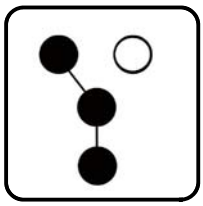
Operation and Installation

Automatic Transfer Switches



Models:

ZCM/ZCB

Bypass/Isolation Switch

Contactors:
150 to 3000 Amperes

Controls:
Decision-Maker® MPAC 1500 (Conversion Kit)

ISO 9001
KOHLER POWER SYSTEMS
NATIONALLY REGISTERED

KOHLER®
Power Systems

TP-7038 3/16

Product Identification Information

Transfer Switch Identification Numbers

Record the product identification numbers from the transfer switch nameplate.

Model Designation _____

Serial Number _____

Accessory Number	Accessory Description

Table of Contents

Table of Contents, continued

IMPORTANT SAFETY INSTRUCTIONS. Electromechanical equipment, including generator sets, transfer switches, switchgear, and accessories, can cause bodily harm and pose life-threatening danger when improperly installed, operated, or maintained. To prevent accidents be aware of potential dangers and act safely. Read and follow all safety precautions and instructions. SAVE THESE INSTRUCTIONS.

This manual has several types of safety precautions and instructions: Danger, Warning, Caution, and Notice.

DANGER

Danger indicates the presence of a hazard that ***will cause severe personal injury, death***, or ***substantial property damage***.

WARNING

Warning indicates the presence of a hazard that ***can cause severe personal injury, death,*** or ***substantial property damage***.

CAUTION

Caution indicates the presence of a hazard that ***will*** or ***can cause minor personal injury*** or ***property damage***.

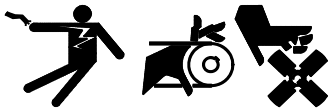
NOTICE

Notice communicates installation, operation, or maintenance information that is safety related but not hazard related.

Safety decals affixed to the equipment in prominent places alert the operator or service technician to potential hazards and explain how to act safely. The decals are shown throughout this publication to improve operator recognition. Replace missing or damaged decals.

Accidental Starting

WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

(Decision-Maker® 3+ and 550 Controllers)

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Press the generator set off/reset button to shut down the generator set. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

(Decision-Maker® 3000, 3500, and 6000 Controllers)

Hazardous Voltage/ Moving Parts

DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before servicing. Install the barrier after adjustments, maintenance, or servicing.

DANGER

Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Installing the battery charger. Hazardous voltage can cause severe injury or death. An ungrounded battery charger may cause electrical shock. Connect the battery charger enclosure to the ground of a permanent wiring system. As an alternative, install an equipment grounding conductor with circuit conductors and connect it to the equipment grounding terminal or the lead on the battery charger. Install the battery charger as prescribed in the equipment manual. Install the battery charger in compliance with local codes and ordinances.

Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

Servicing the transfer switch. Hazardous voltage can cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

(Decision-Maker® 3+ and 550 Controllers)

Servicing the transfer switch. Hazardous voltage can cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Press the generator set off/reset button to shut down the generator set. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

(Decision-Maker® 3000, 3500 and 6000 Controllers)

Installing accessories to the transfer switch transformer assembly. Hazardous voltage can cause severe injury or death. To prevent electrical shock, deenergize all power sources and then disconnect the harness plug before installing accessories that will be connected to the transformer assembly primary terminals on microprocessor logic models. Terminals are at line voltage.

Making line or auxiliary connections. Hazardous voltage can cause severe injury or death. To prevent electrical shock deenergize the normal power source before making any line or auxiliary connections.

⚠ WARNING

Airborne particles.
Can cause severe injury or blindness.

Wear protective goggles and clothing when using power tools, hand tools, or compressed air.

Heavy Equipment

⚠ WARNING

Unbalanced weight.
Improper lifting can cause severe injury or death and equipment damage.

Use adequate lifting capacity.
Never leave the transfer switch standing upright unless it is securely bolted in place or stabilized.

Notice

NOTICE

Improper operator handle usage. Use the manual operator handle on the transfer switch for maintenance purposes only. Return the transfer switch to the normal position. Remove the manual operator handle, if used, and store it in the place provided on the transfer switch when service is completed.

NOTICE

Foreign material contamination. Cover the transfer switch during installation to keep dirt, grit, metal drill chips, and other debris out of the components. Cover the solenoid mechanism during installation. After installation, use the manual operating handle to cycle the contactor to verify that it operates freely. Do not use a screwdriver to force the contactor mechanism.

