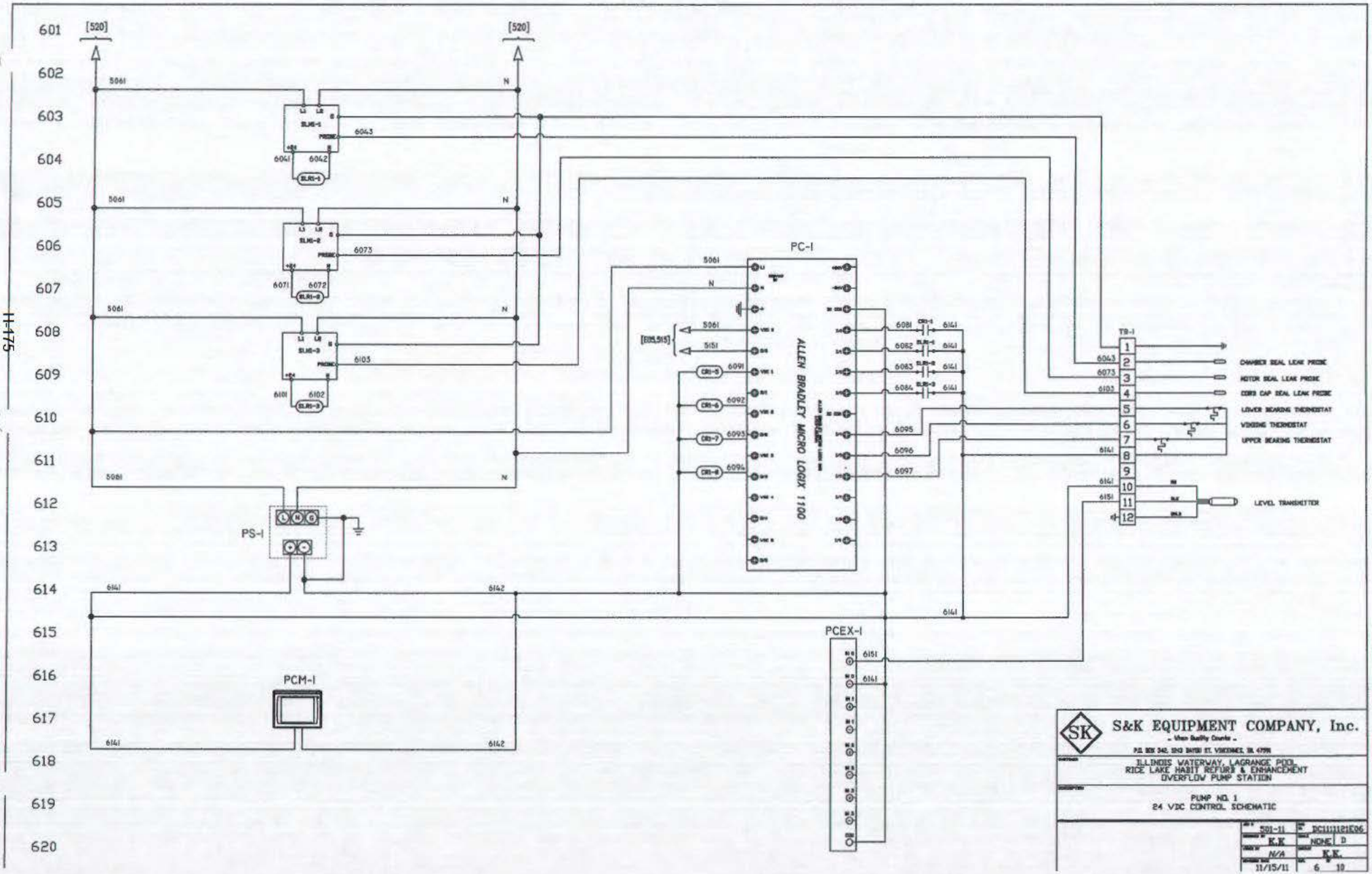
11/15/11	5 10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6102
PC-I
ALLEN BRADLEY MICRO LOGIX 1100
[605,515]
5151
CR1-5
CR1-6
CR1-7
CR1-8
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6095
6096
6097
TB-1
1
2
3
4
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6
7
8
9
10
11
12
CHAMBER SEAL LEAK PROBE
MOTOR SEAL LEAK PROBE
CORD CAP SEAL LEAK PROBE
LOWER BEARING THERMOSTAT
WINDING THERMOSTAT
UPPER BEARING THERMOSTAT
LEVEL TRANSMITTER
6151
PS-1
L
N
G
6142
PCM-1
PCEX-1
S&K EQUIPMENT COMPANY, Inc.
ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REPURB & ENHANCEMENT
OVERFLOW PUMP STATION
PUMP NO. 1
24 VDC CONTROL SCHEMATIC
501-11
DC1111121E06
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NONE
D
N/A
K.K.
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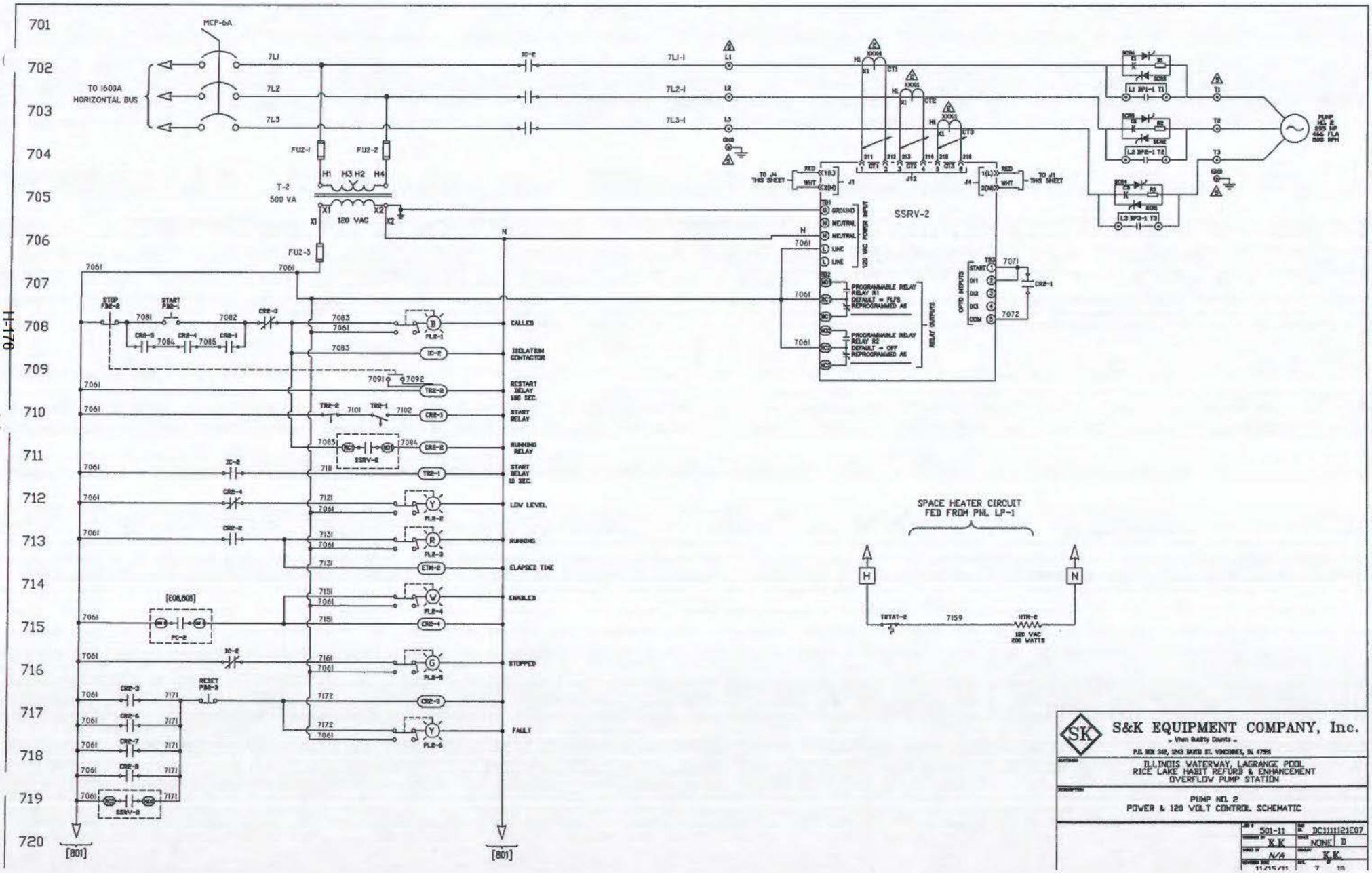
10



S&K EQUIPMENT COMPANY, Inc.
- Vhen Quality Counts -
P.O. BOX 342, 1243 BAYOU ST. VINCENNES, IN 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

PUMP NO. 2
POWER & 120 VOLT CONTROL SCHEMATIC

501-11	DC1111121E07
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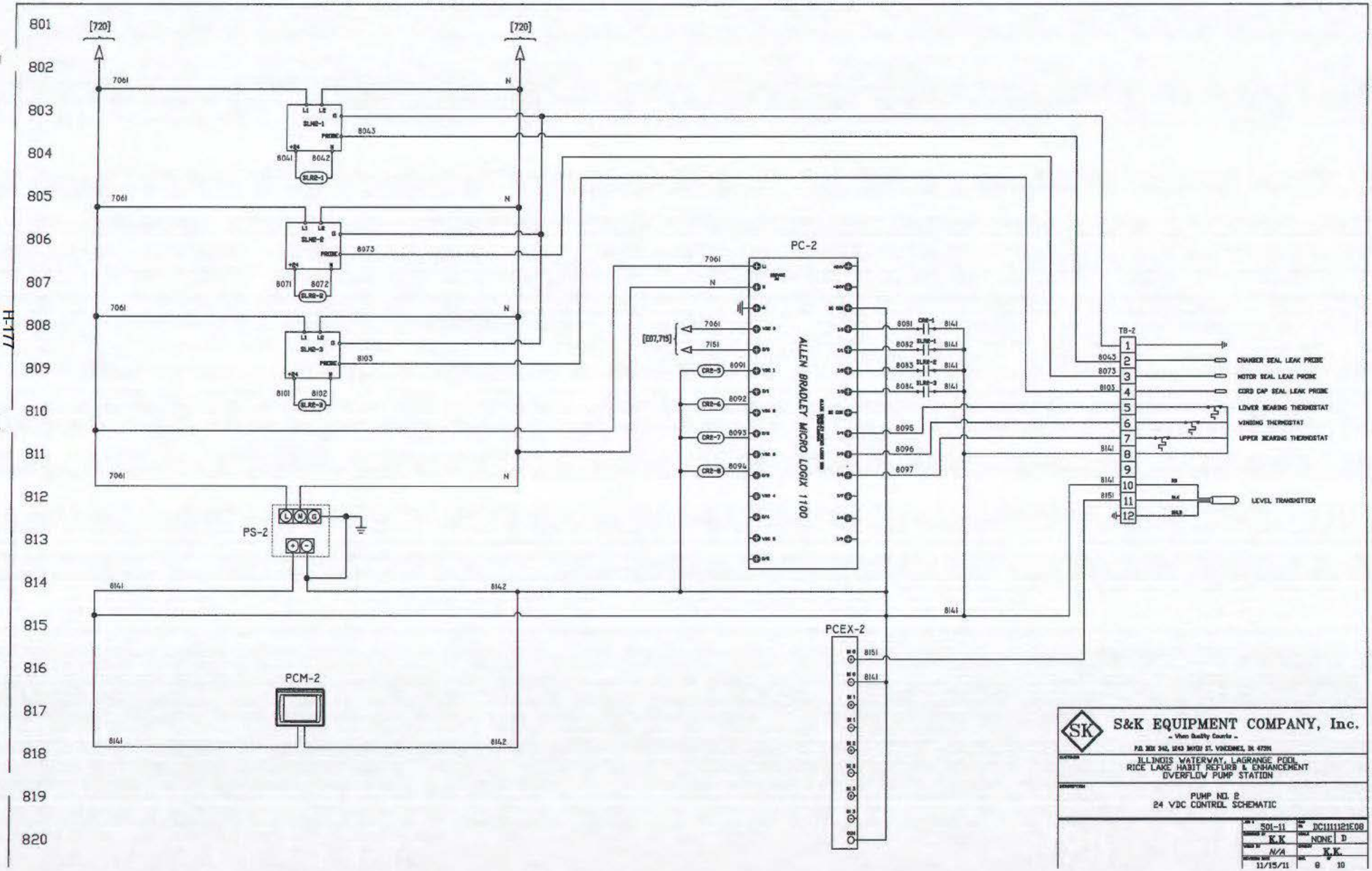
N/A	K.K.
11/15/11	7 10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[720]
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SLM2-1
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SLM2-2
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8101
8102
SLM2-3
PC-2
ALLEN BRADLEY MICRO LOGIX 1100
[207,715]
7151
CR2-5
CR2-4
CR2-7
CR2-8
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8097
8141
TB-2
CHAMBER SEAL LEAK PROBE
MOTOR SEAL LEAK PROBE
CORD CAP SEAL LEAK PROBE
LOWER BEARING THERMOSTAT
WINDING THERMOSTAT
UPPER BEARING THERMOSTAT
LEVEL TRANSMITTER
8151
PS-2
8142
PCEX-2
PCM-2
H-177
S&K EQUIPMENT COMPANY, Inc.
ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION
PUMP NO. 2
24 VDC CONTROL SCHEMATIC
501-11
DC1111121E08
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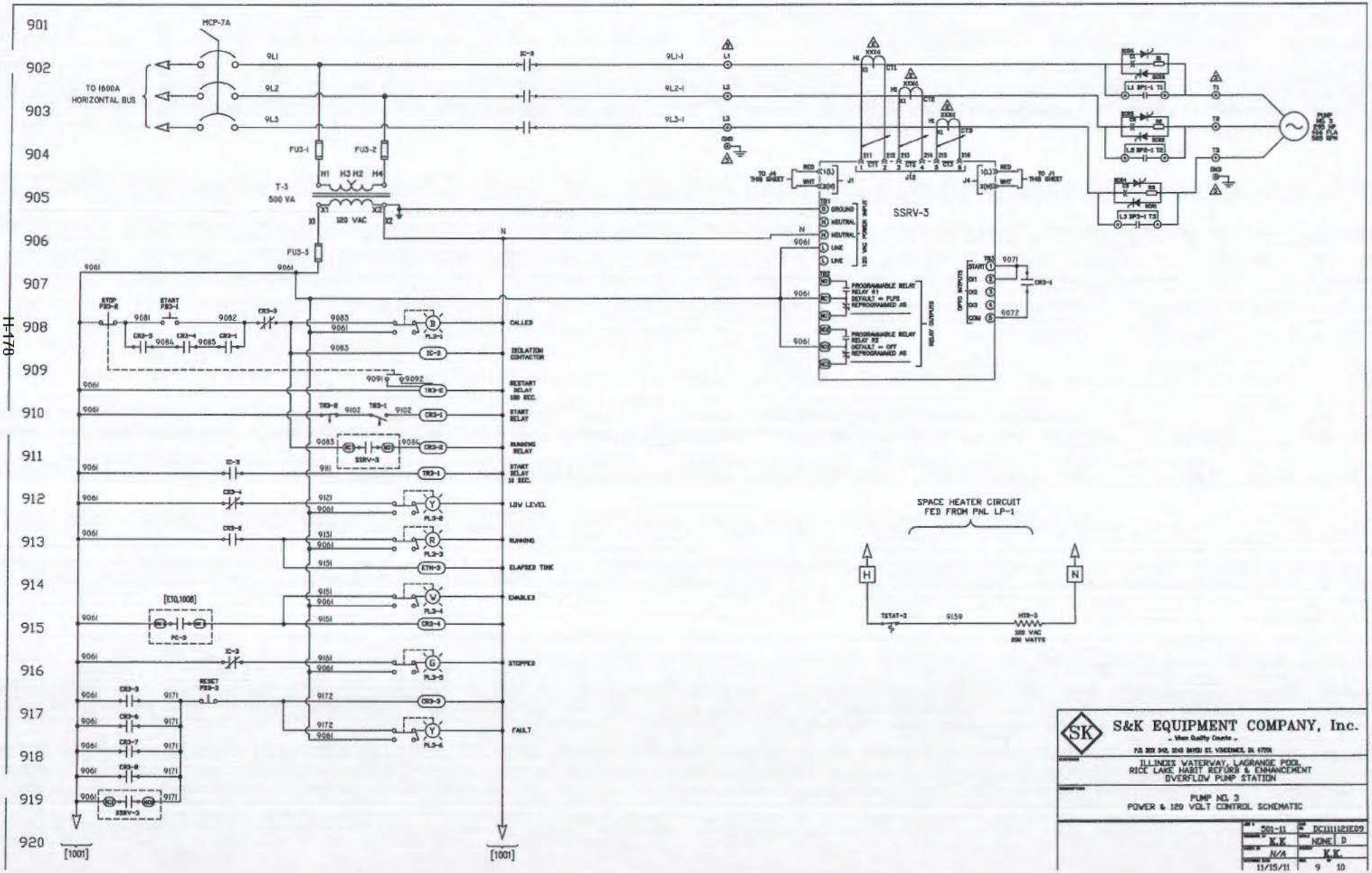
NONE
D
N/A
K.K.
11/15/11
8
10

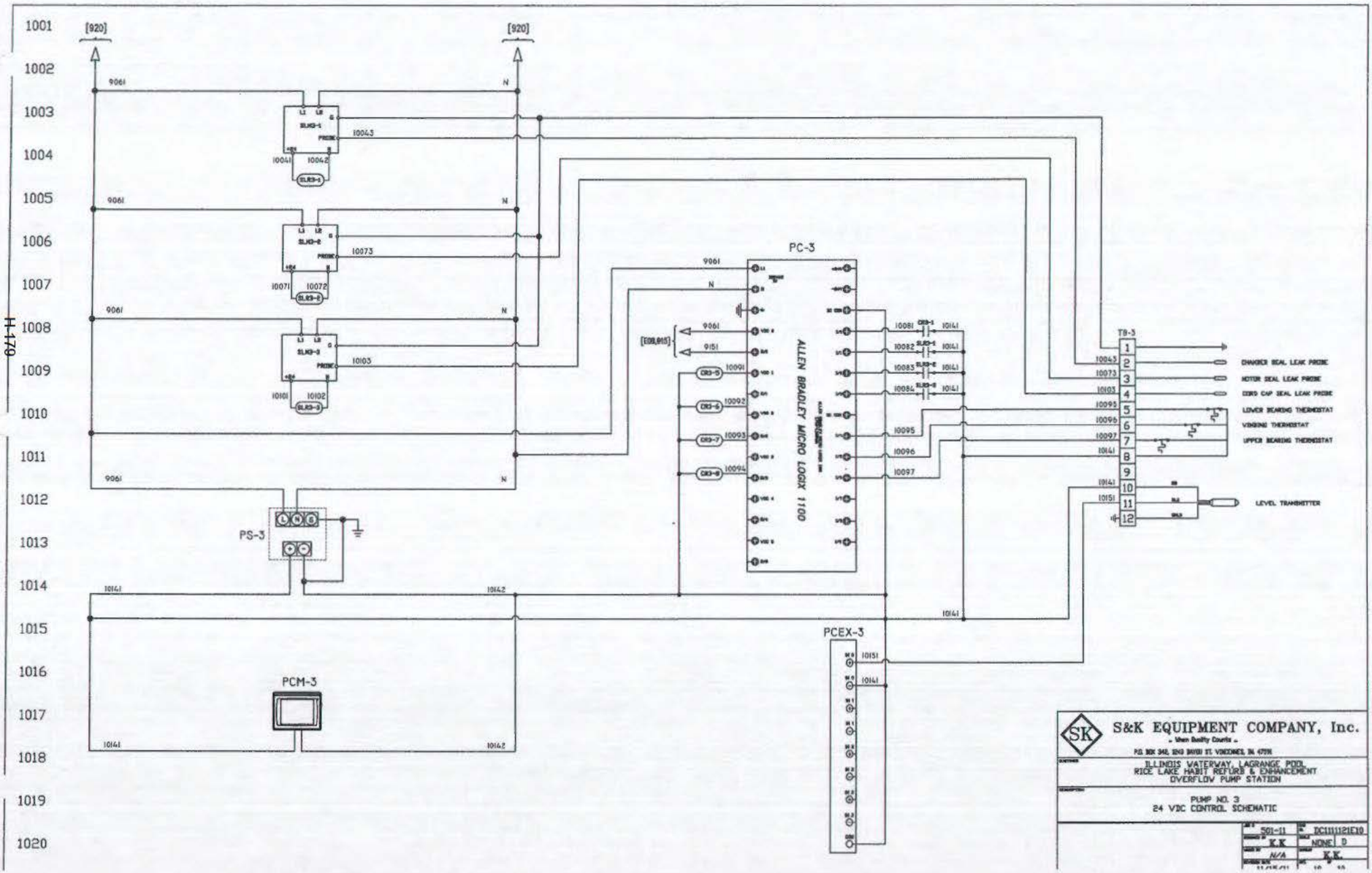


S&K EQUIPMENT COMPANY, Inc.

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFORB & ENHANCEMENT
OVERFLOW PUMP STATION

PUMP NO. 3
POWER & 120 VOLT CONTROL SCHEMATIC

501-11	DC1111121E09
K.K	NONE D
N/A	K.K.
11/15/11	9 10



S&K EQUIPMENT COMPANY, Inc.

"When Quality Counts"

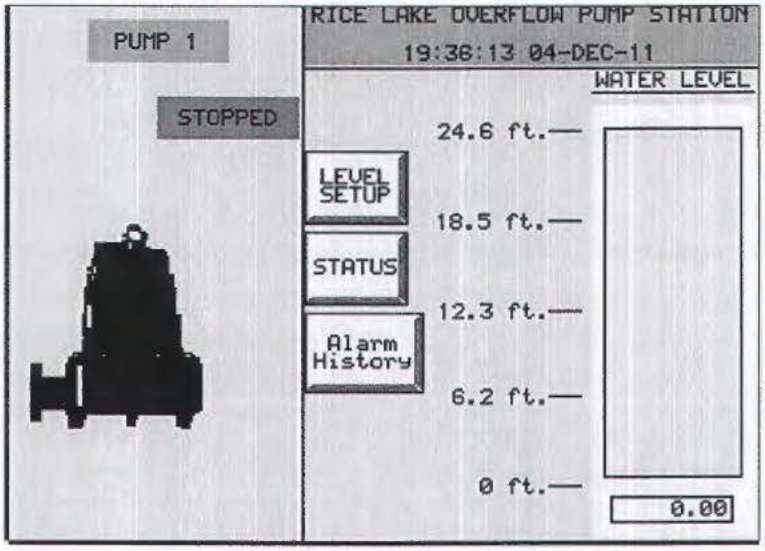
P.O. BOX 340, 1240 DAVIS ST. VINCENNES, IN 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT RETURN & ENHANCEMENT
OVERFLOW PUMP STATION

PUMP NO. 3
24 VDC CONTROL SCHEMATIC

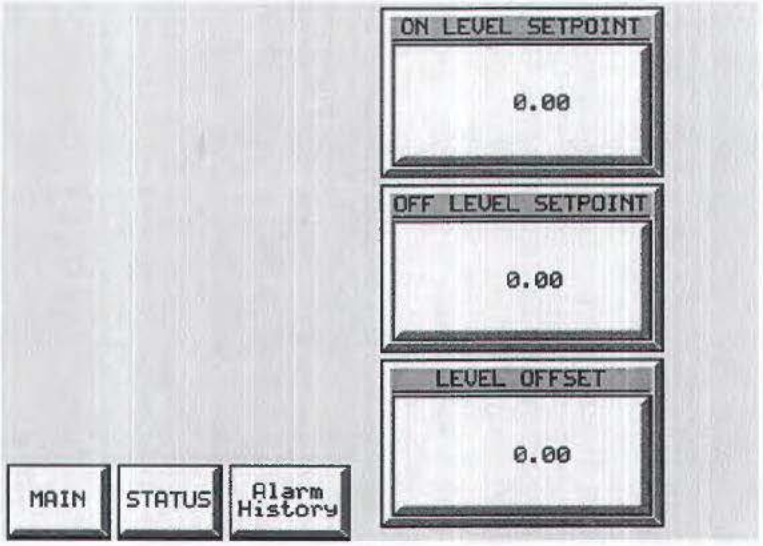
501-11 | DC111121E10
K.K. | NONE | D
N/A | K.K.

MAIN SCREEN



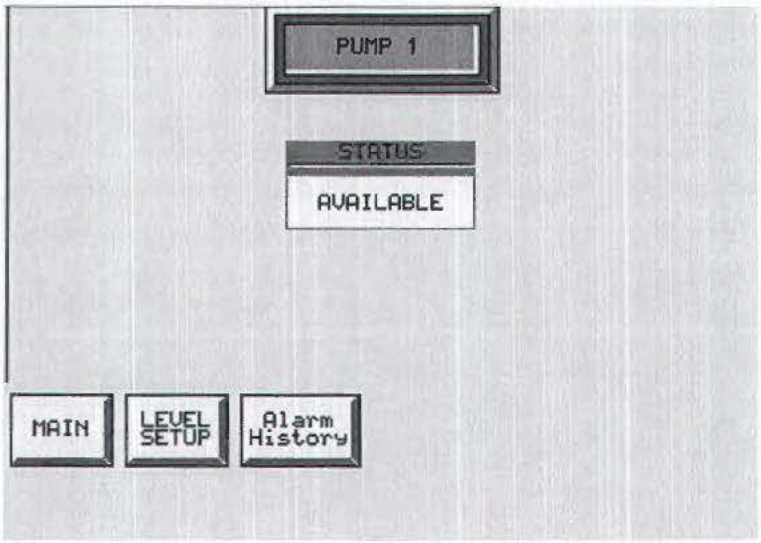
The Main Screen shows an overview of the Pump Status and the Water Level. If a change to the system is required, press the button related to the change that needs to be made.

LEVEL SETPOINT SCREEN



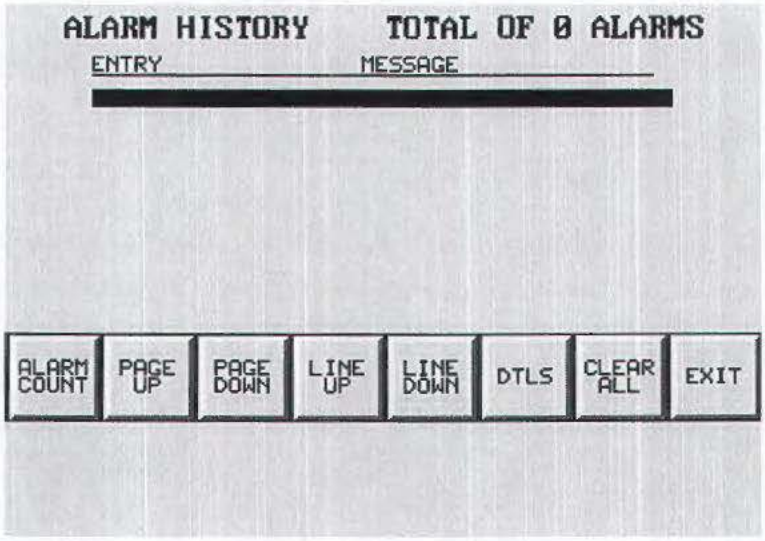
To change the "On and Off" level setpoints, press the button related to the setpoint you wish to change. To set the level for enabling the pump to come on, press the "On Level Setpoint" button. Enter the desired level and press "Enter". To set the level for shutting the pump off, press the "Off Level Setpoint" button. Enter the desired level and press "Enter". Since the submersible level transmitter must be suspended above the bottom of the reservoir, the level reading must be adjusted in order to compensate for the distance between the bottom and the actual elevation of the level transmitter. To change this setting, press the "Level Offset" button and enter a value reflective of the distance from the actual bottom of the reservoir to the bottom of the level transmitter and press enter.

PUMP STATUS SCREEN



The Pump Status Screen displays the current status if its respective pump. From this screen, the run and availability status can be viewed. In the event the pump is removed from service, the status of this pump can be changed to "UNAVAILABLE". This will prevent the pump from being operated. The status of the seal leak and thermal sensors can also be monitored from this screen.

ALARM HISTORY SCREEN



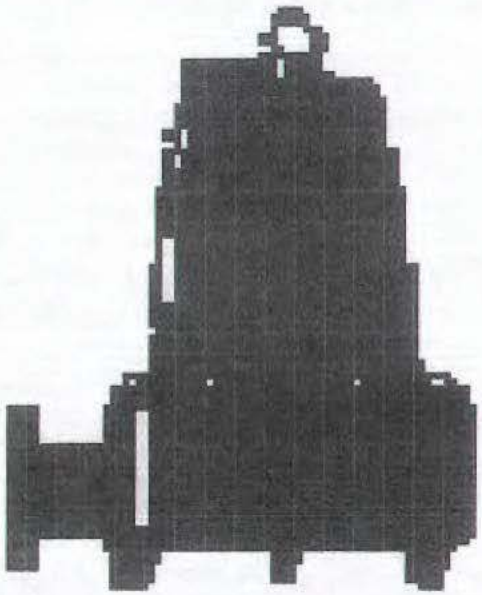
This screen allows the operator to view the history of alarms that have occured with its respective pump. The alarm history will record the actual alarm as well as the time and date of the alarm. The alarm history can be cleared by pressing the "Clear All" button. In the event of an alarm, notification will be projected on the main screen.

RICE LAKE OVERFLOW PUMP STATION

11:12:43 30-AUG-12

PUMP 1

STOPPED



H-182

OFF SETPOINT

0.00

LEVEL SETUP

STATUS

Alarm History

WATER LEVEL

24.6 ft.

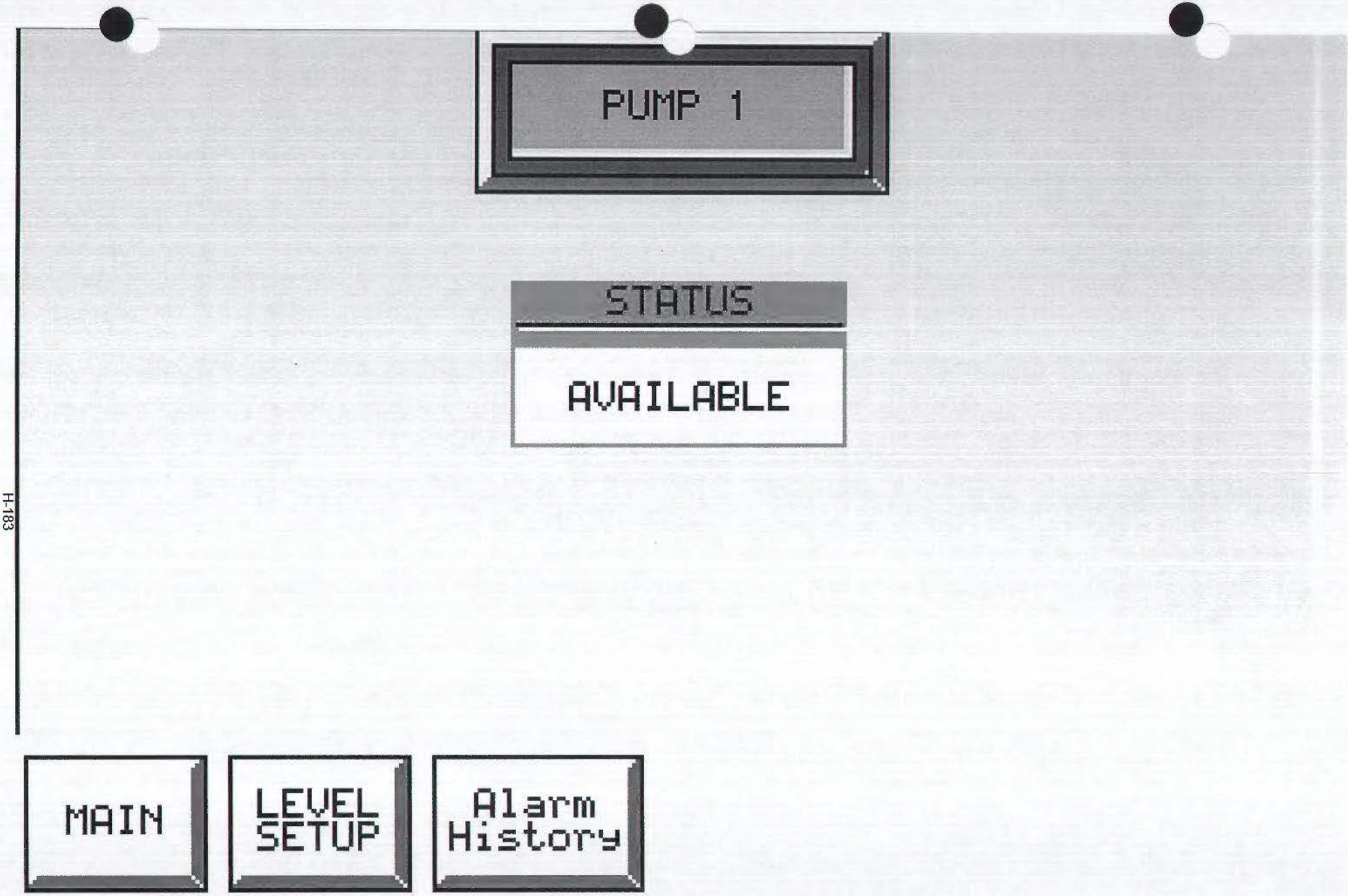
18.5 ft.

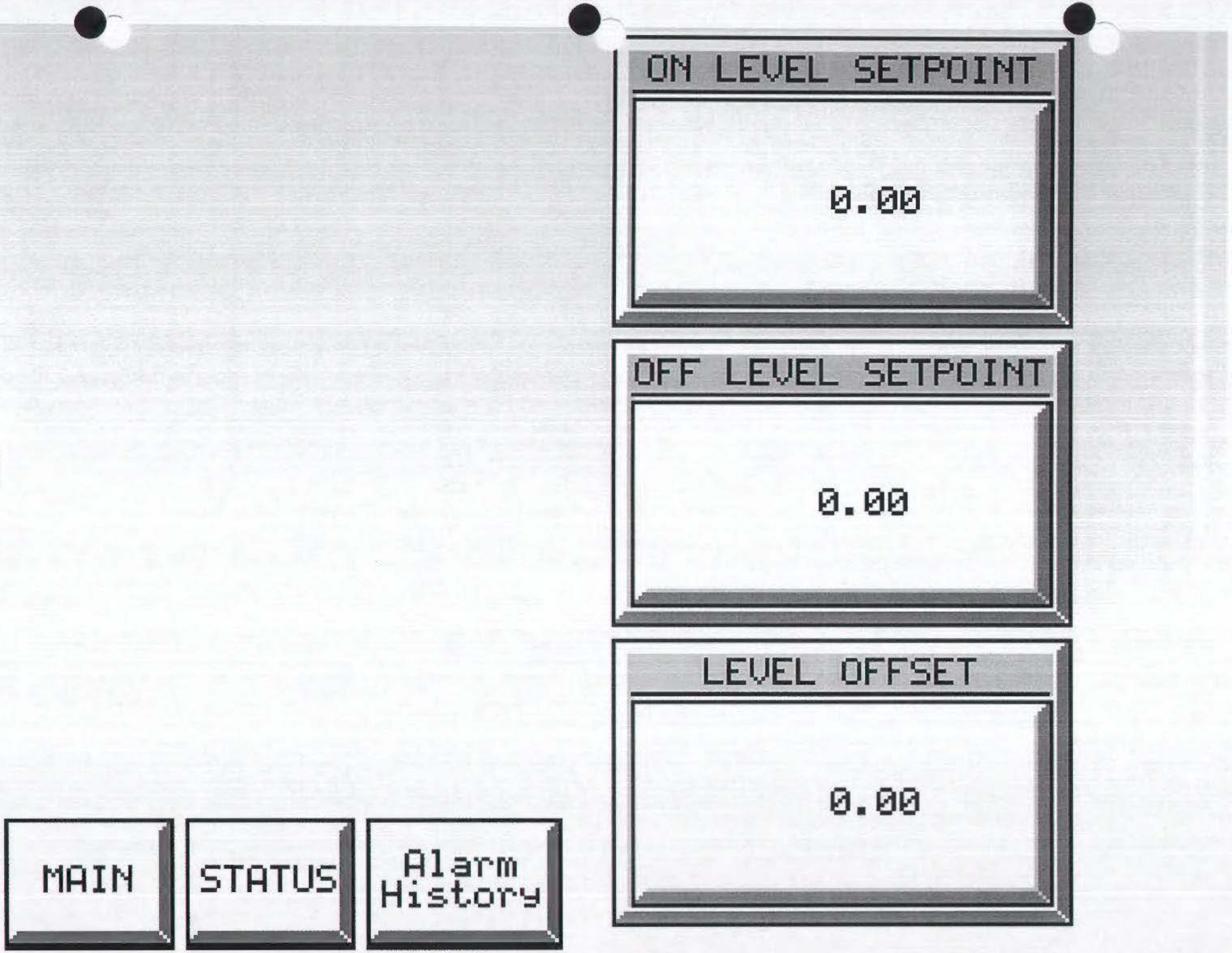
12.3 ft.

6.2 ft.

0 ft.

0.00

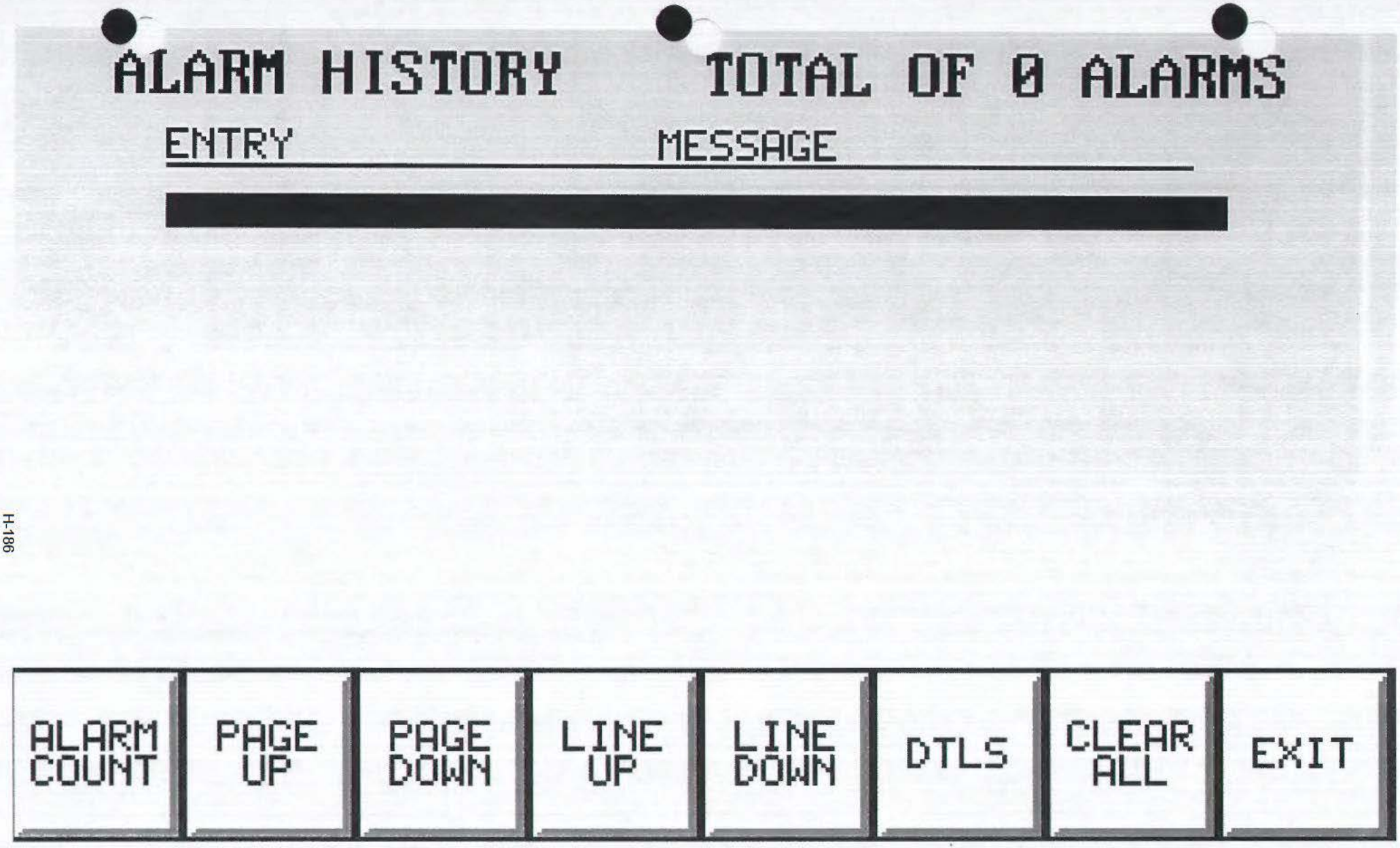

PUMP 1
STATUS
AVAILABLE
MAIN
LEVEL SETUP
Alarm History


ON LEVEL SETPOINT
0.00
OFF LEVEL SETPOINT
0.00
LEVEL OFFSET
0.00
MAIN
STATUS
Alarm History

ALARM COUNT

ALARM	COUNT	MESSAGE
001	00000	LOWER BEARING HIGH TEMP
002	00000	UPPER BEARING HIGH TEMP
003	00000	MOTOR HIGH TEMP
004	00000	SEAL CHAMBER LEAK
005	00000	MOTOR CHAMBER LEAK
006	00000	CORD CAP LEAK

ALARM HIST	PAGE UP	PAGE DOWN	LINE UP	LINE DOWN	CLEAR	CLEAR ALL	EXIT


ALARM HISTORY
TOTAL OF 0 ALARMS
ENTRY
MESSAGE
ALARM COUNT
PAGE UP
PAGE DOWN
LINE UP
LINE DOWN
DTLS
CLEAR ALL
EXIT

Esterline

Pressure Systems

Non-Fouling Submersible Level Transducer

KPSI™ Transducers — Series 750

FEATURES

- Custom Level Ranges to 115 ft (35 m) H_2O
- Analog Outputs of 4-20mA or 0-5 VDC
- Accuracy of ±0.25% FS
- Welded 316 SS and Teflon® PTFE Construction
- Non-clogging 2.75" Sensing Area
- Integral Diaphragm Protector
- Optional Lifetime Lightning Protection
- Optional Temperature Measurement Output
- Custom Cable Lengths

APPLICATIONS

- Lift Stations
- Pump Control
- Slurry

The Series 750 submersible hydrostatic level transducer is specifically designed to meet the rigorous environments encountered in a slurry or highly viscous environment. It provides precision depth measurement under most hostile conditions.

All KPSI Transducers utilize a highly accurate pressure sensor assembly specifically designed for hostile fluids and gases. The assembly is integrated with supporting electronics in a durable waterproof housing constructed of 316SS. The attached electrical cable is custom manufactured to Pressure Systems' specifications and includes Kevlar® members to prevent errors due to cable elongation as well as a unique water block feature that self-seals in the event of accidental cuts to the cable. Each transducer is shipped with our latest SuperDry™ Vent Filter that prevents moisture from entering the vent tube for at least one year without maintenance even in the most humid environments.

These units are designed for installation in a Class I, Division 1, Groups A, B, C, and D, Class II, Division 1, Groups E, F and G, Class III, Division 1 hazardous location when connected to appropriate apparatus such as those manufactured by R. G. Stahl, Inc., and others. KPSI transducers are type approved by the American Bureau of Shipping (ABS) and are UL, CUL, and FM approved; and have a IP 68 and NEMA 6P housing protection rating. The Series 750 is CE compliant to EN 61000-6-4:2001 and EN 61000-6-2:2001.

Pressure Systems, Inc.
34 Research Drive
Hampton, VA 23666
USA
Phone: (757) 865-1243
Toll Free: 800-328-3665
Fax: (757) 865-8744
E-mail: sales@PressureSystems.com

ISO-9001:2000 Certified

Web: PressureSystems.com

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Order On-Line!
E-commerce: LEVELandPRESSURE.com

PSI Ltd.
124, Victoria Road
Farnborough, Hants
GU14 7PW
United Kingdom
Phone: +44 1252 510000
Fax: +44 1252 510099
E-mail: psi@WestonAero.com

Parameter	750	Units	Comments
TEMPERATURE OUTPUT OPTION (AVAILABLE FOR 4-20 MA OUTPUT ONLY) NOT INTRINSIC SAFETY APPROVED			
Temperature Range	0 to 50 -20 to 60	°C	
Temperature Output Signal	4-20	mA	
Temperature Measurement Accuracy	±4	°C	

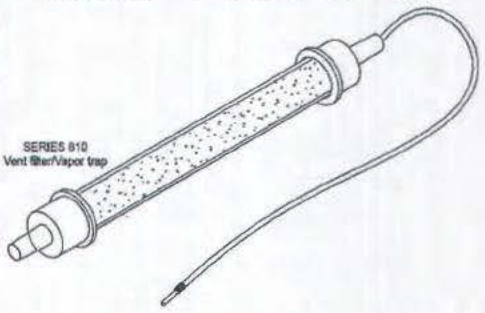
Uniquely-Designed Submersible Cable
Our level transducers utilize one of two types of custom cable made specifically for submersible applications. The cable of choice for most applications is a polyurethane-jacketed cable incorporating Kevlar® strength members to prevent errors due to cable elongation, and a water block liner to prevent water intrusion due to minor cuts to the cable jacket. Polyurethane cable is attached to the transducer using an injection molded polyurethane cable seal.

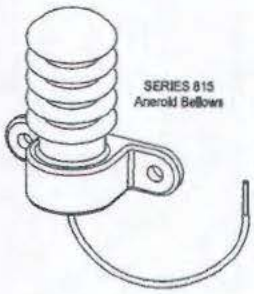
The other alternative is a Tefzel®-jacketed cable which provides superior chemical resistance and toughness yet preserving the other features found in the polyurethane-jacketed cable. Tefzel® is a Teflon® derivative from DuPont and is the better choice for caustic media or when a high degree of abrasion is anticipated. While more expensive and less flexible, it can save money in the long term due to reduced maintenance costs. Tefzel® cable is attached to the transducer using a compressed Viton® gland cable seal.

Both submersible cables have a pull strength of over 200 lbs. In all installations, care should be taken to ensure no damage occurs to the cable as cable damage represents one of the most frequent causes of transducer failure. In the case where the user is not sure which material is best, contact Pressure Systems for assistance.

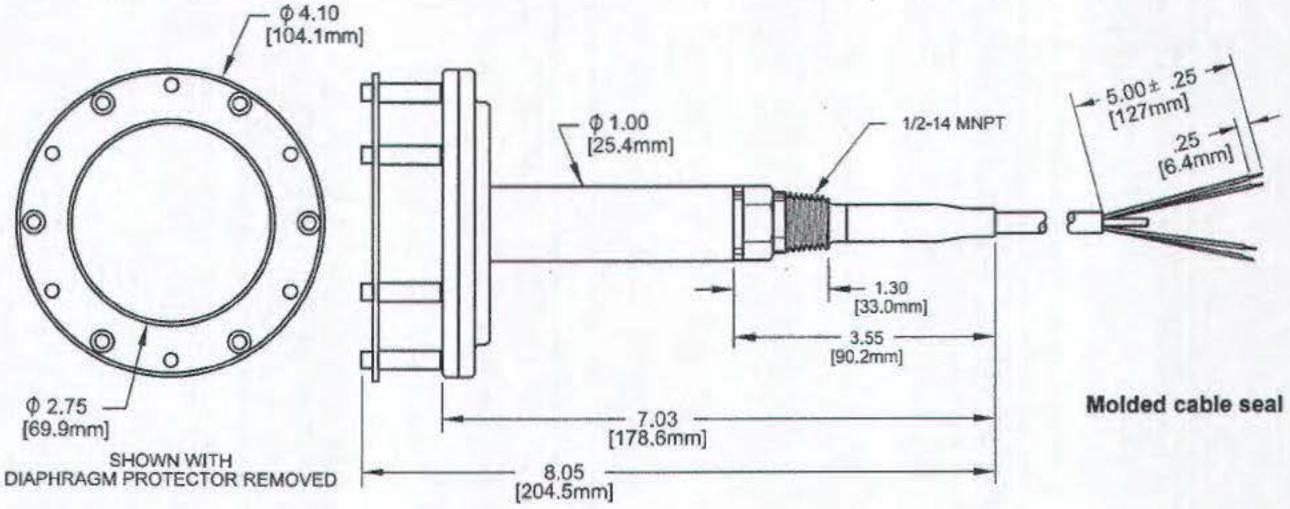
Moisture Protection
Our submersible transducers are equipped with custom, vented cable. The vent provides an atmospheric reference for the sensor, which is necessary for ensuring the highest possible accuracy when making a level measurement. It must be noted that if left unprotected, it provides a pathway for water vapor to enter the level transducer. This vapor will condense into water and could create an offset in the transducer output, or cause permanent damage. For these reasons, a Series 810 desiccant-filled vent filter is provided free of charge with each Series 750 we ship. Our latest SuperDry™ Vent Filter prevents moisture from entering the vent tube for at least one year without maintenance. Replacement filters are available from the factory.