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

This manual provides operation and initial installation instructions for Kohler® Model ZCB and ZCM automatic transfer and bypass/isolation switches that use a 150- to 4000-ampere contactor as the power switching device. This manual applies to units that have had the Decision-Maker® MPAC 1500 Controller Conversion Kit installed.

Read through this manual and carefully follow all procedures and safety precautions to ensure safe, reliable operation of your automatic transfer switch. Keep a copy of this manual with the automatic transfer switch for future reference.

All information found in this publication is based on data available at time of printing. The manufacturer reserves the right to make changes to this literature and the products represented at any time without notice and without incurring obligation.

The equipment service requirements are very important to safe and efficient operation. Inspect parts often and perform required service at the prescribed intervals. Obtain service from an authorized service distributor/ dealer to keep equipment in top condition.

List of Related Materials

This manual covers operation and installation information for the transfer switch's power switching device. Verify that the transfer switch's power switching device matches the model shown on the front cover of this manual before proceeding with operation or installation.

The transfer switch controller is covered in a separate operation and installation manual. To be complete, the power switching device operation and installation manual must be accompanied by a copy of the operation and installation manual for the controller used in that transfer switch.

Document	Part Number
Operation Manual, Decision-Maker® MPAC 1500 Controls	TP-6883
Installation Instructions, Decision-Maker® MPAC 1500 Controller Conversion Kit	TT-1681

Service Assistance

For professional advice on generator power requirements and conscientious service, please contact your nearest Kohler distributor or dealer.

- Consult the Yellow Pages under the heading Generators—Electric.
- Visit the Kohler Power Systems website at KOHLERPower.com.
- Look at the labels and decals on your Kohler product or review the appropriate literature or documents included with the product.
- Call toll free in the US and Canada 1-800-544-2444.
- Outside the US and Canada, call the nearest regional office.

Headquarters Europe, Middle East, Africa (EMEA)
Kohler Power Systems Netherlands B.V.
Kristallaan 1
4761 ZC Zevenbergen
The Netherlands
Phone: (31) 168 331630
Fax: (31) 168 331631

Asia Pacific
Power Systems Asia Pacific Regional Office
Singapore, Republic of Singapore
Phone: (65) 6264-6422
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North China Regional Office, Beijing
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(86) 10 6518 7951
(86) 10 6518 7952
Fax: (86) 10 6518 7955

East China Regional Office, Shanghai
Phone: (86) 21 6288 0500
Fax: (86) 21 6288 0550

India, Bangladesh, Sri Lanka
India Regional Office
Bangalore, India
Phone: (91) 80 3366208
(91) 80 3366231
Fax: (91) 80 3315972

Japan, Korea
North Asia Regional Office
Tokyo, Japan
Phone: (813) 3440-4515
Fax: (813) 3440-2727

Latin America
Latin America Regional Office
Lakeland, Florida, USA
Phone: (863) 619-7568
Fax: (863) 701-7131

1.1 Transfer Switch Description

1.1.1 Purpose of Automatic Transfer Switch

An Automatic Transfer Switch (ATS) is a device used for transferring critical electrical loads from a normal (preferred) source of electrical power to an emergency (standby) source. This transfer occurs automatically when the normal source voltage fails, or is substantially reduced, and the emergency source's voltage has reached an acceptable level.

Upon normal source failure, the automatic transfer switch controller signals the generator set(s) to start and transfer to the emergency source. The automatic transfer switch controller continuously senses for an acceptable normal source and will retransfer the load to the normal source after it has been restored to an acceptable level. After retransfer of the load, the generator set start signal is removed and the generator set(s) is allowed to shut down.

1.1.2 Purpose of Bypass/Isolation Switch

A bypass/isolation switch is a manually operated device used in conjunction with an ATS to provide a means of directly connecting load conductors to either a normal (preferred) power source or to an emergency (standby) power source. It is also used to disconnect the automatic transfer switch from the power sources and the load for inspection and maintenance.