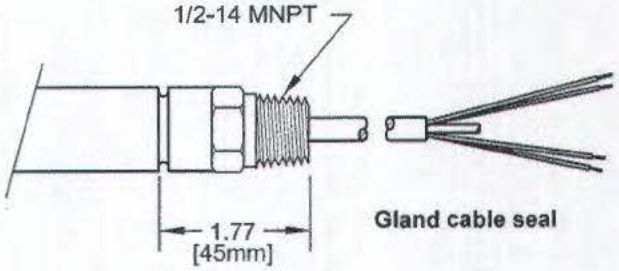
SuperDry™ Long Life Vent Filter



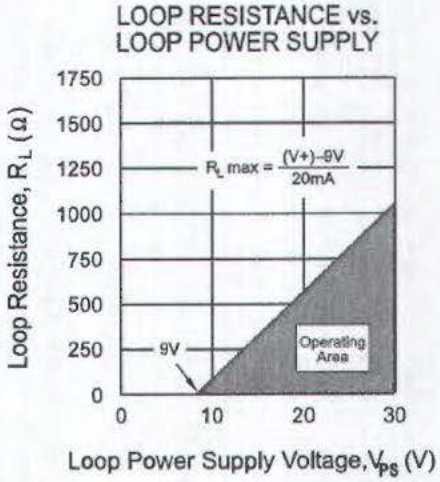


For those applications where periodic maintenance is not practical, our Series 815 Aneroid Bellows is a direct replacement for the vent filter. This sensitive bellows responds to and transmits changes in atmospheric pressure to the sensor while remaining a maintenance-free, closed system. It should be noted, however, that the Bellows may not be a suitable replacement for the desiccant cartridge in applications where extremely high accuracy is required, usually 0.25% or better or where the bellows may be exposed to extreme temperature changes. The user is cautioned to evaluate a Bellows in the specific application intended.





ELECTRICAL TERMINATION		
22AWG CONDUCTORS IN A SHIELDED CABLE WITH VENT TUBE		
4-20 mA	RED	+ EXCITATION
	BLACK	- EXCITATION
0-5 VDC	RED	+ EXCITATION
	BLACK	- EXCITATION
	WHITE	+ SIGNAL
ALL	DRAIN WIRE	SHIELD



Esterline

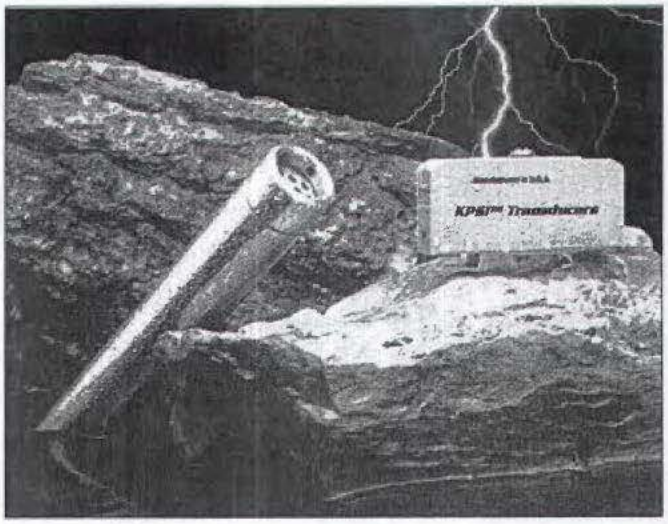
Pressure Systems

Surge Protection for Transducers and Transmitters

KPSI™ Transducers Option-009 and -012

FEATURES

- Lifetime Warranty Protection vs. Voltage Surge
- Low Peak Clamping Voltage
- Up to 20,000 Amperes Peak Surge Protection
- Automatically Resets
- FM/UL-approved for Hazardous Environments



APPLICATIONS

- Well Monitoring
- Storm Water
- Leachate Levels
- Ground Water Monitoring
- Sludge/Slurry
- Pump Control
- Irrigation
- Tank Levels
- Dewatering

OPTION-009 and OPTION-012 Surge protection kits are designed to protect above and below ground pressure transducers from damaging surge voltage and current. The OPTION-009 protector is designed for 4-20 mA current loop (2 wire) transmitters while the OPTION-012 protector is for VDC output and all other 3 wire circuits. Designed in cooperation with a major manufacturer of surge protection devices, these systems are capable of protecting against fast rising voltage transients as well as current surges associated with lightning discharges.

The protectors are a multi-stage design, with a solid state section that intercepts the leading edge of the surge within nanoseconds. The second stage of the design contains a gas discharge tube which crowbars up to 20 ,000 ampere currents to ground. The tube remains in the crowbar state until the surge has passed, then automatically resets the line to normal operation without the need to reset a circuit breaker.

Each system consists of two parts. One is housed integral to the pressure transducer housing via a factory-installed extension to the cable end of the transducer housing while the other is installed by the user between the transducer wiring and the power supply/readout. The protectors are FM and UL Intrinsic Safety rated for use in hazardous environments when used with an appropriate barrier.

The transducer is covered against damage due to lightning or voltage spikes for the life of the instrument, however, it is not meant to protect against continuous overvoltage and will not be warranted for such applications. This option is available on the Models 27, 28, 30, & 35 above ground pressure transducers and on the Models 500, 700, 705, 710, 720, 730, 735, & 750 submersible level transducers. This protection is available from the factory on all new units, on units sent for repair, or on existing units that are in good working condition.

Pressure Systems, Inc.
34 Research Drive
Hampton, VA 23666
USA
Phone: (757) 865-1243
Toll Free: 800-328-3665
Fax: (757) 865-8744
E-mail: sales@PressureSystems.com

ISO-9001:2000 Certified

Web: PressureSystems.com

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Order On-Line!
E-commerce: LEVELandPRESSURE.com

PSI Ltd.
124, Victoria Road
Farnborough, Hants
GU14 7PW
United Kingdom
Phone: +44 1252 510000
Fax: +44 1252 510099
E-mail: psi@WestonAero.com

PRESSURE SYSTEMS

ISO-9001:2000 Certified

Maintenance-Free Aneroid Bellows

KPSI™ Transducers — Series 815

FEATURES

- Replacement for Desiccant Vent Filter
- Small Size
- Maintenance-Free
- Includes Mounting Bracket
- Compatible with all KPSI Submersible Transducers

For most submersible transducer applications, the Series 815 Aneroid Bellows is a maintenance-free alternative to traditional desiccant cartridges widely used to prevent moisture from entering and condensing in the vent tube of a submersible pressure transducer cable.

Constructed of a rugged yet flexible neoprene material, the Aneroid Bellows is a compact 3.25 inches in height and 3 inches in diameter. This field-installable device connects to the cable vent tube via a flexible extension provided with the bellows. This sensitive bellows responds to changes in atmospheric pressure ensuring reliable liquid level measurements. Preferred mounting location is inside a junction box or control panel.

The Aneroid Bellows is the preferred replacement for the older technologies of replaceable inline moisture filters and desiccant packs that require strict maintenance schedules for fault-free operation and warranty protection. It should be noted, however, that the Bellows may not be a suitable replacement for the desiccant cartridge in applications with extremely high temperature and where high accuracy is required, usually 0.25% or better.

Pressure Systems, Inc.
An Esterline Company
34 Research Drive
Hampton, VA 23666
USA
Phone: (757) 865-1243
Toll Free: 800-328-3665
Fax: (757) 865-8744
E-mail: sales@PressureSystems.com

Order On-line!

Web: PressureSystems.com

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Resource Center: LEVELandPRESSURE.com

PSI Ltd.
124, Victoria Road
Farnborough, Hants
GU14 7PW
United Kingdom
Phone: +44 1252 510000
Fax: +44 1252 510099
E-mail: psi@WestonAero.com

Rice Lake Habitat Rehab & Enhancement

Canton, IL

Motor Control Center
Testing Documentation

Contractor:
SAF, Inc.
Akron, OH

Engineer:
U. S. Army Corp of Engineers.
Rock Island District

Equipment Supplier:
Flow-Technics, Inc.
Frankfort, IL

Project No. W912EK-11-C-0090
Customer PO: PO00001805

S & K Job #501-11

Respectfully Submitted by:
S & K Equipment Company, Inc.
1243 Bayou Street
P. O. Box 342
Vincennes, IN 47591
Ph (812) 886-0245
Fx (812) 886-1211

A APPROVAL RECOMMENDED
DATE 9/16/13 BY BR

8-25-2013

S & K EQUIPMENT COMPANY, Inc.
... When Quality Counts ...

P. O. Box 342
1243 Bayou Street
Vincennes, IN 47591
Ph (812) 886-0245
Fx (812) 886-1211

Rice Lake Habitat Rehabilitation
LaGrange Pool
Fulton County, IL
S & K Job # 501-11

SYSTEM DESCRIPTION AND OPERATING INSTRUCTIONS

INDEX

Section 1

System Description & Functionality

The Motor Control Center consists of (7) individual sections as defined below. The sections are connected together via a copper bus and provide for 480 volt power distribution to the building as well as controls for the control of (3) submersible pumps. This layout is depicted on the drawing labeled DC1111121E02 in section 4 of this manual.

MCC Section: 1 – Service Entry Section

The Service Entry Section provides for the connection of the Electric Utility to the MCC Lineup. The structure is designed per the specification for Ameren Energy to install Current Transformers in line with the bus work.

MCC Section: 2 – Main Breaker Section

The Main Breaker Section contains a 1600 amp circuit breaker, which feeds the horizontal bus to the remaining sections. It also contains the electronic equipment for the power monitoring system.

MCC Section: 3 – First Vertical Section

The First Vertical Section houses the following devices from top to bottom respectively:

- Power Monitor Readout
- TVSS Circuit Breaker
- TVSS Readout
- Spare 12" Section
- Spare 12" Section
- TR1 Transformer Feed Breaker
- UH-1 Unit Heater Feed Breaker
- Spare 20 amp Breaker for future use
- Spare 20 amp Breaker for future use

MCC Section: 4 – Second Vertical Section

The entire Second Vertical Section is designated as spare for future use

MCC Section: 5 – PUMP #1 Vertical Section

The Third Vertical Section houses the Main Circuit Breaker and all devices used in the control of Submersible Pump #1.

MCC Section: 6 – PUMP #2 Vertical Section

The Sixth Vertical Section houses the Main Circuit Breaker and all devices used in the control of Submersible Pump #2

MCC Section: 7 – PUMP #3 Vertical Section

The Seventh Vertical Section houses the Main Circuit Breaker and all devices used in the control of Submersible Pump #3

FUNCTIONALITY

The Motor Control Center is designed to control the operation of (3) Submersible Pumps independently from one another. MCC Sections 5, 6, and 7 house the components which control the stopping, starting and monitoring of these pumps. All three pump control sections are identical with regard to functionality. They differ only in the labeling of the components and wires.

The controls are designed to start the pumps when operations personnel wish to pump water to the flood area. The pump monitoring and control portion of this system is designed to limit the availability of the pumps when the water supply levels are within the ranges selected on the touchscreen operator and no system faults are present. This operation will be explained in section 3 of this manual.

The operator will check the pump monitoring screen to verify that no problems or faults exist with the pumps with regard to bearing and motor temperatures or leakage.

The operator will then set the desired pumping range by selecting an "enable" level and an "off" level. Once the pumping range is set and the actual level reaches the enable set point, the pumps are ready to be started. The starting sequence is as follows:

- The start button is pressed and held. At this point the isolation contactor closes and applies voltage to the power section of the reduced voltage motor starter. An auxiliary contact on the isolation contactor closes and energizes a time delay relay, which times for 10 seconds. After the 10 seconds has elapsed, a run relay is energized providing a run command to the reduced voltage motor starter.

- At this point the pump will start and ramp up to full voltage and speed. After the pump is at full voltage, the integral bypass contactor will close, creating a circuit around the SCR's, changing the current flow from the SCR's through the contactor. This design eliminates any heat generation by the SCR's.
- The pump will continue to run until the off level set point has been reached or the operator presses the stop button. In the event the stop button is pressed, a second time delay relay begins timing for 180 seconds, prohibiting the pump from being re-started until the timing is complete.
- A total of 8 fault provisions are monitored. They are as follows:
  1. Seal Chamber Leak – Monitors the leak sensor in the seal chamber
  2. Motor Housing Leak – Monitors the leak sensor in the motor housing
  3. Cord Cap Leak – Monitors the leak sensor in the cord cap
  4. Lower Bearing Heat – Monitors the thermostat on the lower bearing
  5. Motor Housing Heat – Monitors the thermostat in the motor winding
  6. Upper Bearing Heat – Monitors the thermostat on the upper bearing
  7. SSRV Fault – Monitors the fault status of the reduced voltage motor starter
  8. Level Transducer Failure – Monitors the level transducer feedback

Section 2

Pump Control Component Description

MAIN 3 PHASE POWER CIRCUIT

Each pump controller section is equipped with a main circuit breaker and a lockable through the door disconnect handle for isolating the section from the horizontal bus. A solid state reduced voltage motor starter is used to start the pump motor with an extended ramp time in order to limit the inrush current as well as reduce water hammer caused by across the line starting. An isolation contactor is installed between the main circuit breaker and the reduced voltage motor starter, which isolates the reduced voltage motor starter from line voltage when the pump is not running.

CONTROL POWER

A transformer with a secondary voltage of 120 VAC is installed for powering the control circuitry. This voltage level is utilized in the main control circuit, which operates the isolation contactor, time delay relays, control relays and pilot lights. A 24 VDC power supply is installed to provide power to the pump monitoring and control system and its related circuitry.

PILOT DEVICES

A total of 6 pilot lights are located on the front door of each pump control section. They are as follows:

1. Stopped – Indicates the pump is stopped
2. Called – Indicates the start button has been pressed and remains illuminated while the pump is running.
3. Running – Indicates the pump has started and remains illuminated while the pump is running.
4. Low Level – Indicates the water level is below the "enable" setting.
5. Enabled – Indicates the water level is at or above the "enable" setting.
6. Fault – Indicates a fault is present

A total of 3 push button operators are located on the front door of each pump control section. They are as follows:

1. Start – Initializes the starting of the pump
2. Stop – Stops the pump operation
3. Reset – Resets system in the event of a fault

Elapsed Time Meters

Elapsed time meters are installed on the front door of the each pump control section, which indicate the amount of time the pump has run. Elapsed time is also recorded in the Pump Monitoring and Control System.

SSRV Keypad

An Operator Interface is mounted on the front door of each pump control section, which enables the programming and status checking of the Solid State Reduced Voltage Starter.

PUMP MONITORING OPERATOR INTERFACE

A 6 inch diagonal operator touchscreen is mounted on the front door of each pump control section, which is utilized to enter parameters and monitor all aspects of the pump level control and protective functions.

SEAL MINDER LEAK DETECTOR UNITS (SLM, SLR)

Each pump control section is equipped with 3 leak detector units (SLM), which monitor moisture levels in the lower seal housing, stator winding and cord cap of the pump. The detector is connected to moisture probes inside the 3 areas of the pump defined above and monitors the resistance level between the moisture probe and equipment ground. In the event of a leak, the SLM's energize their respective relays (SLR). The SLR's then provide an input to the Monitoring System, producing fault notification and stopping the pump.

TIME DELAY RELAYS

Each pump control section is equipped with 2 time delay relays as follows:

TR ( )-1 – Start Delay after start button is pressed

TR ( )-2 – Restart Delay after the stop button is pressed

DPDT CONTROL RELAYS

Each pump control section is equipped with 8 time delay relays as follows:

CR ( )-1 – Start Relay: Energized after the 10 second time delay has elapsed. Provides run command to the SSRV.

CR ( )-2 – Running Relay: Energized after the SSRV has started. Provides status information to the pump monitoring system and illuminates the "Running" pilot light.

CR ( )-3 – General Fault Relay: Illuminates the "Fault" pilot light and disables the pump.

CR ( )-4 – Enabled Relay: Energizes when the water level is at or above the "Enable" set point and illuminates the "Enabled" pilot light.

CR ( )-5 – No Fault Relay: Energizes when there are no faults present and provides interlocking for the SSRV.

CR ( )-6 – Leak Fault Relay: Energizes when a leak fault is present. Energizes the General Fault Relay.

CR ( )-7 – Thermal Fault Relay: Energizes when a thermal fault is present. Energizes the General Fault Relay.

CR ( )-8 – Transducer Failure Relay: Energizes when the level transducer feedback is out of range. Energizes the General Fault Relay.

PC UNIT

Each pump control section is equipped with a PC (programmable controller). This unit monitors the level feedback signal from the Level Transducer, the contact status from the individual SLR's and the contact status from the individual Thermostats in the pumps. This information is received via the digital inputs. The program is written to allow the PC to provide messaging, control interlocking, fault outputs as well as the "Enable" function.

Section 3

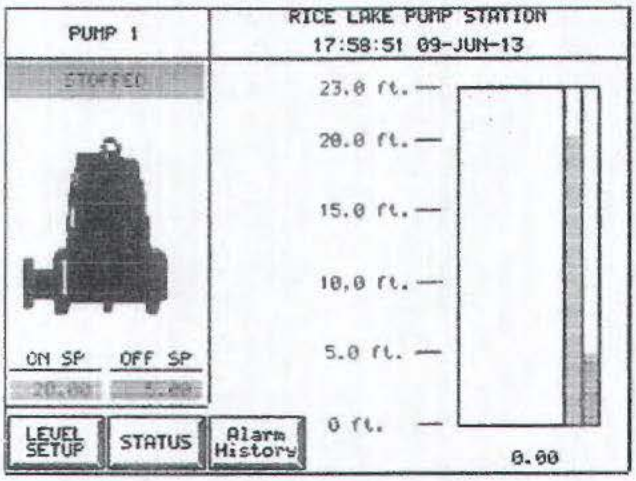
Pump Monitoring & Control System

The Motor Control Center contains a controller to monitor the state of the protective devices in the pumps as well as setting the level range at which the pumps are allowed to run. Other features include individual alarm messages. In addition to the General Fault Pilot Light located on the door, these messages pinpoint the actual problem.

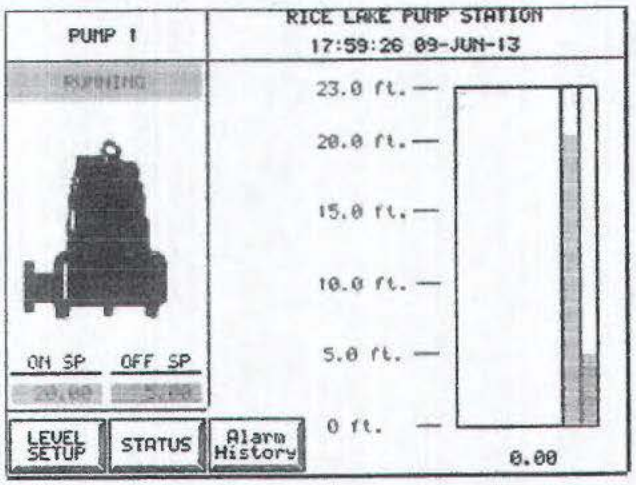
MAIN SCREEN

The Main Screen appears when the unit is powered up. This screen provides information on the status of the pump as well as the current water level and pumping set points. It also displays the actual time and date and provides buttons for navigation to other screens. There are two bars to the right of the level indicator. The green bar indicates the "Enable" set point and the red bar indicates the "Off" set point. The water level must be between the top of the green bar and the top of the red bar in order for the pump to run.

Main Screen Showing Pump Stopped



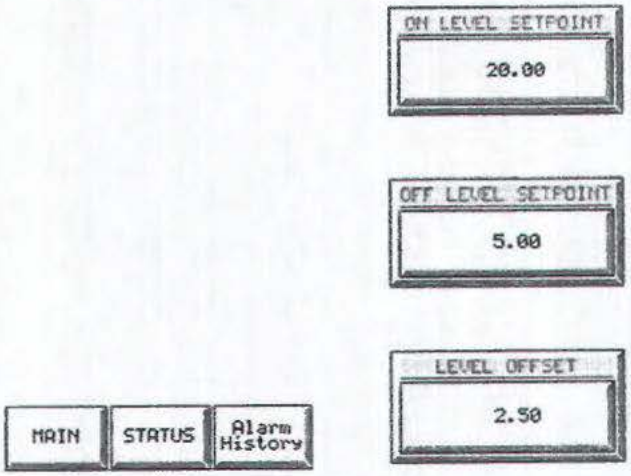
Main Screen Showing Pump Running



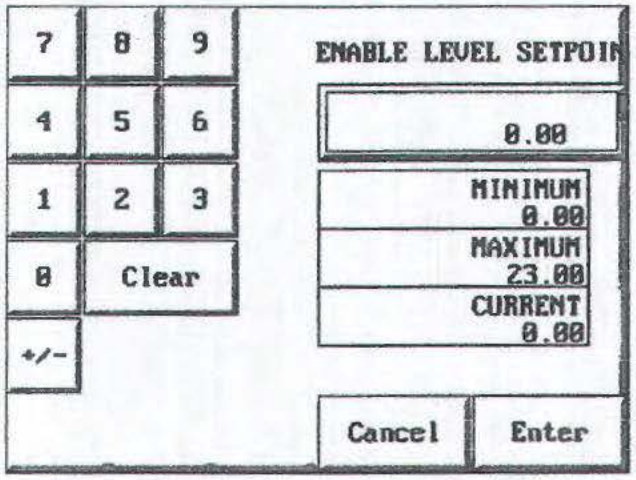
LEVEL SETUP SCREEN

The Level Setup Screen provides the ability to enter the desired level at which the pump will be allowed to start as well as the level at which the pump will shut off. The level offset setting is also included so the actual water level will be reflected while allowing the level transducer to be suspended off of the bottom.

Level Setup Screen depicting an "On" level of 20 feet and a "Shutoff" level of 5 feet. The "Level Offset Value" indicates the transducer is located 2.5 feet from the bottom.



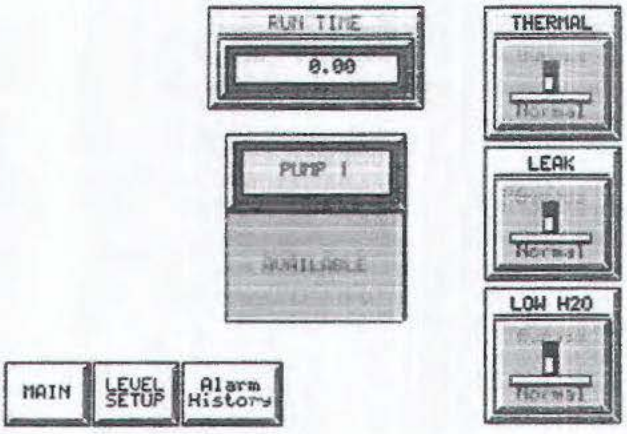
Set point adjustment screen allows the entry of desired set points. In order to reach this screen, press the respective button on the Level Setup Screen and this screen will appear. This particular screen is reflective of the "On Level Set Point" button being pressed on the above screen. Both the "Off Level Set Point" Screen and the "Level Offset" Screens are reached in the same manner.



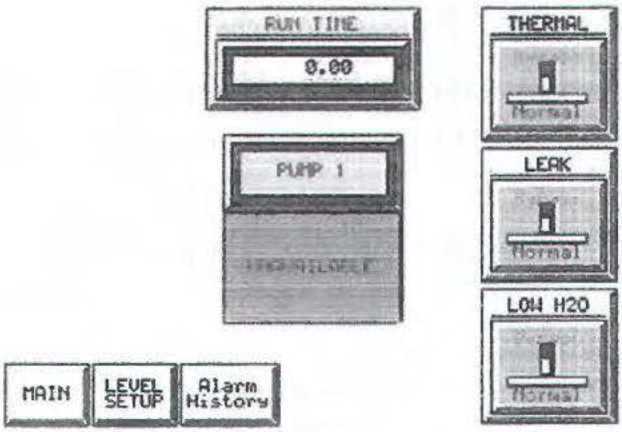
STATUS SCREEN

The Status Screen indicates whether the pump is available to be operated. If the screen indicates that the pump is "Available" then there are no Alarms present. The actual alarm present on a given pump is displayed on all screens. Alarms can also be viewed on the "Alarm Screen" (depicted on the following page). This screen also displays an elapsed time meter in addition to the mechanical meter mounted on the front of the MCC door.

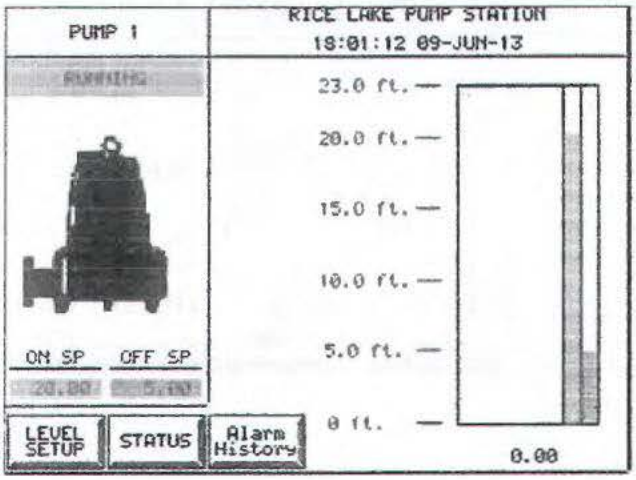
Status Screen indicating the pump is available



Status Screen indicating the pump is unavailable and has alarms present



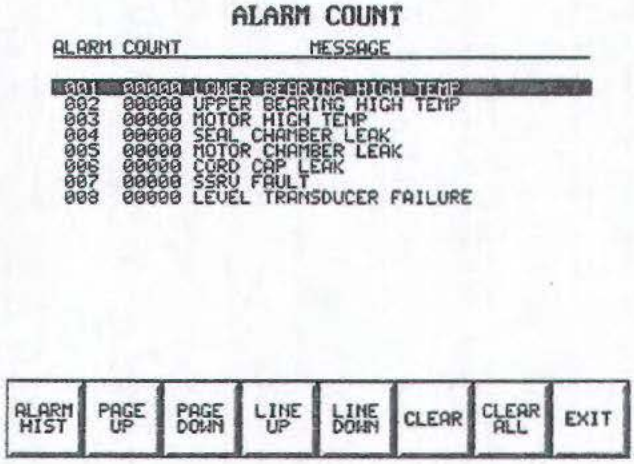
In the event that the pump MUST run with a fault present (ie. Seal chamber leak) or the transducer has failed, there are three buttons on the right of the screen that allow the operator to "Bypass" these faults. In the event a bypass is enabled, it is indicated on the screen as shown below.



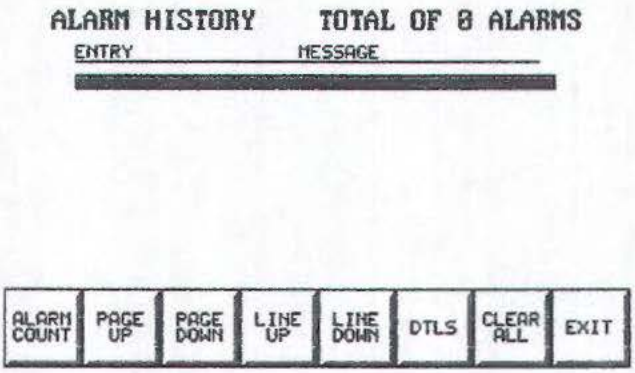
ALARM SCREEN

The Alarm Screen displays the current and past alarms in their respective order. The actual date and time is also available on the "Alarm History Screen". The alarm history can be cleared by the operator.

Alarm Screen all possible alarms displayed.



Alarm History Screen



Operating Parameters

Parameter		Description	Default	Units
LED	LCD			
P1	**QST 01**	**Motor Full Load Amps**	**10**	**RMS Amps**
P2	**QST 02**	**Motor Service Factor**	**1.15**	
P3	**QST 03**	**Motor Running Overload Class**	**10**	
P4	**QST 04**	**Local Source**	**tEr**	
P5	**QST 05**	**Remote Source**		
P6	**QST 06**	**Initial Motor Current 1**	**100**	**%FLA**
P7	**QST 07**	**Maximum Motor Current 1**	**600**	**%FLA**
P8	**QST 08**	**Ramp Time 1**	**15**	**Seconds**
P9	**QST 09**	**Up To Speed Time**	**20**	**Seconds**
P10	CFN 01	Start Mode	curr	
P11	CFN 08	Initial Voltage/Torque/Power	25	%
P12	CFN 09	Maximum Torque/Power	105	%
P13	CFN 10	Kick Level 1	Off	%FLA
P14	CFN 11	Kick Time 1	1.0	Seconds
P15	CFN 14	Stop Mode	Cos	
P16	CFN 15	Decel Begin Level	40	%
P17	CFN 16	Decel End Level	20	%
P18	CFN 17	Decel Time	15	Seconds
P19	CFN 18	DC Brake Level	25	%
P20	CFN 19	DC Brake Time	5	Seconds
P21	CFN 20	DC Brake Delay	0.2	Seconds
P22	CFN 06	Initial Motor Current 2	100	%FLA
P23	CFN 07	Maximum Motor Current 2	600	%FLA
P24	CFN 05	Ramp Time 2	15	Seconds
P25	CFN 12	Kick Level 2	Off	%FLA
P26	CFN 13	Kick Time 2	1.0	Seconds
P27	CFN 21	Slow Speed	Off	%
P28	CFN 22	Slow Speed Current Level	100	%FLA
P29	CFN 23	Slow Speed Time Limit	10	Seconds
P30	CFN 24	Slow Speed Kick Level	Off	%FLA
P31	CFN 25	Slow Speed Kick Time	1.0	Seconds
P32	PFN 01	Over Current Trip Level	Off	%FLA
P33	PFN 02	Over Current Trip Time	0.1	Seconds
P34	PFN 03	Under Current Trip Level	Off	%FLA
P35	PFN 04	Under Current Trip Time	0.1	Seconds
P36	PFN 05	Current Imbalance Trip Level	15	%
P37	PFN 06	Residual Ground Fault Trip Level	Off	%FLA
P38	PFN 07	Over Voltage Trip Level	Off	%
P39	PFN 08	Under Voltage Trip Level	Off	%
P40	PFN 09	Over/Under Voltage Trip Time	0.1	Seconds
P41	PFN 10	Auto Reset Time	Off	Seconds

*NOTE: See MX² User Manual for the complete parameter descriptions.
*NOTE: Parameters in bold print are the most commonly used in initial start up.

Operating Parameters (Continued)

Parameter		Description	Default	Units
LED	LCD			
P42	PFN 11	Auto Reset Count	Off	Off, 1 - 10
P43	PFN 12	Controlled Fault Stop Enable	On	
P44	PFN 13	Independent Starting/Running Overload	Off	
P45	PFN 14	Motor Starting Overload Class	10	
P46	PFN 16	Motor Overload Hot/Cold Ratio	60	%
P47	PFN 17	Motor Overload Cooling Time	30	Minutes
P48	I/O 01	DI 1 Configuration	Stop	
P49	I/O 02	DI 2 Configuration	Off	
P50	I/O 03	DI 3 Configuration	Off	
P51	I/O 04	Digital Fault Input Trip Time	0.1	Seconds
P52	I/O 05	R1 Configuration	FLFS	
P53	I/O 06	R2 Configuration	Off	
P54	I/O 07	R3 Configuration	Off	
P55	I/O 08	Analog Input Trip Type	Off	
P56	I/O 09	Analog Input Trip Level	50	%
P57	I/O 10	Analog Input Trip Time	0.1	Seconds
P58	I/O 11	Analog Input Span	100	%
P59	I/O 12	Analog Input Offset	0	%
P60	I/O 13	Analog Output Function	0: Off	
P61	I/O 14	Analog Output Span	100	%
P62	I/O 15	Analog Output Offset	0	%
P63	I/O 16	Inline Configuration	3.0	Seconds
P64	I/O 17	Bypass Feedback Time	2.0	Seconds
P65	I/O 18	Keypad Stop Disable	Enabled	
P66	I/O 19	Power On Start Selection	0	
P67	FUN 15	Miscellaneous Commands	0	
P68	FUN 12	Communication Timeout	Off	Seconds
P69	FUN 11	Communication Baud Rate	19200	bps
P70	FUN 10	Communication Address	1	
P71	FUN 13	Communication Byte Framing	0	
P72	FUN 09	Energy Saver	Off	
P73	FUN 08	Heater Level	Off	%FLA
P74	FUN 07	Starter Type	nor	
P75	FUN 06	Rated Power Factor	-0.92	
P76	**FUN 05**	**Rated Voltage**	**480**	**RMS Volt.**
P77	FUN 04	Phase Order	InS	
P78	**FUN 03**	**CT Ratio**	**288:1**	
P79	FUN 01	Meter 1	Ave Current	
n/a	FUN 02	Meter 2	Ave Volts	
P80	FUN 14	Software 1 Part Number	810023-01-00	
P81	FUN 16	Passcode	Off	
P82	FL1-9	Fault Log		

*NOTE: See MX² Instruction Manual for the complete parameter descriptions.
*NOTE: Parameters in bold print are the most commonly used in initial start up.

Publication # 890034-04-00

CURTISS WRIGHT Flow Control Company
BENSHAW

MX² Control
Quickstart Reference Guide
For The Integral LED/LCD Display

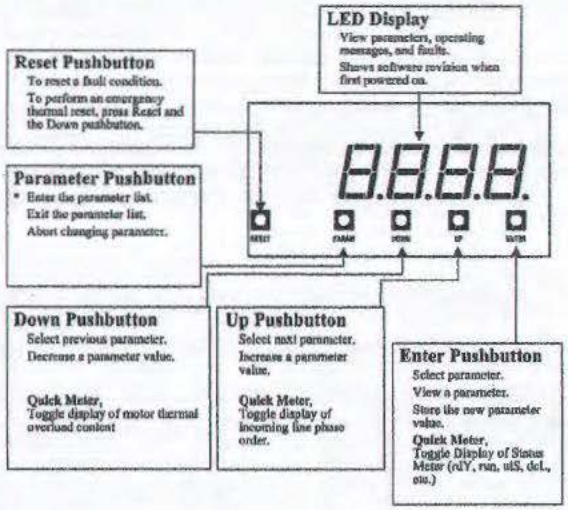
For more information consult the
RediStart MX² User Manual
(RB2,RC2 & RX2E Models)

December 2006
Software Version: 810023-01-02
Hardware Version: 300055-01-04

Benshaw USA: 412-968-0100
Benshaw Canada: 519-291-5112

http://benshaw.cwfc.com

THE BENSHAW PROMISE
3 Year Warranty



Changing Parameter Values

Parameter change mode can be entered by:

- At the default meter display, press the [PARAM] key to enter parameter mode.
- Use the [UP] and [DOWN] keys to scroll through the available parameters.
- The value of the parameter can be viewed by pressing the [ENTER] key.
- When viewing the parameter value, the parameter can be changed by using the [UP] and [DOWN] keys.
- To store the new value, press the [ENTER] key. When the [ENTER] key is pressed the value is saved and the display goes back to parameter # "P_".

To exit parameter change mode without saving the new parameter value either:

- Press the [PARAM] key to return to the parameter number display.
- Wait 60 seconds and the display returns to the default meter display.

Emergency Overload Reset

To perform an emergency overload reset, press [RESET] and [DOWN]. This sets the motor thermal overload content to 0.

Resetting a Fault

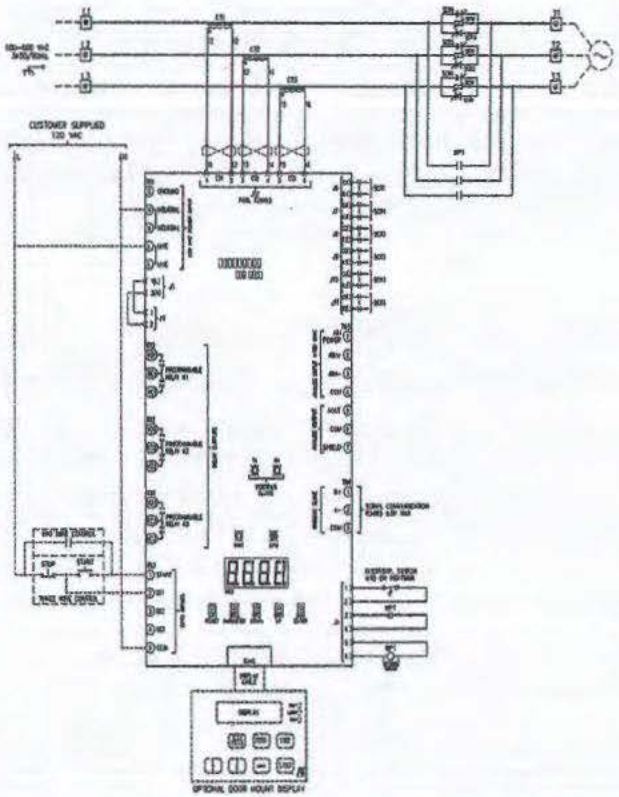
To reset from a fault condition, press [RESET].

Restoring Factory Parameter Settings

LED Display: To restore ALL parameters to the factory default settings, press and hold the [PARAM] and [ENTER] pushbutton switches on power up. The display blinks "dFLt".

LCD Display: To restore ALL parameters to the factory default settings, go to Miscellaneous commands FUN15 and press [ENTER]. Press [UP] until you read "Factory Rst" and press [ENTER].

NOTE: Parameters unique to the motor starter applications need to be set again to appropriate values before motor operation.



Digital Input "DI 1 – 3" Configuration

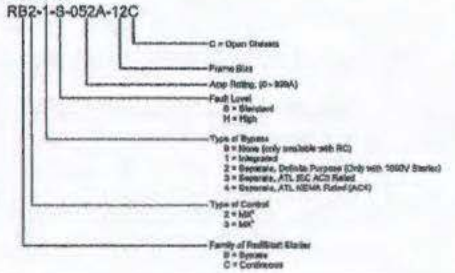
P48 I/O 01	DI 1 Configuration	OFF:	Off	L-r:	Local/Remote
		StOP:	Stop	hdS:	Heat Disable
		FH:	Fault High	HEn:	Heat Enable
		FL:	Fault Low	rSEL:	Ramp Select
P49 I/O 02	DI 2 Configuration	Fr:	Fault Reset	SS F:	Slow Spd Fwd
		dISc:	Disconnect	SS r:	Slow Spd Rev
		InLn:	Inline Confirm	bdS:	Brake Disabl
P50 I/O 03	DI 3 Configuration	byP:	Bypass Confirm	bEn:	Brake Enable
		EoLr:	E OL Reset	run:	Run Enable
				run:	Run Disable

Relay Output "R1 – 3" Configuration

P52 I/O 05	R1 Configuration SPDT form C 5 Amp, 125VAC, resistive 3 Amp, 250VAC, resistive 1250VA res, 500VA ind	OFF:	Off	SHFS:	Shunt FS
		FLFs:	Fault FS	shnF:	Shunt NSF
		FLnF:	Fault NFS	GFLt:	Ground Fault
		run:	Running	ES:	Energy Saver
		uAS:	UTS	HEAt:	Heating
P53 I/O 06	R2 Configuration -Same as R1	AL:	Alarm	SSPd:	Slow Spd
		rdy:	Ready	SSF:	Slow Spd Fwd
		LOC:	Locked Out	SSr:	Slow Spd Rev
		OC:	Overcurrent	dcb:	Braking
		UC:	Undercurrent	FAn:	Cool Fan Ctl
P54 I/O 07	R3 Configuration SPDT form C 16 Amp, 240VAC resistive 16 Amp, 30VDC, resistive 1HP, 240VAC Make/Break VA-4000/400	OLA:	OL Alarm		

Model Number

RB2-1-3-052A-12C



Operating Messages (see user manual for any additional Operating Messages)

nol	No Line	ABC	Phase order meter showing ABC
rdy	Ready	CbA	Phase order meter showing CBA
Acc	Accelerating or Kicking	SPH	Phase order meter showing Single Phase
Acc2	Accelerating or Kicking with ramp 2	xxxx	xxxx = overload content
uAS	Up to Speed	P xx	xx = Parameter code
run	Run – Done with Accel ramp but not yet Up to Speed	A xx	xx = Alarm code. If the condition persists, a fault occurs
dcL	Decelerating Motor	F xx	xx = Fault code
A OL	Overload Alarm - The motor overload level is between 90% and 100%	ioc	Instantaneous Over current
F OL	Overload Fault - The motor overload level has reached 100%	dFLt	Default – Flashes when parameter defaults are loaded
		HSFt	Heater/Anti-windmill Mode
L OL	Overload Lockout - A start is not allowed until the motor overload level cools below 15%	ES	Energy Saver
		FLSH	In reflash mode
L CP	Control Power Lockout - A start is not allowed because the control power is too low	PrgS	In reflash mode, programming
		rSPd	In reflash mode, verifying
LOC	Lock out State	donE	In reflash mode, complete
SSPd	Slow Speed Motor Operation	L dS	Disconnect Switch Open
L Ot	Power Stack Over Temperature Lockout	dcb	DC Injection Brake Active
SS r	Slow Speed Reverse	SS F	Slow Speed Forward
L I r	Digital Inputs (Run Enable or Run Disable) are preventing a run		

Section 4

Schematics/ Bus Splice Ass.

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABITAT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

DRAWING NO.	DESCRIPTION
E01	TITLE PAGE
E02	MCC 1 EXTERIOR LAYOUT
E03	MCC 1 INTERIOR LAYOUT
E04	BLANK SHEET
E05	PUMP #1 POWER & 120 VOLT SCHEMATIC
E06	PUMP #1 24 VOLT DC SCHEMATIC
E07	PUMP #2 POWER & 120 VOLT SCHEMATIC
E08	PUMP #2 24 VOLT DC SCHEMATIC
E09	PUMP #3 POWER & 120 VOLT SCHEMATIC
E10	PUMP #3 24 VOLT DC SCHEMATIC

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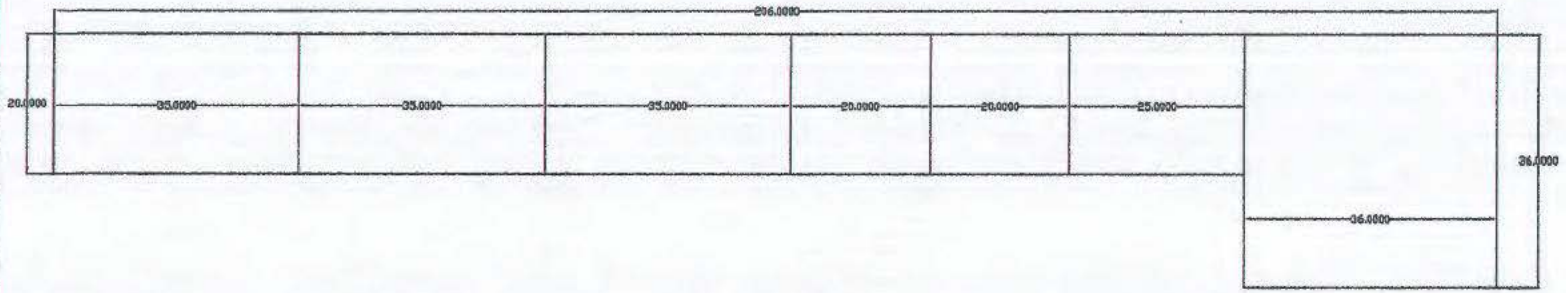
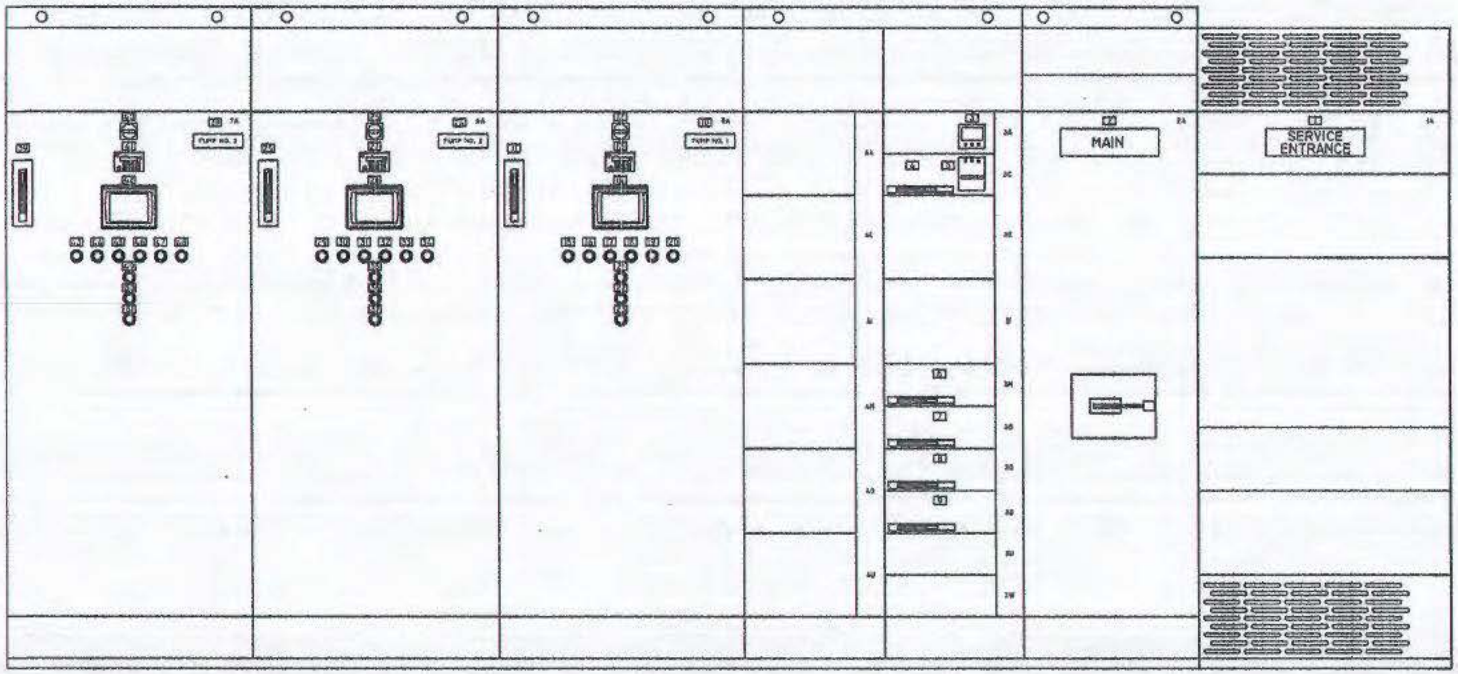
ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

TITLE PAGE

JOB # 501-11	DWG # DC111121E.01
DESIGNED BY K.K	SCALE NONE
DRAWN BY N/A	CHECKED K.K.
REVISION DATE 11/15/11	SHT 1 OF 10

TOP VIEW





NAMEPLATE LIST

NO.	NAMEPLATE	SCHEMATIC COMPONENT
1	SERVICE ENTRANCE	N/A
2	MAIN BREAKER	CB2A
3	POWER MONITOR	PM
4	T2S5 CB	T2S5 CB
5	T1S5	T1S5
6	PM	N/A
7	UNIT HEATER	N/A
8	BLANK	N/A
9	BLANK	N/A
10	PUMP NO. 1	N/A
11	MCP 1A	MCP1A
12	ETM-1	ETM-1
13	SSRV 1	SSRV 1
14	PCM 1	PCM 1
15	ENABLED	PL1-4
16	LOW LEVEL	PL1-2
17	STOPPED	PL1-3
18	RUNNING	PL1-1
19	CALLED	PL1-1
20	FAULT	PL1-5
21	START	PB1-1
22	STOP	PB1-2
23	RESET	PB1-3
24	PUMP NO. 2	N/A
25	MCP 2A	MCP2A
26	ETM-2	ETM-2
27	SSRV 2	SSRV 2
28	PCM 2	PCM 2
29	ENABLED	PL2-4
30	LOW LEVEL	PL2-2
31	STOPPED	PL2-3
32	RUNNING	PL2-1
33	CALLED	PL2-1
34	FAULT	PL2-5
35	START	PB2-1
36	STOP	PB2-2
37	RESET	PB2-3
38	PUMP NO. 3	N/A
39	MCP 3A	MCP3A
40	ETM-3	ETM-3
41	SSRV 3	SSRV 3
42	PCM 3	PCM 3
43	ENABLED	PL3-4
44	LOW LEVEL	PL3-2
45	STOPPED	PL3-3
46	RUNNING	PL3-1
47	CALLED	PL3-1
48	FAULT	PL3-5
49	START	PB3-1
50	STOP	PB3-2
51	RESET	PB3-3

H-212

NOTE) SEE MCC MANUFACTURER DRAWINGS FOR DETAILED INFORMATION ON CONSTRUCTION

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S&K EQUIPMENT COMPANY, Inc.
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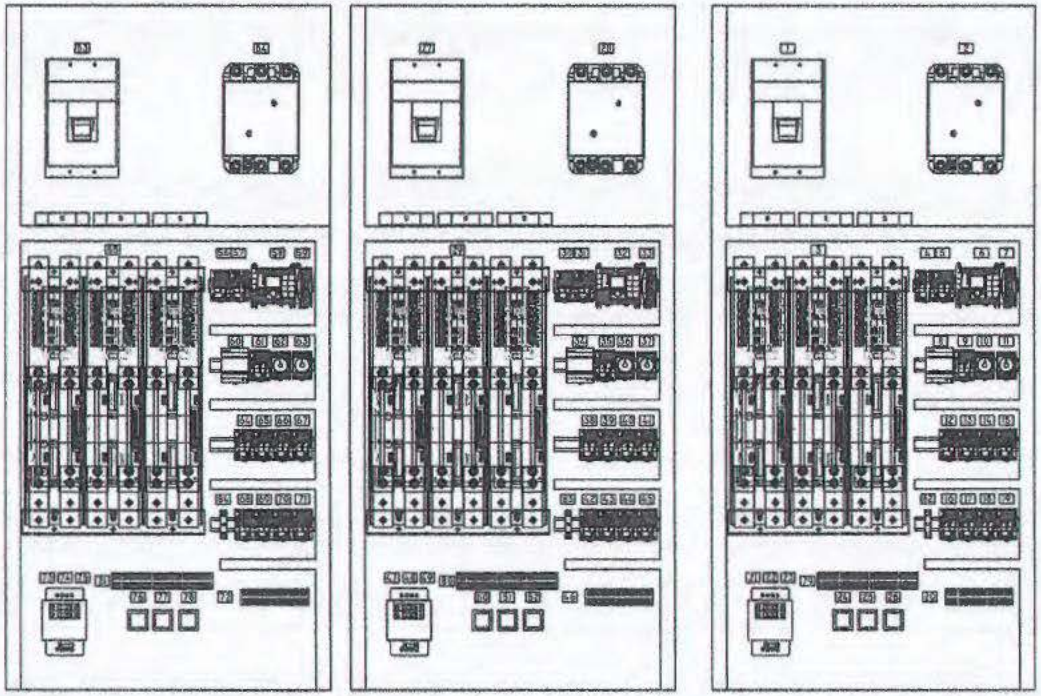
P.O. BOX 340, 1043 BAYOU ST. VINCENNES, IN. 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

MOTOR CONTROL CENTER 'MCC 1'
EXTERIOR LAYOUT

JOB #	301-11
DESIGNED BY	K.K
DRAWN BY	N/A
REVISED DATE	11/15/11
DWG #	DC1111121E02
REV #	NONE 0
CHECKED BY	K.K.
SHT # OF	2 10



NAMEPLATE LIST

NO.	NAMEPLATE	SCHEMATIC COMPONENT	NO.	NAMEPLATE	SCHEMATIC COMPONENT
1	MCP-5A	MCP-5A	43	CR2-6	CR2-6
2	IC-1	IC-1	44	CR2-7	CR2-7
3	SSRV-1	SSRV-1	45	CR2-8	CR2-8
4	SLR1-1	SLR1-1	46	TB-2	TB-2
5	SLR1-2	SLR1-2	47	T-2	T-2
6	PC-1	PC-1	48	FU2-L2	FU2-L2
7	PCEX-1	PCEX-1	49	FU2-3	FU2-3
8	PS-1	PS-1	50	SLM2-1	SLM2-1
9	SLR1-3	SLR1-3	51	SLM2-2	SLM2-2
10	TR1-1	TR1-1	52	SLM2-3	SLM2-3
11	TR1-2	TR1-2	53	MCP-7A	MCP-7A
12	CR1-1	CR1-1	54	IC-3	IC-3
13	CR1-2	CR1-2	55	SSRV-3	SSRV-3
14	CR1-3	CR1-3	56	SLR3-1	SLR3-1
15	CR1-4	CR1-4	57	SLR3-2	SLR3-2
16	CR1-5	CR1-5	58	PC-3	PC-3
17	CR1-6	CR1-6	59	PCEX-3	PCEX-3
18	CR1-7	CR1-7	60	PS-3	PS-3
19	CR1-8	CR1-8	61	SLR3-3	SLR3-3
20	TB-1	TB-1	62	TR3-1	TR3-1
21	T-1	T-1	63	TR3-2	TR3-2
22	FU1-L2	FU1-L2	64	CR3-1	CR3-1
23	FU1-3	FU1-3	65	CR3-2	CR3-2
24	SLM1-1	SLM1-1	66	CR3-3	CR3-3
25	SLM1-2	SLM1-2	67	CR3-4	CR3-4
26	SLM1-3	SLM1-3	68	CR3-5	CR3-5
27	MCP-6A	MCP-6A	69	CR3-6	CR3-6
28	IC-2	IC-2	70	CR3-7	CR3-7
29	SSRV-2	SSRV-2	71	CR3-8	CR3-8
30	SLR2-1	SLR2-1	72	TB-3	TB-3
31	SLR2-2	SLR2-2	73	T-3	T-3
32	PC-2	PC-2	74	FU3-L2	FU3-L2
33	PCEX-2	PCEX-2	75	FU3-3	FU3-3
34	PS-2	PS-2	76	SLM3-1	SLM3-1
35	SLR2-3	SLR2-3	77	SLM3-2	SLM3-2
36	TR2-1	TR2-1	78	SLM3-3	SLM3-3
37	TR2-2	TR2-2	79	TB1A	TB1A
38	CR2-1	CR2-1	80	TB2A	TB2A
39	CR2-2	CR2-2	81	TB3A	TB3A
40	CR2-3	CR2-3	82	SP-1	SP-1
41	CR2-4	CR2-4	83	SP-2	SP-2
42	CR2-5	CR2-5	84	SP-3	SP-3

NOTE: SEE MCC MANUFACTURER DRAWINGS FOR DETAILED INFORMATION ON CONSTRUCTION

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06/15/2013

S&K EQUIPMENT COMPANY, Inc.
... When Quality Counts ...
PO. BOX 342, 1243 BAYOU ST. VINCENNES, IN 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

MOTOR CONTROL CENTER "MCC 1"
INTERIOR LAYOUT

JOB #	501-11	DWG #	DC111121E03
DRAWN BY	K.K	SCALE	NONE D
CHKD BY	N/A	DESIGN	K.K.
REVISION DATE	11/15/11	SHT.	3 10

THIS SHEET IS INTENTIONALLY BLANK

H-214

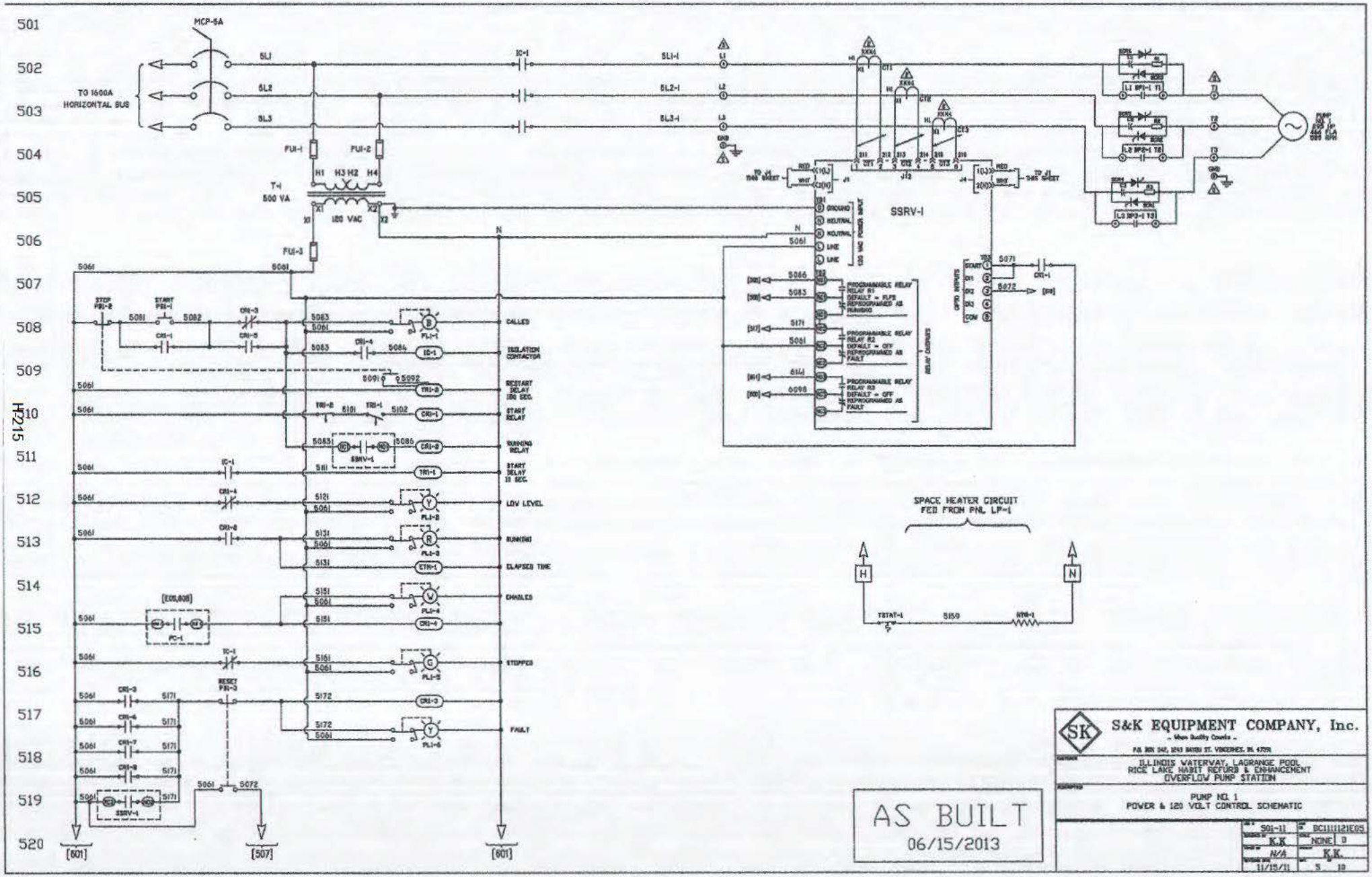
AS BUILT
06/15/2013

S&K EQUIPMENT COMPANY, Inc.
- Value Quality Counts -
P.O. BOX 340, 1243 BAYOU ST. VINCENNES, IN 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT RESTORATION & ENHANCEMENT
OVERFLOW PUMP STATION

BLANK SHEET

SDI-11	DC111121E04
K.K.	NONE D
N/A	K.K.
11/15/11	4 10



AS BUILT
06/15/2013

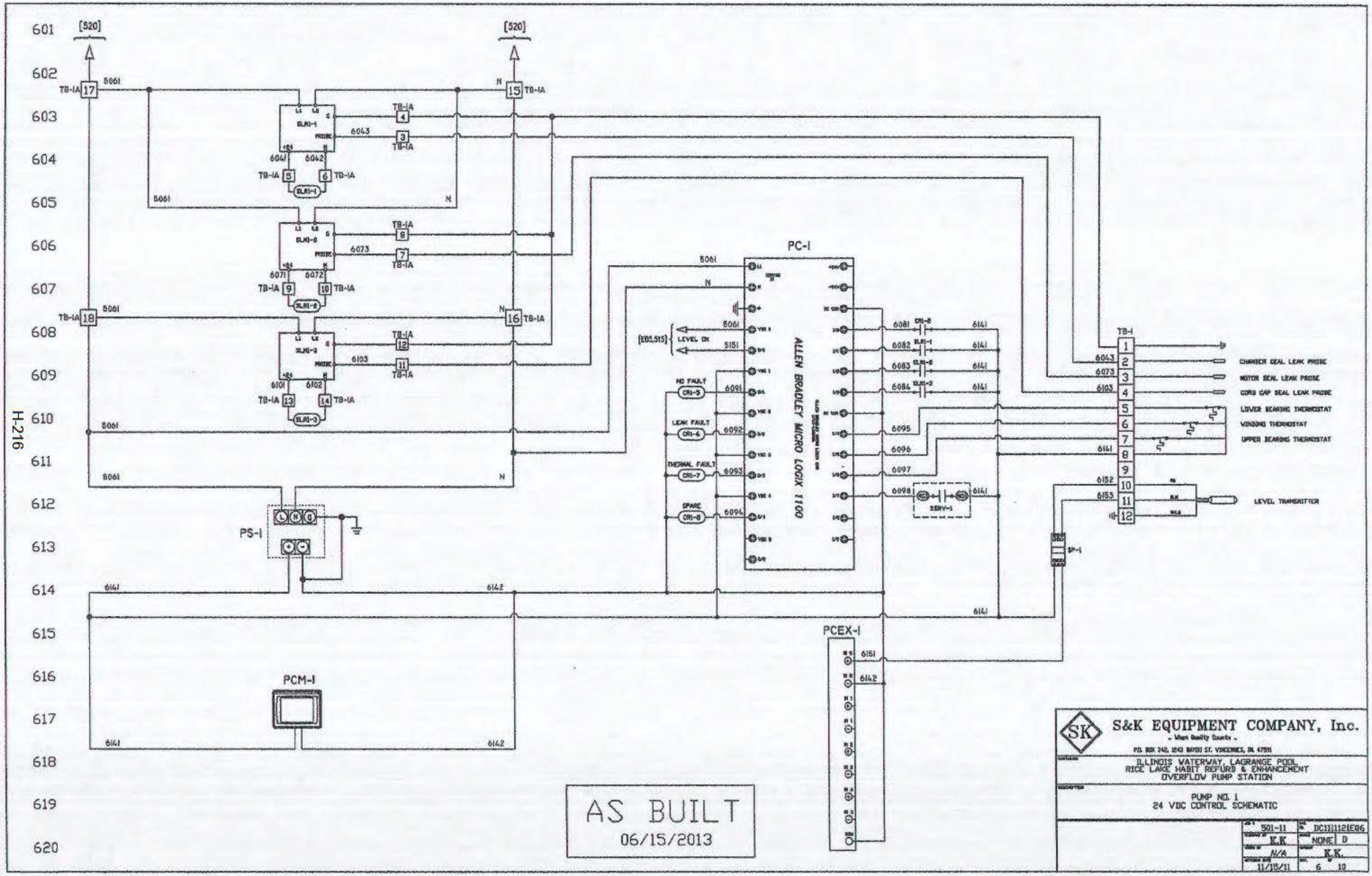
S&K EQUIPMENT COMPANY, Inc.
– Where Quality Counts –
P.O. BOX 342, 1243 BAYOU ST. VINCENNES, IN. 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

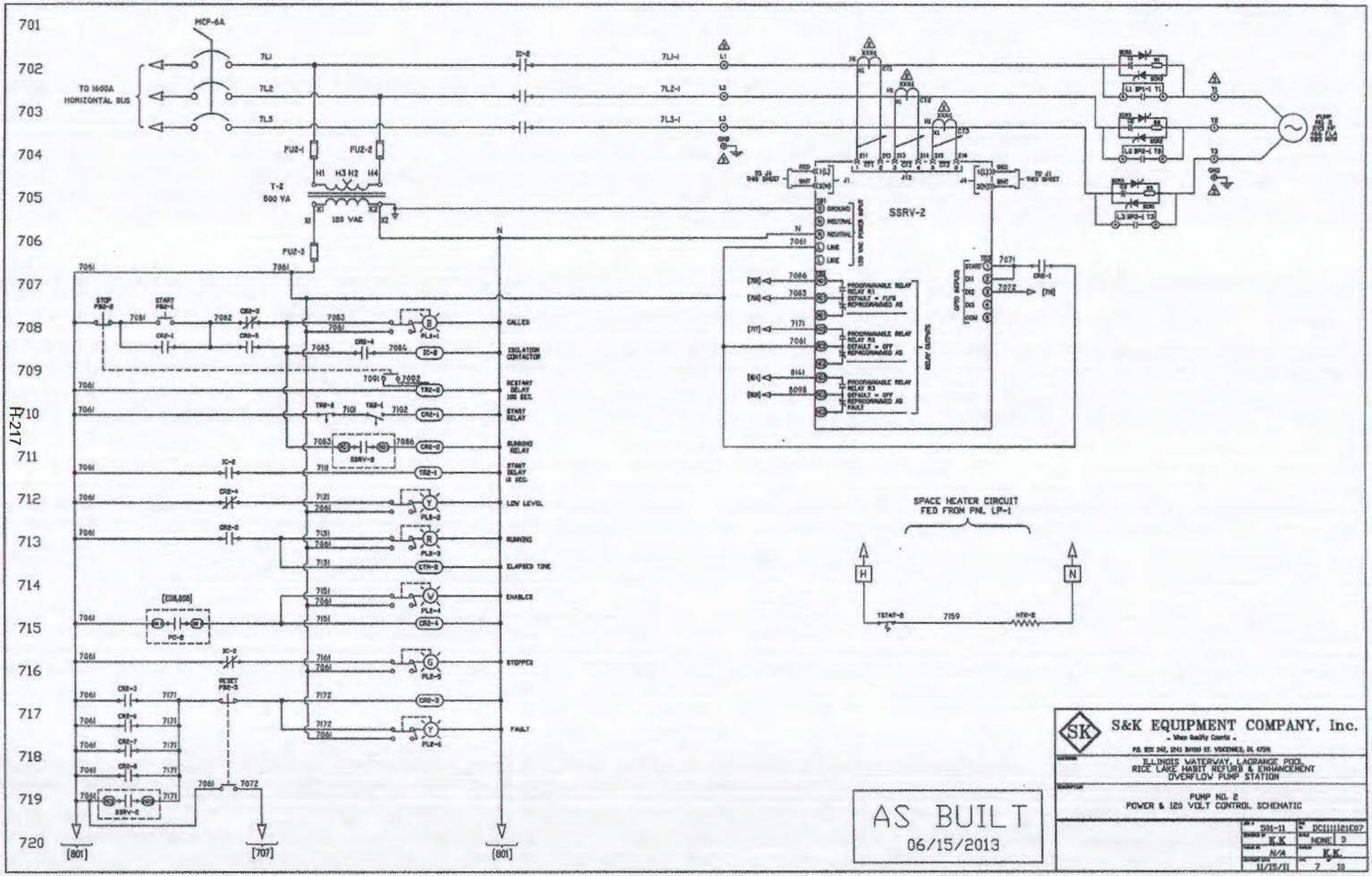
PUMP NO. 1
POWER & 120 VOLT CONTROL SCHEMATIC

S01-11	BC1111121E05
K.K	NONE 0
N/A	K.K.
11/15/11	5 10

H215


[520]
[520]
PC-1
ALLEN BRADLEY MICRO LOGIX 1100
PCEX-1
PCM-1
PS-1
TB-I
SP-1
SSRV-1
SLR1-1
SLR1-2
SLR1-3
CR1-5
CR1-6
CR1-7
CR1-8
CHAMBER SEAL LEAK PROBE
MOTOR SEAL LEAK PROBE
CORD CAP SEAL LEAK PROBE
LOWER BEARING THERMOSTAT
WINDING THERMOSTAT
UPPER BEARING THERMOSTAT
LEVEL TRANSMITTER
AS BUILT
06/15/2013
S&K EQUIPMENT COMPANY, Inc.
ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION
PUMP NO. 1
24 VDC CONTROL SCHEMATIC
501-11
DC1111121E06
K.K.
NONE
D
N/A
K.K.
11/15/11
6 10

H-216

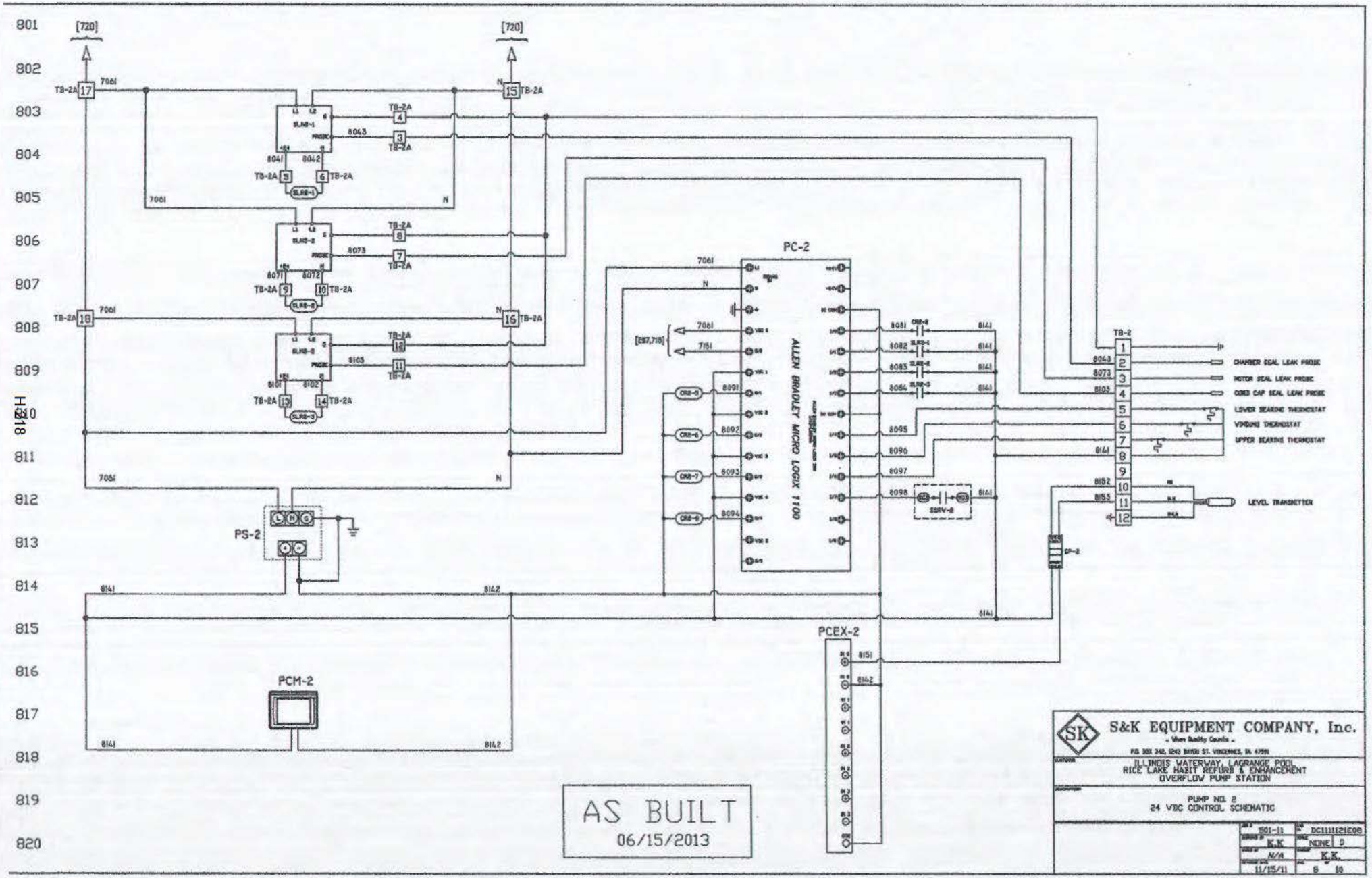


S&K EQUIPMENT COMPANY, Inc.
- Value Quality Counts -
P.O. BOX 342, 1243 BOND ST. VINCENNES, IN. 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

PUMP NO. 2
POWER & 120 VOLT CONTROL SCHEMATIC

JOB #	301-11	DWG #	DC1111121E07
DRAWN BY	K.K	SCALE	NONE
CHECKED BY	N/A	REV	D
DESIGNED BY	K.K.		
DATE	11/15/11	SHT	7 of 10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TB-2A 18
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TB-2A 16
PC-2
ALLEN BRADLEY MICRO LOGIX 1100
PS-2
PCM-2
PCEX-2
TB-2
CHAMBER SEAL LEAK PROBE
MOTOR SEAL LEAK PROBE
GORE CAP SEAL LEAK PROBE
LOWER BEARING THERMISTAT
WINDING THERMISTAT
UPPER BEARING THERMISTAT
LEVEL TRANSMITTER
8141
8142
AS BUILT
06/15/2013
S&K EQUIPMENT COMPANY, Inc.
ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT RESTORE & ENHANCEMENT
OVERFLOW PUMP STATION
PUMP NO. 2
24 VDC CONTROL SCHEMATIC
501-11
DC111121E00
K.K.
NONE
D
N/A
K.K.
11/15/11
8
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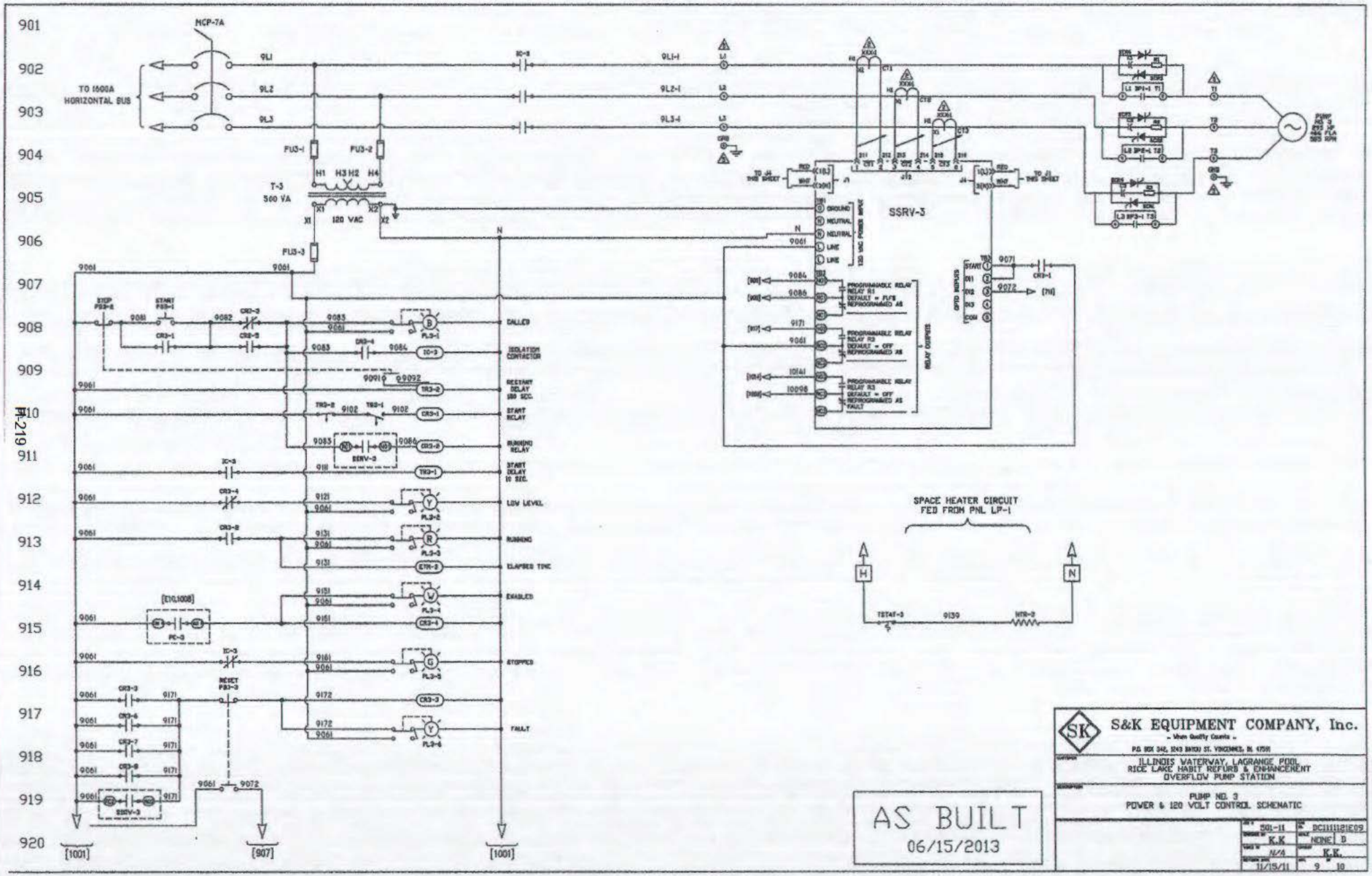


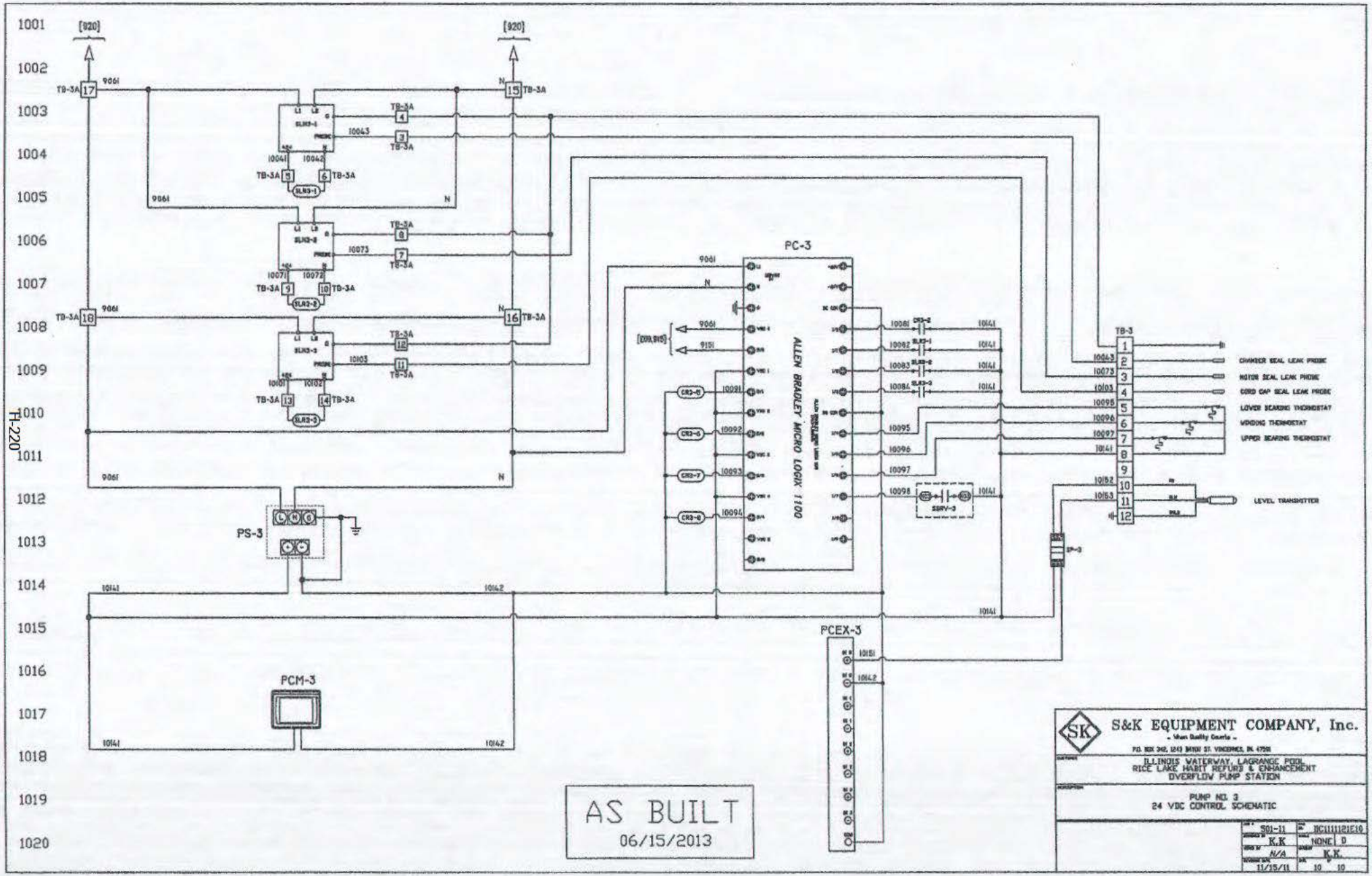
AS BUILT
06/15/2013

S&K EQUIPMENT COMPANY, Inc.
- When Quality Counts -
P.O. BOX 342, 1243 BAYOU ST. VINCENNES, IN. 47591

ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REFURB & ENHANCEMENT
OVERFLOW PUMP STATION

PUMP NO. 3
POWER & 120 VOLT CONTROL SCHEMATIC

501-11	DC111121E09
K.K	NONE D
N/A	K.K.
11/15/11	9 10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9061
TB-3A 15
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SLR3-3
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10073
10103
10041
10042
10071
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10101
10102
TB-3A 4
TB-3A 3
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TB-3A 12
TB-3A 11
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TB-3A 9
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TB-3A 13
TB-3A 14
PC-3
ALLEN BRADLEY MICRO LOGIX 1100
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9151
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CR3-5
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10092
10093
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10095
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9
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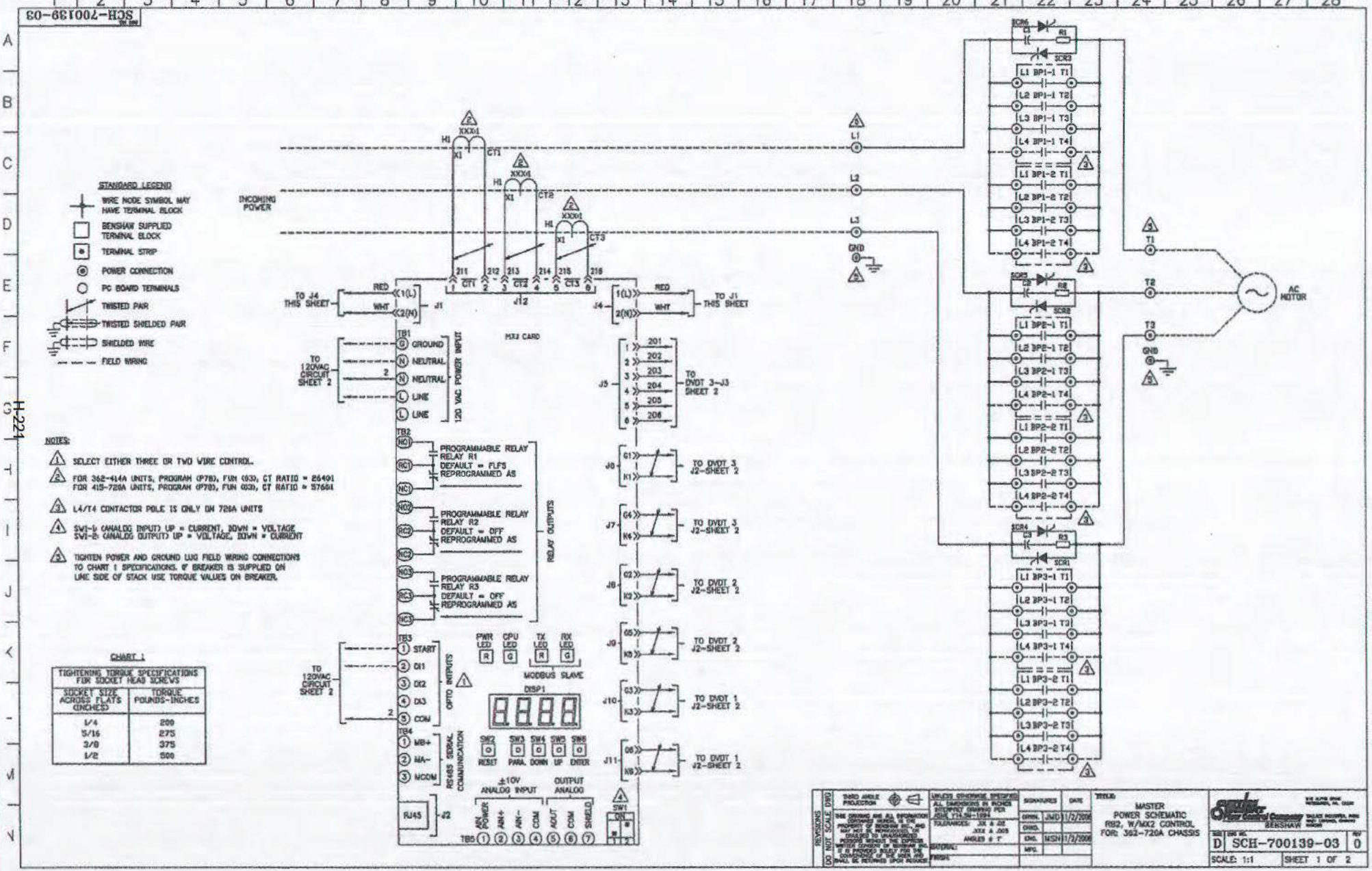
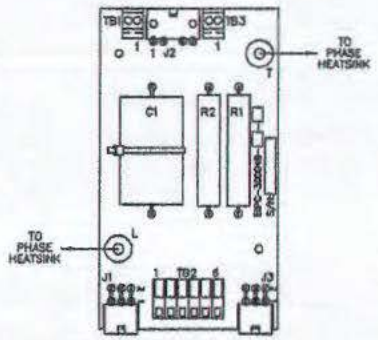
11
12
10043
10073
10103
10098
10096
10097
10141
10152
10153
CHAMBER SEAL LEAK PROBE
MOTOR SEAL LEAK PROBE
CORD CAP SEAL LEAK PROBE
LOWER BEARING THERMOSTAT
WINDING THERMOSTAT
UPPER BEARING THERMOSTAT
LEVEL TRANSMITTER
PS-3
L N G
10141
10142
PCM-3
10141
10142
PCEX-3
10151
10142
10141
AS BUILT
06/15/2013
S&K EQUIPMENT COMPANY, Inc.
ILLINOIS WATERWAY, LAGRANGE POOL
RICE LAKE HABIT REPURP & ENHANCEMENT
OVERFLOW PUMP STATION
PUMP NO. 3
24 VDC CONTROL SCHEMATIC
S01-11
K.K
N/A
11/15/13
NONE
0
K.K.
10
10

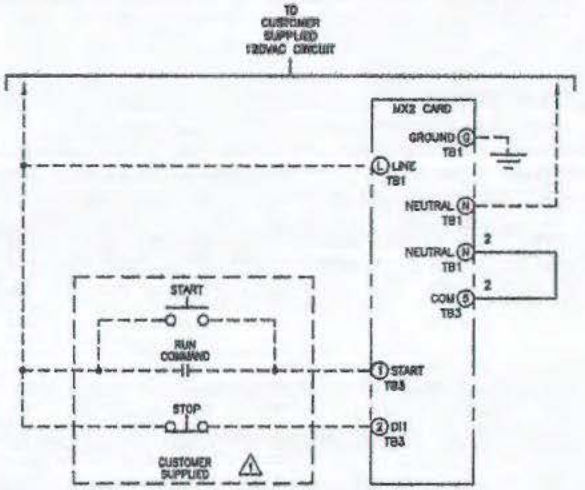
TH-220

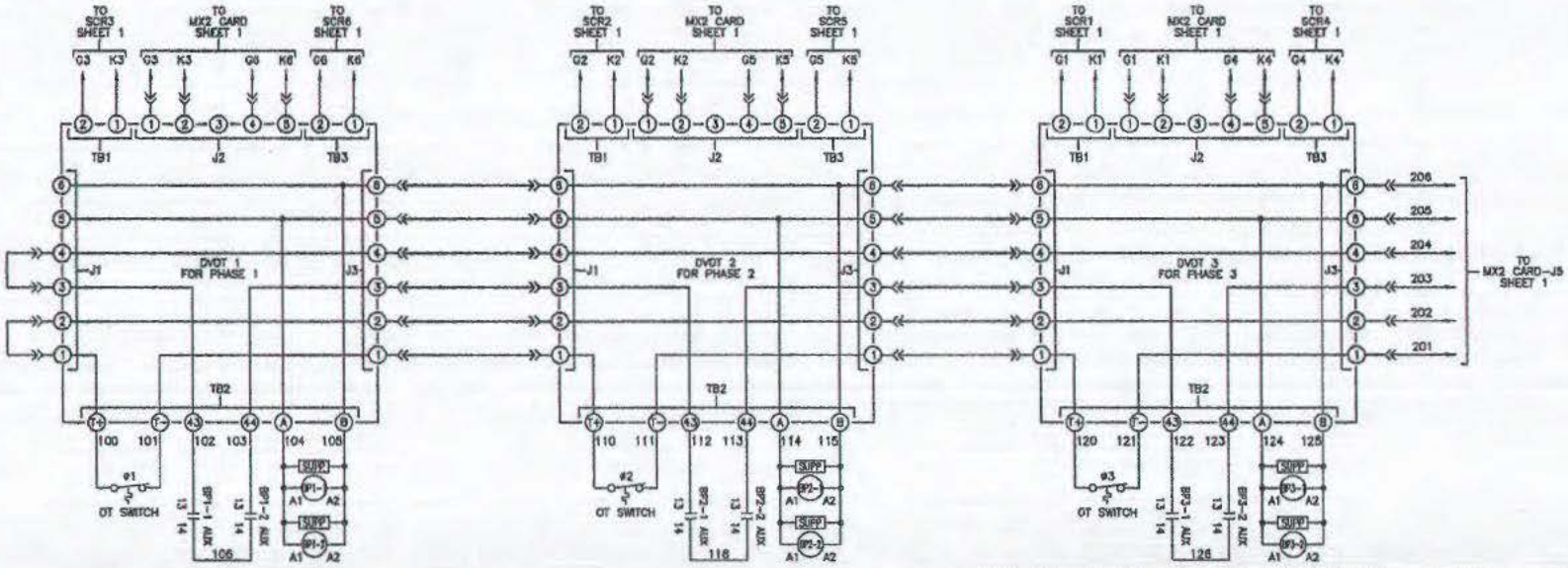

SCH-700139-03
STANDARD LEGEND
WIRE NODE SYMBOL MAY HAVE TERMINAL BLOCK
BENSHAW SUPPLIED TERMINAL BLOCK
TERMINAL STRIP
POWER CONNECTION
PC BOARD TERMINALS
TWISTED PAIR
TWISTED SHIELDED PAIR
SHIELDED WIRE
FIELD WIRING
INCOMING POWER
L1
L2
L3
GND
CT1
CT2
CT3
MX2 CARD
TO J4 THIS SHEET
TO J1 THIS SHEET
TO 120VAC CIRCUIT SHEET 2
TO DVDT 3-J3 SHEET 2
TO DVDT 3 J2-SHEET 2
TO DVDT 2 J2-SHEET 2
TO DVDT 1 J2-SHEET 2
120 VAC POWER INPUT
PROGRAMMABLE RELAY RELAY R1 DEFAULT = FLTS REPROGRAMMED AS
PROGRAMMABLE RELAY RELAY R2 DEFAULT = OFF REPROGRAMMED AS
PROGRAMMABLE RELAY RELAY R3 DEFAULT = OFF REPROGRAMMED AS
RELAY OUTPUTS
OPTO INPUTS
RS485 SERIAL COMMUNICATION
MODBUS SLAVE
PWR LED
CPU LED
TX LED
RX LED
DISP1
RESET
PARA
DOWN
UP
ENTER
±10V ANALOG INPUT
OUTPUT ANALOG
AC MOTOR
NOTES:
1. SELECT EITHER THREE OR TWO WIRE CONTROL.
2. FOR 362-414A UNITS, PROGRAM (P78), FUN (03), CT RATIO = 26401
FOR 415-720A UNITS, PROGRAM (P78), FUN (03), CT RATIO = 57691
3. L4/T4 CONTACTOR POLE IS ONLY ON 720A UNITS
4. SW1-1 (ANALOG INPUT) UP = CURRENT, DOWN = VOLTAGE
SW1-2: (ANALOG OUTPUT) UP = VOLTAGE, DOWN = CURRENT
5. TIGHTEN POWER AND GROUND LUG FIELD WIRING CONNECTIONS TO CHART 1 SPECIFICATIONS. IF BREAKER IS SUPPLIED ON LINE SIDE OF STACK USE TORQUE VALUES ON BREAKER.
CHART 1
TIGHTENING TORQUE SPECIFICATIONS FOR SOCKET HEAD SCREWS
SOCKET SIZE ACROSS FLATS (INCHES) | TORQUE POUNDS-INCHES
1/4 | 200
5/16 | 275
3/8 | 375
1/2 | 500
MASTER POWER SCHEMATIC RB2, W/MX2 CONTROL FOR: 362-720A CHASSIS
BENSHAW
D | SCH-700139-03 | 0
SCALE: 1:1 | SHEET 1 OF 2
H-224



STANDARD LEGEND

- WIRE NODE SYMBOL MAY HAVE TERMINAL BLOCK
- BENSHAW SUPPLIED TERMINAL BLOCK
- TERMINAL STRIP
- POWER CONNECTION
- PC BOARD TERMINALS
- TWISTED PAIR
- TWISTED SHIELDED PAIR
- SHIELDED WIRE
- FIELD WIRING





THIRD ANGLE PROJECTION	UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS IN INCHES INTERPRET DRAWING PER ASME Y14.5M-1994	SIGNATURES	DATE	TITLE: MASTER CONTROL SCHEMATIC RB2, W/MX2 CONTROL FOR: 362-720A CHASSIS	Electric Power Control Company BENSHAW
	TOLERANCES: XX ± .02 XXX ± .005 ANGLES ± 1°	DRAWN: JA/D	11/2/2000		
		CHKD:			
		ENG: MSN	11/1/2000		
		MFG:			
	MATERIAL:				
	FINISH:				

SIZE	DWG NO.	REV
D	SCH-700139-03	0
SCALE: 1:1	SHEET 2 OF 2	

SQUARE D
by Schneider Electric

Job Name:	RICE LAKE SWITCHBOARD/MCC	Square D Quotation #:	30736399
Job Location:	PRINCETON, IN	Quotation Revision #:	
		Sales Contact:	BROECKLING, DEBBIE
		Sales Contact Location:	412
Purchaser:	VALLEY ELECTRIC SUP CORP	Customer:	ALTEK ELECTRICAL SVC
Purchaser PO #:	7033395	Customer PO #:	
User:	RICE LAKE WILDLIFE AREA	Architect:	US ARMY CORPS OF ENGINEERS
User Location:		Cons. Engineer:	
Drawing Status:	RECORD		