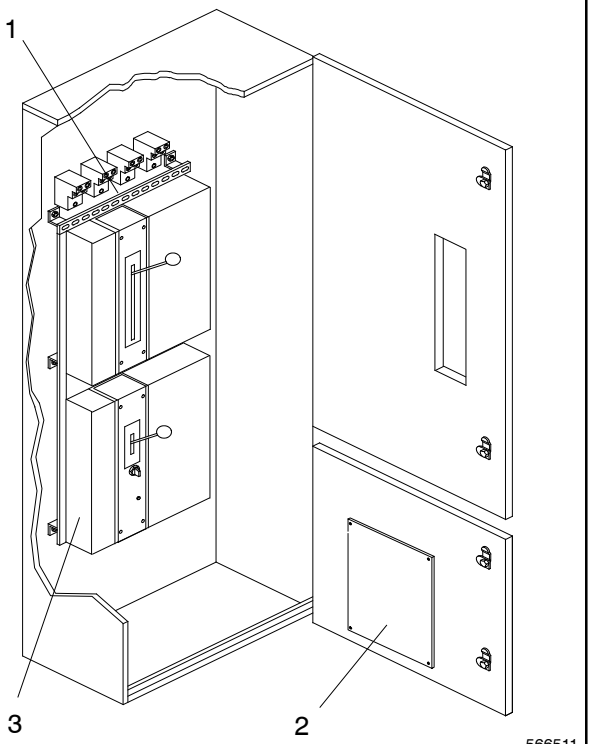
The bypass switch also functions as a manual transfer switch, allowing transfer of the load from one source to the other, if required, with the automatic transfer switch removed from the system.

1.1.3 Components of Switch

A typical bypass/isolation transfer switch includes the actual power switching device, the bypass/isolation switching device, and the logic controller to perform power monitoring and transfer sequencing tasks. See Figure 1-1.

The basic switching device used in these models is a true power transfer switch. The switch is electrically actuated and then mechanically latched in the selected position. However, the switch also includes provisions for manual mechanical operation in emergency conditions. Within the switch, there are two sets of multipole contactors. One set is used to select power from the normal source while the other set is used to select power from the emergency source. The two sets of contacts are mechanically interlocked within the switch so that only one set of contactors can be closed at a time. With this feature, it is possible to select one power source to feed the load without crosscoupling that power source to the other power source.

The functional units that make up the automatic transfer switch are mounted in an enclosure with a hinged front door. The controller mounts on the back of the door so its controls and indicators are available to an operator. A signal cable with inline connectors to facilitate component replacement and door removal connects the controller to the switching devices.



1. Bypass/isolation switch
2. Controller location
3. ATS

Figure 1-1 Transfer Switch Components

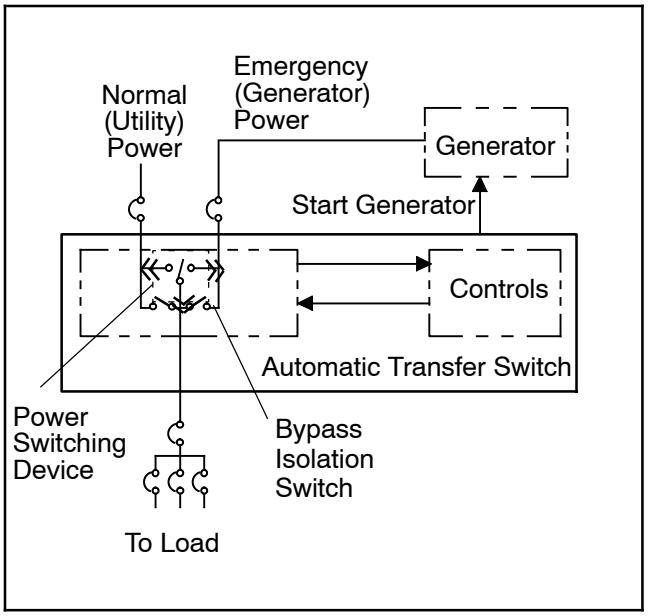


Figure 1-2 Basic Bypass/Isolation Transfer Switch Block Diagram

1.2 Specifications

Specifications for automatic transfer switches covered by this manual are listed below:

- The transfer switch is provided as a complete automatic transfer switch with microprocessor logic controls in a NEMA type 1 enclosure. Other enclosures are available; contact the factory.
- The transfer switch meets UL and CSA standards.
- The transfer switch is voltage rated up to 600 VAC.
- The transfer switch is rated from 150 to 3000 amps.
- The transfer switch is available with standard or programmed transition automatic transfer switches.
- The switching device is electrically and mechanically interlocked.
- The switch is available in 2-pole, 3-pole, and 4-pole configurations.
- The 4-pole switch is fully rated.
- The load is not interrupted during bypass operation.

1.3 Ratings

Withstand and closing current ratings are shown in Figure 1-3. Refer to the transfer switch specification sheet, G11-57, for specific manufacturer's circuit breakers.

Note: The automatic transfer switch and bypass/isolation switch have identical current ratings.