TABLE OF CONTENTS

SQUARE D FACTORY ORDER NUMBER: 30736399–002

REV	DESCRIPTION	BY	DATE
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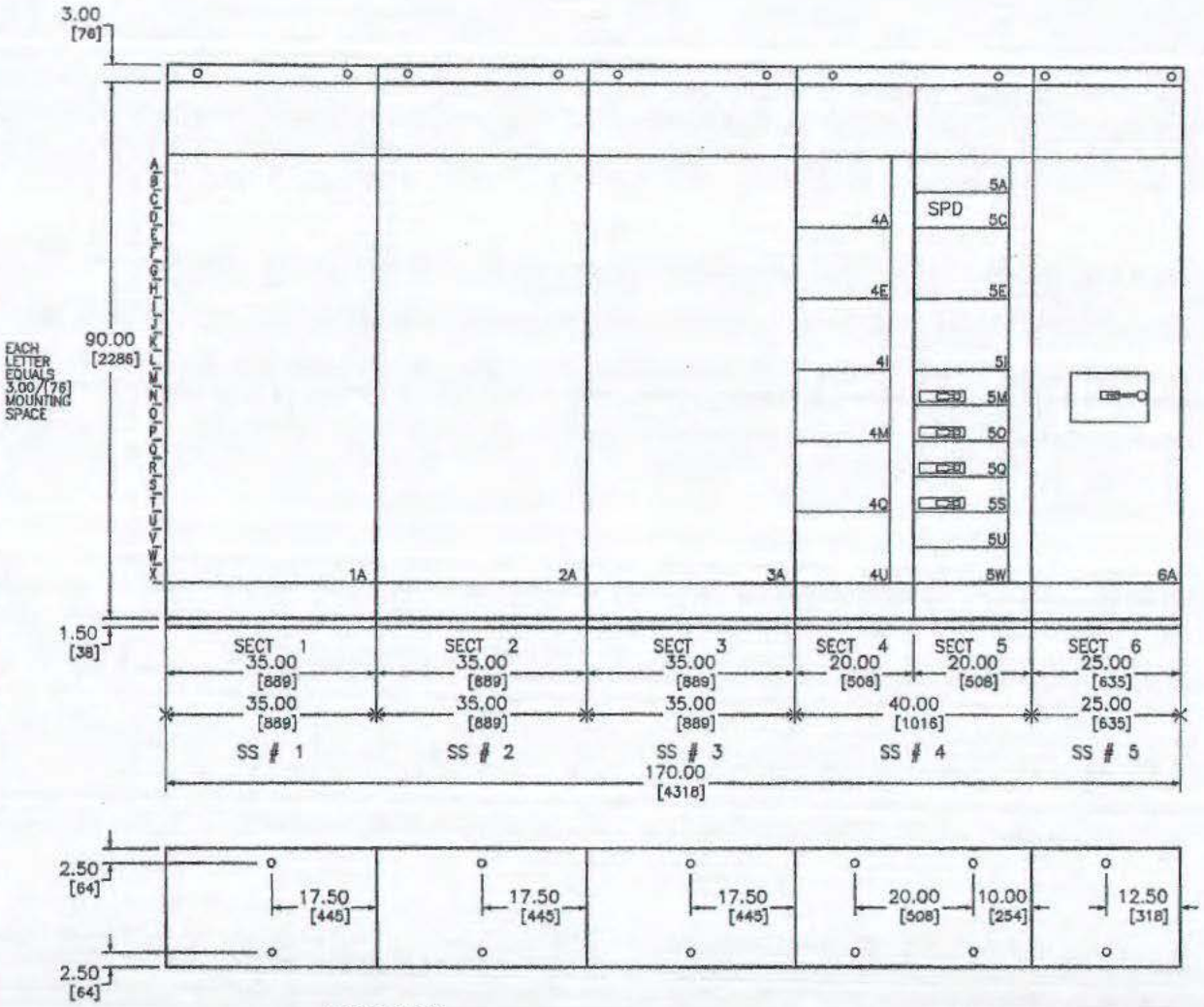

ANCHOR DETAIL

DUAL DIMENSIONS: INCHES MILLIMETERS

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEVATION
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# F30736399-002-01	PG 1 OF 3 REV -

REV	DESCRIPTION	BY	DATE
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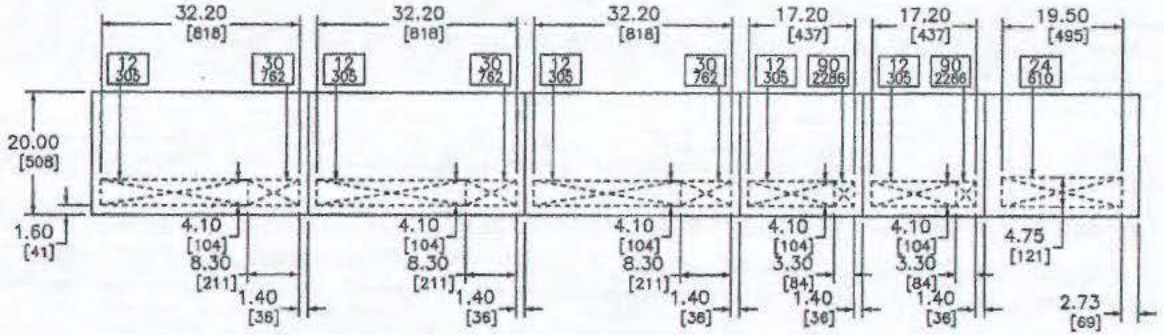
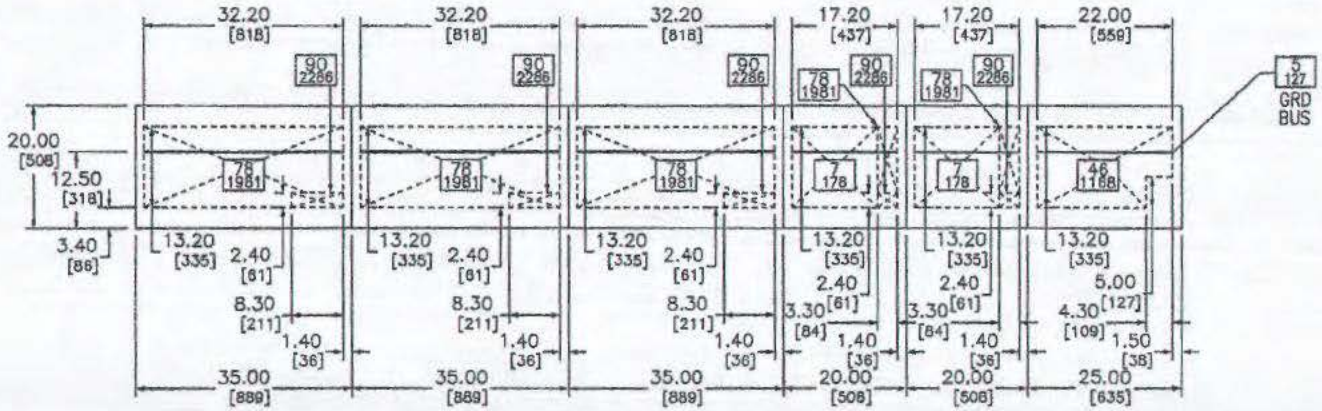


TOP VIEW



DUAL DIMENSIONS: INCHES MILLIMETERS

FLOOR VIEW

CROSSED AREA REPRESENTS CONDUIT ENTRY AREA. NUMBERS IN BOXES INDICATE VERTICAL CLEARANCE TO NEAREST OBSTRUCTION.

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEVATION
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# F30736399-002-01	PG 2 OF 3 REV --

REV	DESCRIPTION	BY	DATE
--	----	--	--/--/--

GENERAL NOTES

Class 1 Type B Wiring

PRODUCT DESCRIPTION AND RATINGS

POWER SYSTEM DATA:

480Y/277V 3PH 4W 60Hz
SHORT CIRCUIT RATING: 42kA
POWER ENTERS: Main Breaker Top Section 6
CONTROL POWER: 120Vac

BUS SYSTEM DATA:

MAIN HORIZONTAL BUS: 1600 Amp Copper/Tin Plated / 1.5"
BUS BRACING: 42kA
VERTICAL BUS: 600 Amp Tin Plated Copper
NEUTRAL BUS: 100 Percent to 1200A, 50 Percent for 1600A
HORIZONTAL GROUND BUS: .25" X 1.0" (6.35mm X 25.4mm) Tin Plated Copper
Units Securely Grounded To Structure

ENCLOSURE DATA:

ENCLOSURE TYPE: 20" DEEP Type 1
EXTERIOR COLOR: Electrodeposition Finish ANSI 49 Medium Light Grey
INTERIOR COLOR: Electrodeposition Finish White

STRUCTURE MODIFICATIONS:

Ground Bus Lug : Main Section
Rodent Barriers 1
Manual Bus Shutters 4,5
Fishtape Barriers 1,2,3,4,5,6
600A Vertical Bus 4,5
Copper Vertical Ground Bus 4,5
Master Nameplate 1

EQUIPMENT WEIGHT:

SHIPPING SPLIT # 1: 760.00 Lbs. (344.74 Kg.)
SHIPPING SPLIT # 2: 760.00 Lbs. (344.74 Kg.)
SHIPPING SPLIT # 3: 760.00 Lbs. (344.74 Kg.)
SHIPPING SPLIT # 4: 1500.00 Lbs. (680.40 Kg.)
SHIPPING SPLIT # 5: 720.00 Lbs. (326.59 Kg.)
TOTAL LINEUP WEIGHT (APPROX): 4500.00 Lbs. (2041.20 Kg.)

PRODUCT ACCESSORIES:

See Unit Features

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEVATION
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG#	F30736399-002-01 PG 3 OF 3 REV --

REV	DESCRIPTION	BY	DATE
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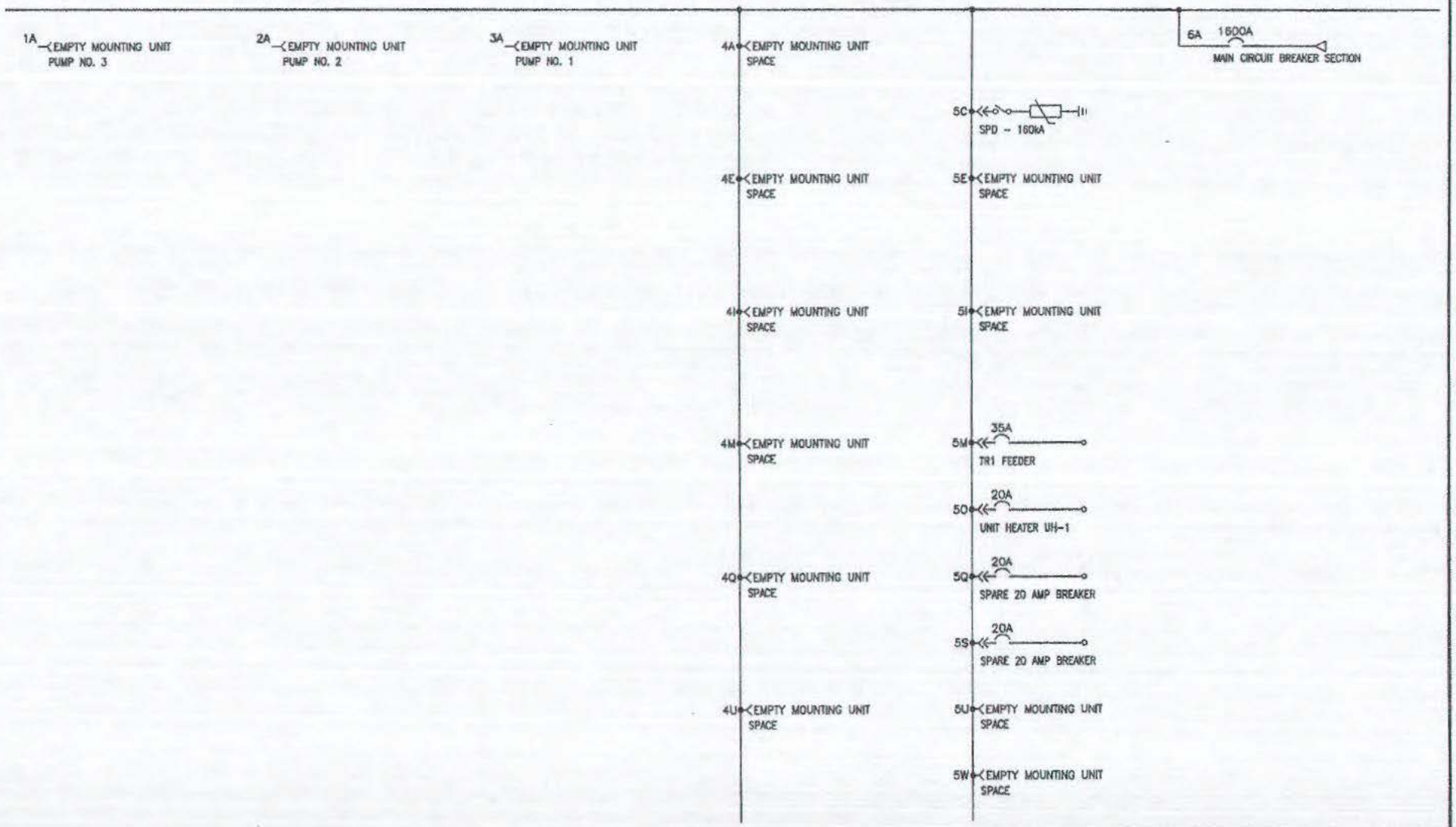

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DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013	DWG#	030736399-002-01
DRAWING STATUS:	RECORD	PG 1 OF 1	REV --

REV	DESCRIPTION	BY	DATE
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-	-----	---	--/--/--
-	-----	--	--/--/--

UNIT LOC	NAMEPLATE DESIGNATION (BLACK SURFACE/WHITE LETTERS)	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	FUSE SIZE PRI	FUSE SIZE SEC	INTERLOCKS NO	INTERLOCKS NC	PILOT DEVICES: 22 mm ** ON LIGHT	PILOT DEVICES: 22 mm ** OFF LIGHT	PILOT DEVICES: 22 mm ** ADDL P/L	PILOT DEVICES: 22 mm ** SS / PB	OTHER UNIT FEATURES	ELEMENTARY #
1A	PUMP NO. 3	BRANCH BKR			U 600	600											(2) 4/0 AWG-500 KCMIL LUG/PH	E30736399-002-05
2A	PUMP NO. 2	BRANCH BKR			U 600	600											(2) 4/0 AWG-500 KCMIL LUG/PH	E30736399-002-05
3A	PUMP NO. 1	BRANCH BKR			U 600	600											(2) 4/0 AWG-500 KCMIL LUG/PH	E30736399-002-05
4A	SPACE	MT UNIT																
4E	SPACE	MT UNIT																
4I	SPACE	MT UNIT																
4M	SPACE	MT UNIT																
4Q	SPACE	MT UNIT																
4U	SPACE	MT UNIT																
5A	MONITORING UNIT FOR MAIN	POWER METER															#14 AWG MTW CONTROL WIRE, PM820 W/DISPLAY	E30736399-002-04
5C	SURGE PROTECTION DEVICE	SPD	160kA		SW 30												SOLIDLY GROUNDED, SURGE COUNTER	E30736399-002-01
5E	SPACE	MT UNIT																
5I	SPACE	MT UNIT																
5M	TR1 FEEDER	6" BRANCH BKR			HJ 150	35											14-3/0AWG 1 LUG/PH, 80% RATED	E30736399-002-02
5O	UNIT HEATER UH-1	6" BRANCH BKR			HJ 150	20											14-3/0AWG 1 LUG/PH, 80% RATED	E30736399-002-03
5Q	SPARE 20 AMP BREAKER	6" BRANCH BKR			HJ 150	20											14-3/0AWG 1 LUG/PH, 80% RATED	E30736399-002-03
5S	SPARE 20 AMP BREAKER	6" BRANCH BKR			HJ 150	20											14-3/0AWG 1 LUG/PH, 80% RATED	E30736399-002-03
5U	SPACE	MT UNIT																
5W	SPACE	MT UNIT																
UNIT LOC	NAMEPLATE DESIGNATION	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	PRI	SEC	NO	NC	ON LIGHT	OFF LIGHT	ADDL P/L	SS / PB	OTHER UNIT FEATURES	ELEMENTARY #
									FUSE SIZE		INTERLOCKS		PILOT DEVICES: 22 mm **					

MCC NAMEPLATE – MCC1
(BLACK SURFACE/WHITE LETTERS)

JOB NAME:	RICE LAKE SWITCHBOARD/MCC
JOB LOCATION:	PRINCETON IN
DRAWN BY:	CAD
ENGR:	KEN BROWN
DATE:	FEBRUARY 19 2013
DRAWING STATUS:	RECORD

EQUIPMENT DESIGNATION:	MCC1
EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWING TYPE:	UNIT INFORMATION
DWG#	I30736399-002-01
PG 1 OF 2	REV –

REV	DESCRIPTION	BY	DATE
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UNIT LOC	NAMEPLATE DESIGNATION	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	FUSE SIZE PRI	FUSE SIZE SEC	INTERLOCKS NO	INTERLOCKS NC	PILOT DEVICES: 22 mm ** ON LIGHT	OFF LIGHT	ADDL P/L	SS / PB	OTHER UNIT FEATURES	ELEMENTARY #
6A	MAIN CIRCUIT BREAKER SECTION	MAIN BKR			RL 3000	1600											1/0-750KCMIL 6 LUGS/PH, 24VDC TRIP UNIT PWR SUPP, 80% RATED, ELECTRONIC AMMETER TRIP UNIT, LSIG TRIP FUNCTION, SOLID NEUTRAL, UL SERVICE ENT LABEL	E30736399-002-04

UNIT LOC	NAMEPLATE DESIGNATION	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	PRI	SEC	NO	NC	ON LIGHT	OFF LIGHT	ADDL P/L	SS / PB	OTHER UNIT FEATURES	ELEMENTARY #
									FUSE SIZE		INTERLOCKS		PILOT DEVICES: 22 mm **					

JOB NAME:	RICE LAKE SWITCHBOARD/MCC
JOB LOCATION:	PRINCETON IN
DRAWN BY:	CAD
ENGR:	KEN BROWN
DATE:	FEBRUARY 19 2013
DRAWING STATUS:	RECORD

EQUIPMENT DESIGNATION:	MCC1
EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWING TYPE:	UNIT INFORMATION
DWG#	I30736399-002-01

PG 2 OF 2 | REV --

REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--
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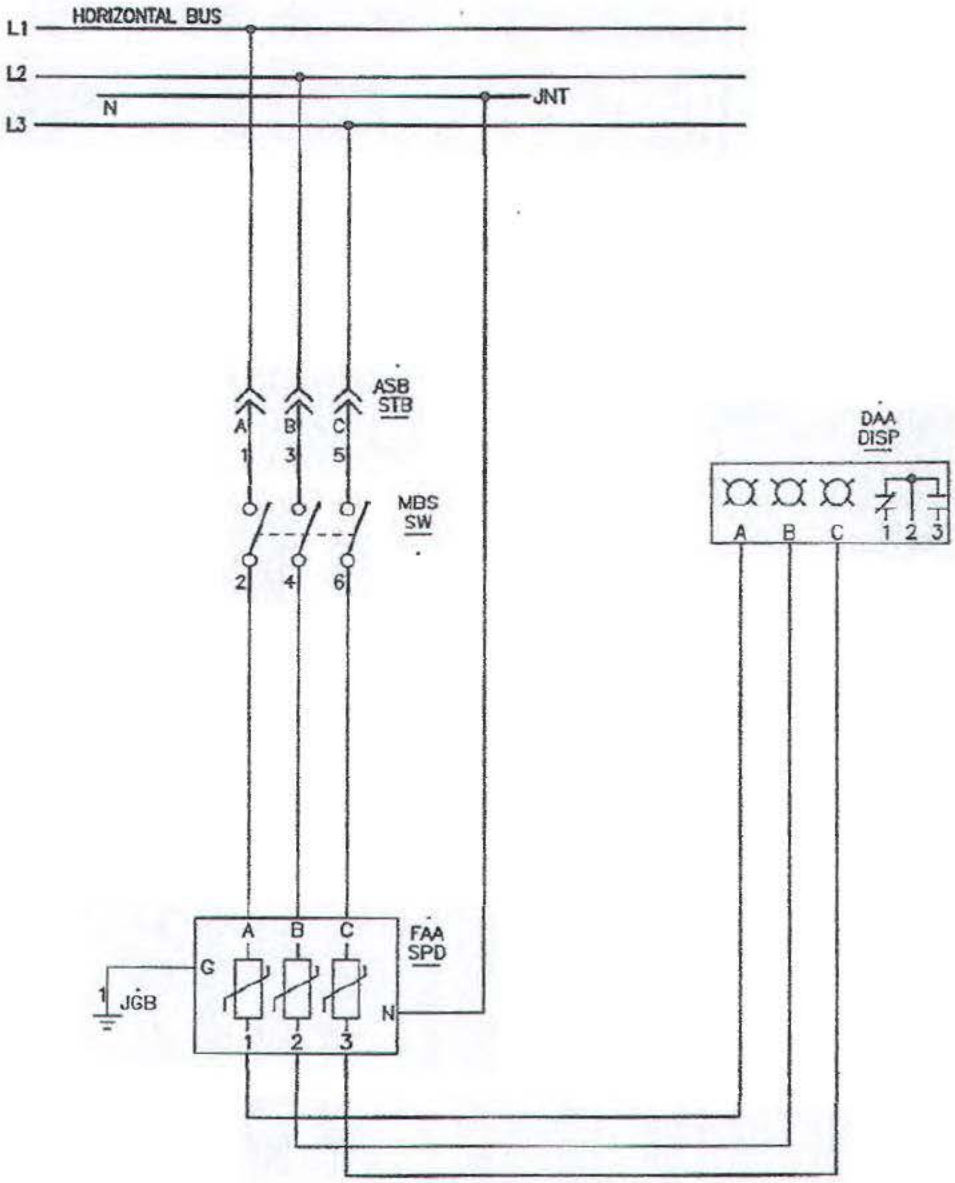

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# E30736399-002-01	PG 1 OF 1 REV -

REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--
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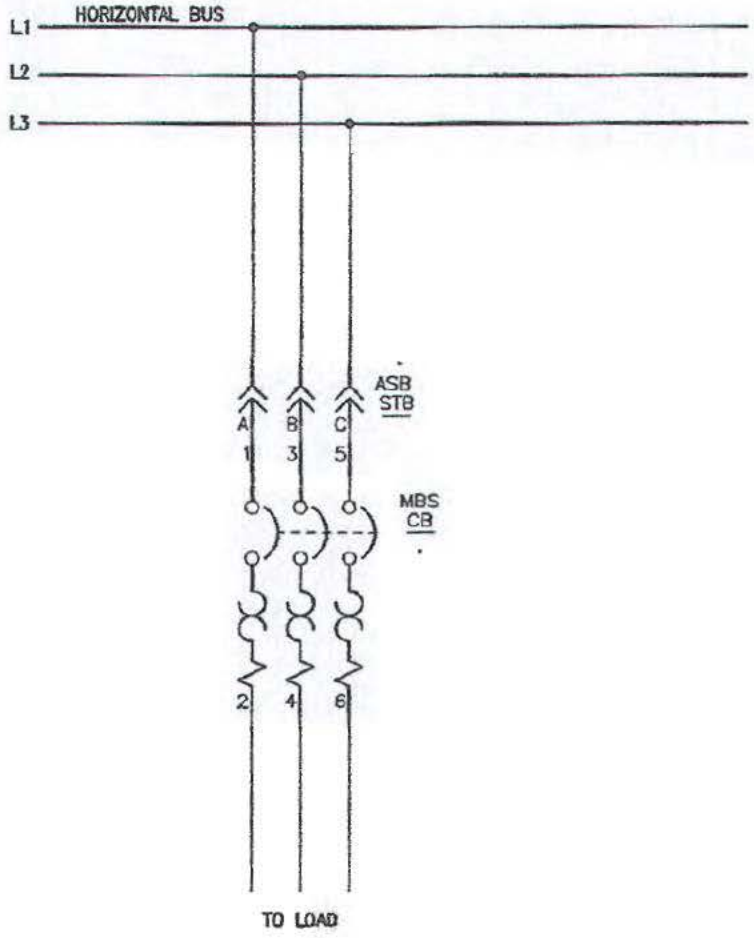

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		SQUARE D by Schneider Electric
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# E30736399-002-02	PG 1 OF 1 REV

REV	DESCRIPTION	BY	DATE				
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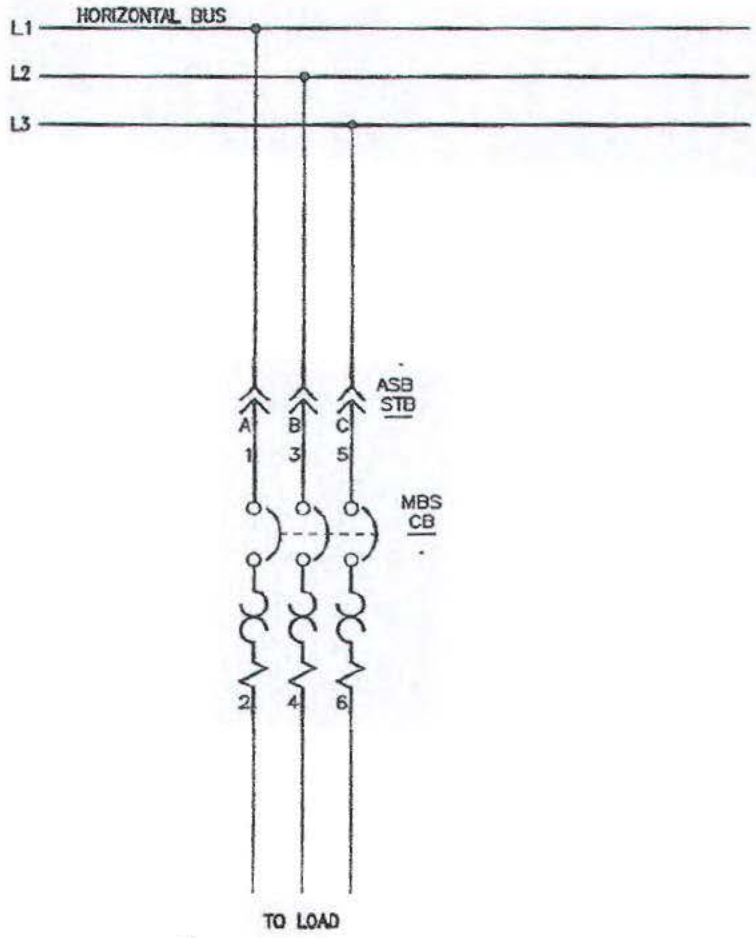

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# E30736399-002-03	PG 1 OF 1 R

REV	DESCRIPTION	BY	DATE
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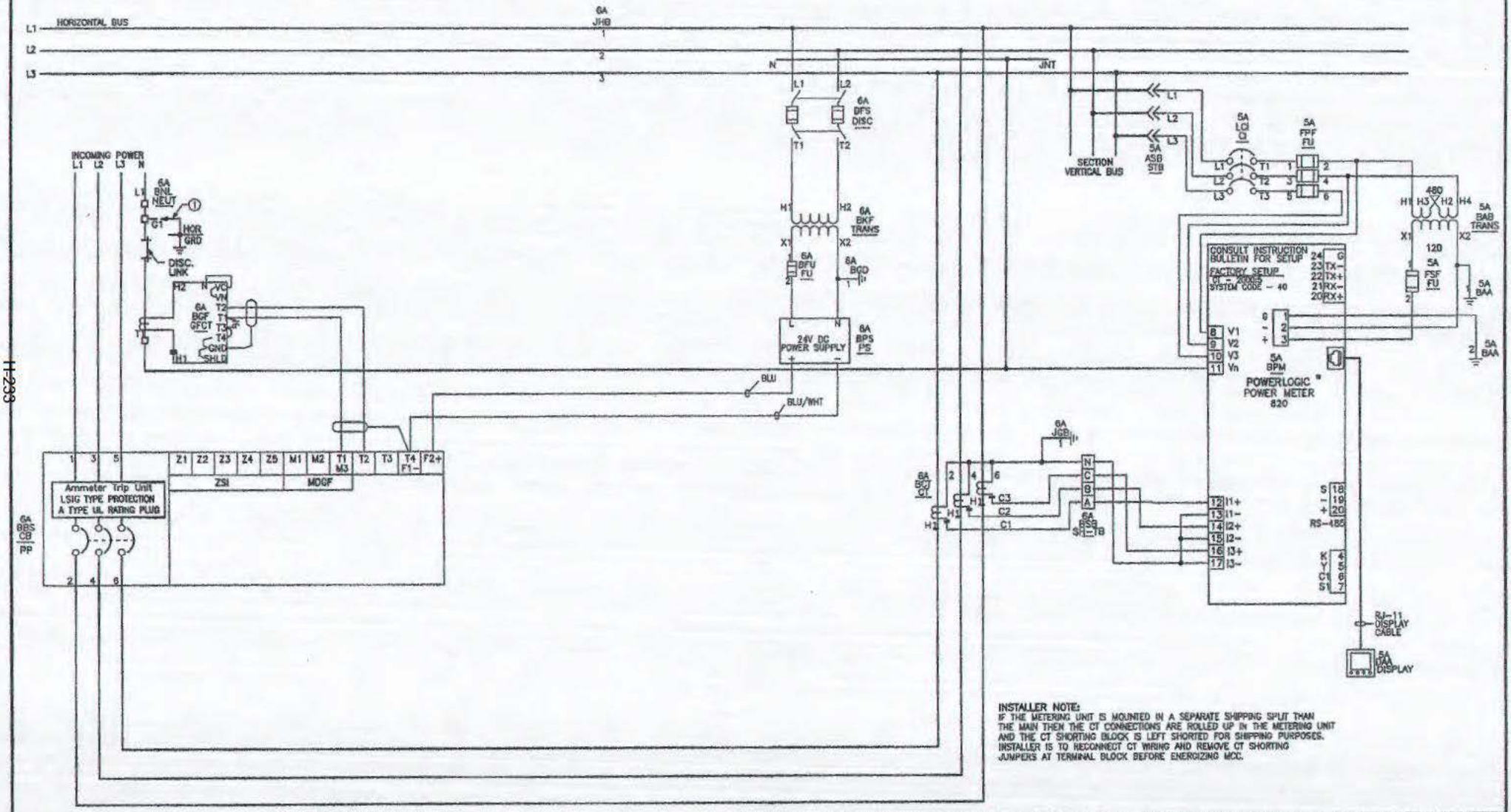


H-233

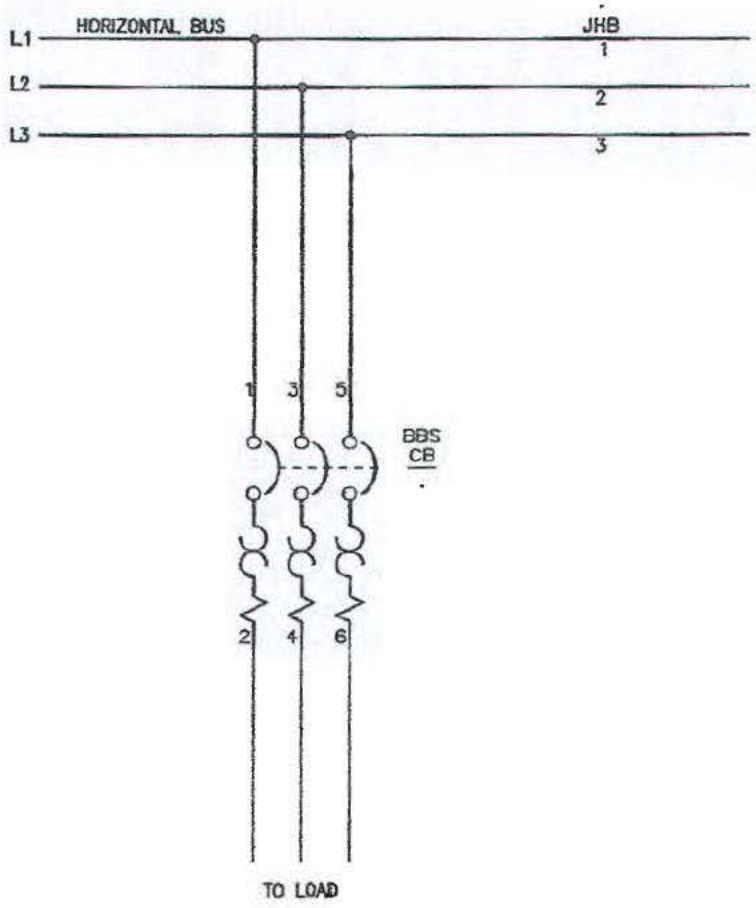
INSTALLER NOTE:
IF THE METERING UNIT IS MOUNTED IN A SEPARATE SHIPPING SPLIT THAN THE MAIN THEN THE CT CONNECTIONS ARE ROLLED UP IN THE METERING UNIT AND THE CT SHORTING BLOCK IS LEFT SHORTED FOR SHIPPING PURPOSES. INSTALLER IS TO RECONNECT CT WIRING AND REMOVE CT SHORTING JUMPERS AT TERMINAL BLOCK BEFORE ENERGIZING MCC.

① "MAIN BONDING JUMPER. CUSTOMER TO CONNECT AS REQUIRED"

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG#	E30736399-002-04

PG 1 OF 1 REV --

REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--
-	----	--	--/--/--	-	----	--	--/--/--



JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		SQUARE D by Schneider Electric
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# E30736399-002-05	PG 1 OF 1 RE

600 A and 800 A Horizontal Bus Splice Assembly

Addendum to 80459-641-01D (Section 4)

Ensamble de empalme de barras horizontales de 600 A y 800 A

Anexo al boletín no. 80459-641-01D (sección 4)

Ensemble de raccordement de barres-bus horizontales de 600 A et 800 A

Supplément aux directives 80459-641-01D (section 4)

Instruction Bulletin
Boletín de instrucciones
Directives d'utilisation

80459-653-01

Retain for Future Use. /
Conservar para uso futuro. /
À conserver pour usage ultérieur.

SQUARE D™
by Schneider Electric

Instruction Bulletin

600 A and 800 A Horizontal Bus Splice Assembly

Addendum to 80459-641-01D (Section 4)

Class 8998

ENGLISH

Retain for future use.

Document Purpose

This addendum contains an important correction to the Model 6 Motor Control Centers (MCCs) instruction bulletin no. **80459-641-01D.**

Please perform the following actions:

- Read this addendum BEFORE commissioning the Low Voltage Motor Control Center.
- Attach this addendum to instruction bulletin no. 80459-641-01D, Section 4, starting on page 15.

Safety Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power to this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm that the power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- When moving the MCC sections, follow the instructions in the section "Handling the MCC" on page 12 of 80459-641-01D. The MCC has a high center of gravity, which may cause it to tilt.

Failure to follow these instructions will result in death or serious injury.

Horizontal Bus Splice

DO NOT use the single splice bar per phase on the fork end of the fork type bus. Two splice bars per phase must be used on the fork end of the fork type bus.

NOTE: For a connection on fork type bus, if two splice bars per phase are not provided, contact your nearest Schneider Electric representative.

Figure 1: Correct Procedure for Joining Sections Together with a Single Splice Bar with the Non Fork Bus

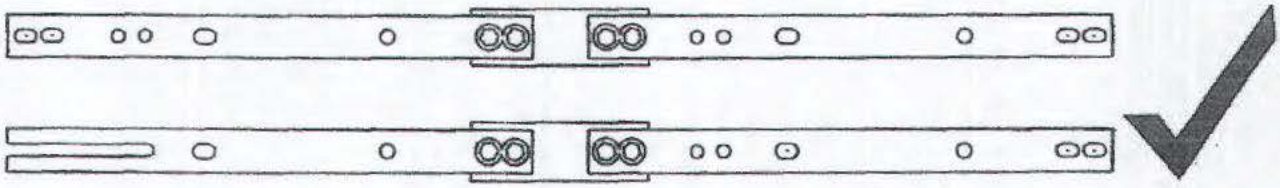


Figure 2: Incorrect Procedure for Joining Sections Together with a Single Splice Bar with Fork Bus

NOTE: The fork bus combination requires two laminations of bus splices.

SQUARE D by Schneider Electric

ENGLISH

Schneider Electric USA, Inc.
1990 Sandifer Blvd.
Seneca, SC 29678 USA
1-888-778-2733
www.schneider-electric.us

Section 5

System Testing Reports

SQUARE D COMPANY
POWER EQUIPMENT GROUP

INSPECTION CHECK LIST

Motor Control Centers

REJECTION CORRECTION

SECTION NO. AND UNIT LOCATION	REMARKS	REWORK REQUIRED	DISPOSITION	RE-INSPECTED AND APPROVED
2	Structure door is scratched	✓	repainted OK'd	By Wallace Beeks ow
1	Master NR included			ow

MCC STRUCTURES IN-PROCESS INSPECTION

STATION	BADGE #	BADGE #
KITTER	7	
ST 1	1331	Bottom
ST 1a		
ST 2	0928	Top
ST 2a		
ST 3		
XFMR		
DOORS		
NP		CRANE
LBL/RESET/INS		

Line 1, 2, or (4) (Circle)
Sect. 2 & 6
AS200.099a REV. DATE 6/1/2010

MCC STRUCTURES IN-PROCESS INSPECTION

STATION	BADGE #	BADGE #
KITTER	1467	
ST 1	1331	Bottom
ST 1a		
ST 2	0928	Top
ST 2a		
ST 3		
XFMR		
DOORS		
NP		CRANE
LBL/RESET/INS		

Line 1, 2, or (4) (Circle)
Sect. 1 & 6
AS200.099a REV. DATE 6/1/2010

MCC STRUCTURES IN-PROCESS INSPECTION

STATION	BADGE #	BADGE #
KITTER	1467	
ST 1		
ST 1a		
ST 2	0928	Top
ST 2a		
ST 3		
XFMR		
DOORS		
NP		CRANE
LBL/RESET/INS		

Line 1, 2, or (4) (Circle)
Sect. 3 OF 6
AS200.099a REV. DATE 6/1/2010

ITEMS SHIPPED SHORT

INSPECTED BY: Corey Layne
DATE: 3-14-12
FACTORY ORDER NO. 30736399-0001
SECTION NO. (S) 2 OF 6
SUPPLEMENT 1,3 3-14-12
APPROVED FOR SHIPMENT BY: M Eg Wyn
C16

SQUARE D COMPANY - SENECA
POWER EQUIPMENT DIVISION

INSPECTION CHECK LIST

Motor Control Centers

1. INSTRUCTIONS
   - .1 MARK EVERY ITEM ON THIS FORM.
   - .2 RECORD REJECTED ITEMS ON REJECTION/CORRECTION SHEET, PAGE 4, NOTE APPROPRIATE DISPOSITION. DO NOT APPROVE AN ITEM UNTIL IT HAS BEEN CORRECTED.
   - .3 USE JOB DRAWINGS AND DOCUMENTS AS WELL AS DESIGN ENGINEERING DRAWINGS, BILLS AND SPECIFICATIONS AS INSPECTION GUIDES. PLACE A RED CHECK MARK ON EACH SYMBOL OR DESCRIPTION OF THE DRAWING OR DOCUMENT WHEN THE ITEM HAS BEEN INSPECTED.
   - .4 IF ADDITIONAL INSPECTION PROCEDURES ARE REQUIRED, ATTACH COPY TO THIS INSPECTION REPORT.
   - .5 UPON COMPLETION OF INSPECTION, THIS REPORT AND SUPPORT DOCUMENTS NOTED IN 1.4 ABOVE ARE TO BE GIVEN TO HEAD OF QUALITY CONTROL FOR RETENTION.
   - .6 REFER TO QA 046.401XX FOR ADDITIONAL EXPLANATION OF INSPECTIONS.
2. GENERAL DATA
   - IF UNITS ONLY, USE UNIT ONLY CHECKLIST (QCF-8048).
   - SECTION(S) 2 OF 6

NOT APPLICABLE	INSPECTED	
	✓	3. PHYSICAL INSPECTION .1 ENCLOSURE
	✓	.1 STRUCTURE NAMEPLATE: STAMPING CONSISTENT WITH FACTORY ORDER NUMBER. RATINGS PER OUR RECORDS.
	✓	.2 NEMA ENCLOSURE TYPE, OVERALL DIMENSIONS, LAYOUT, ETC. - PER ENGINEERING RECORDS.
	✓	.3 FASTENERS: CORRECT QUANTITY AND TYPE - PROPERLY TORQUED AND SECURED.
	✓	.4 DOORS & COVERS FIT PROPERLY; MECHANICAL OR ELECTRICAL INTERLOCKS OPERATE CORRECTLY.
✓		.5 GASKETING: QUANTITY AND LOCATION CORRECT PER NEMA TYPE AND ENGINEERING RECORDS-GLUED OR OTHERWISE SECURELY ATTACHED.
	✓	.6 INTERNAL BARRIERS - PER ENGINEERING RECORDS.
	✓	.7 LIFTING ANGLES AND BASE CHANNELS PROPERLY ASSEMBLED AND SECURED.
	✓	.8 STRUCTURE FORM NUMBERS PRESENT - PER ENGINEERING RECORDS.
	✓	.9 FINISH KIND, COLOR, APPEARANCE.
	✓	.10 VERIFY GROUND STRAP CONNECTIONS FOR MULTI PIECE SADDLES..
		.2 ELECTRICAL CONDUCTORS .1 BUS SYSTEM
	✓	.1 MATERIAL (☑ COPPER OR ☐ ALUMINUM) - PER ENGINEERING RECORDS.
	✓	.2 SIZE - WIDTH, THICKNESS AND QUANTITY PER PHASE - PER ENGINEERING RECORDS. SPECIAL BUS OR WIRING BETWEEN INTERRUPTED BUS IS CONSISTENT IN CURRENT CARRYING RATING AS IS SECTION BUS. LIST SPECIAL BUS OR WIRE SIZES AND QUANTITIES.
		SECTION AND UNIT LOCATION 2 & 6
		BUS OR WIRE SIZE & MATERIAL 1600A
		NUMBER PER PHASE 4 1/4"
	✓	.3 PLATING: FINISH (☑ TIN OR ☐ SILVER) - PER ENGINEERING RECORDS. PLATING IS SMOOTH, TIGHT, ADHERING AT ALL POSSIBLE CONTACT SURFACES.
	✓	.4 NEUTRAL BUS IS PRESENT (IF REQUIRED). 50%
	✓	.5 HORIZONTAL & VERTICAL GROUND BUS AS REQUIRED.
	✓	.6 ALIGNMENT AND SUPPORT: BUS RUN MUST BE SQUARE AND PROPERLY SUPPORTED.
	✓	.7 JOINTS
	✓	.1 CONTACT AREA - PER ENGINEERING RECORDS OR BASED ON 200 AMPS PER SQUARE INCH IF SPECIAL BUSSING JOINT.
	✓	.2 JOINT FASTENERS ARE PROPERLY TORQUED AND SECURED. IF ALUMINUM, A CONICAL OR SPRING WASHER MUST BE USED.
	✓	.8 SHORT CIRCUIT CURRENT BRACING: BUS MUST BE PROPERLY BRACED - PER ENGINEERING RECORDS AND CONSISTENT WITH THE SHORT CIRCUIT RATING OF THE CONTROL CENTER.
	✓	.9 ELECTRICAL SPACINGS PER TABLE 1 BELOW.

TABLE 1
MINIMUM ACCEPTABLE SPACINGS (a)

VOLTAGE INVOLVED	MINIMUM SPACINGS BETWEEN LIVE PARTS OF OPPOSITE POLARITY: THROUGH AIR	MINIMUM SPACINGS BETWEEN LIVE PARTS OF OPPOSITE POLARITY: OVER SURFACE	MINIMUM SPACING THROUGH AIR AND OVER SURFACE BETWEEN LIVE PARTS AND GROUNDED METAL PARTS
125 OR LESS VOLTS	1/8 INCH	3/4 INCH	1/8 INCH
126-250	3/4	1-1/4	1/2
251-600	1	2	1(b)

(a) AN ISOLATED DEAD METAL PART (SUCH AS A SCREW HEAD OR WASHER) INTERPOSED BETWEEN UNINSULATED LIVE PARTS OF OPPOSITE POLARITY OR BETWEEN AN UNINSULATED LIVE PART AND GROUNDED DEAD METAL IS CONSIDERED TO REDUCE THE SPACING BY AN AMOUNT EQUAL TO THE DIMENSION OF THE INTERPOSED PART ALONG THE PATH OF MEASUREMENT.

(b) A THROUGH-AIR SPACING OF NO LESS THAN 1/2 INCH IS ACCEPTABLE (1) AT A CIRCUIT BREAKER OR FUSIBLE DISCONNECTION MEANS, AND (2) BETWEEN GROUNDED DEAD METAL AND THE NEUTRAL OF A 277/480 VOLT, 3 PHASE, FOUR-WIRE MOTOR CONTROL CENTER.

QCF-604 REV. 4/94

H-239

NOT APPLICABLE	INSPECTED	
		3. PHYSICAL INSPECTION
		.2 ELECTRICAL CONDUCTORS
		.1 BUS SYSTEM
		.1 HORIZONTAL SPLICE BARS
		.2 GROUND SPLICE BAR
		.3 NEUTRAL SPLICE BARS
		.4 SPECIAL SPLICE BARS -- TYPE
		.11 CUSTOMER CONNECTIONS
		.1 LUGS, IF SUPPLIED, CORRECT TYPE AND QUANTITY - PER ENGINEERING RECORDS. SUITABLE FOR INCOMING CABLE SIZE LISTED ON DATA SHEET.
		.2 CUSTOMER CABLE BENDING SPACE ACCEPTABLE PER UL STANDARD 845.
		.3 SHARP EDGES OR PROTRUSIONS IN POTENTIAL WIRING AREAS ARE REMOVED OR COVERED TO PROTECT WIRE INSULATION AND PERSON INSTALLING.
		.12 CONDUCTORS THROUGH OPENINGS: SQUARE D OR CUSTOMER MADE WIRING OR BUSSING (INCLUDING NEUTRAL) MUST NOT BE SEPARATED BY STEEL OR OTHER MAGNETIC MATERIALS.
		.3 GENERAL WIRING
		.1 NEMA CLASS AND TYPE: WIRE SIZE - PER ENGINEERING RECORDS.
		.2 SUPPORT IS PROVIDED, AS NECESSARY, TO PREVENT WIRING FROM INTERFERING WITH DEVICE OPERATION OR FROM BEARING AGAINST LIVE, UNINSULATED PARTS SUCH AS BUS BARS, LUGS, ETC.
		.3 SHARP EDGES OR PROTRUSIONS ARE REMOVED OR COVERED SO WIRING WILL NOT REST ON THEM AT TIME OF INSPECTION OR LATER AFTER MOVEMENT DUE TO SHIPPING, INSTALLATION OR USE VIBRATION.
		.4 TORQUE IS PROPERLY APPLIED TO ALL CONNECTIONS, DEVICES, TERMINAL BLOCKS, AND LUGS.
		.3 UNITS INTO STRUCTURES
		.1 LOCATION - UNITS AND SPACES LABELED - PER ENGINEERING RECORDS.
		.2 DEVICES - ALL FORM NUMBERS PRESENT IN UNITS - PER ENGINEERING RECORDS.
		.3 UNIT DEVICES WITH ADJUSTABLE SETTINGS SUCH AS TIMERS.

DEVICE ____ SETTING ____

NOT APPLICABLE	INSPECTED	
		.4 ELECTRICAL SPACINGS: DEVICES ARE MOUNTED PER UNIT ARRANGEMENT DRAWING SO THAT PROPER ELECTRICAL SPACINGS ARE MAINTAINED, AND PER TABLE 2 BELOW.