Switch Rating (amps)	Withstand and Closing Current Ratings, Maximum Current in RMS Symmetrical Amperes When Coordinated With								
	Current-Limiting Fuses				Molded-Case Circuit Breakers				
					Any Manufacturer's (3 cycles)			Specific Manufacturer's (See G11-57)	
	Max. Size (amps)	@ 480 VAC Max.	@ 600 VAC Max.	Class	@ 480 VAC Max.	@ 600 VAC Max.	Max. Size (amps)	@ 480 VAC Max.	@ 600 VAC Max.
150 225 260 400	600	200,000	150,000	J	35,000	30,000	800	50,000	42,000
		100,000	—	RK5, RK1					
600	750	200,000	150,000	J, L, RK5, RK1	50,000	42,000	800	65,000	50,000
800	1000	200,000	150,000	L			1600	85,000	65,000
1000	1200								
1200	1500								
1600	2000				100,000	85,000	2500	100,000	85,000
2000	2500								
2500	4000						4000		
3000									
4000	6000								
* UL 1008 listed at 480 VAC and CSA listed at 600 VAC.									

Figure 1-3 Withstand and Closing Current Ratings

1.4 Nameplate

A nameplate is attached to the automatic transfer switch enclosure. See Figure 1-5. The nameplate label includes a factory part number coded to provide characteristic and rating information that affects installation and operation. Copy the part number into the blank spaces provided in the introduction and then use the key in Figure 1-6 to interpret the part number.

Also copy the part number and serial number from the nameplate into the spaces provided on the inside front cover of this manual for use when requesting service or parts.

On transfer switches equipped with the Decision-Maker® MPAC 1500 controller conversion kit, refer to the information recorded on decal GM70205 located on the door near the controller assembly. See Figure 1-4.

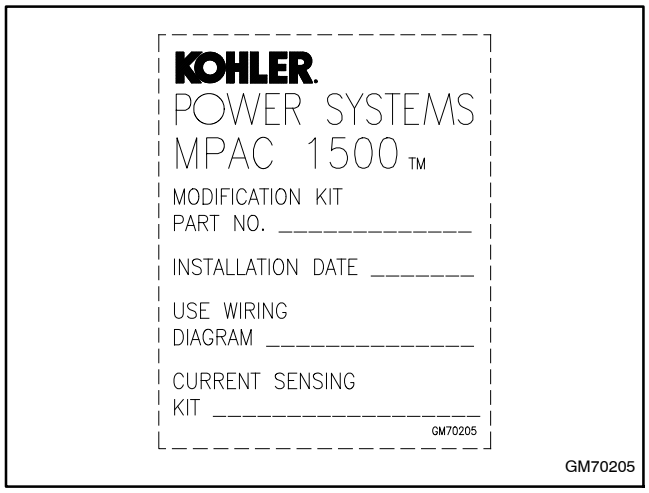


Figure 1-4 Controller Conversion Kit Decal

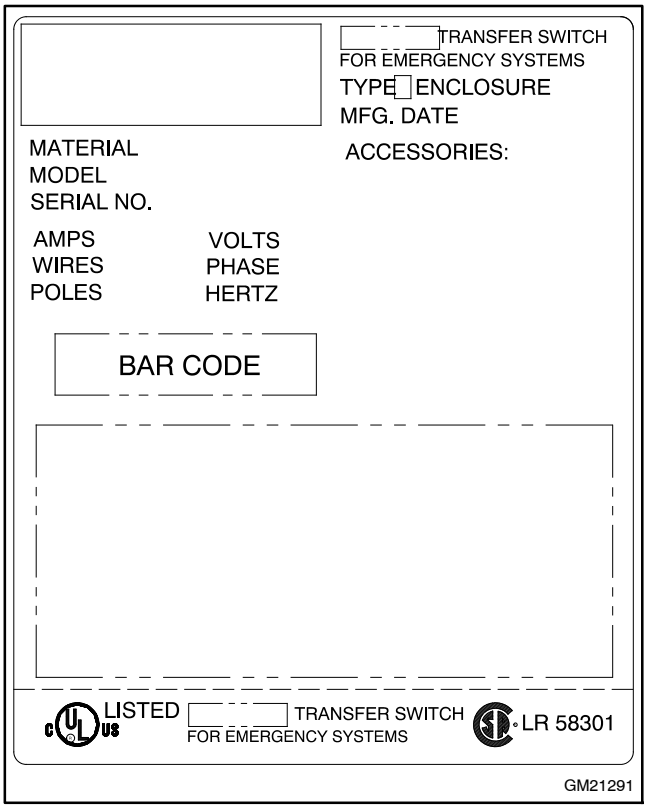
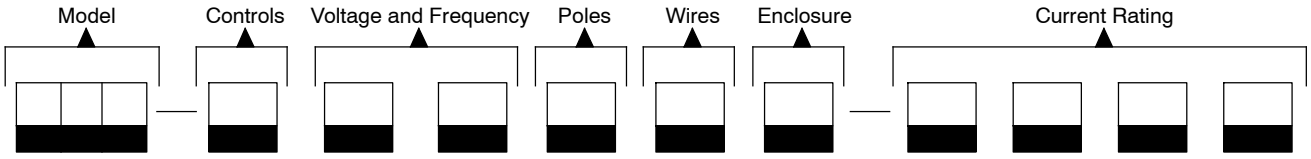