TABLE 2
SPACINGS WITH MOTOR CONTROL UNITS

VOLTAGE INVOLVED	BETWEEN UNINSULATED LIVE PARTS OF OPPOSITE POLARITY AND BETWEEN ANY UNINSULATED LIVE PART AND ANY EXPOSED OR UNINSULATED DEAD METAL PART OTHER THAN THE ENCLOSURE: THROUGH AIR	BETWEEN UNINSULATED LIVE PARTS OF OPPOSITE POLARITY AND BETWEEN ANY UNINSULATED LIVE PART AND ANY EXPOSED OR UNINSULATED DEAD METAL PART OTHER THAN THE ENCLOSURE: OVER SURFACE	BETWEEN UNINSULATED LIVE PARTS AND THE WALLS OF A METAL ENCLOSURE (b), INCLUDING FITTINGS FOR CONDUIT OR ARMORED CABLE: SHORTEST DISTANCE
125 OR LESS	1/8(a)	1/4	1/2
126-250	1/4	3/8	1/2
251-600	3/8	1/2	1/2

(a) THE SPACING BETWEEN WIRING TERMINALS OF OPPOSITE POLARITY SHALL NOT BE LESS THAN 1/4 INCH IN ANY CASE IF THE TERMINALS ARE IN THE SAME PLANE. A METAL PIECE ATTACHED TO THE ENCLOSURE FOR THE PURPOSE OF THIS NOTE, IF DEFORMATION OF THE ENCLOSURE IS LIKELY TO REDUCE THE SPACING BETWEEN THE METAL PIECE AND A LIVE PART.

(b) THE ENCLOSURE REFERS TO THE SECTION ENCLOSURE.

		.5 ELECTRICAL RATINGS: VOLTAGE, CURRENT SHORT CIRCUIT INTERRUPT RATINGS & FREQUENCY 60 Hz PER ENGINEERING RECORDS.
		.6 MECHANICAL OPERATION: ALL HANDLES, OPERATORS, INTERLOCKS, SWITCHES, ETC. ARE PROPERLY ASSEMBLED - PER ENGINEERING RECORDS AND OPERATE FREELY.
		.7 DEVICE OR COMPONENT IDENTIFICATION (IF REQUIRED) - PER ENGINEERING RECORDS.
		.8 EXTERNAL RESETS: CORRECT TYPE AND FUNCTION PROPERLY - PER ENGINEERING RECORDS.
		.9 CIRCUIT BREAKER PUSH-TO-TRIP: OPERATION FUNCTIONS CORRECTLY: HANDLE RESETS BREAKER.
		.10 THERMAL OVERLOADS: PRESENT AND PROPERLY SIZED AND LOCATED - PER ENGINEERING RECORDS.
		.11 APPEARANCE: COMPONENTS UNDAMAGED, CLEAN, AND HAVE ACCEPTABLE FINISH.
		.12 GROUND STABS ENGAGED PROPERLY.
		.13 POWER BUS STABS ENGAGED PROPERLY.
		.14 TERMINAL BLOCKS SECURED.
		.15 SECURED TO STRUCTURE (QUARTER TURNS & SHOULDER SCREWS)
		.16 UNIT NAME PLATE: ENGRAVED, IF NECESSARY, AND PROPERLY SECURED.

NOT APPLICABLE	INSPECTED	
		4. ELECTRICAL TESTS
		.1 SAFETY WARNING
		.1 USE ONLY APPROVED TEST EQUIPMENT
		.2 FOLLOW ALL SAFETY RULES FOR ELECTRICAL TESTING.
		.3 TEST IN SAFETY AREA - ERECT BARRIER AND HAZARD SIGNS.
		.2 GENERAL ELECTRICAL TESTS
		.1 POWER CIRCUIT PHASING. USE LOW VOLTAGE ELECTRICAL CONTINUITY TESTER. CHECK POWER CIRCUIT COMPLETELY TO INSURE THAT THERE IS NO PHASE REVERSAL UNLESS SPECIFIED ON ENGINEERING RECORDS. POWER WIRING CONTINUITY MUST EXIST AS SPECIFIED ON ENGINEERING RECORDS.
		.2 CONTROL CIRCUIT WIRING: USE LOW VOLTAGE ELECTRICAL CONTINUITY TESTER. WIRING EXIST AT AND BETWEEN ALL CONNECTION POINTS - PER ENGINEERING RECORDS.
		.3 INSTRUMENT TRANSFORMERS
		.1 CASE GROUNDS: TEST FOR CONTINUITY USING LOW VOLTAGE ELECTRICAL CONTINUITY TESTER.
		.2 CONNECTIONS: TEST WITH LOW VOLTAGE ELECTRICAL TESTER TO INSURE THAT POLARITY IS CORRECT IN THE INSTRUMENT CIRCUIT.
		.4 METERS: TEST FOR CORRECT POLARITY OF CONNECTIONS AND CORRECT DIRECTION OR MOVEMENT OF INDICATOR.
		.5 GROUND FAULT SYSTEM: TEST AT FULL VOLTAGE PER ENGINEERING TEST PROCEDURE. SEQUENCE AND OPERATION IS CORRECT.
		.6 COMPONENT DEVICE ELECTRICAL OPERATION TEST
		.1 FOLLOW SAFETY PROCEDURES IN 4.1.1, 4.1.2, AND 4.1.3 ABOVE.
		.2 CONNECT TEST VOLTAGE SUPPLY TO HORIZONTAL BUS OR UNIT DISCONNECT DEVICE. VOLTAGE MUST BE CONSISTENT WITH RESPECTIVE BUS OR COMPONENT RATING. COILS THAT ARE SUPPLIED BY SEPARATE SOURCE SHALL BE ELECTRICALLY ENERGIZED AT COIL CONNECTIONS WITH SAME RATED VOLTAGE.
		.3 TEST EACH UNIT AND RESPECTIVE COMPONENTS AT RATED VOLTAGE. DEVICES MUST OPERATE IN SEQUENCE AS PER ENGINEERING ELEMENTARY DIAGRAMS. ELECTRICAL CONTACTS OR INTERLOCKS SHALL OPEN OR CLOSE - PER ENGINEERING RECORDS.
		.3 AC DIELECTRIC TESTS
		.1 FOLLOW SAFETY PROCEDURES 4.1.1, 4.1.2, AND 4.1.3 ABOVE.
		.2 POWER CIRCUIT TEST: TEST VOLTAGE PER TABLE 3 BELOW.
		.1 ALL SWITCHING DEVICES ARE TO BE OPEN.
		.2 VOLTAGE SENSITIVE DEVICES MUST BE DISCONNECTED FROM ONE SIDE.
		.3 TEST BETWEEN ALL LIVE CONDUCTORS OF OPPOSITE POLARITY.
		.4 TEST BETWEEN ALL LIVE CONDUCTORS AND DEAD METAL PARTS.

TABLE 3
AD DIELECTRIC TEST VOLTAGES

SYSTEM VOLTAGE	TEST VOLTAGE	TIME ON
240 OR 277	1500	1 SEC.
480 OR 550	2500	1 SEC.
600	2640	1 SEC.

		.3 CONTROL CIRCUITS: ALL CIRCUIT GROUNDS DISCONNECTED. BARE METAL JUMPERS SHORTING VOLTAGE SENSITIVE DEVICES (COILS, SOLID-STATE ELECTRONICS, ETC). TEST VOLTAGE 1500 VOLTS, 60 HERTZ 1 SECOND (WHEN REQUIRED).
		.5 MARKINGS
		.1 STANDARD MARKINGS AND LABELS PRESENT AS SPECIFIED BY ENGINEERING. PROPERLY SECURED.
		.1 HAZARD LABEL
		.2 REMOTE SUPPLY
		.3 WARNING LABEL
		.2 SPECIAL INSTRUCTION LABELS OR MARKINGS: PRESENT AS SPECIFIED BY ENGINEERING AND PROPERLY SECURED.
		.3 UNDERWRITERS LABORATORY (UL) LABELS.
		.4 INSPECTOR'S STAMP OR LABEL, APPLIED ON INSIDE OF VERTICAL WIRE THROUGH DOOR.
		.6 RELEASE FOR SHIPMENT

FINAL INSPECTION BEFORE SIGN-OFF AND PRIOR TO PACKAGING SHALL INCLUDE INSPECTION TO SEE THAT ALL SHAVINGS, CHIPS, LOOSE NUTS, BOLTS AND SCREWS, WHICH MAY HAVE FALLEN DURING ASSEMBLY, ARE REMOVED.

SQUARE D COMPANY
POWER EQUIPMENT GROUP

INSPECTION CHECK LIST

Motor Control Centers

REJECTION CORRECTION

SECTION NO. AND UNIT LOCATION	REMARKS	REWORK REQUIRED	DISPOSITION	RE-INSPECTED AND APPROVED
4A,4B	DOOR: BAD PAINT	✓	REPAINED	TBJ
5M (Standards)	UID LABEL OMITTED	✓	ADDED	TBJ
NOTE	MT UNITS: 4A, 4B, 5I, 4M, 4O, 4N, 5E, 5J, 5O, 5N			
	POWER APPLIED AND TESTED: 5A, 5C			
	CT WIRES POLED UP IN 5A			
	PROGRAMMED POWER METER (CT 2000:5, AND PT SYS CODE: 40)			
	CUSTOMER COPY SENT			

MCC STRUCTURES IN-PROCESS INSPECTION

STATION	BADGE #	BADGE #
KITTER		4948
ST1	5723	SP
ST1a	1328	
ST2	0468	3108
ST2a	1316	
ST3	1249	6957
XFMR		
DOORS		
NP	1341	CRANE
LAUNDERTAPS		

Line 1, (2) or 4 (Circle)

Sect. 4, 5 of 6

AS200.099a REV. DATE 8/1/2010

ITEMS SHIPPED SHORT

INSPECTED BY: Tyler B Watkins

DATE: 3/19/15

FACTORY ORDER NO. 30736399-002

SECTION NO. (S) 4,5 OF 6

SUPPLEMENT

APPROVED FOR SHIPMENT BY: Tyler B Watkins

C20

H-241

INSPECTION CHECK LIST

Motor Control Centers

SQUARE D COMPANY - SENECA
POWER EQUIPMENT DIVISION

1. INSTRUCTIONS
   - .1 MARK EVERY ITEM ON THIS FORM.
   - .2 RECORD REJECTED ITEMS ON REJECTION/CORRECTION SHEET, PAGE 4, NOTE APPROPRIATE DISPOSITION. DO NOT APPROVE AN ITEM UNTIL IT HAS BEEN CORRECTED.
   - .3 USE JOB DRAWINGS AND DOCUMENTS AS WELL AS DESIGN ENGINEERING DRAWINGS, BILLS AND SPECIFICATIONS AS INSPECTION GUIDES. PLACE A RED CHECK MARK ON EACH SYMBOL OR DESCRIPTION OF THE DRAWING OR DOCUMENT WHEN THE ITEM HAS BEEN INSPECTED.
   - .4 IF ADDITIONAL INSPECTION PROCEDURES ARE REQUIRED, ATTACH COPY TO THIS INSPECTION REPORT.
   - .5 UPON COMPLETION OF INSPECTION, THIS REPORT AND SUPPORT DOCUMENTS NOTED IN 1.4 ABOVE ARE TO BE GIVEN TO HEAD OF QUALITY CONTROL FOR RETENTION.
   - .6 REFER TO QA 046.40(XX FOR ADDITIONAL EXPLANATION OF INSPECTIONS.
2. GENERAL DATA

   S* UNITS ONLY, USE UNIT ONLY CHECKLIST (QCF-6048).

   SECTION(S) 4,5 OF 6

NOT APPLICABLE	INSPECTED
	✓
	✓
	✓
	✓
	✓
	✓
	✓
	✓
	✓
	✓
	✓
	✓
	✓

3. PHYSICAL INSPECTION
   - .1 ENCLOSURE
     - .1 STRUCTURE NAMEPLATE: STAMPING CONSISTENT WITH FACTORY ORDER NUMBER. RATINGS PER OUR RECORDS.
     - .2 NEMA ENCLOSURE TYPE, OVERALL DIMENSIONS, LAYOUT, ETC. - PER ENGINEERING RECORDS.
     - .3 FASTENERS: CORRECT QUANTITY AND TYPE - PROPERLY TORQUED AND SECURED.
     - .4 DOORS & COVERS FIT PROPERLY; MECHANICAL OR ELECTRICAL INTERLOCKS OPERATE CORRECTLY.
     - .5 GASKETING: QUANTITY AND LOCATION CORRECT PER NEMA TYPE AND ENGINEERING RECORDS-GLUED OR OTHERWISE SECURELY ATTACHED.
     - .6 INTERNAL BARRIERS - PER ENGINEERING RECORDS.
     - .7 LIFTING ANGLES AND BASE CHANNELS PROPERLY ASSEMBLED AND SECURED.
     - .8 STRUCTURE FORM NUMBERS PRESENT - PER ENGINEERING RECORDS.
     - .9 FINISH KIND, COLOR, APPEARANCE.
     - .10 VERIFY GROUND STRAP CONNECTIONS FOR MULTI PIECE SADDLES.
   - .2 ELECTRICAL CONDUCTORS
     - .1 BUS SYSTEM
       - .1 MATERIAL (☒ COPPER OR ☐ ALUMINUM) - PER ENGINEERING RECORDS.
       - .2 SIZE - WIDTH, THICKNESS AND QUANTITY PER PHASE - PER ENGINEERING RECORDS. SPECIAL BUS OR WIRING BETWEEN INTERRUPTED BUS IS CONSISTENT IN CURRENT CARRYING RATING AS IS SECTION BUS. LIST SPECIAL BUS OR WIRE SIZES AND QUANTITIES.

         SECTION AND UNIT LOCATION 4S

         BUS OR WIRE SIZE & MATERIAL 1600A

         NUMBER PER PHASE 4
       - .3 PLATING: FINISH (☒ TIN OR ☐ SILVER) - PER ENGINEERING RECORDS. PLATING IS SMOOTH, TIGHT, ADHERING AT ALL POSSIBLE CONTACT SURFACES.
       - .4 NEUTRAL BUS IS PRESENT (IF REQUIRED). ~~FULL~~ 50%
       - .5 HORIZONTAL & VERTICAL GROUND BUS AS REQUIRED.
       - .6 ALIGNMENT AND SUPPORTS BUS RUN MUST BE SQUARE AND PROPERLY SUPPORTED.
       - .7 JOINTS
         - .1 CONTACT AREA - PER ENGINEERING RECORDS OR BASED ON 200 AMPS PER SQUARE INCH IF SPECIAL BUSSING JOINT.
         - .2 JOINT FASTENERS ARE PROPERLY TORQUED AND SECURED. IF ALUMINUM, A CONICAL OR SPRING WASHER MUST BE USED.
       - .8 SHORT CIRCUIT CURRENT BRACING: BUS MUST BE PROPERLY BRACED - PER ENGINEERING RECORDS AND CONSISTENT WITH THE SHORT CIRCUIT RATING OF THE CONTROL CENTER.
       - .9 ELECTRICAL SPACINGS PER TABLE 1 BELOW.

TABLE 1
MINIMUM ACCEPTABLE SPACINGS (a)

VOLTAGE INVOLVED	MINIMUM SPACINGS BETWEEN LIVE PARTS OF OPPOSITE POLARITY: THROUGH AIR	MINIMUM SPACINGS BETWEEN LIVE PARTS OF OPPOSITE POLARITY: OVER SURFACE	MINIMUM SPACING THROUGH AIR AND OVER SURFACE BETWEEN LIVE PARTS AND GROUNDED METAL PARTS
125 OR LESS VOLTS	1/2 INCH	3/4 INCH	1/2 INCH
126-250	3/4	1-1/4	1/2
251-600	1	2	1(b)

(a) AN ISOLATED DEAD METAL PART (SUCH AS A SCREW HEAD OR WASHER) INTERPOSED BETWEEN UNINSULATED LIVE PARTS OF OPPOSITE POLARITY OR BETWEEN AN UNINSULATED LIVE PART AND GROUNDED DEAD METAL IS CONSIDERED TO REDUCE THE SPACING BY AN AMOUNT EQUAL TO THE DIMENSION OF THE INTERPOSED PART ALONG THE PATH OF MEASUREMENT.

(b) A THROUGH-AIR SPACING OF NO LESS THAN 1/2 INCH IS ACCEPTABLE (1) AT A CIRCUIT BREAKER OR FUSIBLE DISCONNECTION MEANS, AND (2) BETWEEN GROUNDED DEAD METAL AND THE NEUTRAL OF A 277/480 VOLT, 3 PHASE, FOUR-WIRE MOTOR CONTROL CENTER.

QCF-604 REV. 4/98

NOT APPLICABLE	INSPECTED	
		3. PHYSICAL INSPECTION
		.2 ELECTRICAL CONDUCTORS
		.1 BUS SYSTEM
		.1 HORIZONTAL SPLICE BARS
		.2 GROUND SPLICE BAR
		.3 NEUTRAL SPLICE BARS
		.4 SPECIAL SPLICE BARS — TYPE
		.11 CUSTOMER CONNECTIONS
		.1 LUGS, IF SUPPLIED, CORRECT TYPE AND QUANTITY - PER ENGINEERING RECORDS. SUITABLE FOR INCOMING CABLE SIZE LISTED ON DATA SHEET.
		.2 CUSTOMER CABLE BENDING SPACE ACCEPTABLE PER UL STANDARD 845.
		.3 SHARP EDGES OR PROTRUSIONS IN POTENTIAL WIRING AREAS ARE REMOVED OR COVERED TO PROTECT WIRE INSULATION AND PERSON INSTALLING.
		.12 CONDUCTORS THROUGH OPENINGS: SQUARE D OR CUSTOMER MADE WIRING OR BUSSING (INCLUDING NEUTRAL) MUST NOT BE SEPARATED BY STEEL OR OTHER MAGNETIC MATERIALS.
		.3 GENERAL WIRING
		.1 NEMA CLASS AND TYPE; WIRE SIZE - PER ENGINEERING RECORDS.
		.2 SUPPORT IS PROVIDED, AS NECESSARY, TO PREVENT WIRING FROM INTERFERING WITH DEVICE OPERATION OR FROM BEARING AGAINST LIVE, UNINSULATED PARTS SUCH AS BUS BARS, LUGS, ETC.
		.3 SHARP EDGED OR PROTRUSIONS ARE REMOVED OR COVERED SO WIRING WILL NOT REST ON THEM AT TIME OF INSPECTION OR LATER AFTER MOVEMENT DUE TO SHIPPING, INSTALLATION OR USE VIBRATION.
		.4 TORQUE IS PROPERLY APPLIED TO ALL CONNECTIONS, DEVICES, TERMINAL BLOCKS, AND LUGS.
		.5 UNITS INTO STRUCTURES
		.1 LOCATION - UNITS AND SPACES LABELED - PER ENGINEERING RECORDS.
		.2 DEVICES - ALL FORM NUMBERS PRESENT IN UNITS - PER ENGINEERING RECORDS.
		.3 UNIT DEVICES WITH ADJUSTABLE SETTINGS SUCH AS TIMERS.

DEVICE	SETTING

		.4 ELECTRICAL SPACINGS: DEVICES ARE MOUNTED PER UNIT ARRANGEMENT DRAWING SO THAT PROPER ELECTRICAL SPACINGS ARE MAINTAINED, AND PER TABLE 2 BELOW.

TABLE 2
SPACINGS WITH MOTOR CONTROL UNITS

VOLTAGE INVOLVED	BETWEEN UNINSULATED LIVE PARTS OF OPPOSITE POLARITY AND BETWEEN ANY UNINSULATED LIVE PART AND AN EXPOSED OR UNINSULATED DEAD METAL PART OTHER THAN THE ENCLOSURE		BETWEEN UNINSULATED LIVE PARTS AND THE WALLS OF A METAL ENCLOSURE (b), INCLUDING FITTINGS FOR CONDUIT OR ARMORED CABLE
	THROUGH AIR	OVER SURFACE	SHORTEST DISTANCE
125 OR LESS	1/8(a)	1/4	1/2
126-250	1/4	3/8	1/2
251-600	3/8	1/2	1/2

(a) THE SPACING BETWEEN WIRING TERMINALS OF OPPOSITE POLARITY SHALL NOT BE LESS THAN 1/4 INCH IN ANY CASE IF THE TERMINALS ARE IN THE SAME PLANE. A METAL PIECE ATTACHED TO THE ENCLOSURE FOR THE PURPOSE OF THIS NOTE, IF DEFORMATION OF THE ENCLOSURE IS LIKELY TO REDUCE THE SPACING BETWEEN THE METAL PIECE AND A LIVE PART.

(b) THE ENCLOSURE REFERS TO THE SECTION ENCLOSURE.

		.5 ELECTRICAL RATINGS: VOLTAGE, CURRENT SHORT CIRCUIT INTERRUPT RATINGS & FREQUENCY 60 Hz PER ENGINEERING RECORDS.
		.6 MECHANICAL OPERATION: ALL HANDLES, OPERATORS, INTERLOCKS, SWITCHES, ETC. ARE PROPERLY ASSEMBLED - PER ENGINEERING RECORDS AND OPERATE FREELY.
		.7 DEVICE OR COMPONENT IDENTIFICATION (IF REQUIRED) - PER ENGINEERING RECORDS.
		.8 EXTERNAL RESETS: CORRECT TYPE AND FUNCTION PROPERLY - PER ENGINEERING RECORDS.
		.9 CIRCUIT BREAKER PUSH-TO-TRIP: OPERATION FUNCTIONS CORRECTLY; HANDLE RESETS BREAKER.
		.10 THERMAL OVERLOADS: PRESENT AND PROPERLY SIZED AND LOCATED - PER ENGINEERING RECORDS.
		.11 APPEARANCE: COMPONENTS UNDAMAGED, CLEAN, AND HAVE ACCEPTABLE FINISH.
		.12 GROUND STABS ENGAGED PROPERLY.
		.13 POWER BUS STABS ENGAGED PROPERLY.
		.14 TERMINAL BLOCKS SECURED.
		.15 SECURED TO STRUCTURE (QUARTER TURNS & SHOULDER SCREWS)
		.16 UNIT NAME PLATE: ENGRAVED, IF NECESSARY, AND PROPERLY SECURED.

NOT APPLICABLE	INSPECTED	
		4. ELECTRICAL TESTS
		.1 SAFETY WARNING
		.1 USE ONLY APPROVED TEST EQUIPMENT
		.2 FOLLOW ALL SAFETY RULES FOR ELECTRICAL TESTING.
		.3 TEST IN SAFETY AREA - ERECT BARRIER AND HAZARD SIGNS.
		.2 GENERAL ELECTRICAL TESTS
		.1 POWER CIRCUIT PHASING: USE LOW VOLTAGE ELECTRICAL CONTINUITY TESTER, CHECK POWER CIRCUIT COMPLETELY TO INSURE THAT THERE IS NO PHASE REVERSAL UNLESS SPECIFIED ON ENGINEERING RECORDS. POWER WIRING CONTINUITY MUST EXIST AS SPECIFIED ON ENGINEERING RECORDS.
		.2 CONTROL CIRCUIT WIRING: USE LOW VOLTAGE ELECTRICAL CONTINUITY TESTER. WIRING EXIST AT AND BETWEEN ALL CONNECTION POINTS - PER ENGINEERING RECORDS.
		.3 INSTRUMENT TRANSFORMERS
		.1 CASE GROUNDS: TEST FOR CONTINUITY USING LOW VOLTAGE ELECTRICAL CONTINUITY TESTER.
		.2 CONNECTIONS: TEST WITH LOW VOLTAGE ELECTRICAL TESTER TO INSURE THAT POLARITY IS CORRECT IN THE INSTRUMENT CIRCUIT.
		.4 METERS: TEST FOR CORRECT POLARITY OF CONNECTIONS AND CORRECT DIRECTION OF MOVEMENT OF INDICATOR.
		.5 GROUND FAULT SYSTEM: TEST AT FULL VOLTAGE PER ENGINEERING TEST PROCEDURE. SEQUENCE AND OPERATION IS CORRECT.
		.6 COMPONENT DEVICE ELECTRICAL OPERATION TEST
		.1 FOLLOW SAFETY PROCEDURES IN 4.1.1, 4.1.2, AND 4.1.3 ABOVE.
		.2 CONNECT TEST VOLTAGE SUPPLY TO HORIZONTAL BUS OR UNIT DISCONNECT DEVICE. VOLTAGE MUST BE CONSISTENT WITH RESPECTIVE BUS OR COMPONENT RATING. COILS THAT ARE SUPPLIED BY SEPARATE SOURCE SHALL BE ELECTRICALLY ENERGIZED AT COIL CONNECTIONS WITH SAME RATED VOLTAGE.
		.3 TEST EACH UNIT AND RESPECTIVE COMPONENTS AT RATED VOLTAGE. DEVICES MUST OPERATE IN SEQUENCE AS PER ENGINEERING ELEMENTARY DIAGRAMS. ELECTRICAL CONTACTS OR INTERLOCKS SHALL OPEN OR CLOSE - PER ENGINEERING RECORDS.
		.3 AC DIELECTRIC TESTS
		.1 FOLLOW SAFETY PROCEDURES 4.1.1, 4.1.2, AND 4.1.3 ABOVE.
		.2 POWER CIRCUIT TEST: TEST VOLTAGE PER TABLE 3 BELOW.
		.1 ALL SWITCHING DEVICES ARE TO BE OPEN.
		.2 VOLTAGE SENSITIVE DEVICES MUST BE DISCONNECTED FROM ONE SIDE.
		.3 TEST BETWEEN ALL LIVE CONDUCTORS OF OPPOSITE POLARITY.
		.4 TEST BETWEEN ALL LIVE CONDUCTORS AND DEAD METAL PARTS.

TABLE 3
AC DIELECTRIC TEST VOLTAGES

SYSTEM VOLTAGE	TEST VOLTAGE	TIME OF
240 OR 277	1500	1 SEC.
480 OR 550	2500	1 SEC.
600	2640	1 SEC.

		.3 CONTROL CIRCUITS: ALL CIRCUIT GROUNDS DISCONNECTED. BARE METAL JUMPERS SHORTING VOLTAGE SENSITIVE DEVICES (COILS, SOLID-STATE ELECTRONICS, ETC. TEST VOLTAGE 1500 VOLTS, 60 HERTZ 1 SECOND (WHEN REQUIRED).
		.5 MARKINGS
		.1 STANDARD MARKINGS AND LABELS PRESENT AS SPECIFIED BY ENGINEERING, PROPERLY SECURED.
		.1 HAZARD LABEL
		.2 REMOTE SUPPLY
		.3 WARNING LABEL
		.2 SPECIAL INSTRUCTION LABELS OR MARKINGS: PRESENT AS SPECIFIED BY ENGINEERING AND PROPERLY SECURED.
		.3 UNDERWRITERS LABORATORY (UL) LABELS.
		.4 INSPECTOR'S STAMP OR LABEL, APPLIED ON INSIDE OF VERTICAL WIRE THROUGH DOOR.
		.6 RELEASE FOR SHIPMENT
		FINAL INSPECTION BEFORE SIGN-OFF AND PRIOR TO PACKAGING SHALL INCLUDE INSPECTION TO SEE THAT ALL SHAVINGS, CHIPS, LOOSE NUTS, BOLTS AND SCREWS, WHICH MAY HAVE FALLEN DURING ASSEMBLY, ARE REMOVED.

SQUARE D COMPANY
POWER EQUIPMENT GROUP

INSPECTION CHECK LIST

Motor Control Centers

REJECTION CORRECTION

SECTION NO. AND UNIT LOCATION	REMARKS	REWORK REQUIRED	DISPOSITION	RE-INSPECTED AND APPROVED
6	Added Customer cable			NM

MCC STRUCTURES IN-PROCESS INSPECTION

STATION	BADGE #	BADGE #
KITTER	1467	1846
ST 1	331	Bottom
ST 1a		
ST 2	0928	TOP
ST 2a		
ST 3		
XFMR		
DOORS		CRANE
NP		
UNASSIGNED		

Line 1, 2, or 4 (Circle)

Sect. 6 of 6

AS200.05Da REV. DATE 6/1/2010

ITEMS SHIPPED SHORT

INSPECTED BY: N. Moore

DATE: 3.20.13

FACTORY ORDER NO. 30736329-002

SECTION NO. (S) 6 OF 6

SUPPLEMENT

APPROVED FOR SHIPMENT BY: N. Moore

C21

H-243

SQUARE D COMPANY - SENECA
POWER EQUIPMENT DIVISION

INSPECTION CHECK LIST

Motor Control Centers

1. INSTRUCTIONS

.1 MARK EVERY ITEM ON THIS FORM.

.2 RECORD REJECTED ITEMS ON REJECTION/CORRECTION SHEET, PAGE 4, NOTE APPROPRIATE DISPOSITION. DO NOT APPROVE AN ITEM UNTIL IT HAS BEEN CORRECTED.

.3 USE JOB DRAWINGS AND DOCUMENTS AS WELL AS DESIGN ENGINEERING DRAWINGS, BILLS AND SPECIFICATIONS AS INSPECTION GUIDES. PLACE A RED CHECK MARK ON EACH SYMBOL OR DESCRIPTION OF THE DRAWING OR DOCUMENT WHEN THE ITEM HAS BEEN INSPECTED.

.4 IF ADDITIONAL INSPECTION PROCEDURES ARE REQUIRED, ATTACH COPY TO THIS INSPECTION REPORT.

.5 UPON COMPLETION OF INSPECTION, THIS REPORT AND SUPPORT DOCUMENTS NOTED IN 1.4 ABOVE ARE TO BE GIVEN TO HEAD OF QUALITY CONTROL FOR RETENTION.

.6 REFER TO QA 048.401XX FOR ADDITIONAL EXPLANATION OF INSPECTIONS.

2. GENERAL DATA

IF UNITS ONLY, USE UNIT ONLY CHECKLIST (QCF-804B).

SECTION(S) 6 OF 6

NOT APPLICABLE	INSPECTED	
	✓	3. PHYSICAL INSPECTION .1 ENCLOSURE .1 STRUCTURE NAMEPLATE: STAMPING CONSISTENT WITH FACTORY ORDER NUMBER. RATINGS PER OUR RECORDS.
	✓	.2 NEMA ENCLOSURE TYPE, OVERALL DIMENSIONS, LAYOUT, ETC. - PER ENGINEERING RECORDS.
	✓	.3 FASTENERS: CORRECT QUANTITY AND TYPE - PROPERLY TORQUED AND SECURED.
	✓	.4 DOORS & COVERS FIT PROPERLY; MECHANICAL OR ELECTRICAL INTERLOCKS OPERATE CORRECTLY.
	✓	.5 GASKETING: QUANTITY AND LOCATION CORRECT PER NEMA TYPE AND ENGINEERING RECORDS-GLUED OR OTHERWISE SECURELY ATTACHED.
	✓	.6 INTERNAL BARRIERS - PER ENGINEERING RECORDS.
	✓	.7 LIFTING ANGLES AND BASE CHANNELS PROPERLY ASSEMBLED AND SECURED.
	✓	.8 STRUCTURE FORM NUMBERS PRESENT - PER ENGINEERING RECORDS.
	✓	.9 FINISH KIND, COLOR, APPEARANCE.
	✓	.10 VERIFY GROUND STRAP CONNECTIONS FOR MULTI PIECE SADDLES.
		.2 ELECTRICAL CONDUCTORS
	✓	.1 BUS SYSTEM .1 MATERIAL (☐ COPPER OR ☐ ALUMINUM) - PER ENGINEERING RECORDS.
	✓	.2 SIZE - WIDTH, THICKNESS AND QUANTITY PER PHASE - PER ENGINEERING RECORDS. SPECIAL BUS OR WIRING BETWEEN INTERRUPTED BUS IS CONSISTENT IN CURRENT CARRYING RATING AS IS SECTION BUS. LIST SPECIAL BUS OR WIRE SIZES AND QUANTITIES. SECTION AND UNIT LOCATION 6 BUS OR WIRE SIZE & MATERIAL 1600A NUMBER PER PHASE 4
	✓	.3 PLATING: FINISH (☐ TIN OR ☐ SILVER) - PER ENGINEERING RECORDS. PLATING IS SMOOTH, TIGHT, ADHERING AT ALL POSSIBLE CONTACT SURFACES.
	✓	.4 NEUTRAL BUS IS PRESENT (IF REQUIRED).
	✓	.5 HORIZONTAL & VERTICAL GROUND BUS AS REQUIRED.
	✓	.6 ALIGNMENT AND SUPPORT: BUS RUN MUST BE SQUARE AND PROPERLY SUPPORTED.
	✓	.7 JOINTS .1 CONTACT AREA - PER ENGINEERING RECORDS OR BASED ON 100 AMPS PER SQUARE INCH IF SPECIAL BUSSING JOINT. .2 JOINT FASTENERS ARE PROPERLY TORQUED AND SECURED. IF ALUMINUM, A CONICAL OR SPRING WASHER MUST BE USED.
	✓	.8 SHORT CIRCUIT CURRENT BRACING: BUS MUST BE PROPERLY BRACED - PER ENGINEERING RECORDS AND CONSISTENT WITH THE SHORT CIRCUIT RATING OF THE CONTROL CENTER.
	✓	.9 ELECTRICAL SPACINGS PER TABLE 1 BELOW.

TABLE 1
MINIMUM ACCEPTABLE SPACINGS (a)

VOLTAGE INVOLVED	MINIMUM SPACINGS BETWEEN LIVE PARTS OF OPPOSITE POLARITY: THROUGH AIR	MINIMUM SPACINGS BETWEEN LIVE PARTS OF OPPOSITE POLARITY: OVER SURFACE	MINIMUM SPACING THROUGH AIR AND OVER SURFACE BETWEEN LIVE PARTS AND GROUNDED METAL PARTS
125 OR LESS VOLTS	1/2 INCH	3/4 INCH	1/2 INCH
126-250	3/4	1-1/4	1/2
251-600	1	2	1(b)

(a) AN ISOLATED DEAD METAL PART (SUCH AS A SCREW HEAD OR WASHER) INTERPOSED BETWEEN UNINSULATED LIVE PARTS OF OPPOSITE POLARITY OR BETWEEN AN UNINSULATED LIVE PART AND GROUNDED DEAD METAL IS CONSIDERED TO REDUCE THE SPACING BY AN AMOUNT EQUAL TO THE DIMENSION OF THE INTERPOSED PART ALONG THE PATH OF MEASUREMENT.

(b) A THROUGH-AIR SPACING OF NO LESS THAN 1/2 INCH IS ACCEPTABLE (1) AT A CIRCUIT BREAKER OR FUSIBLE DISCONNECTION MEANS, AND (2) BETWEEN GROUNDED DEAD METAL AND THE NEUTRAL OF A 277/480 VOLT, 3 PHASE, FOUR-WIRE MOTOR CONTROL CENTER.

QCF-804 REV. 4/08

NOT APPLICABLE	INSPECTED	
		3. PHYSICAL INSPECTION
		.2 ELECTRICAL CONDUCTORS
		.1 BUS SYSTEM
		.1 HORIZONTAL SPLICE BARS
		.2 GROUND SPLICE BAR
		.3 NEUTRAL SPLICE BARS
		.4 SPECIAL SPLICE BARS — TYPE
		.11 CUSTOMER CONNECTIONS
		.1 LUGS, IF SUPPLIED, CORRECT TYPE AND QUANTITY - PER ENGINEERING RECORDS, SUITABLE FOR INCOMING CABLE SIZE LISTED ON DATA SHEET.
		.2 CUSTOMER CABLE BENDING SPACE ACCEPTABLE PER UL STANDARD 845.
		.3 SHARP EDGES OR PROTRUSIONS IN POTENTIAL WIRING AREAS ARE REMOVED OR COVERED TO PROTECT WIRE INSULATION AND PERSON INSTALLING.
		.12 CONDUCTORS THROUGH OPENINGS: SQUARE D OR CUSTOMER MADE WIRING OR BUSSING (INCLUDING NEUTRAL) MUST NOT BE SEPARATED BY STEEL OR OTHER MAGNETIC MATERIALS.
		.2 GENERAL WIRING
		.1 NEMA CLASS AND TYPE; WIRE SIZE - PER ENGINEERING RECORDS.
		.2 SUPPORT IS PROVIDED, AS NECESSARY, TO PREVENT WIRING FROM INTERFERING WITH DEVICE OPERATION OR FROM BEARING AGAINST LIVE, UNINSULATED PARTS SUCH AS BUS BARS, LUGS, ETC.
		.3 SHARP EDGES OR PROTRUSIONS ARE REMOVED OR COVERED SO WIRING WILL NOT REST ON THEM AT TIME OF INSPECTION OR LATER AFTER MOVEMENT DUE TO SHIPPING, INSTALLATION OR USE VIBRATION.
		.4 TORQUE IS PROPERLY APPLIED TO ALL CONNECTIONS, DEVICES, TERMINAL BLOCKS, AND LUGS.
		.3 UNITS INTO STRUCTURES
		.1 LOCATION - UNITS AND SPACES LABELED - PER ENGINEERING RECORDS.
		.2 DEVICES - ALL POWN NUMBERS PRESENT IN UNITS - PER ENGINEERING RECORDS.
		.3 UNIT DEVICES WITH ADJUSTABLE SETTINGS SUCH AS TIMERS.

DEVICE	SETTING
N/A	N/A

		.4 ELECTRICAL SPACINGS: DEVICES ARE MOUNTED PER UNIT ARRANGEMENT DRAWING SO THAT PROPER ELECTRICAL SPACINGS ARE MAINTAINED, AND PER TABLE 2 BELOW.

TABLE 2
SPACINGS WITH MOTOR CONTROL UNITS

VOLTAGE INVOLVED	BETWEEN UNINSULATED LIVE PARTS OF OPPOSITE POLARITY AND BETWEEN ANY UNINSULATED LIVE PART AND AN EXPOSED OR UNINSULATED DEAD METAL PART OTHER THAN THE ENCLOSURE		BETWEEN UNINSULATED LIVE PARTS AND THE WALLS OF A METAL ENCLOSURE (b), INCLUDING FITTINGS FOR CONDUIT OR ARMORED CABLE
	THROUGH AIR	OVER SURFACE	SHORTEST DISTANCE
125 OR LESS	1/8(a)	1/4	1/2
126-250	1/4	3/8	1/2
251-600	3/8	1/2	1/2

(a) THE SPACING BETWEEN WIRING TERMINALS OF OPPOSITE POLARITY SHALL NOT BE LESS THAN 1/4 INCH IN ANY CASE IF THE TERMINALS ARE IN THE SAME PLANE. A METAL PIECE ATTACHED TO THE ENCLOSURE FOR THE PURPOSE OF THIS NOTE. IF DEFORMATION OF THE ENCLOSURE IS LIKELY TO REDUCE THE SPACING BETWEEN THE METAL PIECE AND A LIVE PART.

(b) THE ENCLOSURE REFERS TO THE SECTION ENCLOSURE.

		.5 ELECTRICAL RATINGS: VOLTAGE, CURRENT SHORT CIRCUIT INTERRUPT RATINGS & FREQUENCY 60 Hz PER ENGINEERING RECORDS.
		.6 MECHANICAL OPERATION: ALL HANDLES, OPERATORS, INTERLOCKS, SWITCHES, ETC. ARE PROPERLY ASSEMBLED - PER ENGINEERING RECORDS AND OPERATE FREELY.
		.7 DEVICE OR COMPONENT IDENTIFICATION (IF REQUIRED) - PER ENGINEERING RECORDS.
		.8 EXTERNAL RESETS: CORRECT TYPE AND FUNCTION PROPERLY - PER ENGINEERING RECORDS.
		.9 CIRCUIT BREAKER PUSH-TO-TRIP: OPERATION FUNCTIONS CORRECTLY; HANDLE RESETS BREAKER.
		.10 THERMAL OVERLOADS: PRESENT AND PROPERLY SIZED AND LOCATED - PER ENGINEERING RECORDS.
		.11 APPEARANCE: COMPONENTS UNDAMAGED, CLEAN, AND HAVE ACCEPTABLE FINISH.
		.12 GROUND STABS ENGAGED PROPERLY.
		.13 POWER BUS STABS ENGAGED PROPERLY.
		.14 TERMINAL BLOCKS SECURED.
		.15 SECURED TO STRUCTURE (QUARTER TURNS & SHOULDER SCREWS)
		.16 UNIT NAME PLATE: ENGRAVED, IF NECESSARY, AND PROPERLY SECURED.

NOT APPLICABLE	INSPECTED	
		4. ELECTRICAL TESTS
		.1 SAFETY WARNING
		.1 USE ONLY APPROVED TEST EQUIPMENT
		.2 FOLLOW ALL SAFETY RULES FOR ELECTRICAL TESTING.
		.3 TEST IN SAFETY AREA - ERECT BARRIER AND HAZARD SIGNS.
		.2 GENERAL ELECTRICAL TESTS
		.1 POWER CIRCUIT PHASING: USE LOW VOLTAGE ELECTRICAL CONTINUITY TESTER, CHECK POWER CIRCUIT COMPLETELY TO INSURE THAT THERE IS NO PHASE REVERSAL UNLESS SPECIFIED ON ENGINEERING RECORDS. POWER WIRING CONTINUITY MUST EXIST AS SPECIFIED ON ENGINEERING RECORDS.
		.2 CONTROL CIRCUIT WIRING: USE LOW VOLTAGE ELECTRICAL CONTINUITY TESTER. WIRING EXIST AT AND BETWEEN ALL CONNECTION POINTS - PER ENGINEERING RECORDS.
		.3 INSTRUMENT TRANSFORMERS
		.1 CASE GROUNDS: TEST FOR CONTINUITY USING LOW VOLTAGE ELECTRICAL CONTINUITY TESTER.
		.2 CONNECTIONS: TEST WITH LOW VOLTAGE ELECTRICAL TESTER TO INSURE THAT POLARITY IS CORRECT IN THE INSTRUMENT CIRCUIT.
		.4 METERS: TEST FOR CORRECT POLARITY OF CONNECTIONS AND CORRECT DIRECTION OR MOVEMENT OF INDICATOR.
		.5 GROUND FAULT SYSTEM: TEST AT FULL VOLTAGE PER ENGINEERING TEST PROCEDURE. SEQUENCE AND OPERATION IS CORRECT.
		.6 COMPONENT DEVICE ELECTRICAL OPERATION TEST
		.1 FOLLOW SAFETY PROCEDURES IN 4.1.1, 4.1.2, AND 4.1.3 ABOVE.
		.2 CONNECT TEST VOLTAGE SUPPLY TO HORIZONTAL BUS OR UNIT DISCONNECT DEVICE. VOLTAGE MUST BE CONSISTENT WITH RESPECTIVE BUS OR COMPONENT RATING. COILS THAT ARE SUPPLIED BY SEPARATE SOURCE SHALL BE ELECTRICALLY ENERGIZED AT COIL CONNECTIONS WITH SAME RATED VOLTAGE.
		.3 TEST EACH UNIT AND RESPECTIVE COMPONENTS AT RATED VOLTAGE. DEVICES MUST OPERATE IN SEQUENCE AS PER ENGINEERING ELEMENTARY DIAGRAMS. ELECTRICAL CONTACTS OR INTERLOCKS SHALL OPEN OR CLOSE - PER ENGINEERING RECORDS.
		.3 AC DIELECTRIC TESTS
		.1 FOLLOW SAFETY PROCEDURES 4.1.1, 4.1.2, AND 4.1.3 ABOVE.
		.2 POWER CIRCUIT TEST: TEST VOLTAGE PER TABLE 3 BELOW.
		.1 ALL SWITCHING DEVICES ARE TO BE OPEN.
		.2 VOLTAGE SENSITIVE DEVICES MUST BE DISCONNECTED FROM ONE SIDE.
		.3 TEST BETWEEN ALL LIVE CONDUCTORS OF OPPOSITE POLARITY.
		.4 TEST BETWEEN ALL LIVE CONDUCTORS AND DEAD METAL PARTS.

TABLE 3
AC DIELECTRIC TEST VOLTAGES

SYSTEM VOLTAGE	TEST VOLTAGE	TIME ON
240 OR 277	1800	1 SEC.
480 OR 600	2500	1 SEC.
600	2540	1 SEC.

		.3 CONTROL CIRCUITS: ALL CIRCUIT GROUNDS DISCONNECTED. SAFE METAL JUMPERS SHORTING VOLTAGE SENSITIVE DEVICES (COILS, SOLID-STATE ELECTRONICS, ETC). TEST VOLTAGE 1800 VOLTS, 60 HERTZ 1 SECOND (WHEN REQUIRED).
		.5 MARKINGS
		.1 STANDARD MARKINGS AND LABELS PRESENT AS SPECIFIED BY ENGINEERING. PROPERLY SECURED.
		.1 HAZARD LABEL
		.2 REMOTE SUPPLY
		.3 WARNING LABEL
		.2 SPECIAL INSTRUCTION LABELS OR MARKINGS: PRESENT AS SPECIFIED BY ENGINEERING AND PROPERLY SECURED.
		.3 UNDERWRITERS LABORATORY (UL) LABELS.
		.4 INSPECTOR'S STAMP OR LABEL, APPLIED ON INSIDE OF VERTICAL WIRE THROUGH DOOR.
		.6 RELEASE FOR SHIPMENT
		FINAL INSPECTION BEFORE SIGN-OFF AND PRIOR TO PACKAGING SHALL INCLUDE INSPECTION TO SEE THAT ALL SHAVINGS, CHIPS, LOOSE NUTS, BOLTS AND SCREWS, WHICH MAY HAVE FALLEN DURING ASSEMBLY, ARE REMOVED.