Figure 1-5 Transfer Switch Nameplate

1.5 Transfer Switch Part Number Interpretation

Record the transfer switch model number in the boxes below. The transfer switch model number defines characteristics and ratings as explained in the accompanying chart.



Kohler® Part Number Key

This chart explains the Kohler® transfer switch model numbering system. The sample model number shown is for a Model ZCB automatic transfer switch that uses a standard contactor power switching device with M340+ microprocessor electrical controls rated at 600 volts, 60 hertz, 3 phase, 3 poles, and 4 wires in a NEMA type 1 enclosure with a current rating of 1000 amperes. Not all possible combinations are available.

SAMPLE MODEL NUMBER

ZCB-560341-1000

Switch Classification or Family
ZCM: 150–400 amp automatic transfer and bypass isolation switch
ZCB: 600–4000 amp automatic transfer and bypass isolation switch

Electrical Controls †
5: M340+ microprocessor

Voltage and Frequency (other codes possible)

53: 220 Volts, 60 Hz	60: 600 Volts, 60 Hz	62: 120 Volts, 60 Hz
63: 220 Volts, 50 Hz	64: 240 Volts, 60 Hz	66: 480 Volts, 60 Hz
68: 208 Volts, 60 Hz	71: 380 Volts, 50 Hz	72: 380 Volt, 60 Hz
73: 416 Volts, 50 Hz		

Number of Poles and Phase

2: 2 pole, 1 phase	3: 3 pole, 3 phase	4: 3 pole, 1 phase
6: 4 pole, 3 phase		

Number of Wires

3: 3 wire	4: 4 wire

Enclosure

0: Open unit*	1: NEMA type 1	2: NEMA type 12*
3: NEMA type 3R*		

* Contact the factory.

Current Rating
Numbers indicate the current rating of the switch in amperes

† For switches equipped with the Decision-Maker® MPAC 1500 controller conversion kit, refer to the information recorded on decal GM70205 near the controller assembly.

Figure 1-6 Transfer Switch Model Designations Key

Kohler® automatic transfer switches are shipped factory-wired and tested, ready for installation. The actual installation process consists of mechanically mounting and electrically wiring the unit to the normal and emergency power sources, to the load circuits, and to the generator set.

Have the equipment installed only by trained and qualified personnel. The installation must comply with applicable codes and standards.

2.1 Receipt of Unit

2.1.1 Inspection

At the time of delivery, inspect the packaging and the transfer switch for signs of shipping damage. If damage is discovered, immediately file damage claims with the shipping company and notify the distributor/dealer.

2.1.2 Storage

Protect the automatic transfer switch at all times from excessive moisture, construction grit, and metal chips. Avoid storage in low temperature, high humidity areas where moisture could condense on the unit.

2.1.3 Unpacking

Allow the equipment to warm up to room temperature for 24 hours (minimum) prior to unpacking to prevent condensation on the electrical apparatus from surrounding moist air if it is uncrated after cold weather storage.

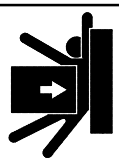
Unpack the transfer switch as soon as possible after receipt since failure to do so may cause difficulty in making claims for damage not evident upon receipt. Carefully unpack to avoid damaging any of the transfer switch components. Remove all packing material and dirt that may have accumulated in the transfer switch or any of its components.

Note: Do not use compressed air to clean the transfer switch. Cleaning with compressed air can cause debris to lodge in the components and damage the switch.