SQUARE D
by Schneider Electric

Job Name: RICE LAKE SWITCHBOARD/MCC
Job Location: PRINCETON, IN

Purchaser: VALLEY ELECTRIC SUP CORP
Purchaser PO #: 7033395

User: RICE LAKE WILDLIFE AREA
User Location:

Drawing Status: RECORD

Square D Quotation #: 30736399
Quotation Revision #:
Sales Contact: BROECKLING, DEBBIE
Sales Contact Location: 412

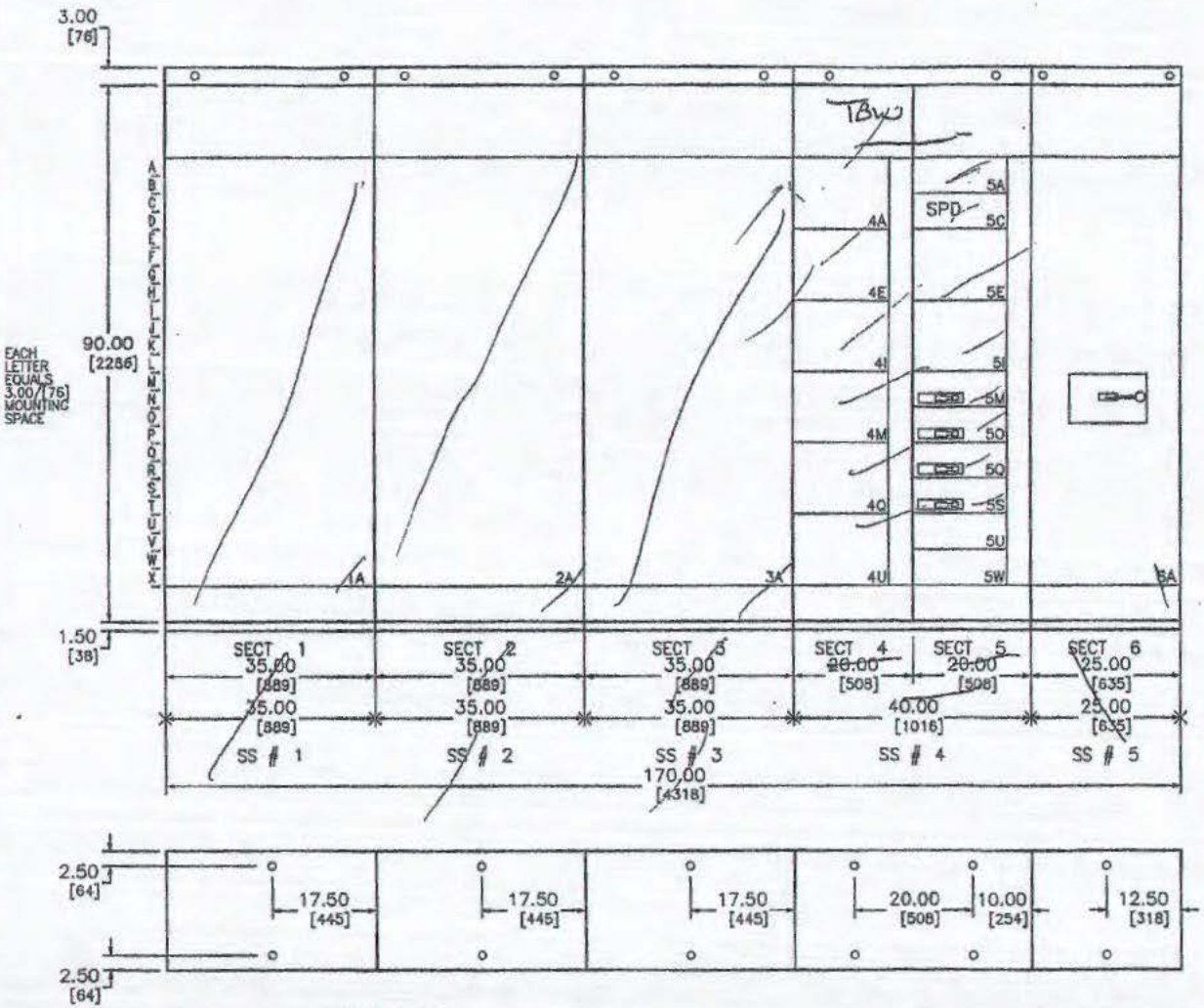
Customer: ALTEK ELECTRICAL SVC
Customer PO #:

Architect: US ARMY CORPS OF ENGINEERS
Cons. Engineer:

TABLE OF CONTENTS

SQUARE D FACTORY ORDER NUMBER: 30736399-002

REV	DESCRIPTION	BY	DATE
-	-----	---	--/--/--

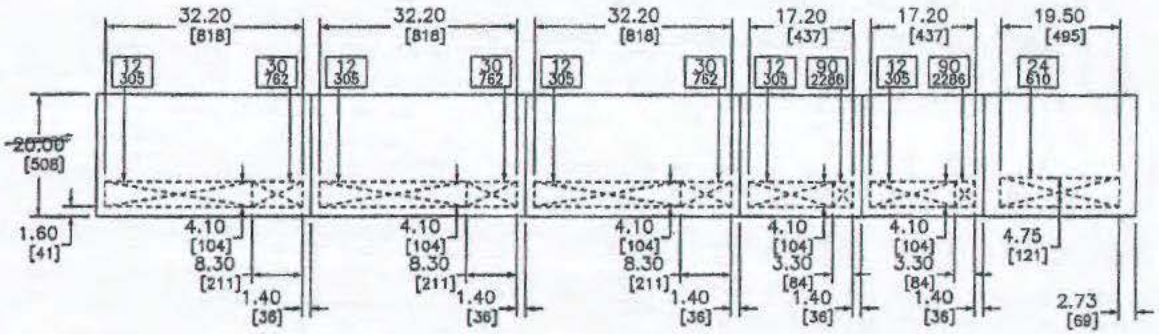


ANCHOR DETAIL

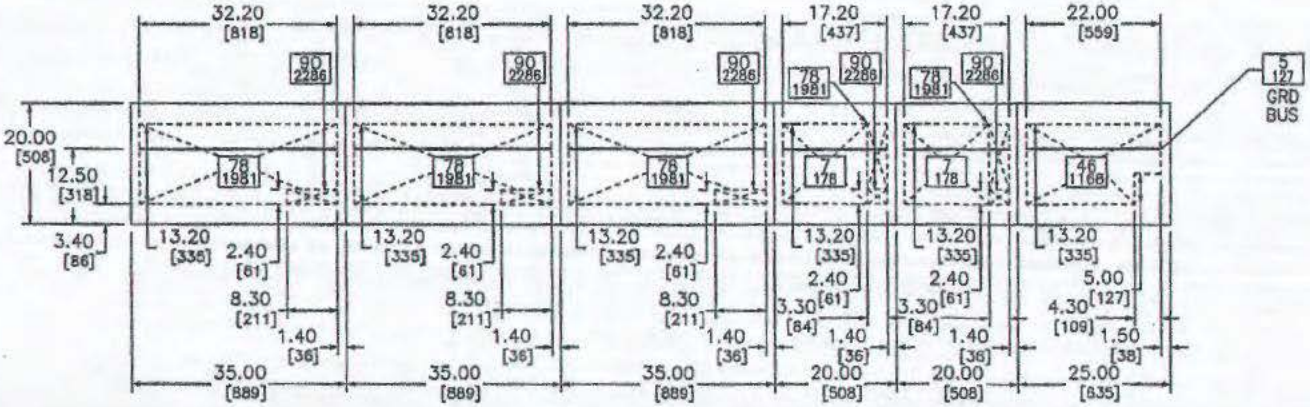
DUAL DIMENSIONS: INCHES / MILLIMETERS

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEVATION
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# F30736399-002-01	PG 1 OF 3 REV -

REV	DESCRIPTION	BY	DATE
–	-----	---	--/--/--



TOP VIEW



DUAL DIMENSIONS: INCHES MILLIMETERS

FLOOR VIEW

CROSSED AREA REPRESENTS CONDUIT ENTRY AREA. NUMBERS IN BOXES INDICATE VERTICAL CLEARANCE TO NEAREST OBSTRUCTION.

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEVATION
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# F30736399-002-01	PG 2 OF 3 REV –

REV	DESCRIPTION	BY	DATE
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GENERAL NOTES

Class 1 Type B Wiring 2,1,3

PRODUCT DESCRIPTION AND RATINGS

POWER SYSTEM DATA:

480Y/277V 3PH 4W 60Hz 2,1,3
SHORT CIRCUIT RATING: ~~42kA~~ 2
POWER ENTERS: Main Breaker Top Section 6
CONTROL POWER: 120Vac

BUS SYSTEM DATA:

MAIN HORIZONTAL BUS: 1600 Amp Copper/Tin Plated / 1.5" 2,1,3
BUS BRACING: ~~42kA~~ 2,1,3
VERTICAL BUS: 600 Amp Tin Plated Copper
NEUTRAL BUS: ~~100 Percent to 1200A, 50 Percent for 1600A~~ 2,1,3
HORIZONTAL GROUND BUS: ~~.25~~ .25" X 1.0" (6.35mm X 25.4mm) Tin Plated Copper 2,1,3
Units Securely Grounded To Structure

ENCLOSURE DATA:

ENCLOSURE TYPE: 20" DEEP ~~Type 1~~ 1
EXTERIOR COLOR: ~~Electrodeposition~~ Finish ANSI 49 Medium Light Grey
INTERIOR COLOR: Electrodeposition Finish White

STRUCTURE MODIFICATIONS:

Ground Bus Lug : Main Section 1,2,3
Rodent Barriers 1
Manual Bus Shutters 4,5
Fishtape Barriers 1,2,3,4,5,6
600A Vertical Bus 4,5
Copper Vertical Ground Bus 4,5
Master Nameplate 1

EQUIPMENT WEIGHT:

SHIPPING SPLIT # 1: 760.00 Lbs. (344.74 Kg.)
SHIPPING SPLIT # 2: 760.00 Lbs. (344.74 Kg.)
SHIPPING SPLIT # 3: 760.00 Lbs. (344.74 Kg.)
SHIPPING SPLIT # 4: 1500.00 Lbs. (680.40 Kg.)
SHIPPING SPLIT # 5: 720.00 Lbs. (326.59 Kg.)
TOTAL LINEUP WEIGHT (APPROX): 4500.00 Lbs. (2041.20 Kg.)

PRODUCT ACCESSORIES:

See Unit Features

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEVATION
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# F30736399-002-01	PG 3 OF 3 REV –

REV	DESCRIPTION	BY	DATE				
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F.O. # 30736399-002
Section 1 of 6
NEMA Type 1
1600 A Horizontal Bus
0 A Vertical Bus
Service Entrance? N
Neutral Bus? Y
Supplemental Info: REV 05
3 Phase, 4 Wire, 60 Hz

F.O. # 30736399-002
Section 2 of 6
NEMA Type 1
1600 A Horizontal Bus
0 A Vertical Bus
Service Entrance? N
Neutral Bus? Y
Supplemental Info: REV 05
3 Phase, 4 Wire, 60 Hz

F.O. # 30736399-002
Section 3 of 6
NEMA Type 1
1600 A Horizontal Bus
0 A Vertical Bus
Service Entrance? N
Neutral Bus? Y
Supplemental Info: REV 05
3 Phase, 4 Wire, 60 Hz

F.O. # 30736399-002
Section 4 of 6
NEMA Type 1
1600 A Horizontal Bus
600 A Vertical Bus
Service Entrance? N
Neutral Bus? Y
Supplemental Info: REV 05
3 Phase, 4 Wire, 60 Hz

F.O. # 30736399-002
Section 5 of 6
NEMA Type 1
1600 A Horizontal Bus
600 A Vertical Bus
Service Entrance? N
Neutral Bus? Y
Supplemental Info: REV 05
3 Phase, 4 Wire, 60 Hz

F.O. # 30736399-002
Section 6 of 6
NEMA Type 1
1600 A Horizontal Bus
0 A Vertical Bus
Service Entrance? Y
Neutral Bus? Y
Supplemental Info: REV 05
3 Phase, 4 Wire, 60 Hz

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	NAMEPLATE INFORMATION
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# N30736399-002-01	PG 1 OF 2 REV –

REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--
-	----	--	--/--/--	-	----	--	--/--/--

1, 2, 3, 4, 5

SHORT-CIRCUIT-CURRENT RATING

WHEN PROTECTED BY RK CIRCUIT BREAKER OR _____ AMPERE MAXIMUM CLASS _____ FUSES, THE SHORT-CIRCUIT-CURRENT RATING OF THIS MOTOR-CONTROL-CENTER SECTION IS 100K AMPS RMS SYMMETRICAL, 480 VOLTS MAXIMUM.

DO NOT INSTALL THIS SECTION ON CIRCUITS WITH AVAILABLE FAULT CURRENTS HIGHER THAN THIS VALUE.

DO NOT INSTALL THIS SECTION ON CIRCUITS WITH AVAILABLE FAULT CURRENTS HIGHER THAN THE LOWEST SHORT-CIRCUIT-CURRENT RATING OF ANY INSTALLED UNIT.

REFER TO INDIVIDUAL UNIT RATING LABELS TO DETERMINE UNIT SHORT-CIRCUIT-CURRENT RATINGS.

ADDITIONAL OR REPLACEMENT UNITS OR SECTIONS MUST BE OF THE SAME MANUFACTURER AND TYPE WITH A SHORT-CIRCUIT-CURRENT RATING EQUAL TO OR GREATER THAN THE AVAILABLE FAULT CURRENT.

80438-788-01 SQUARE D REV -

SHORT-CIRCUIT-CURRENT RATING

THE SHORT-CIRCUIT-CURRENT RATING OF THIS MOTOR-CONTROL-CENTER SECTION IS _____ AMPS RMS SYMMETRICAL, _____ VOLTS MAXIMUM.

DO NOT INSTALL THIS SECTION ON CIRCUITS WITH AVAILABLE FAULT CURRENTS HIGHER THAN THIS VALUE.

DO NOT INSTALL THIS SECTION ON CIRCUITS WITH AVAILABLE FAULT CURRENTS HIGHER THAN THE LOWEST SHORT-CIRCUIT-CURRENT RATING OF ANY INSTALLED UNIT.

REFER TO INDIVIDUAL UNIT RATING LABELS TO DETERMINE UNIT SHORT-CIRCUIT-CURRENT RATINGS.

ADDITIONAL OR REPLACEMENT UNITS OR SECTIONS MUST BE OF THE SAME MANUFACTURER AND TYPE WITH A SHORT-CIRCUIT-CURRENT RATING EQUAL TO OR GREATER THAN THE AVAILABLE FAULT CURRENT.

80438-789-01 SQUARE D REV -

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	NAMEPLATE INFORMATION
ENGR:	KEN BROWN		SQUARE D by Schneider Electric
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# N30736399-002-01	PG 2 OF 2 REV -

REV	DESCRIPTION	BY	DATE
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UNIT LOC	NAMEPLATE DESIGNATION (BLACK SURFACE/WHITE LETTERS)	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	FUSE SIZE PRI	FUSE SIZE SEC	INTERLOCKS NO	INTERLOCKS NC	PILOT DEVICES: 22 mm ** ON LIGHT	PILOT DEVICES: 22 mm ** OFF LIGHT	PILOT DEVICES: 22 mm ** ADDL P/L	PILOT DEVICES: 22 mm ** SS / PB	OTHER UNIT FEATURES	ELEMENTARY #
1A	PUMP NO. 3	BRANCH BKR			LJ 600	600	〃										(2) 4/0 AWG-500 KCMIL LUG/PH	E30736399-002-05
2A	PUMP NO. 2	BRANCH BKR			LJ 600	600	2/0 AWG 2x										(2) 4/0 AWG-500 KCMIL LUG/PH	E30736399-002-05
3A	PUMP NO. 1	BRANCH BKR			LJ 600	600	〃										(2) 4/0 AWG-500 KCMIL LUG/PH	E30736399-002-05
4A	SPACE	MT UNIT																
4E	SPACE	MT UNIT																
4I	SPACE	MT UNIT																
4M	SPACE	MT UNIT																
4Q	SPACE	MT UNIT																
4U	SPACE	MT UNIT																
5A	MONITORING UNIT FOR MAIN	POWER METER															#14 AWG MTW CONTROL WIRE-PM820-M/DISPLAY	E30736399-002-04
5C	SURGE PROTECTION DEVICE	SPD	160kA		SW 30												SOLIDLY GROUNDED, SURGE COUNTER	E30736399-002-01
5E	SPACE	MT UNIT																
5I	SPACE	MT UNIT																
5M	TR1 FEEDER	6" BRANCH BKR			HJ 150	35											14-3/0AWG 1 LUG/PH, 80% RATED	E30736399-002-02
5O	UNIT HEATER UH-1	6" BRANCH BKR			HJ 150	20											14-3/0AWG 1 LUG/PH, 80% RATED	E30736399-002-03
5Q	SPARE 20 AMP BREAKER	6" BRANCH BKR			HJ 150	20											14-3/0AWG 1 LUG/PH, 80% RATED	E30736399-002-03
5S	SPARE 20 AMP BREAKER	6" BRANCH BKR			HJ 150	20											14-3/0AWG 1 LUG/PH, 80% RATED	E30736399-002-03
5U	SPACE	MT UNIT																
5W	SPACE	MT UNIT																

UNIT LOC	NAMEPLATE DESIGNATION	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	PRI	SEC	NO	NC	ON LIGHT	OFF LIGHT	ADDL P/L	SS / PB	OTHER UNIT FEATURES	ELEMENTARY #
									FUSE SIZE		INTERLOCKS		PILOT DEVICES: 22 mm **					

MCC NAMEPLATE – MCC1
(BLACK SURFACE/WHITE LETTERS)

JOB NAME:	RICE LAKE SWITCHBOARD/MCC
JOB LOCATION:	PRINCETON IN
DRAWN BY:	CAD
ENGR:	KEN BROWN
DATE:	FEBRUARY 19 2013
DRAWING STATUS:	RECORD

EQUIPMENT DESIGNATION:	MCC1
EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWING TYPE:	UNIT INFORMATION
DWG #	E30736399-002-01

REV	DESCRIPTION	BY	DATE
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UNIT LOC	NAMEPLATE DESIGNATION	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	FUSE SIZE PRI	FUSE SIZE SEC	INTERLOCKS NO	INTERLOCKS NC	PILOT DEVICES: 22 mm ** ON LIGHT	PILOT DEVICES: 22 mm ** OFF LIGHT	PILOT DEVICES: 22 mm ** ADDL P/L	PILOT DEVICES: 22 mm ** SS / PB	OTHER UNIT FEATURES	ELEMENTARY #
6A	MAIN CIRCUIT BREAKER SECTION	MAIN BKR			RK 3000	1600											1/0-750KCMIL/6 LUGS/PH, 24VDC TRIP UNIT PWR SUPP, 80% RATED, ELECTRONIC AMMETER TRIP UNIT, LSIG TRIP FUNCTION, SOLID NEUTRAL, UL SERVICE ENT LABEL	E30736399-002-04

UNIT LOC	NAMEPLATE DESIGNATION	UNIT TYPE	SIZE	HP	FRAME AMPS	TRIP AMPS	CONTROL SOURCE	VA	FUSE SIZE PRI	FUSE SIZE SEC	INTERLOCKS NO	INTERLOCKS NC	PILOT DEVICES: 22 mm ** ON LIGHT	PILOT DEVICES: 22 mm ** OFF LIGHT	PILOT DEVICES: 22 mm ** ADDL P/L	PILOT DEVICES: 22 mm ** SS / PB	OTHER UNIT FEATURES	ELEMENTARY #

JOB NAME:	RICE LAKE SWITCHBOARD/MCC
JOB LOCATION:	PRINCETON IN
DRAWN BY:	CAD
ENGR:	KEN BROWN
DATE:	FEBRUARY 19 2013
DRAWING STATUS:	RECORD

EQUIPMENT DESIGNATION:	MCC1
EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWING TYPE:	UNIT INFORMATION
DWG#	E30736399-002-01

REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--
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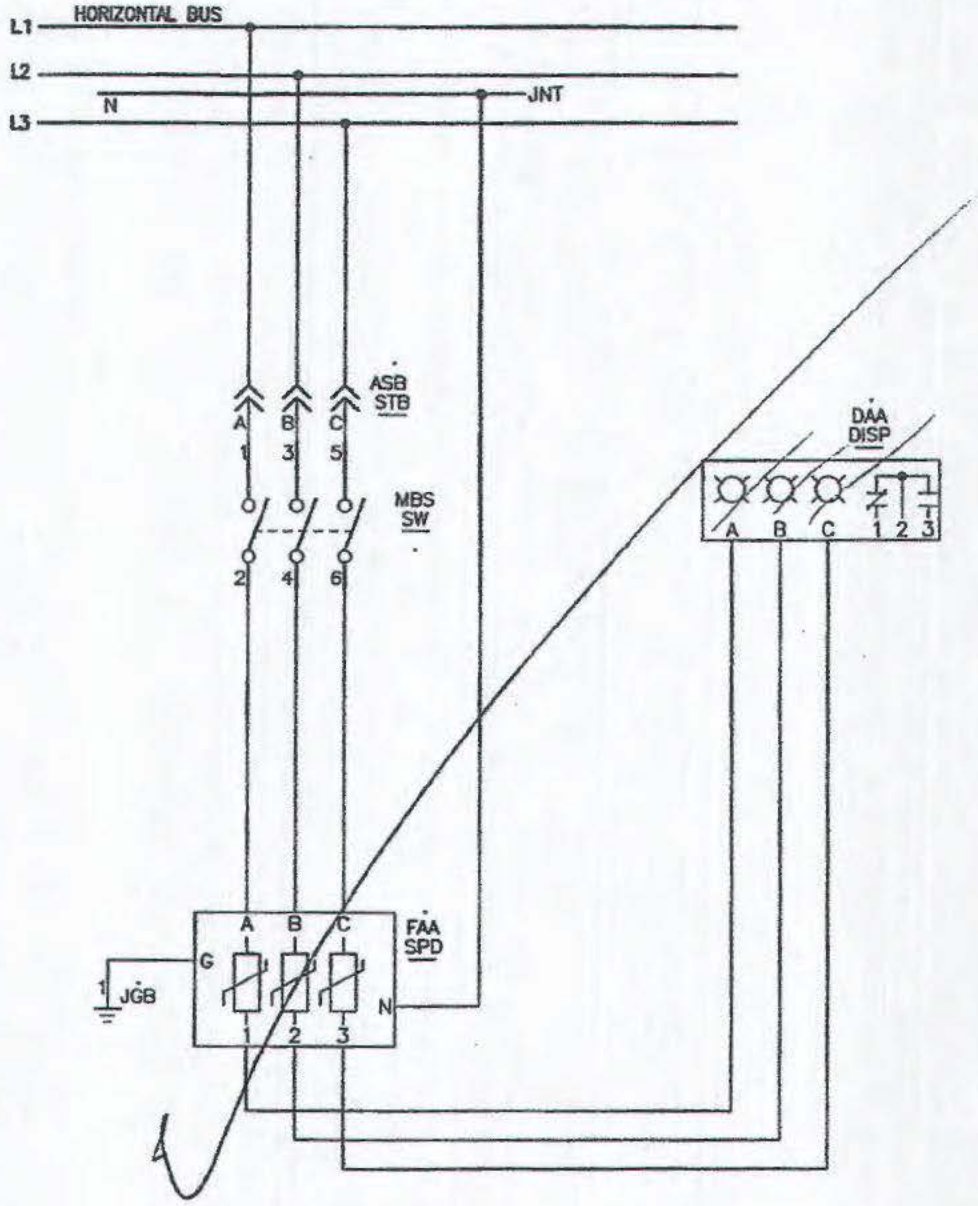

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		SQUARE D by Schneider Electric
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# E30736399-002-01	PG 1 OF 1 REV -

REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--
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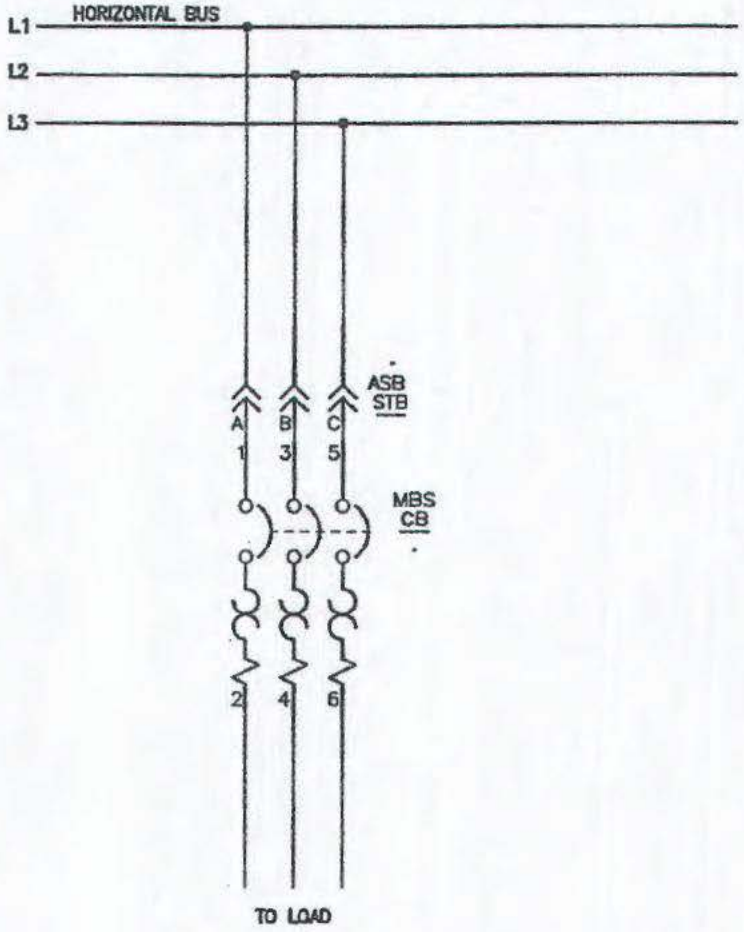

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		SQUARE D by Schneider Electric
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# E30736399-002-02	PG 1 OF 1 REV

REV	DESCRIPTION	BY	DATE	-	-----	--	--/--/--
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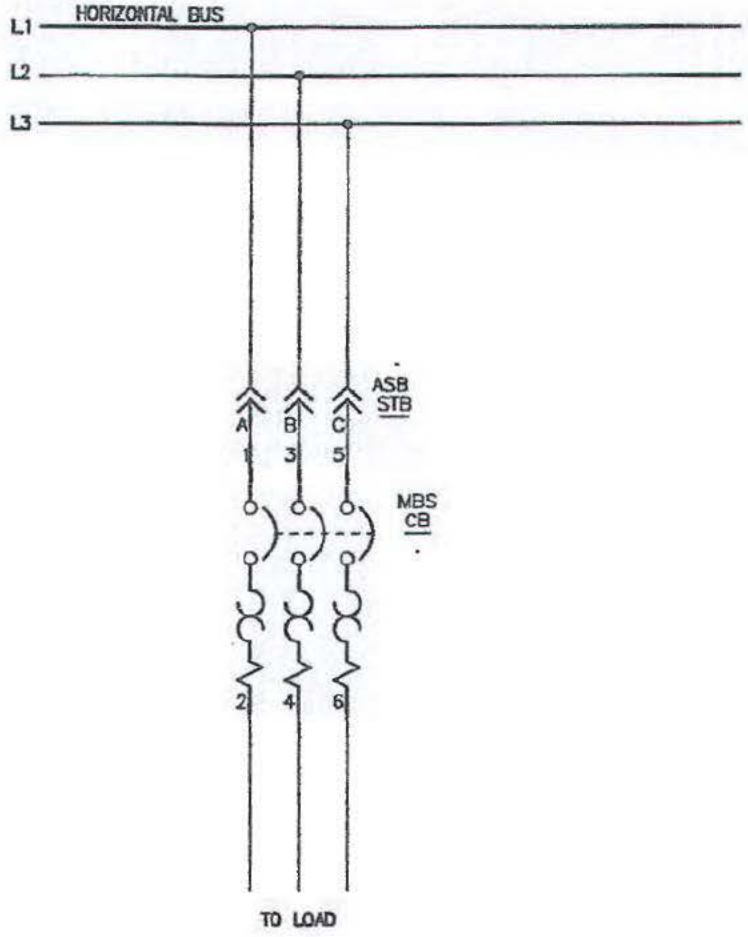

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		SQUARE D by Schneider Electric
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# E30736399-002-03	PG 1 OF 1 REV -

REV	DESCRIPTION	BY	DATE
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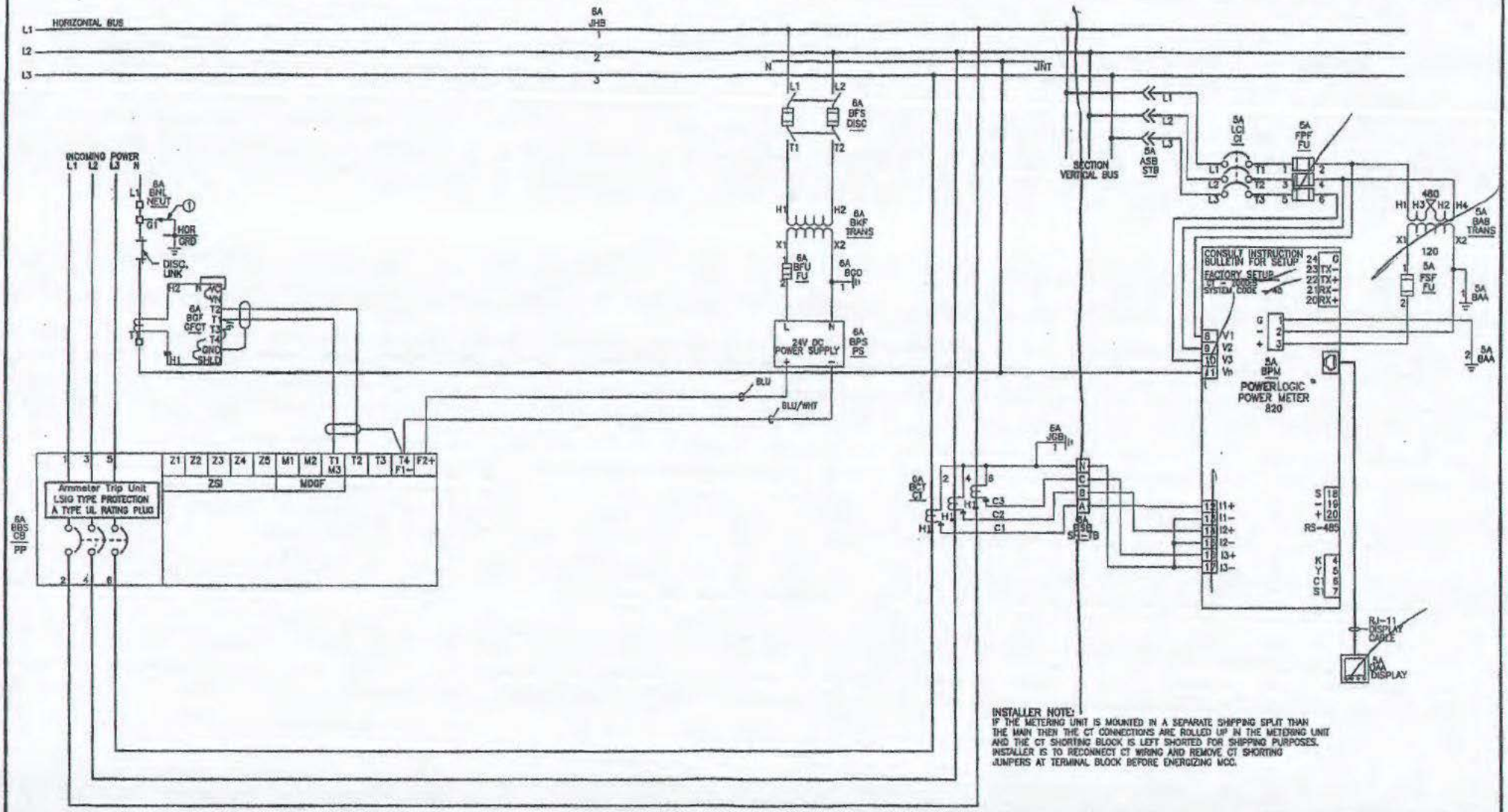

INSTALLER NOTE:
IF THE METERING UNIT IS MOUNTED IN A SEPARATE SHIPPING SPLIT THAN THE MAIN THEN THE CT CONNECTIONS ARE ROLLED UP IN THE METERING UNIT AND THE CT SHORTING BLOCK IS LEFT SHORTED FOR SHIPPING PURPOSES. INSTALLER IS TO RECONNECT CT WIRING AND REMOVE CT SHORTING JUMPERS AT TERMINAL BLOCK BEFORE ENERGIZING MCC.

① "MAIN BONDING JUMPER. CUSTOMER TO CONNECT AS REQUIRED"

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG#	E30736399-002-04

PG 1 OF 1 | REV –

H-256

REV	DESCRIPTION	BY	DATE				
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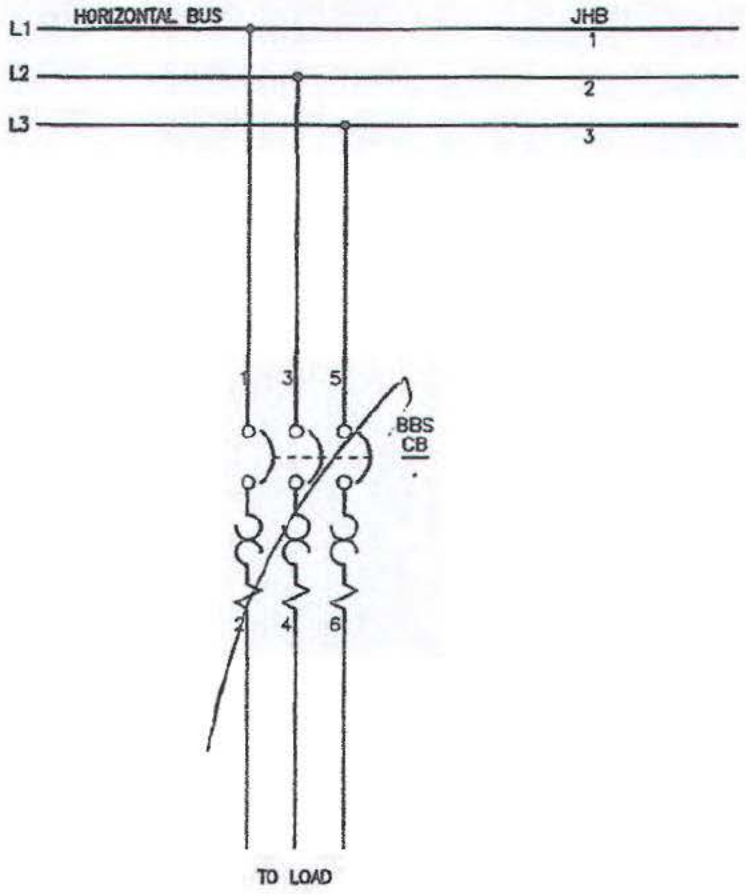

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# E30736399-002-05	PG 1 OF 1 REV -

REV	DESCRIPTION	BY	DATE
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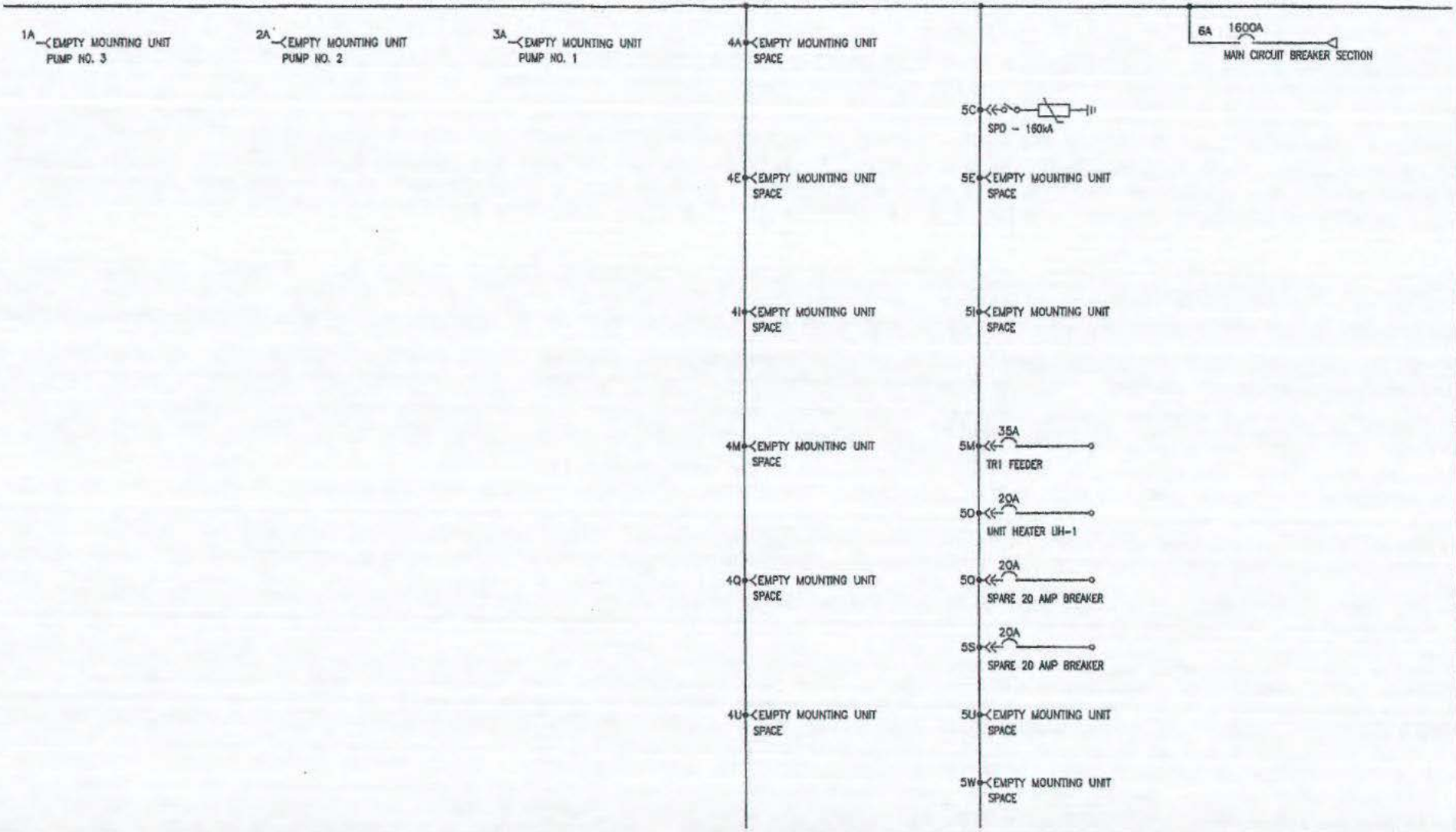


H-258

JOB NAME:	RICE LAKE SWITCHBOARD/MCC	EQUIPMENT DESIGNATION:	MCC1
JOB LOCATION:	PRINCETON IN	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:	KEN BROWN		
DATE:	FEBRUARY 19 2013		
DRAWING STATUS:	RECORD	DWG# 030736399-002-01	PG 1 OF 1 REV --

Pack Out Inspection Sheet

FO# 3073639-002 Section No. 1 of 6 Date 3-14-13

Special **Shipping Instructions:**					
Special **Cover** Request:					
Any other **special instructions:**					
Is a **switchboard side plate** required?	Yes		No	✓	**QC Inspection Stamp** QC2
Are **Pullboxes** required?	Yes		No	✓	
Is a **Tesys-T handheld programmer** required?	Yes		No	✓	
Is **double coated paint** required?	Yes		No	✓	
Does it require **2500A bus?**	Yes		No	✓	
Is it **seismic?** IBC Standard _____ OSHPD_____	Yes		No	✓	
Is the **PID label** correct?	Yes	✓	No		

Attention: Did analyst note all special requirements? If no please note in errors.

Horizontal Wireway Barrier and Red Glastic Barrier Check all Requirements that apply from FE then answer acceptable or not	Acceptable Yes	Acceptable No	Initials Barriers
Is a **horizontal wireway barrier** required? Yes ✓ No____ If Yes Which Sections? 1	✓		DH
Are **red glastic barriers** required? Special____ Left ✓ Right____ Both____ None____	✓		
What **structure type** is it? Nema 1 ✓ Nema 1A___ Nema 12____ 3R____ (check for appropriate gasketing and screws)	✓		

Initial here if verified that structure has the correct wireway barrier and red glastic barriers RJ

Stop! Do not put on top cover until initialed above by QC designate!

Pack Out Close-up Standard Check all requirements that apply from the FE then answer whether it is acceptable or not	Acceptable Yes	Acceptable No	Initials Backs
Is **instruction packet** and **label** required? Book ✓ CC_____ No_____	✓		JC
Is it **MCC or Enclosed Drive?** MCC ✓ Enclosed_____ (Verify appropriate labels are attached,end plates are installed, and whether to ship standing.)	✓		
Are **end closing plates** required? Special____ Left ✓ Right____ Both____ None____	✓		
Is a **cardbord cover** required on the left side? Yes____ No ✓			**Initials Fronts**
Is **Square-D Logo** or **master nameplate** req? Sec.# Logo____ Master ✓ SS____ No____	✓		
Is the section **seismic?** (Make sure appropriate labels are present.) Yes____ No ✓			DH
Is a **drip hood/drip hood splice** required? Yes____ No ✓			
Are **vented backs and kickplates** required? Yes____ No ✓			
Are **labels** attached in the correct location and neatly placed?	✓		

Pullbox : Part 1 Is a Pullbox required? Yes____ No ✓ If yes how many? 1____ 2____ 3_____

Initial here if verified that structure is built according to the Close-up Standard RJ

Stop! Do not lay down shipping split until initialed above by QC designate!

MCC Packaging Check all requirements that apply from the FE then answer whether it is acceptable or not	Acceptable Yes	Acceptable No	Initials Packaging
Pullbox : Part 2 If required how are they being shipped? Separate____ with Split____			RJ
Are there any **special packaging** Required: Crate____ Stand-up____ West-Coast____ Canada____ Pagota ____ Seismic Labels____Other_____			
Was **packaging** done according to the MCC Packout Standard?	✓		

Note Any Errors Here:	Rework	Responsible

Inspected By: RJ **Date** 3.14

Pack Out Inspection Sheet

FO# 30736399-002 Section No. 2 of 6 Date 3-14-13

Special **Shipping Instructions:**					
Special **Cover** Request:					
Any other **special instructions:**					
Is a **switchboard side plate** required?	Yes		No	✓	QC Inspection Stamp
Are **Pullboxes** required?	Yes		No	✓	
Is a **Tesys-T handheld programmer** required?	Yes		No	✓	
Is **double coated paint** required?	Yes		No	✓	
Does it require **2500A bus?**	Yes		No	✓	QC2
Is it **seismic?** IBC Standard ____ OSHPD____	Yes		No	✓	
Is the **PID label** correct?	Yes	✓	No		

Attention: Did analyst note all special requirements? If no please note in errors.

Horizontal Wireway Barrier and Red Glastic Barrier Check all Requirements that apply from FE then answer acceptable or not	Acceptable Yes	Acceptable No	Initials Barriers
Is a **horizontal wireway barrier** required? Yes ✓ No____ If Yes Which Sections? 2	✓		
Are **red glastic barriers** required? Special____ Left____ Right____ Both____ None ✓			
What **structure type** is it? Nema 1 ✓ Nema 1A____ Nema 12____ 3R____ (check for appropriate gasketing and screws)	✓		

Initial here if verified that structure has the correct wireway barrier and red glastic barriers RJ

Stop! Do not put on top cover until initialed above by QC designate!

Pack Out Close-up Standard Check all requirements that apply from the FE then answer whether it is acceptable or not.	Acceptable Yes	Acceptable No	Initials Backs
Is **instruction packet** and **label** required? Book____ CC____ No ✓			
Is it **MCC or Enclosed Drive?** MCC ✓ Enclosed____ (Verify appropriate labels are attached, end plates are installed, and whether to ship standing.)	✓		CS
Are **end closing plates** required? Special____ Left____ Right____ Both____ None ✓			
Is a **cardbord cover** required on the left side? Yes____ No ✓			Initials Fronts
Is **Square-D Logo** or **master nameplate** req? Sec.# Logo____ Master____ SS____ No ✓			
Is the section **seismic?** (Make sure appropriate labels are present.) Yes____ No ✓			
Is a **drip hood/drip hood splice** required? Yes____ No ✓			SP
Are **vented backs and kickplates** required? Yes____ No ✓			
Are **labels** attached in the correct location and neatly placed?	✓		

Pullbox : Part 1 Is a Pullbox required? Yes____ No ✓ If yes how many? 1____ 2____ 3____

Initial here if verified that structure is built according to the Close-up Standard RJ

Stop! Do not lay down shipping split until initialed above by QC designate!

MCC Packaging Check all requirements that apply from the FE then answer whether it is acceptable or not.	Acceptable Yes	Acceptable No	Initials Packaging
Pullbox : Part 2 If required how are they being shipped? Separate____ with Split____			
Are there any **special packaging** Required: Crate____ Stand-up____ West-Coast____ Canada____ Pagota____ Seismic Labels____ Other____			
Was **packaging** done according to the MCC Packout Standard?	✓		

Note Any Errors Here:	Rework	Responsible

Inspected By: RJ Date 3/19

Pack Out Inspection Sheet

FO# 30736399-002 Section No. 3 of 6 Date 3-14-13

Special **Shipping Instructions:**

Special **Cover** Request:

Any other **special instructions:**

Is a **switchboard side plate** required?	Yes		No	✓	QC Inspection Stamp
Are **Pullboxes** required?	Yes		No	✓	
Is a **Tesys-T handheld programmer** required?	Yes		No	✓	
Is **double coated paint** required?	Yes		No	✓	QC2
Does it require **2500A bus?**	Yes		No	✓	
Is it **seismic?** IBC Standard _____ OSHPD_____	Yes		No	✓	
Is the **PID label** correct?	Yes	✓	No		

Attention: Did analyst note all special requirements? If no please note in errors.

Horizontal Wireway Barrier and Red Glastic Barrier Check all Requirements that apply from FE then answer acceptable or not	Acceptable Yes	Acceptable No	Initials Barriers
Is a **horizontal wireway barrier** required? Yes ✓ No_____ If Yes Which Sections? 3	✓		DH
Are **red glastic barriers** required? Special_____ Left____ Right____ Both____ None ✓			
What **structure type** is it? Nema 1 ✓ Nema 1A___ Nema 12_____ 3R_____ (check for appropriate gasketing and screws)	✓		

Initial here if verified that structure has the correct wireway barrier and red glastic barriers RJ

Stop! Do not put on top cover until initialed above by QC designate!

Pack Out Close-up Standard Check all requirements that apply from the FE then answer whether it is acceptable or not.	Acceptable Yes	Acceptable No	Initials Backs
Is **instruction packet** and **label** required? Book_____ CC_____ No ✓			TE
Is it **MCC or Enclosed Drive?** MCC ✓ Enclosed_____ (Verify appropriate labels are attached,end plates are installed, and whether to ship standing.)	✓		
Are **end closing plates** required? Special____ Left____ Right____ Both____ None ✓			
Is a **cardbord cover** required on the left side? Yes_____ No ✓			Initials Fronts
Is **Square-D Logo** or **master nameplate** req? Sec.# Logo____ Master____ SS____ No ✓			
Is the section **seismic?** (Make sure appropriate labels are present.) Yes____ No ✓			DH
Is a **drip hood/drip hood splice** required? Yes_____ No ✓			
Are **vented backs and kickplates** required? Yes_____ No ✓			
Are **labels** attached in the correct location and neatly placed?	✓		

Pullbox : Part 1 Is a Pullbox required? Yes____ No ✓ If yes how many? 1____ 2_____ 3_____

Initial here if verified that structure is built according to the Close-up Standard RJ

Stop! Do not lay down shipping split until initialed above by QC designate!

MCC Packaging Check all requirements that apply from the FE then answer whether it is acceptable or not.	Acceptable Yes	Acceptable No	Initials Packaging
Pullbox : Part 2 If required how are they being shipped? Separate____ with Split____			CS
Are there any **special packaging** Required: Crate____ Stand-up____ West-Coast____ Canada____ Pagota ____ Seismic Labels____Other_____			
Was **packaging** done according to the MCC Packout Standard?	✓		

Note Any Errors Here:	Rework	Responsible

Inspected By: RJ Date 3/14

Pack Out Inspection Sheet

FO# 30736399-002 Section No. 45 of 6 Date 3/19/13

Special **Shipping Instructions:**					
Special **Cover** Request:					
Any other **special instructions:**					
Is a **switchboard side plate** required?	Yes		No	/	**QC Inspection Stamp** Tyler B WATKINS
Are **Pullboxes** required?	Yes		No	/	
Is a **Tesys-T handheld programmer** required?	Yes		No	/	
Is **double coated paint** required?	Yes		No	/	
Does it require **2500A bus?**	Yes		No	/	
Is it **seismic?** IBC Standard _____ OSHPD_____	Yes		No	/	
Is the **PID label** correct?	Yes	/	No		

Attention: Did analyst note all special requirements? if no please note in errors.

Horizontal Wireway Barrier and Red Glastic Barrier Check all Requirements that apply from FE then answer acceptable or not	Acceptable Yes	Acceptable No	Initials Barriers
Is a **horizontal wireway barrier** required? Yes / No____ If Yes Which Sections? 4,5	/		
Are **red glastic barriers** required? Special____ Left____ Right____ Both____ None /			
What **structure type** is it? Nema 1 / Nema 1A___ Nema 12____ 3R____ (check for appropriate gasketing and screws)	/		

Initial here if verified that structure has the correct wireway barrier and red glastic barriers RJ

Stop! Do not put on top cover until initialed above by QC designate!

Pack Out Close-up Standard Check all requirements that apply from the FE then answer whether it is acceptable or not.	Acceptable Yes	Acceptable No	Initials Backs
Is **instruction packet** and **label** required? Book / CC / No____	/		
Is it **MCC or Enclosed Drive?** MCC / Enclosed____ (Verify appropriate labels are attached,end plates are installed, and whether to ship standing.)	/		JB
Are **end closing plates** required? Special____ Left____ Right____ Both____ None /			
Is a **cardbord cover** required on the left side? Yes____ No /			Initials Fronts
Is **Square-D Logo** or **master nameplate** req? Sec.# Logo____ Master____ SS____ No /			
Is the section **seismic?** (Make sure appropriate labels are present.) Yes____ No /			
Is a **drip hood/drip hood splice** required? Yes____ No /			
Are **vented backs and kickplates** required? Yes____ No /			DH
Are **labels** attached in the correct location and neatly placed?	/		

Pullbox : Part 1 Is a Pullbox required? Yes____ No / If yes how many? 1____ 2____ 3____

Initial here if verified that structure is built according to the Close-up Standard RJ

Stop! Do not lay down shipping split until initialed above by QC designate!

MCC Packaging Check all requirements that apply from the FE then answer whether it is acceptable or not.	Acceptable Yes	Acceptable No	Initials Packaging
Pullbox : Part 2 If required how are they being shipped? Separate____ with Split____			
Are there any **special packaging** Required: Crate____ Stand-up____ West-Coast____ Canada____ Pagota____ Seismic Labels____ Other_____			JB
Was **packaging** done according to the MCC Packout Standard?	/		

Note Any Errors Here:	Rework	Responsible

Inspected By: RJ **Date** 3,19

Pack Out Inspection Sheet

FO# 30736399-002 Section No. 6 of 6 Date 3.20.13

Special **Shipping Instructions:**					
Special **Cover** Request:					
Any other **special instructions:**					
Is a **switchboard side plate** required?	Yes		No		QC Inspection Stamp
Are **Pullboxes** required?	Yes		No		
Is a **Tesys-T handheld programmer** required?	Yes		No		
Is **double coated paint** required?	Yes		No		QC 19
Does it require **2500A bus?**	Yes		No		
Is it **seismic?** IBC Standard _____ OSHPD_____	Yes		No		
Is the **PID label** correct?	Yes		No		

Attention: Did analyst note all special requirements? If no please note in errors.

Horizontal Wireway Barrier and Red Glastic Barrier Check all Requirements that apply from FE then answer acceptable or not	Acceptable Yes	Acceptable No	Initials Barriers
Is a **horizontal wireway barrier** required? Yes_____ No ✓ If Yes Which Sections? NA			DH
Are **red glastic barriers** required? Special_____ Left____ Right ✓ Both____ None____	✓		
What **structure type** is it? Nema 1 ✓ Nema 1A___ Nema 12_____ 3R_____ (check for appropriate gasketing and screws)	✓		

Initial here if verified that structure has the correct wireway barrier and red glastic barriers RJ

Stop! Do not put on top cover until initialed above by QC designate!

Pack Out Close-up Standard Check all requirements that apply from the FE then answer whether it is acceptable or not.	Acceptable Yes	Acceptable No	Initials Backs
Is **instruction packet** and **label** required? Book ✓ CC ✓ No_____	✓		
Is it **MCC or Enclosed Drive?** MCC ✓ Enclosed_____ (Verify appropriate labels are attached, end plates are installed, and whether to ship standing.)	✓		CS
Are **end closing plates** required? Special____ Left____ Right ✓ Both____ None____	✓		
Is a **cardbord cover** required on the left side? Yes_____ No ✓			Initials Fronts
Is **Square-D Logo** or **master nameplate** req? Sec.# Logo ✓ Master____ SS____ No____	✓		
Is the section **seismic?** (Make sure appropriate labels are present.) Yes____ No ✓			
Is a **drip hood/drip hood splice** required? Yes_____ No ✓			DH
Are **vented backs and kickplates** required? Yes_____ No ✓			
Are **labels** attached in the correct location and neatly placed?	✓		

Pullbox : Part 1 Is a Pullbox required? Yes____ No ✓ If yes how many? 1____ 2_____ 3_____

Initial here if verified that structure is built according to the Close-up Standard RJ

Stop! Do not lay down shipping split until initialed above by QC designate!

MCC Packaging Check all requirements that apply from the FE then answer whether it is acceptable or not.	Acceptable Yes	Acceptable No	Initials Packaging
Pullbox : Part 2 If required how are they being shipped? Separate____ with Split____			
Are there any **special packaging** Required: Crate____ Stand-up____ West-Coast____ Canada____ Pagota____ Seismic Labels____ Other_____			JB
Was **packaging** done according to the MCC Packout Standard?	✓		

Note Any Errors Here:	Rework	Responsible

Inspected By: RJ **Date** 3.20

Structure Line Inspection

F.O.# 30736399-002 Section 4,5 of 6
Date: 3-8-17 Inspector: 5007 Line 1 ____ Line 2 ✓

Structure Inspection	Acceptable		
Check all that apply Include sec# when required	Yes	No	NA
Is the structure lay out correct?	✓		
Is the structure clear of all cosmetic defects? (ie. scratches, dents, bad paint, etc.)	✓		
Height: Standard ✓ 12" Reduced ___ 18" Reduced ___ 24" Reduced ___	✓		
Width: 20 ✓ 25 ___ 30 ___ 35 ___	✓		
Shipping Split: Single ___ Double ✓ Triple ___	✓		
Are Front and Rear Frame splice screws present?	✓		
Is the hardware bag present?	✓		
Make sure all applicable screws are present and welds on side frames are good.	✓		
Horizontal Buss			
Wider Glastic strap (65k 1 Lam. 85 or greater):	✓		
Flat and Conical washer(1 Lam. :65k or greater)	✓		
Steel Vertical phase bus brace (85k or greater)			✓
600A Vertical Bus required (if 85k or greater)			✓
Material: Copper Tin ✓ Copper Silver ___ Aluminum ___ Width: 1.5" ✓ 2" ___	✓		
Laminations: 1 Lamination ___ 2 Laminations ___ 4 Laminations ✓	✓		
Splice Kit: Mounted ✓ In a Box ___	✓		
Are all bus flaps present?	✓		
Are all torque marks present?	✓		
Are Glastic End Barriers Required: Left ___ Right ___ Both ___			✓
Are horizontal wireway tracks required and present?	✓		
Is the rear horizontal phase barrier present? Vented ___	✓		

Other Buss	Acceptable		
Check all that apply Include sec# when required	Yes	No	NA
Vertical Buss: 300A Tin ___ 600A Tin ✓ 300A Silver ___ 600A Silver ___	✓		
Neutral Buss: 1 Lam. Tin ___ 2 Lam. Tin ___ 1 Lam. Silver ___ 2 Lam. Silver ___		✓	
Is a Neutral Drop Required? If Yes which Sec ___		✓	
Neutral Splice Kit: Mounted ___ In a Box ___		✓	
Check Neutral for proper torque marks, conical washers turned correctly.		✓	
Horizontal Ground Bus: 1"Tin ✓ 2"Tin ___ 1"Silver ___ 2"Silver ___	✓		
Vertical Ground Buss: Steel ___ Copper ✓	✓		
Other Features			
Depth: 15" ___ 20" ✓	✓		
Gasketing: Nema 1 ✓ Nema 1A ___ Nema 12 ___	✓		
Color: Ansi 49 ✓ Ansi 61 ___ Other ___	✓		
Shutters: Manual Shutters ✓ Auto Bus Shutters ___	✓		
Wire Trough Area			
Fish Tape Barriers ✓ Communication Barrier ___ Section Barriers ___ Wire Retainers ___	✓		
Thermostat ___ Humidistat ___			
Accessories			
Seismic ___ Strip Heaters ___ Bottom Closing Plates ___			
Top Plate: Standard ✓ Vented ___ Drip Hood ___ Two-Piece ___	✓		

Error	Section	Associate1 / Associate2
missing neutral buss	4,5	[redacted].57
15 min. rework		SP

AS200.315
09/27/2012

STRUCTURE LINE INSPECTION CHECKLIST

F.O.# 3073-6899-002 Section 4,5 of 6

Date: 3/11/13 Inspector: 6426 Line 1 ____ Line 2 ✓

AT RESETS AND LABELS		Acceptable	
Sec.	CHECK	Yes	No
	Door / Receptacles / Quarter Turns Present and recepticles align with door.	✓	
	Labels RS, SCCR, door labels	✓	
	Gasket Nema 1 ✓ 1A___ 12___ 3R___	✓	
	Nameplates: No NP's or screws missing. Orientation is correct.	✓	
	Nameplate Screws: Screw type correct. Stainless Steel Screws Required NO	✓	
	Unit NP: Engraving matches UIS	✓	
	UL Structure Nameplate UL or Non-UL Engraving matches UIS	✓	
	Red Glastic End Barrier 1st and Last Sections		

Badge #	Errors & Comments:
	Sect 5A-Meter, 5C-TVSS

CONTROL SYSTEM TEST REPORT

DATE ISSUED: 6/15/2013 BY: KARL KOCH

CUSTOMER NAME: S&K EQUIPMENT	JOB NO.:		DESCRIPTION:		
JOB NAME: RICE LAKE PUMP STATION	C1111121		PUMP NO. 1 CONTROL SECTION		
EQUIPMENT	**TEST PERFORMED**	**METHOD**	**RESULT**	**TECH**	**COMPLETE**

FLUKE 787 METER	POINT TO POINT WIRING CHECK	CONTINUITY TEST	PASS/FAIL	TECH	COMPLETE
OHMS	POWER WIRING	X	PASS	KGK	X
OHMS	PILOT DEVICE AND DOOR WIRING	X	PASS	KGK	X
OHMS	CONTROL AND TIME DELAY WIRING	X	PASS	KGK	X
OHMS	PUMP MONITOR WIRING	X	PASS	KGK	X
OHMS	FAULT CIRCUIT WIRING	X	PASS	KGK	X
OHMS	CONTROL TRANSFORMER AND CONTROL POWER DISTRIBUTION	X	PASS	KGK	X
OHMS	SSRV CONTROL WIRING	X	PASS	KGK	X

FLUKE 787 METER	POWER UP TEST	VOLTAGE CHECK	MEASUREMENT	TECH	COMPLETE
AC VOLTS	ENERGIZE MAIN CIRCUIT BREAKER	L1 - L2	487 VAC	KGK	X
		L1 - L3	493 VAC	KGK	X
		L2 - L3	487 VAC	KGK	X
N/A	SSRV KEYPAD BOOT UP VERIFICATION	N/A	N/A	KGK	X
AC VOLTS	CONTROL POWER	X1 - X2	127.9 VAC	KGK	X
AC VOLTS	24 VDC POWER SUPPLY INPUT	L1 - N	127.9 VAC	KGK	X
AC VOLTS	ENERGIZE 120 VOLT ISOLATION CONTACTOR @ 90%	A1-A2	108 VAC	KGK	X
AC VOLTS	ENERGIZE 120 VOLT CONTROL RELAYS @ 90%	A1-A2	108 VAC	KGK	X
DC VOLTS	ENERGIZE 24 VDC CONTROL RELAYS @ 90%	A1-A2	21.6 VDC	KGK	X
DC VOLTS	24 VDC POWER SUPPLY OUTPUT	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	PUMP MONITOR PLC INPUT	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	LEVEL TRANSMITTER LOOP POWER	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	LEAK PROBE POWER FEED	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	THERMAL SENSOR POWER FEED	POS - NEG	24.2 VDC	KGK	X
N/A	PLC BOOT UP VERIFICATION	N/A	N/A	KGK	X
N/A	TOUCHSCREEN BOOT UP VERIFICATION	N/A	N/A	KGK	X

FLUKE 787 METER	FUNCTIONALITY TEST	OPERATIONAL	PASS/FAIL	TECH	COMPLETE
	PILOT LIGHT PUSH TO TEST VERIFICATION:				
N/A	BLUE: CALLED	PRESS BUTTON	PASS	KGK	X
N/A	YELLOW: LOW LEVEL	PRESS BUTTON	PASS	KGK	X
N/A	RED: RUNNING	PRESS BUTTON	PASS	KGK	X
N/A	WHITE: ENABLED	PRESS BUTTON	PASS	KGK	X
N/A	GREEN: STOPPED	PRESS BUTTON	PASS	KGK	X
N/A	YELLOW: FAULT	PRESS BUTTON	PASS	KGK	X
	PILOT DEVICE TEST VERIFICATION				
N/A	BLUE: CALLED	SYSTEM TEST	PASS	KGK	X
N/A	YELLOW: LOW LEVEL	SYSTEM TEST	PASS	KGK	X
N/A	RED: RUNNING	SYSTEM TEST	PASS	KGK	X
N/A	WHITE: ENABLED	SYSTEM TEST	PASS	KGK	X
N/A	GREEN: STOPPED	SYSTEM TEST	PASS	KGK	X
N/A	YELLOW: FAULT	SYSTEM TEST	PASS	KGK	X
N/A	START BUTTON	SYSTEM TEST	PASS	KGK	X
N/A	STOP BUTTON	SYSTEM TEST	PASS	KGK	X
	PUMP MONITORING AND CONTROL				
N/A	CHAMBER SEAL LEAK DETECTION HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	CHAMBER SEAL LEAK PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	MOTOR HOUSING LEAK DETECTION HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	MOTOR HOUSING LEAK DETECTION PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	CORD CAP LEAK DETECTION HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	CORD CAP LEAK DETECTION PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	LOWER BEARING THERMOSTAT HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	LOWER BEARING THERMOSTAT PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	MOTOR HOUSING THERMOSTAT HMI NOTIFICATION	JUMPER	PASS	KGK	X

N/A	MOTOR HOUSING THERMOSTAT PUMP DISABLE			JUMPER	PASS	KGK	X
	LEVEL TRANSMITTER FEEDBACK AND SCALING 0-23 FT						
	VALUES						
	MILLIAMP CALCULATED	MILLIAMP ACTUAL	LEVEL CALCULATED	HMI READOUT			
4-20 ma	4.00	4.00	0 FT	0.01	INDUCED CURRENT	PASS	KGK	X
4-20 ma	4.696	4.696	1 FT.	1.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	5.392	5.392	2 FT.	2.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	6.088	6.088	3 FT.	3.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	6.784	6.784	4 FT.	4.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	7.48	7.48	5 FT.	5.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	8.176	8.176	6 FT.	6.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	8.872	8.872	7 FT.	7.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	9.568	9.568	8 FT.	8.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	10.264	10.264	9 FT.	9.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	10.96	10.96	10 FT.	10.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	11.656	11.656	11 FT.	11.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	12.352	12.352	12 FT.	12.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	13.048	13.048	13 FT.	13.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	13.744	13.744	14 FT.	14.04	INDUCED CURRENT	PASS	KGK	X
4-20 ma	14.44	14.44	15 FT.	15.04	INDUCED CURRENT	PASS	KGK	X
4-20 ma	15.136	15.136	16 FT.	16.04	INDUCED CURRENT	PASS	KGK	X
4-20 ma	15.832	15.832	17 FT.	17.04	INDUCED CURRENT	PASS	KGK	X
4-20 ma	16.528	16.528	18 FT.	18.04	INDUCED CURRENT	PASS	KGK	X
4-20 ma	17.224	17.224	19 FT.	19.04	INDUCED CURRENT	PASS	KGK	X
4-20 ma	17.92	17.92	20 FT.	20.04	INDUCED CURRENT	PASS	KGK	X
4-20 ma	18.616	18.616	21 FT.	21.05	INDUCED CURRENT	PASS	KGK	X
4-20 ma	19.312	19.312	22 FT.	22.05	INDUCED CURRENT	PASS	KGK	X
4-20 ma	20.008	20.008	23 FT.	23.05	INDUCED CURRENT	PASS	KGK	X
	PUMP ENABLE AND SHUTOFF CONTROLS						
N/A	CONTROLLER/HMI ACCEPTANCE OF ENABLE LEVEL SETTING				SYSTEM TEST	PASS	KGK	X
N/A	CONTROLLER/HMI ACCEPTANCE OF OFF LEVEL SETTING				SYSTEM TEST	PASS	KGK	X
N/A	NUMERIC DISPLAY ACCEPTANCE OF ENABLE LEVEL SETTING				VISUAL VERIFICATION	PASS	KGK	X
N/A	NUMERIC DISPLAY ACCEPTANCE OF OFF LEVEL SETTING				VISUAL VERIFICATION	PASS	KGK	X
N/A	BAR INDICATOR ACCEPTANCE OF ENABLE LEVEL SETTING				VISUAL VERIFICATION	PASS	KGK	X
N/A	BAR INDICATOR ACCEPTANCE OF OFF LEVEL SETTING				VISUAL VERIFICATION	PASS	KGK	X
N/A	HMI PUMP STATUS INDICATOR				VISUAL VERIFICATION	PASS	KGK	X
N/A	THERMAL BYPASS BUTTON				SYSTEM TEST	PASS	KGK	X
N/A	LEAKAGE BYPASS BUTTON				SYSTEM TEST	PASS	KGK	X
N/A	TRANSDUCER FAIL BYPASS BUTTON				SYSTEM TEST	PASS	KGK	X

CONTROL SYSTEM TEST REPORT

DATE ISSUED: 6/15/2013 BY: KARL KOCH

CUSTOMER NAME: S&K EQUIPMENT	JOB NO.:		DESCRIPTION:
JOB NAME: RICE LAKE PUMP STATION	C1111121		PUMP NO. 2 CONTROL SECTION

EQUIPMENT	TEST PERFORMED	METHOD	RESULT	TECH	COMPLETE
FLUKE 787 METER	POINT TO POINT WIRING CHECK	CONTINUITY TEST	PASS/FAIL	TECH	COMPLETE
OHMS	POWER WIRING	X	PASS	KGK	X
OHMS	PILOT DEVICE AND DOOR WIRING	X	PASS	KGK	X
OHMS	CONTROL AND TIME DELAY WIRING	X	PASS	KGK	X
OHMS	PUMP MONITOR WIRING	X	PASS	KGK	X
OHMS	FAULT CIRCUIT WIRING	X	PASS	KGK	X
OHMS	CONTROL TRANSFORMER AND CONTROL POWER DISTRIBUTION	X	PASS	KGK	X
OHMS	SSRV CONTROL WIRING	X	PASS	KGK	X
FLUKE 787 METER	POWER UP TEST	VOLTAGE CHECK	MEASUREMENT	TECH	COMPLETE
AC VOLTS	ENERGIZE MAIN CIRCUIT BREAKER	L1 - L2	487 VAC	KGK	X
		L1 - L3	493 VAC	KGK	X
		L2 - L3	487 VAC	KGK	X
N/A	SSRV KEYPAD BOOT UP VERIFICATION	N/A	N/A	KGK	X
AC VOLTS	CONTROL POWER	X1 - X2	127.9 VAC	KGK	X
AC VOLTS	24 VDC POWER SUPPLY INPUT	L1 - N	127.9 VAC	KGK	X
DC VOLTS	24 VDC POWER SUPPLY OUTPUT	POS - NEG	24.2 VDC	KGK	X
AC VOLTS	ENERGIZE 120 VAC ISOLATION CONTACTOR @ 90%	A1-A2	108 VAC	KGK	X
AC VOLTS	ENERGIZE 120 VAC CONTROL RELAYS @ 90%	A1-A2	108 VAC	KGK	X
DC VOLTS	ENERGIZE 24 VDC CONTROL RELAYS @ 90%	A1-A2	21.6 VDC	KGK	X
DC VOLTS	PUMP MONITOR PLC INPUT	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	LEVEL TRANSMITTER LOOP POWER	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	LEAK PROBE POWER FEED	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	THERMAL SENSOR POWER FEED	POS - NEG	24.2 VDC	KGK	X
N/A	PLC BOOT UP VERIFICATION	N/A	N/A	KGK	X
N/A	TOUCHSCREEN BOOT UP VERIFICATION	N/A	N/A	KGK	X
FLUKE 787 METER	FUNCTIONALITY TEST	OPERATIONAL	PASS/FAIL	TECH	COMPLETE
	PILOT LIGHT PUSH TO TEST VERIFICATION:				
N/A	BLUE: CALLED	PRESS BUTTON	PASS	KGK	X
N/A	YELLOW: LOW LEVEL	PRESS BUTTON	PASS	KGK	X
N/A	RED: RUNNING	PRESS BUTTON	PASS	KGK	X
N/A	WHITE: ENABLED	PRESS BUTTON	PASS	KGK	X
N/A	GREEN: STOPPED	PRESS BUTTON	PASS	KGK	X
N/A	YELLOW: FAULT	PRESS BUTTON	PASS	KGK	X
	PILOT DEVICE TEST VERIFICATION				
N/A	BLUE: CALLED	SYSTEM TEST	PASS	KGK	X
N/A	YELLOW: LOW LEVEL	SYSTEM TEST	PASS	KGK	X
N/A	RED: RUNNING	SYSTEM TEST	PASS	KGK	X
N/A	WHITE: ENABLED	SYSTEM TEST	PASS	KGK	X
N/A	GREEN: STOPPED	SYSTEM TEST	PASS	KGK	X
N/A	YELLOW: FAULT	SYSTEM TEST	PASS	KGK	X
N/A	START BUTTON	SYSTEM TEST	PASS	KGK	X
N/A	STOP BUTTON	SYSTEM TEST	PASS	KGK	X
	PUMP MONITORING AND CONTROL				
N/A	CHAMBER SEAL LEAK DETECTION HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	CHAMBER SEAL LEAK PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	MOTOR HOUSING LEAK DETECTION HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	MOTOR HOUSING LEAK DETECTION PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	CORD CAP LEAK DETECTION HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	CORD CAP LEAK DETECTION PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	LOWER BEARING THERMOSTAT HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	LOWER BEARING THERMOSTAT PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	MOTOR HOUSING THERMOSTAT HMI NOTIFICATION	JUMPER	PASS	KGK	X

N/A	MOTOR HOUSING THERMOSTAT PUMP DISABLE	JUMPER	PASS	KGK	X

	LEVEL TRANSMITTER FEEDBACK AND SCALING 0-23 FT							
	VALUES							
	MILLIAMP CALCULATED	MILLIAMP ACTUAL	LEVEL CALCULATED	HMI READOUT				
4-20 ma	4.00	4.00	0 FT	0.01	INDUCED CURRENT	PASS	KGK	X
4-20 ma	4.696	4.696	1 FT.	1.01	INDUCED CURRENT	PASS	KGK	X
4-20 ma	5.392	5.392	2 FT.	2.01	INDUCED CURRENT	PASS	KGK	X
4-20 ma	6.088	6.088	3 FT.	3.01	INDUCED CURRENT	PASS	KGK	X
4-20 ma	6.784	6.784	4 FT.	4.01	INDUCED CURRENT	PASS	KGK	X
4-20 ma	7.48	7.48	5 FT.	5.01	INDUCED CURRENT	PASS	KGK	X
4-20 ma	8.176	8.176	6 FT.	6.01	INDUCED CURRENT	PASS	KGK	X
4-20 ma	8.872	8.872	7 FT.	7.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	9.568	9.568	8 FT.	8.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	10.264	10.264	9 FT.	9.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	10.96	10.96	10 FT.	10.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	11.656	11.656	11 FT.	11.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	12.352	12.352	12 FT.	12.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	13.048	13.048	13 FT.	13.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	13.744	13.744	14 FT.	14.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	14.44	14.44	15 FT.	15.02	INDUCED CURRENT	PASS	KGK	X
4-20 ma	15.136	15.136	16 FT.	16.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	15.832	15.832	17 FT.	17.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	16.528	16.528	18 FT.	18.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	17.224	17.224	19 FT.	19.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	17.92	17.92	20 FT.	20.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	18.616	18.616	21 FT.	21.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	19.312	19.312	22 FT.	22.03	INDUCED CURRENT	PASS	KGK	X
4-20 ma	20.008	20.008	23 FT.	23.03	INDUCED CURRENT	PASS	KGK	X

	PUMP ENABLE AND SHUTOFF CONTROLS				
N/A	CONTROLLER/HMI ACCEPTANCE OF ENABLE LEVEL SETTING	SYSTEM TEST	PASS	KGK	X
N/A	CONTROLLER/HMI ACCEPTANCE OF OFF LEVEL SETTING	SYSTEM TEST	PASS	KGK	X
N/A	NUMERIC DISPLAY ACCEPTANCE OF ENABLE LEVEL SETTING	VISUAL VERIFICATION	PASS	KGK	X
N/A	NUMERIC DISPLAY ACCEPTANCE OF OFF LEVEL SETTING	VISUAL VERIFICATION	PASS	KGK	X
N/A	BAR INDICATOR ACCEPTANCE OF ENABLE LEVEL SETTING	VISUAL VERIFICATION	PASS	KGK	X
N/A	BAR INDICATOR ACCEPTANCE OF OFF LEVEL SETTING	VISUAL VERIFICATION	PASS	KGK	X
N/A	HMI PUMP STATUS INDICATOR	VISUAL VERIFICATION	PASS	KGK	X
N/A	THERMAL BYPASS BUTTON	SYSTEM TEST	PASS	KGK	X
N/A	LEAKAGE BYPASS BUTTON	SYSTEM TEST	PASS	KGK	X
N/A	TRANSDUCER FAIL BYPASS BUTTON	SYSTEM TEST	PASS	KGK	X

CONTROL SYSTEM TEST REPORT

DATE ISSUED: 6/15/2013 BY: KARL KOCH

CUSTOMER NAME: S&K EQUIPMENT JOB NAME: RICE LAKE PUMP STATION	JOB NO.: C1111121		DESCRIPTION: PUMP NO. 3 CONTROL SECTION		
EQUIPMENT	**TEST PERFORMED**	**METHOD**	**RESULT**	**TECH**	**COMPLETE**

FLUKE 787 METER	POINT TO POINT WIRING CHECK	CONTINUITY TEST	PASS/FAIL	TECH	COMPLETE
OHMS	POWER WIRING	X	PASS	KGK	X
OHMS	PILOT DEVICE AND DOOR WIRING	X	PASS	KGK	X
OHMS	CONTROL AND TIME DELAY WIRING	X	PASS	KGK	X
OHMS	PUMP MONITOR WIRING	X	PASS	KGK	X
OHMS	FAULT CIRCUIT WIRING	X	PASS	KGK	X
OHMS	CONTROL TRANSFORMER AND CONTROL POWER DISTRIBUTION	X	PASS	KGK	X
OHMS	SSRV CONTROL WIRING	X	PASS	KGK	X

FLUKE 787 METER	POWER UP TEST	VOLTAGE CHECK	MEASUREMENT	TECH	COMPLETE
AC VOLTS	ENERGIZE MAIN CIRCUIT BREAKER	L1 - L2	487 VAC	KGK	X
		L1 - L3	493 VAC	KGK	X
		L2 - L3	487 VAC	KGK	X
N/A	SSRV KEYPAD BOOT UP VERIFICATION	N/A	N/A	KGK	X
AC VOLTS	CONTROL POWER	X1 - X2	127.9 VAC	KGK	X
AC VOLTS	24 VDC POWER SUPPLY INPUT	L1 - N	127.9 VAC	KGK	X
DC VOLTS	24 VDC POWER SUPPLY OUTPUT	POS - NEG	24.2 VDC	KGK	X
AC VOLTS	ENERGIZE 120 VAC ISOLATION CONTACTOR @ 90%	A1-A2	108 VAC	KGK	X
AC VOLTS	ENERGIZE 120 VAC CONTROL RELAYS @ 90%	A1-A2	108 VAC	KGK	X
DC VOLTS	ENERGIZE 24 VDC CONTROL RELAYS @ 90%	A1-A2	21.6 VDC	KGK	X
DC VOLTS	PUMP MONITOR PLC INPUT	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	LEVEL TRANSMITTER LOOP POWER	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	LEAK PROBE POWER FEED	POS - NEG	24.2 VDC	KGK	X
DC VOLTS	THERMAL SENSOR POWER FEED	POS - NEG	24.2 VDC	KGK	X
N/A	PLC BOOT UP VERIFICATION	N/A	N/A	KGK	X
N/A	TOUCHSCREEN BOOT UP VERIFICATION	N/A	N/A	KGK	X

FLUKE 787 METER	FUNCTIONALITY TEST	OPERATIONAL	PASS/FAIL	TECH	COMPLETE
	PILOT LIGHT PUSH TO TEST VERIFICATION:				
N/A	BLUE: CALLED	PRESS BUTTON	PASS	KGK	X
N/A	YELLOW: LOW LEVEL	PRESS BUTTON	PASS	KGK	X
N/A	RED: RUNNING	PRESS BUTTON	PASS	KGK	X
N/A	WHITE: ENABLED	PRESS BUTTON	PASS	KGK	X
N/A	GREEN: STOPPED	PRESS BUTTON	PASS	KGK	X
N/A	YELLOW: FAULT	PRESS BUTTON	PASS	KGK	X
	PILOT DEVICE TEST VERIFICATION				
N/A	BLUE: CALLED	SYSTEM TEST	PASS	KGK	X
N/A	YELLOW: LOW LEVEL	SYSTEM TEST	PASS	KGK	X
N/A	RED: RUNNING	SYSTEM TEST	PASS	KGK	X
N/A	WHITE: ENABLED	SYSTEM TEST	PASS	KGK	X
N/A	GREEN: STOPPED	SYSTEM TEST	PASS	KGK	X
N/A	YELLOW: FAULT	SYSTEM TEST	PASS	KGK	X
N/A	START BUTTON	SYSTEM TEST	PASS	KGK	X
N/A	STOP BUTTON	SYSTEM TEST	PASS	KGK	X
	PUMP MONITORING AND CONTROL				
N/A	CHAMBER SEAL LEAK DETECTION HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	CHAMBER SEAL LEAK PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	MOTOR HOUSING LEAK DETECTION HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	MOTOR HOUSING LEAK DETECTION PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	CORD CAP LEAK DETECTION HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	CORD CAP LEAK DETECTION PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	LOWER BEARING THERMOSTAT HMI NOTIFICATION	JUMPER	PASS	KGK	X
N/A	LOWER BEARING THERMOSTAT PUMP DISABLE	JUMPER	PASS	KGK	X
N/A	MOTOR HOUSING THERMOSTAT HMI NOTIFICATION	JUMPER	PASS	KGK	X

N/A	MOTOR HOUSING THERMOSTAT PUMP DISABLE			JUMPER	PASS	KGK	X
	LEVEL TRANSMITTER FEEDBACK AND SCALING 0-23 FT						
	VALUES						
	MILLIAMP CALCULATED	MILLIAMP ACTUAL	LEVEL CALCULATED	HMI READOUT			
4-20 ma	4.00	4.00	0 FT	0.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	4.696	4.696	1 FT.	1.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	5.392	5.392	2 FT.	2.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	6.088	6.088	3 FT.	3.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	6.784	6.784	4 FT.	4.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	7.48	7.48	5 FT.	5.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	8.176	8.176	6 FT.	6.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	8.872	8.872	7 FT.	7.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	9.568	9.568	8 FT.	8.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	10.264	10.264	9 FT.	9.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	10.96	10.96	10 FT.	10.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	11.656	11.656	11 FT.	11.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	12.352	12.352	12 FT.	12.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	13.048	13.048	13 FT.	13.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	13.744	13.744	14 FT.	14.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	14.44	14.44	15 FT.	15.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	15.136	15.136	16 FT.	16.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	15.832	15.832	17 FT.	17.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	16.528	16.528	18 FT.	18.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	17.224	17.224	19 FT.	19.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	17.92	17.92	20 FT.	20.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	18.616	18.616	21 FT.	21.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	19.312	19.312	22 FT.	22.00	INDUCED CURRENT	PASS	KGK	X
4-20 ma	20.008	20.008	23 FT.	23.00	INDUCED CURRENT	PASS	KGK	X
	PUMP ENABLE AND SHUTOFF CONTROLS						
N/A	CONTROLLER/HMI ACCEPTANCE OF ENABLE LEVEL SETTING				SYSTEM TEST	PASS	KGK	X
N/A	CONTROLLER/HMI ACCEPTANCE OF OFF LEVEL SETTING				SYSTEM TEST	PASS	KGK	X
N/A	NUMERIC DISPLAY ACCEPTANCE OF ENABLE LEVEL SETTING				VISUAL VERIFICATION	PASS	KGK	X
N/A	NUMERIC DISPLAY ACCEPTANCE OF OFF LEVEL SETTING				VISUAL VERIFICATION	PASS	KGK	X
N/A	BAR INDICATOR ACCEPTANCE OF ENABLE LEVEL SETTING				VISUAL VERIFICATION	PASS	KGK	X
N/A	BAR INDICATOR ACCEPTANCE OF OFF LEVEL SETTING				VISUAL VERIFICATION	PASS	KGK	X
N/A	HMI PUMP STATUS INDICATOR				VISUAL VERIFICATION	PASS	KGK	X
N/A	THERMAL BYPASS BUTTON				SYSTEM TEST	PASS	KGK	X
N/A	LEAKAGE BYPASS BUTTON				SYSTEM TEST	PASS	KGK	X
N/A	TRANSDUCER FAIL BYPASS BUTTON				SYSTEM TEST	PASS	KGK	X

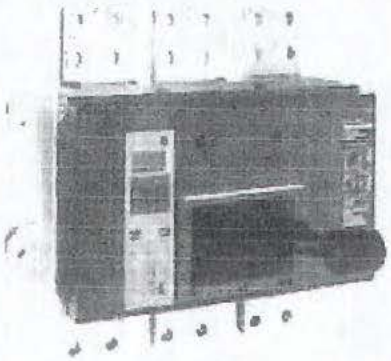
Section 6

Breaker Trip Data

Product Data Sheet

RJF36160CU44A

Electronic Trip Circuit Breaker (R-Frame) 1600A, 3-Pole, 100% Rated, LSIG, 600 Vac



SQUARE D

by Schneider Electric

List Price $35,436.00 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

Main Disconnect Circuit Breaker

Technical Characteristics

Sensor Rating	1600A
Approvals	UL Listed - CSA Certified - IEC Rated
General Application	Provides overload and short circuit protection
For Use With	Panelboards and Switchboards
Circuit Breaker Type	Standard
Marketing Trade Name	Powerpact
Installed Rating Plug	Type A
Frame Type	R-Frame
Voltage Rating	600 Vac
Mounting Type	Unit Mount
Circuit Breaker Rating	100% Rated
Electronic Trip Unit	Micrologic Ammeter Trip Unit (6.0A)
Weight	52 Pounds
Interrupting Rating	100kA@240Vac - 65kA@480Vac - 25kA@600Vac
Number of Poles	3-Pole
Rating Plug Range	0.4A to 1A
Terminal Type	No Lugs (Includes terminal nut kit for ON and OFF
Trip Function	LSIG
Wire Size	#3/0 to 600 AWG/kcmil(Al/Cu)

Shipping and Ordering

Category	01245 - Circuit Breakers, Electronic Trip, Type RGA, RJA & RLA, UL/CSA, Unit Mount
Discount Schedule	DE2
GTIN	00785901278962
Package Quantity	1
Weight	75 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	US

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

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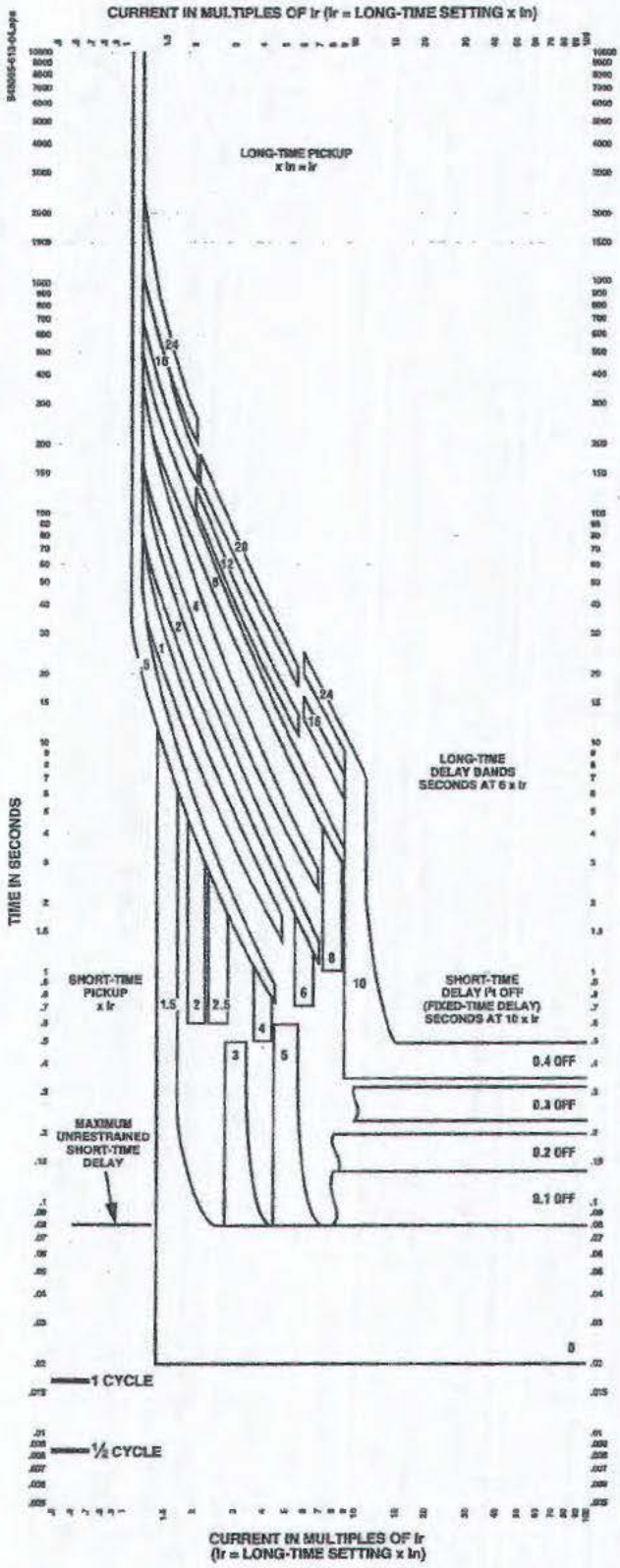
Micrologic 5.0/6.0 P-Frame, R-Frame and NS630b–NS3200 A/P/H Trip Unit Characteristic Trip Curve



Curve No. 0613TC0004
Drawing No. 048095-613-04

Micrologic 5.0/6.0 A/P/H Trip Units

Long-Time Pickup and Delay
Short-Time Pickup and I²t OFF Delay

Characteristic Trip Curve No. 613-4

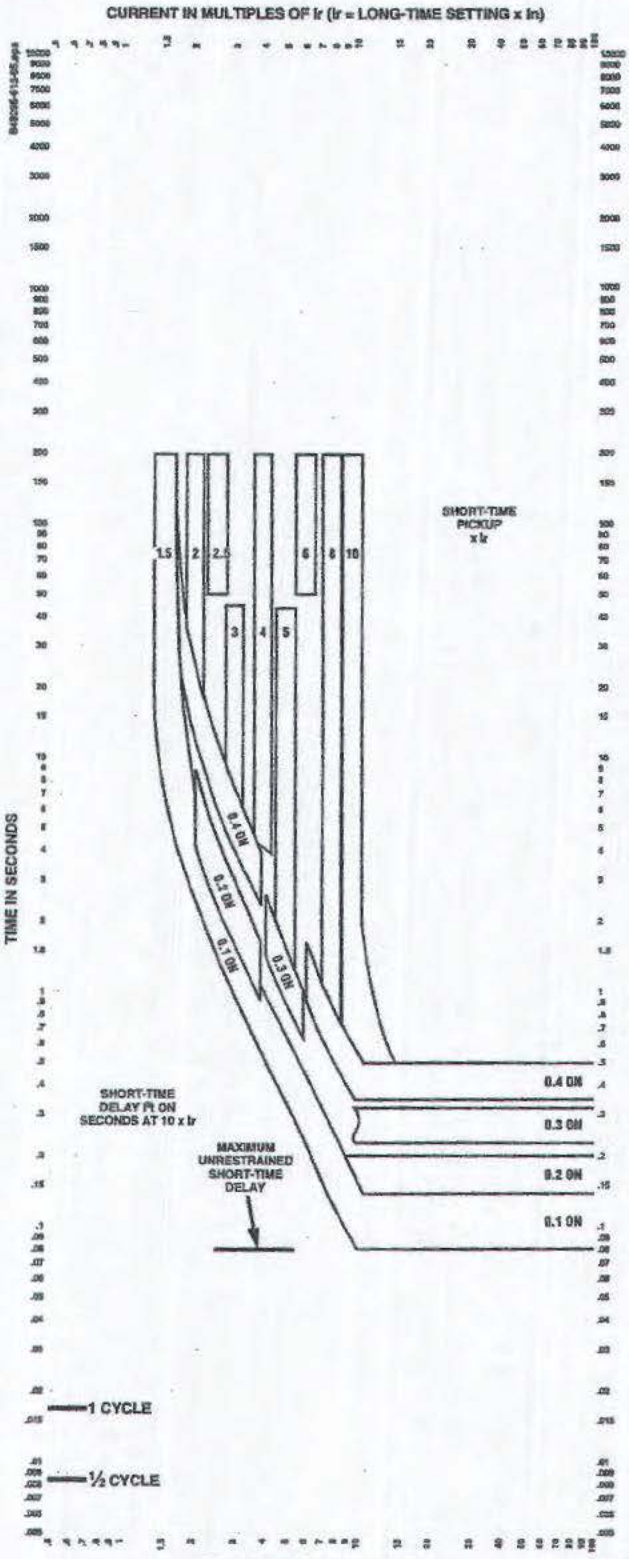
The time-current curve information is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C (-22°F to +140°F) ambient temperature.

Notes:

1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal-imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately twenty minutes is required between overloads to completely reset thermal-imaging.
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. With zone-selective interlocking ON, short-time delay utilized, and no restraining signal, the maximum unrestrained short-time delay time band applies regardless of the setting.
4. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
5. For a withstand circuit breaker, instantaneous can be turned OFF. See trip curve 613-7 on page 139 for instantaneous trip curve. See table on page 143 for instantaneous override values.
6. Overload indicator illuminates at 100%.

Micrologic 5.0/6.0 P-Frame, R-Frame and NS630b–NS3200 A/P/H Trip Units Characteristic Trip Curve



Curve No. 0613TC0005
Drawing No. B48095-613-05

Micrologic 5.0/6.0 A/P/H Trip Units

Short-Time Pickup and I^2t ON Delay

Characteristic Trip Curve No. 613-5

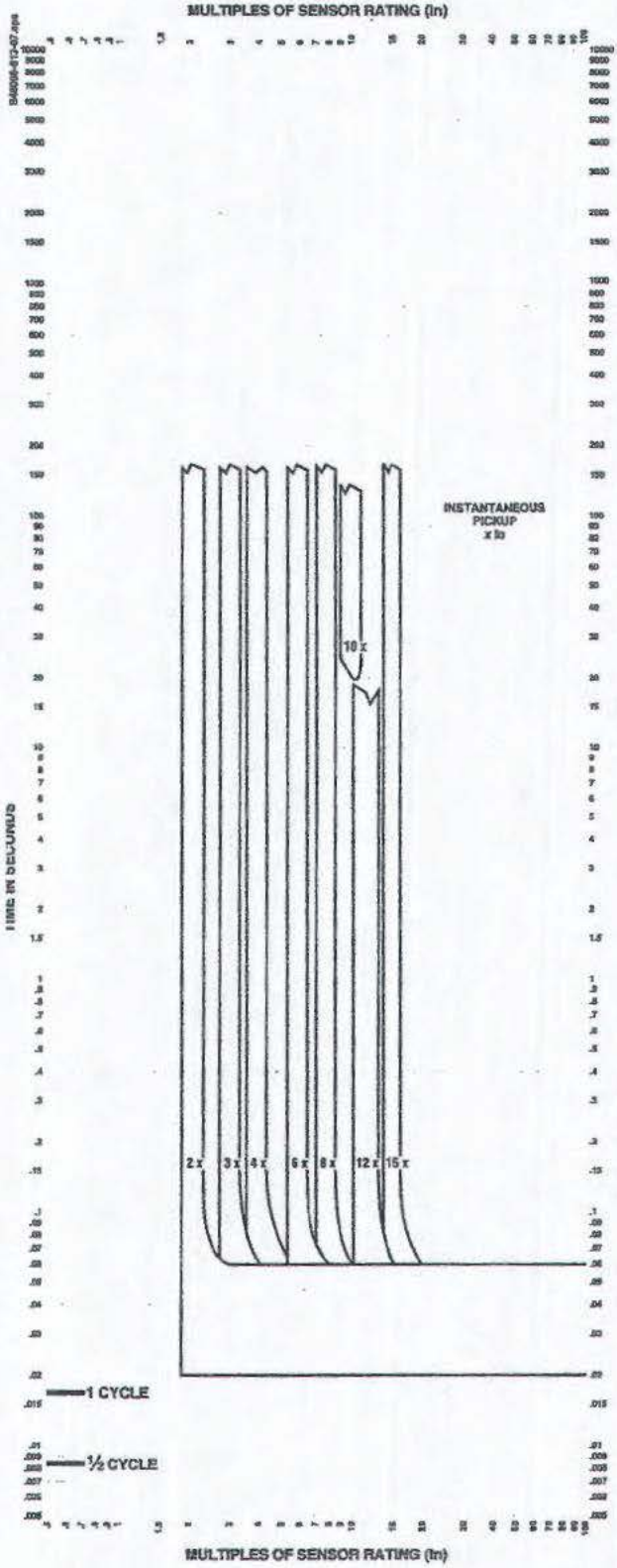
The time-current curve information is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C (-22°F to +140°F) ambient temperature.

Notes:

1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal-imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately twenty minutes is required between overloads to completely reset thermal-imaging.
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. With zone-selective interlocking ON, short-time delay utilized, and no restraining signal, the maximum unrestrained short-time delay time band applies regardless of the setting.
4. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of current.
5. For withstand circuit breaker, instantaneous can be turned OFF. See trip curve 613-7 on page 139 for instantaneous trip curve. See table on page 143 for instantaneous override values.
6. See Trip Curve 613-4 on page 137 for long-time pickup and delay trip curve.

Micrologic 5.0/6.0 P-Frame, R-Frame and NS630b–NS3200 A P/H Trip Units Characteristic Trip Curve



Curve No. 0613TC0007
Drawing No. B48065-613-07

Micrologic 5.0/6.0 Trip Units

Instantaneous Pickup, 2X to 15X and OFF

Characteristic Trip Curve No. 613-7

The time-current curve information is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C (-22°F to +140°F) ambient temperature.

Notes:

1. The end of the curve is determined by the interrupting rating of the circuit breaker.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of current.
3. The instantaneous region of the trip curve shows maximum total clearing times. Actual clearing times in this region can vary depending on the circuit breaker mechanism design and other factors. The actual clearing time can be considerably faster than indicated. Contact your local sales office for additional information.
4. For a withstand circuit breaker, instantaneous can be turned OFF. See trip curve 613-7 on page 139 for the instantaneous trip curve. See table on page 143 for the instantaneous override values.
5. See trip curve 613-4 on page 137 and trip curve 613-5 on page 138 for long-time pickup, long-time delay, short-time pickup and short-time delay trip curves.

Product Data Sheet

LIL36600

MOLDED CASE CIRCUIT BREAKER 600V 600A

SQUARE D

by Schneider Electric

List Price $13,949.00 USD

Availability **Non-Stock Item: This item is not normally stocked in our distribution facility.**

Technical Characteristics

Shipping and Ordering

Pump Power Breakers MCP-1, MCP-2 & MCP-3

Category	00941 - Circuit Breakers, Thermal Magnetic, 600 Vac, Current Limiting, Type LIL, UL, Unit Mount
Discount Schedule	DE2
GTIN	00785901717171
Package Quantity	1
Weight	28 lbs.
Availability Code	Non-Stock Item: This item is not normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

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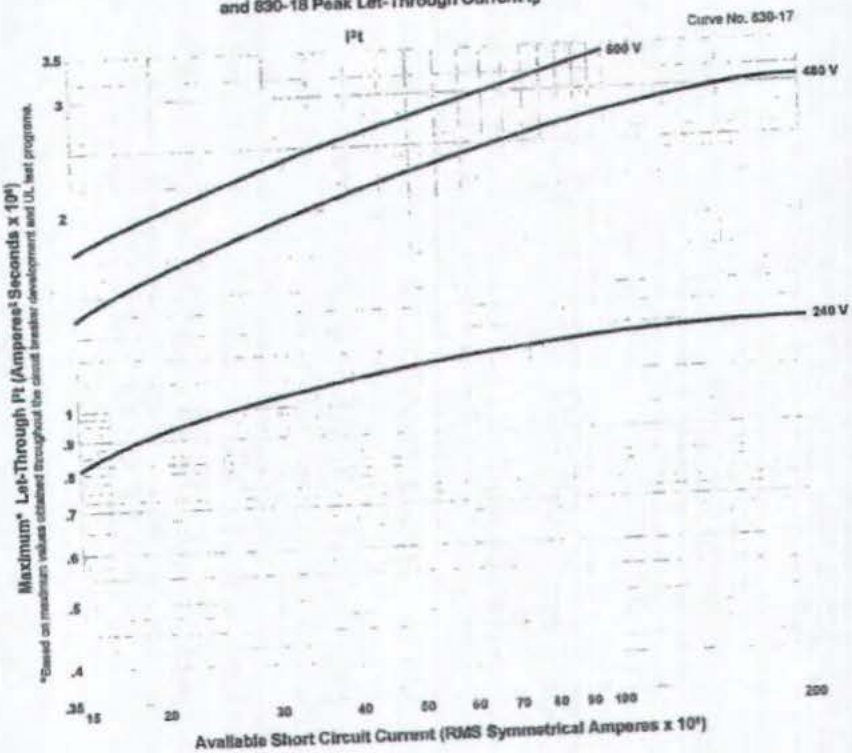
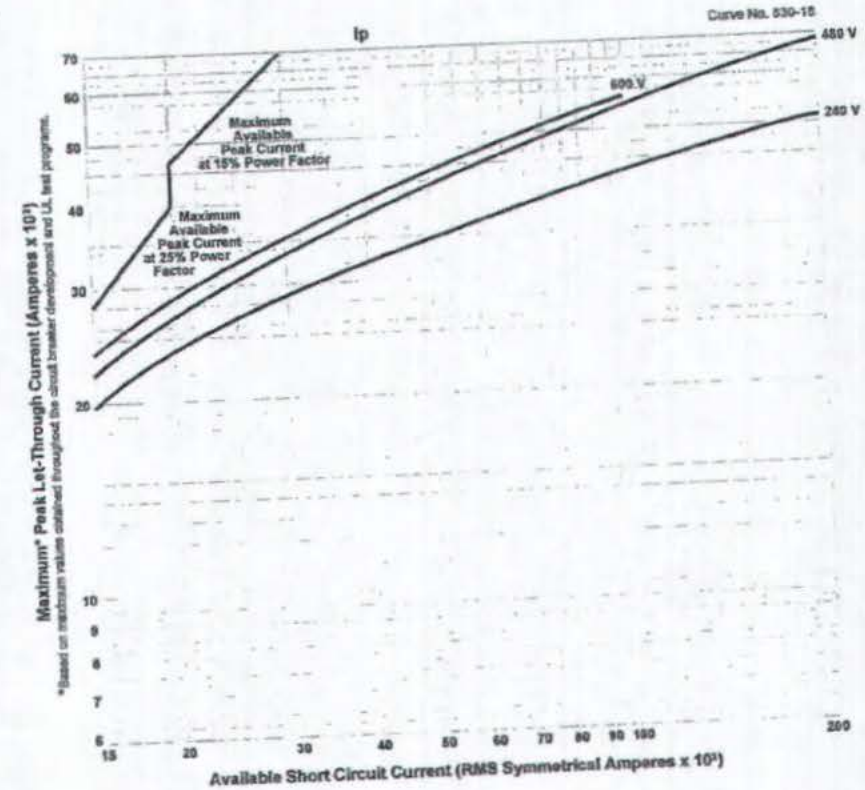
Schneider Electric

I-LIMITER® CURRENT LIMITING CIRCUIT BREAKERS

LI Series 2, 3 and LXI Series 2B, 3B 600 Ampere Frame at 240, 480 and 600 Vac, 3Ø
450–600 Amperes

Curve No. 830-17 Let-Through I^2t
and 830-18 Peak Let-Through Current I_p

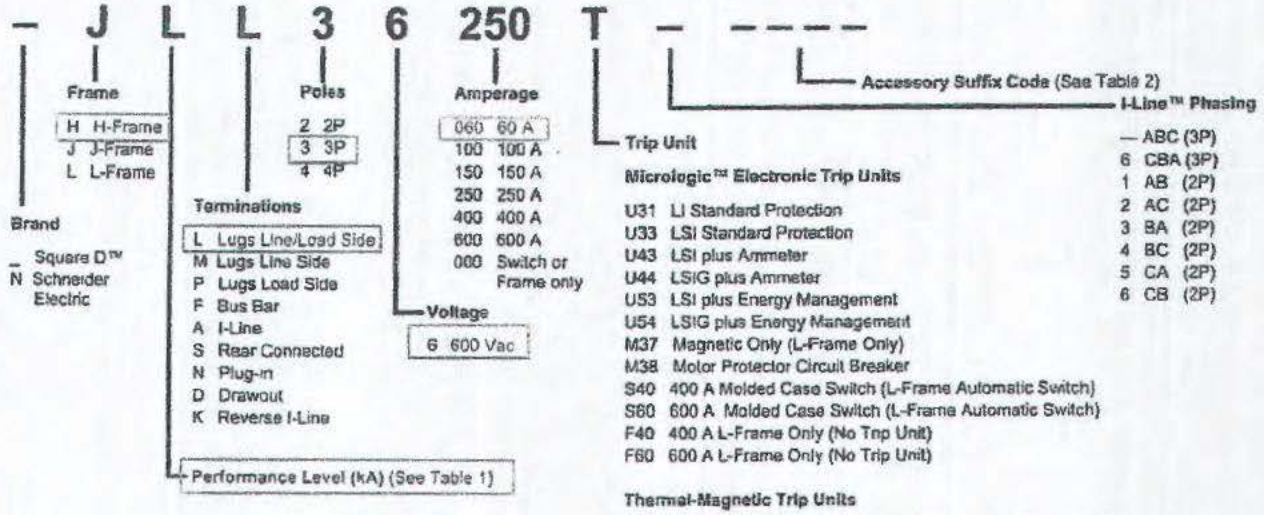




Curve No. 0620TC0218
March 2002
Drawing No. 648095-830-18
(Replaces No. 0620TC0018)

SQUARE D®

Catalog Numbering



[1] 100% ratings valid for:
3P H/J frame unit mount only
3P/4P L-frame 250 A and 400 A unit mount
3P L-frame 250 A and 400 A I-Line

Table 1: Interrupting Rating

	UL/CSA/NOM					IEC 647-2 Icu/Ics					
	240 Vac	480 Vac	600 Vac	250 Vdc[1]	500 Vdc[2]	220/240 Vac	380/440/415 Vac	500/525 Vac	690 Vac	250 Vdc[1]	500 Vdc[3]
D	25 kA	18 kA	14 kA	20 kA	—	25/25 kA	18/18 kA	14/14 kA	—	20 kA	20 kA
G	65 kA	35 kA	18 kA	20 kA	20 kA	65/65 kA	35/35 kA	18/18 kA	—	20 kA	20 kA
J	100 kA	65 kA	25 kA	20 kA	—	100/100 kA	65/65 kA	25/25 kA	—	20 kA	20 kA
L	125 kA	100 kA	50 kA	20 kA	—	125/125 kA	100/100 kA	50/50 kA	—	20 kA	20 kA
R	200 kA	200 kA	100 kA	—	—	150 kA	125 kA	75 kA	20 kA	—	—

[1] 250 Vdc ratings only available with PowerPact H or J circuit breakers with thermal-magnetic trip units (not including MCP).
[2] UL 500 Vdc ratings only available with PowerPact J circuit breakers with thermal-magnetic trip units (not including MCP).
[3] IEC 500 Vdc rating only available on PowerPact J-frame circuit beakers.

Table 6: Circuit Breakers

Circuit Breaker		150 A H-Frame					250 A J-Frame					400 A L-Frame					600 A L-Frame				
Circuit Breaker Type		HD	HG	HJ	HL	HR	JD	JG	JJ	JL	JR	LD	LG	LJ	LL	LR	LD	LG	LJ	LL	LR
Number of poles[1]		2, 3				3	2, 3				3	3, 4					3, 4				
Amperage Range (A)		15-150					70-250					70-400					200-600				
UL 489 Circuit Breaker Ratings																					
UL/CSA/NOM (kA rms)	240 Vac	25	65	100	125	200	25	65	100	125	200	25	65	100	125	200	25	65	100	125	200
	480 Vac	18	35	65	100	200	18	35	65	100	200	18	35	65	100	200	18	35	65	100	200
	600 Vac	14	18	25	50	100	14	18	25	50	100	14	18	25	50	100	14	18	25	50	100
	250 Vdc[2]	20	20	20	20	—	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—
	500 Vdc[2, 3]	—	—	—	—	—	—	20	—	—	—	—	—	—	—	—	—	—	—	—	—
IEC 947-2 Circuit Breaker Ratings																					
Ultimate breaking capacity (Icu) (kA rms)	220/240 Vac	25	65	100	125	150	25	65	100	125	150	25	65	100	125	150	25	65	100	125	150
	380/415 Vac	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125
	440/480 Vac	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125
	500/525 Vac	14	18	25	50	75	14	18	25	50	75	14	18	25	50	75	14	18	25	50	75[4]
	690 Vac	—	—	—	—	20	—	—	—	—	20	—	—	—	—	20	—	—	—	—	20
	250 Vdc[2]	—	—	—	—	—	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—
	500 Vdc[2, 3]	—	—	—	—	—	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—
Service breaking capacity (Ics)	% Icu	100%					100%					100%					100%				
Insulation Voltage	V_i	750 Vac					750 Vac					750 Vac					750 Vac				
Impulse Withstand Voltage	V_{imp}	8 kVac					8 kVac					8 kVac					8 kVac				
Operational Voltage	V_e	690 Vac					690 Vac					690 Vac					690 Vac				
Sensor Rating	I_n	150 A					250 A					400 A					600 A				
Utilization Category	—	A					A					A					A				
Operations (Open-Close Cycles)																					
Without Current		4000					5000					5000					5000				
With Current		4000					1000					1000					1000				
Protection and Measurements																					
Short-circuit protection	Magnetic only	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Overload/short-circuit protection	Thermal-magnetic	■	■	■	■	■	■	■	■	■	■	—	—	—	—	—	—	—	—	—	—
	Electronic	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	with neutral protection (Off-0.5-1-OSN)[5]	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	with ground fault protection	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	with zone selective interlocking (ZSI)[5]	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Display / I, V, f, P, E, THD measurements / interrupted-current measurement		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Options	Front display module (FDM121)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Operating assistance	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Counters	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Histories and alarms	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Metering Com	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Device status/control com	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Dimensions / Weight / Connections																					
Dimensions 3P (Unit Mount) in. (mm)	Height	6.4 (163)					7.5 (191)					13.38 (340)					13.38 (340)				
	Width	4.1 (104)					4.1 (104)					5.51 (140)					5.51 (140)				
	Depth	3.4 (86)					3.4 (86)					4.33 (110)					4.33 (110)				
Weight 3P - lb. (Kg)		4.8 (2.2)					5.3 (2.4)					13.2 (6.0)					13.7 (6.2)				
Connections / Terminations	Unit Mount	■					■					■					■				
	I-Line™	■					■					■					■				
	Rear Connection	■					■					■					■				
	Plug-In	■					■					■					■				
	Drawout	■					■					■					■				
	Optional Lugs	■					■					■					■				

1 H and J-frame breakers with Micrologic™ trip units available only with 3P. The HJ, HL and the J-Frame 2P breakers are 3P modules.

2 DC not available with PowerPact H, J or L-frame circuit breakers with Micrologic trip units.

3 500 Vdc specific catalog numbers, ungrounded UPS systems only.

4 I_{cs} for 600 A L-frame circuit breaker at 525 V is 19 kA.

H- and J-Frame Catalog Numbers

Unit-Mount Circuit Breaker Catalog Numbers

Table 12: PowerPact H-Frame 150 A Unit-Mount[1] Thermal-Magnetic Circuit Breakers (600 Vac, 250 Vdc) with Factory Sealed Trip Unit (Suitable for Reverse Connection)

Current Rating @ 40 C	Fixed AC Magnetic Trip		Interrupting Rating							
			D		G		J[2]		L[2]	
	Hold	Trip	Standard (80%) Rated	100% Rated[3]	Standard (80%) Rated	100% Rated[3]	Standard (80%) Rated	100% Rated[3]	Standard (80%) Rated	100% Rated[3]
H-Frame, 150 A, 2P, 600 Vac 50/60Hz, 250 Vdc[4]										
15 A	350 A	750 A	HDL26015	HDL26015C	HGL26015	HGL26015C	HJL26015	HJL26015C	HLL26015	HLL26015C
20 A	350 A	750 A	HDL26020	HDL26020C	HGL26020	HGL26020C	HJL26020	HJL26020C	HLL26020	HLL26020C
25 A	350 A	750 A	HDL26025	HDL26025C	HGL26025	HGL26025C	HJL26025	HJL26025C	HLL26025	HLL26025C
30 A	350 A	750 A	HDL26030	HDL26030C	HGL26030	HGL26030C	HJL26030	HJL26030C	HLL26030	HLL26030C
35 A	400 A	850 A	HDL26035	HDL26035C	HGL26035	HGL26035C	HJL26035	HJL26035C	HLL26035	HLL26035C
40 A	400 A	850 A	HDL26040	HDL26040C	HGL26040	HGL26040C	HJL26040	HJL26040C	HLL26040	HLL26040C
45 A	400 A	850 A	HDL26045	HDL26045C	HGL26045	HGL26045C	HJL26045	HJL26045C	HLL26045	HLL26045C
50 A	400 A	850 A	HDL26050	HDL26050C	HGL26050	HGL26050C	HJL26050	HJL26050C	HLL26050	HLL26050C
60 A	800 A	1450 A	HDL26060	HDL26060C	HGL26060	HGL26060C	HJL26060	HJL26060C	HLL26060	HLL26060C
70 A	800 A	1450 A	HDL26070	HDL26070C	HGL26070	HGL26070C	HJL26070	HJL26070C	HLL26070	HLL26070C
80 A	800 A	1450 A	HDL26080	HDL26080C	HGL26080	HGL26080C	HJL26080	HJL26080C	HLL26080	HLL26080C
90 A	800 A	1450 A	HDL26090	HDL26090C	HGL26090	HGL26090C	HJL26090	HJL26090C	HLL26090	HLL26090C
100 A	900 A	1700 A	HDL26100	HDL26100C	HGL26100	HGL26100C	HJL26100	HJL26100C	HLL26100	HLL26100C
110 A	900 A	1700 A	HDL26110	HDL26110C	HGL26110	HGL26110C	HJL26110	HJL26110C	HLL26110	HLL26110C
125 A	900 A	1700 A	HDL26125	HDL26125C	HGL26125	HGL26125C	HJL26125	HJL26125C	HLL26125	HLL26125C
150 A	900 A	1700 A	HDL26150	HDL26150C	HGL26150	HGL26150C	HJL26150	HJL26150C	HLL26150	HLL26150C
H-Frame, 150 A, 3P, 600 Vac 50/60Hz, 250 Vdc										
15 A	350 A	750 A	HDL36015	HDL36015C	HGL36015	HGL36015C	HJL36015	HJL36015C	HLL36015	HLL36015C
20 A	350 A	750 A	HDL36020	HDL36020C	HGL36020	HGL36020C	HJL36020	HJL36020C	HLL36020	HLL36020C
25 A	350 A	750 A	HDL36025	HDL36025C	HGL36025	HGL36025C	HJL36025	HJL36025C	HLL36025	HLL36025C
30 A	350 A	750 A	HDL36030	HDL36030C	HGL36030	HGL36030C	HJL36030	HJL36030C	HLL36030	HLL36030C
35 A	400 A	850 A	HDL36035	HDL36035C	HGL36035	HGL36035C	HJL36035	HJL36035C	HLL36035	HLL36035C
40 A	400 A	850 A	HDL36040	HDL36040C	HGL36040	HGL36040C	HJL36040	HJL36040C	HLL36040	HLL36040C
45 A	400 A	850 A	HDL36045	HDL36045C	HGL36045	HGL36045C	HJL36045	HJL36045C	HLL36045	HLL36045C
50 A	400 A	850 A	HDL36050	HDL36050C	HGL36050	HGL36050C	HJL36050	HJL36050C	HLL36050	HLL36050C
60 A	800 A	1450 A	HDL36060	HDL36060C	HGL36060	HGL36060C	HJL36060	HJL36060C	HLL36060	HLL36060C
70 A	800 A	1450 A	HDL36070	HDL36070C	HGL36070	HGL36070C	HJL36070	HJL36070C	HLL36070	HLL36070C
80 A	800 A	1450 A	HDL36080	HDL36080C	HGL36080	HGL36080C	HJL36080	HJL36080C	HLL36080	HLL36080C
90 A	800 A	1450 A	HDL36090	HDL36090C	HGL36090	HGL36090C	HJL36090	HJL36090C	HLL36090	HLL36090C
100 A	900 A	1700 A	HDL36100	HDL36100C	HGL36100	HGL36100C	HJL36100	HJL36100C	HLL36100	HLL36100C
110 A	900 A	1700 A	HDL36110	HDL36110C	HGL36110	HGL36110C	HJL36110	HJL36110C	HLL36110	HLL36110C
125 A	900 A	1700 A	HDL36125	HDL36125C	HGL36125	HGL36125C	HJL36125	HJL36125C	HLL36125	HLL36125C
150 A	900 A	1700 A	HDL36150	HDL36150C	HGL36150	HGL36150C	HJL36150	HJL36150C	HLL36150	HLL36150C

1 Standard Lug Kit AL150HD Terminal Wire Range 14–3/0 AWG Al or Cu

2 UL Listed/CSA Certified as current limiting circuit breakers.

3 100% rated circuit breakers have copper lugs and can be used with copper wire only.

4 HD and HG circuit breakers are true 2-pole construction.

Section 13—Trip Curves

PowerPact H- and J-Frame Thermal-Magnetic Trip Circuit Breakers

Figure 56: H-Frame 15–35 A (HD, HG, HJ, and HL) Thermal-Magnetic Trip

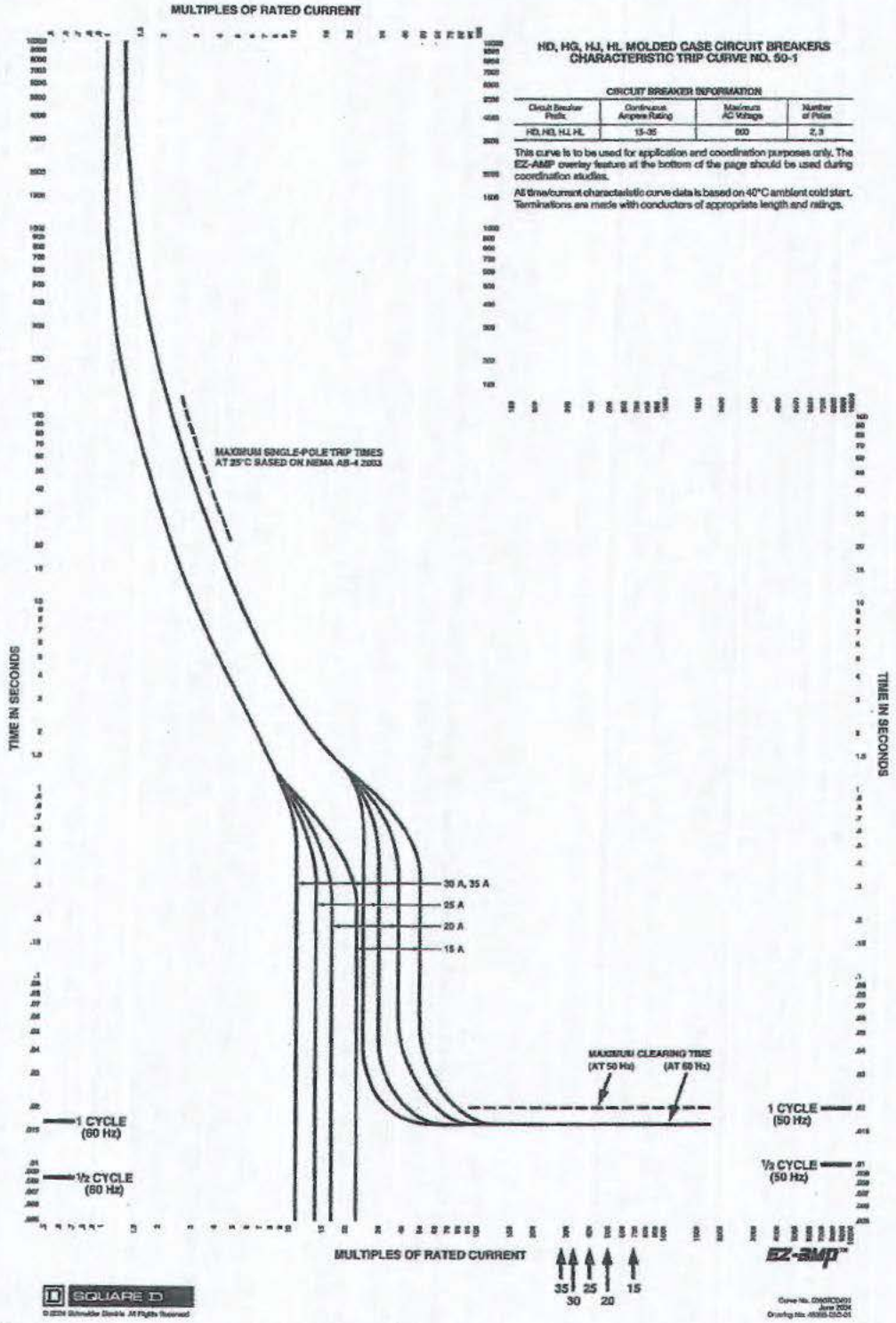


Figure 57: H-Frame 40–60 A (HD, HG, HJ, and HL) Thermal-Magnetic Trip

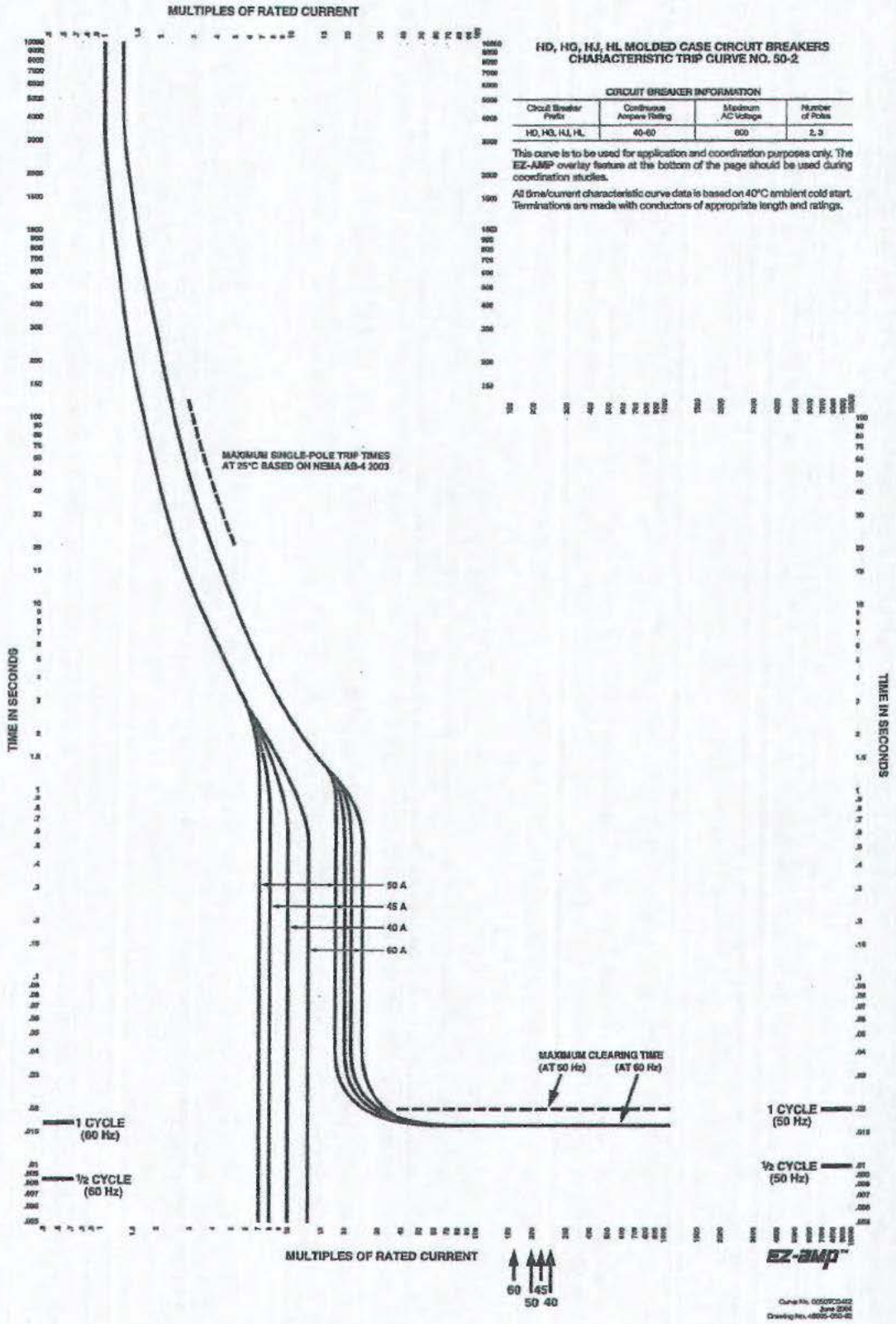


Figure 68: H-Frame 150 A Typical Peak Let-Through Curves

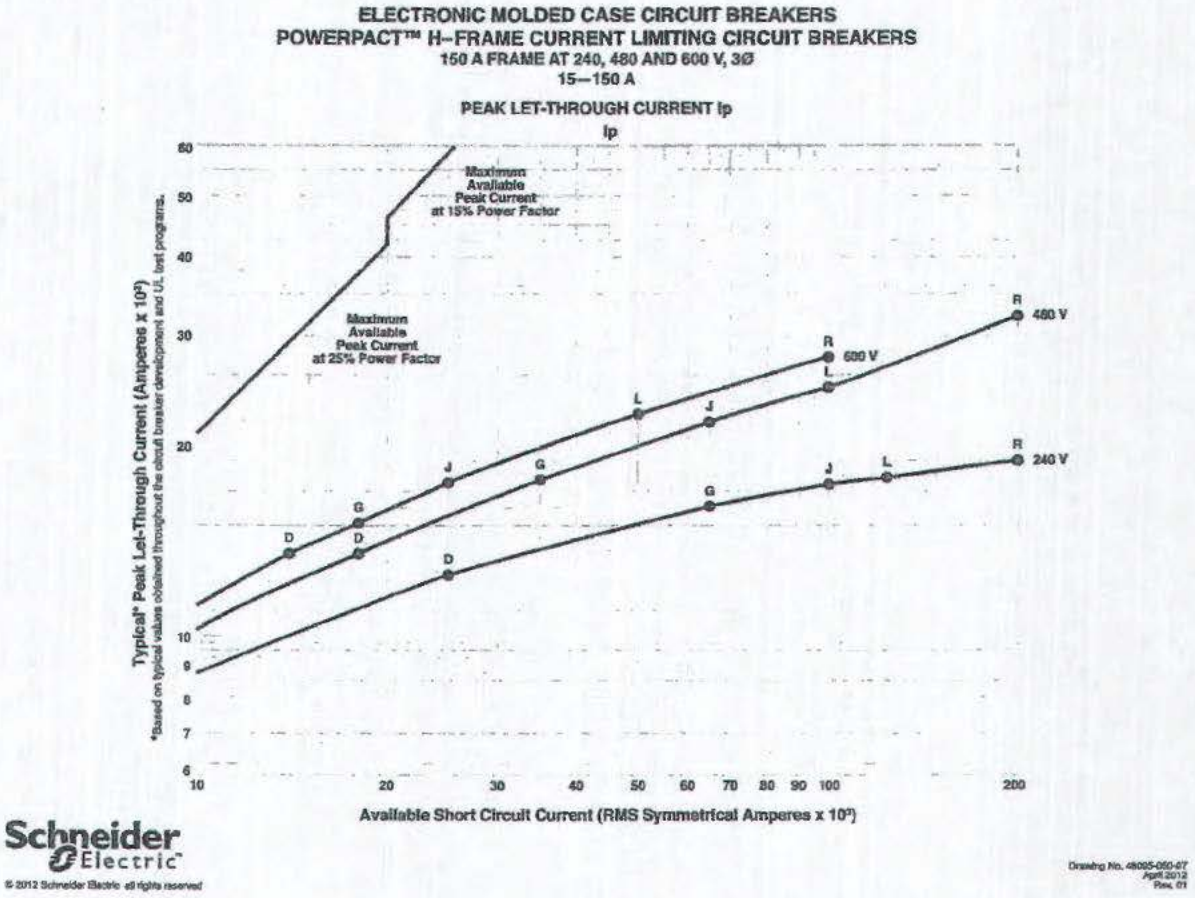
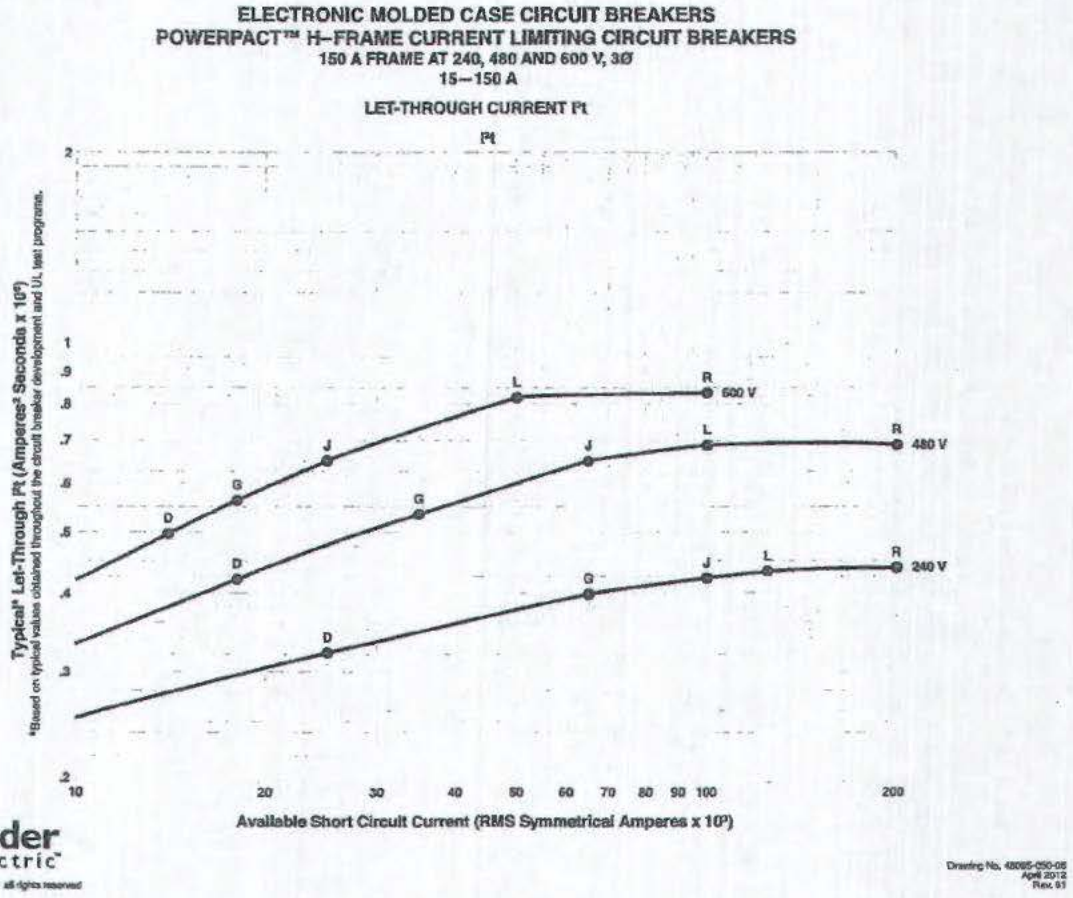


Figure 69: H-Frame 150 A Typical I^2t Let-Through Curves



Drawing No. 48065-050-05
April 2012
Rev. 01

Figure 74: H-Frame UL Listed Current-Limiting Circuit Breaker

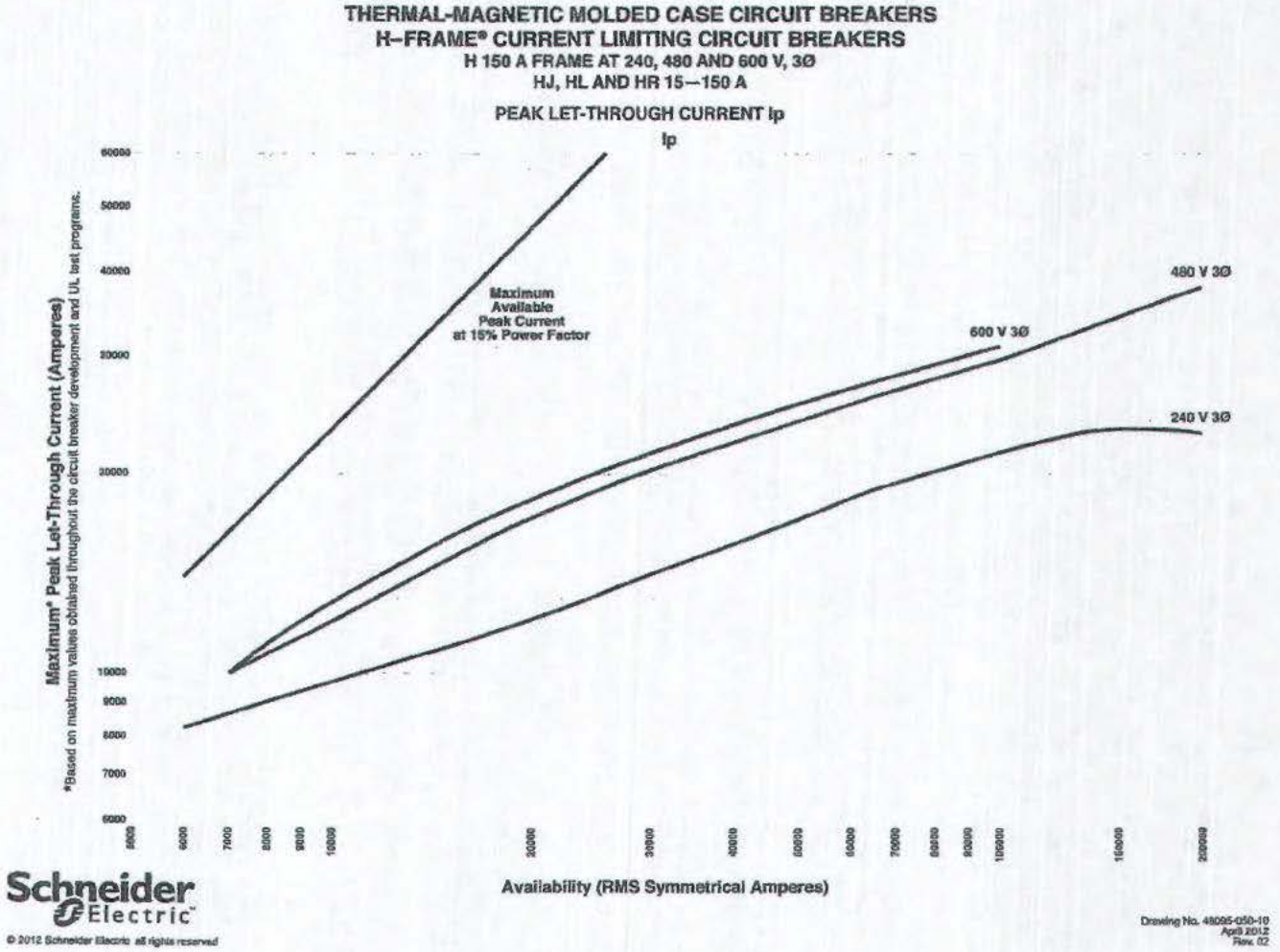
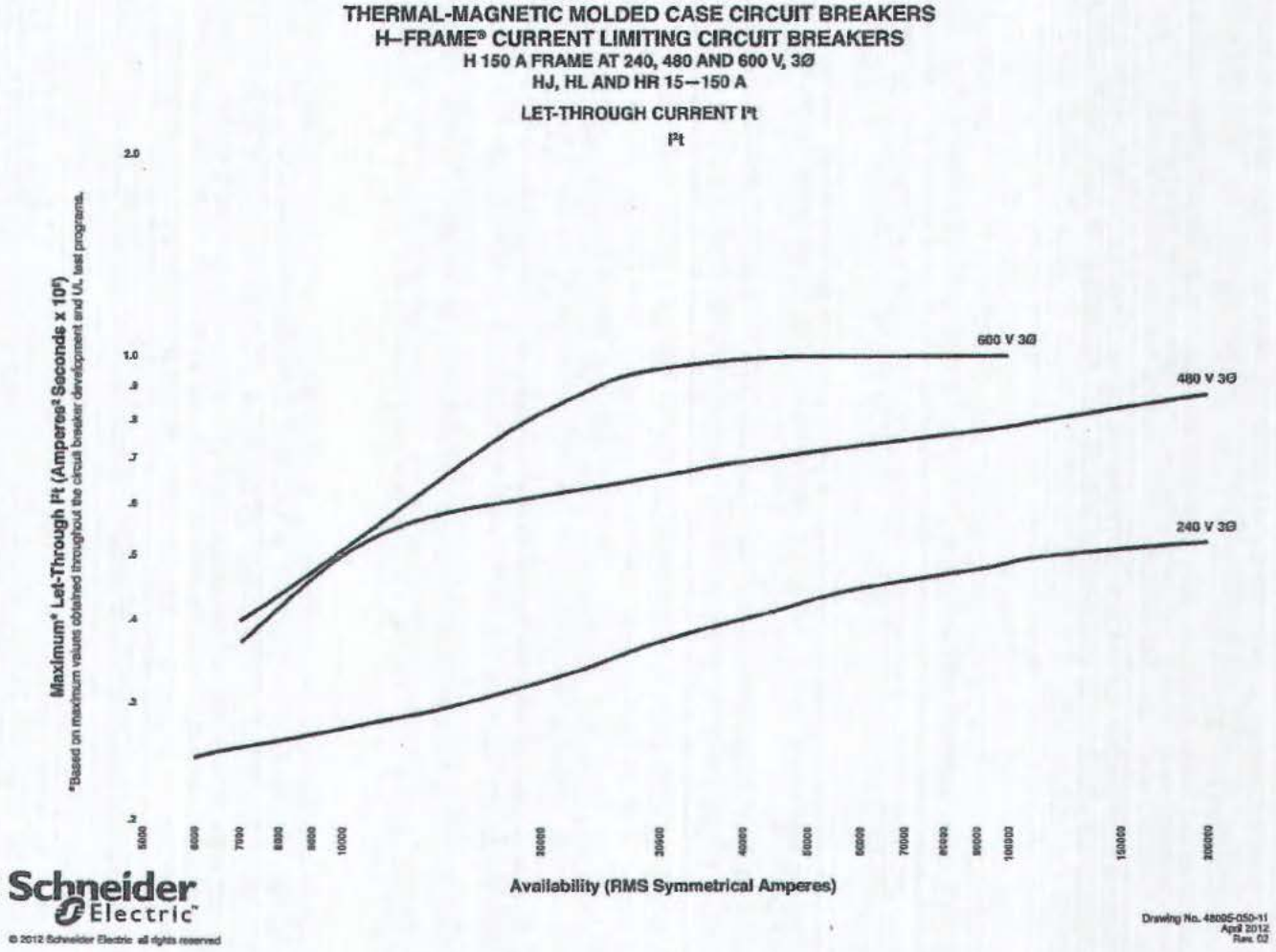


Figure 75: H-Frame UL Listed Current-Limiting Circuit Breaker



Section 7

SPARE PARTS LIST

RICE LAKE SPARE PARTS				
	JOB # C1112121			
QTY.	DESCRIPTION	MFG.	PART #	ITEM ID
1	CONTROL RELAY	FINDER	56.34.8.120.0050	CR1-X, CR2-X, CR3-X
1	CONTROL RELAY	FINDER	56.34.9.024.0050	SLR1-X, SLR2-X, SLR3-X
1	CONTROL TRANSFORMER	MICRON	B500BTZ13RBF	T-1, T-2, T-3
1	TIME DELAY RELAY	FINDER	88.12	TR1-2, TR2-2, TR3-2
1	TIME DELAY RELAY	FINDER	88.02	TR1-1, TR2-1, TR3-1
2	CONTACT ASSEMBLIES	CURTISS WRIGHT	RSC-T600	IC-1, IC-2, IC-3
2	AUXILIARY CONTACT SET	CURTISS WRIGHT	RSC-A100	IC-1, IC-2, IC-3
2	OPERATING COIL	CURTISS WRIGHT	RSC-C800U120	IC-1, IC-2, IC-3
2	PILOT LIGHT	SQUARE D	9001KM38LL	PL1-1, PL1-2, PL1-3
2	PILOT LIGHT	SQUARE D	9001KM38LY	PL2-(1,2,3), PL6-(1,2,3)
2	PILOT LIGHT	SQUARE D	9001KM38LR	PL3-1, PL3-2, PL3-3
2	PILOT LIGHT	SQUARE D	9001KM38LW	PL4-1, PL4-2, PL4-3
2	PILOT LIGHT	SQUARE D	9001KM38LG	PL5-1, PL5-2, PL5-3
2	CONTROL FUSE	LITTLEFUSE	CCMR-3	FU1-(1,2,3), FU2-(1,2,3)
2	CONTROL FUSE	LITTLEFUSE	CCMR-6	FU3-(1,2,3)
6	FINISH TOUCHUP PAINT	SQUARE D	PK49SP	MCC

Section 8

Test Meter Calibration Certificate

N.I.S.T. Traceable
Certificate of Calibration

INTEGRITY CALIBRATION SERVICES
WWW.ICSCAL.COM
EVANSVILLE, IN · p 812.401.1900 · f 812.401.2472

Certificate Number
1306174494

Customer: Altek Inc. 1603 East Broadway 1603 East Broadway **Contact / Reference:** Karl Koch	**Item:** Fluke 787 **Serial / ID Number:** 6900052 **Calibration Location:** ☑ ICS Laboratory ☐ Customer Site **Temperature:** 23.6 °C **Relative Humidity:** 38.8 % RH
Condition Received: ☑ In Tolerance ☐ Out of Tolerance ☐ Inoperable **Returned Condition:** ☑ In Tolerance ☐ Limited Calibration ☐ Reject	**Date Received:** 6/17/2013 **Calibration Date:** 6/17/2013 **Calibration Due:** 6/17/2014 **Test Procedure:** ISOP100 (T.O. 3358-4-1107-1)

N.I.S.T. Traceable Reference Standards and Measurement Equipment Used in this Calibration

ICS Asset #	Model	Calibration Due	Trace Number
RS7100	Fluke 5500A	Dec-13	593123
TS5121	Fluke 8846A	Jul-13	120702

Item Specification	Nominal	Measured	After Adj.
DC Volts			
±(0.1% of Reading + 1 Count)	360.0000mV	359.9	
	3.600000V	3.599	
	36.00000V	35.99	
	360.0000V	359.9	
	900.000V	900	
AC Volts @ 45Hz			
±(1.2% of Reading + 4 Counts)	360.00mV	359.2	
	3.6000V	3.592	
	36.000V	35.92	
	360.00V	359.1	
	900.00V	900	

Marcus Church
Certified By

Marcus Church
Name

Calibration Technician
Function

ICSCCN-03

N.I.S.T. Traceable
Certificate of Calibration

INTEGRITY
CALIBRATION SERVICES
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Certificate Number
1306174494

Item Specification	Nominal	Measured	After Adj.
AC Volts @ 60 Hz			
±(0.7% of Reading + 2 Counts)	360.00mV	360.2	
	3.6000V	3.600	
	36.000V	36.00	
	360.00V	360.0	
	900.00V	901	
AC Volts @ 500 Hz			
±(7% of Reading + 4 Counts)	360.00mV	364.3	
	3.6000V	3.636	
	36.000V	36.15	
	360.00V	361.9	
	900.00V	905	
DC Current			
±(0.05% of Reading + 2 Counts)	27.0000mA	26.993	
±(0.2% of Reading + 2 Counts)	0.90000A	0.896	
AC Current			
±(1% of Reading + 2 Counts)			
@45 Hz	0.90000A	0.896	
@400 Hz	0.90000A	0.900	
@1 kHz	0.90000A	0.899	
@ 2 kHz	0.90000A	0.895	
Resistance			
±(0.2% of Reading + 2 Counts)	190.000 Ω	190.1	
	1.90000 kΩ	1.900	
	19.0000 kΩ	19.00	
	190.000 kΩ	190.0	
±(0.35% of Reading + 3 Counts)	1.90000 MΩ	1.900	
±(2.5% of Reading + 3 Counts)	19.0000 MΩ	19.02	

Notes:

N.I.S.T. Traceable
Certificate of Calibration

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Certificate Number
1306174494

Item Specification	Nominal	Measured	After Adj.
Frequency			
±(0.005% of Reading + 1 Count)	100.00 Hz	100.00	
	1000.0 Hz	1000.0	
	10.000 kHz	10.000	
Diode Test			
±(2% of Reading + 1 Count)	2.000000V	2.000	
OUTPUT			
DC Current			
±(0.05% of Full Scale)	4.0000 mA	4.0023	
	8.0000 mA	8.0026	
	12.0000 mA	12.0038	
	16.0000 mA	16.0048	
	20.0000 mA	20.0059	

Notes:

Section 9

UL File Numbers

MOTOR CONTROL CENTER

DATE ISSUED: 8/12/2013	
CUSTOMER NAME: S&K EQUIPMENT JOB NAME: RICE LAKE PUMP STATION	JOB NO.: C1111121

MCC SECTION	DESCRIPTION	UL FILE #
1,1A	SERVICE ENTRY SECTION	G-709862

MCC SECTION	DESCRIPTION	UL FILE #
2,2A	MAIN CIRCUIT BREAKER SECTION	U-136407

MCC SECTION	DESCRIPTION	UL FILE #
3	MCC VERTICAL SECTION 3	U-339490
3A	POWER MONITOR SLOT	T-961, 467
3C	TVSS EQUIPMENT SLOT	T-961, 438
3E	EMPTY	N/A
3I	EMPTY	N/A
3M	TR1 FEED BREAKER	U-278, 845
3O	UNIT HEATER FEED BREAKER	U-278, 774
3Q	SPARE FEED BREAKER	U-278, 775
3S	SPARE FEED BREAKER	U-278, 782
3U	EMPTY	N/A
3W	EMPTY	N/A

MCC SECTION	DESCRIPTION	UL FILE #
4	MCC VERTICAL SECTION 4	U-136407
3A	EMPTY	N/A
4E	EMPTY	N/A
4I	EMPTY	N/A
4M	EMPTY	N/A
4Q	EMPTY	N/A
4U	EMPTY	N/A

MCC SECTION	DESCRIPTION	UL FILE #
5, 5A	PUMP #1 VERTICAL SECTION	U-339, 488

MCC SECTION	DESCRIPTION	UL FILE #
6, 6A	PUMP #2 VERTICAL SECTION	U-339, 489

MCC SECTION	DESCRIPTION	UL FILE #
7, 7A	PUMP #3 VERTICAL SECTION	U-339, 487

End
Of
Document