2.1.4 Lifting

The approximate weight of each automatic transfer switch covered by this manual is given in Figure 2-1. For lifting, use a spreader bar. Attach the bar only to the enclosure's mounting holes or lifting brackets; do not lift the unit at any other points. Ensure the front door is in place and latched closed when moving or mounting the unit.

⚠ WARNING



Unbalanced weight.
Improper lifting can cause severe injury or death and equipment damage.

Use adequate lifting capacity.
Never leave the transfer switch standing upright unless it is securely bolted in place or stabilized.

2.2 Mechanical Installation

NOTICE

Foreign material contamination. Cover the transfer switch during installation to keep dirt, grit, metal drill chips, and other debris out of the components. Cover the solenoid mechanism during installation. After installation, use the manual operating handle to cycle the contactor to verify that it operates freely. Do not use a screwdriver to force the contactor mechanism.

NOTICE

The transfer switch may use both American Standard and metric hardware. Use the correct size tools to prevent rounding of the bolt heads and nuts.

2.2.1 Preparation

Check the system voltage and frequency. Compare the voltage and frequency shown on the transfer switch nameplate to the source voltage and frequency. Do not install the transfer switch if the system voltage and frequency are different from the nominal normal (utility) source voltage and frequency or the nominal emergency source voltage and frequency shown on the generator set nameplate.

Plan the installation. Use the dimensions given on the enclosure dimension (ADV) drawings provided with the switch. Select a mounting site that complies with local electrical code restrictions for the enclosure type. Mount the transfer switch as close to the load and power sources as possible. Allow adequate space to fully open the enclosure and to service the switch. Provide cable bending space and clearance to live metal parts.

Prepare the foundation. Ensure that the supporting foundation for the enclosure is level and straight. For bottom cable entry, if used, install conduit stubs in the foundation. Refer to the enclosure dimension drawing for the conduit stub locations. When pouring a concrete floor, use interlocking conduit spacer caps or a wood or metal template to maintain proper conduit alignment.

2.2.2 Mounting

The 150- and 225-amp transfer switches covered by this manual must be mounted vertically to a wall or other rigid supporting structure. Keyhole slots for mounting purposes are provided in the mounting brackets on the top and bottom of each unit. When mounting these units, plumb the enclosure to ensure that the door hinges are vertical to avoid any distortion of the enclosure or door. Place washers behind the mounting bracket keyholes to shim the enclosure to a plumb condition.

The 260–1200 amp transfer switches covered by this manual can be floor-mounted or attached to a rigid supporting structure such as a wall. For floor mounting, bolt the mounting feet to the floor, shimming the mounting feet as needed to plumb the enclosure so that the door hinges are vertical to avoid any distortion of the enclosure or door. Keyhole slots for wall mounting are provided in the rear panel of the enclosure. When mounting these units, plumb the enclosure to ensure that that the door hinges are vertical to avoid any distortion of the enclosure or door. Place washers behind the mounting bracket keyholes to shim the enclosure to a plumb condition.

The 1600–3000 amp transfer switches covered by this manual are intended to be bolted directly to floor mounting pads. When mounting one of these units, it is important to accurately level the mounting pads so that the door hinges are plumb when the unit is installed in order to avoid any distortion of the enclosure or door.

Number of Poles	Amperes	Complete NEMA Type 1 Unit			
			Dimensions, mm (in.)		
		Weight, kg (lb.)	Height	Width	Depth
2	150, 225, 260, 400	340 (755)	2108 (83.00)	762 (30.00)	787 (31.00)
	600	549 (1220)	2286 (90.00)	914 (36.00)	718 (28.25)
	800	610 (1355)	2286 (90.00)	1016 (40.00)	718 (28.25)
3	150, 225, 260, 400	340 (755)	2108 (83.00)	762 (30.00)	787 (31.00)
	600	549 (1220)	2286 (90.00)	914 (36.00)	718 (28.25)
	800, 1000, 1200	610 (1355)	2286 (90.00)	1016 (40.00)	718 (28.25)
	1600, 2000	1406 (3100)	2286 (90.00)	1016 (40.00)	1552 (61.10)
	2500, 3000	1769 (3900)	2286 (90.00)	1016 (40.00)	1857 (73.10)
	4000	2994 (6600)	2286 (90.00)	1206 (47.50)	2032 (80.00)
4	150, 225, 260, 400	388 (855)	2108 (83.00)	762 (30.00)	787 (31.00)
	600	614 (1365)	2286 (90.00)	1016 (40.00)	718 (28.25)
	800, 1000, 1200	707 (1570)	2286 (90.00)	1168 (46.00)	718 (28.25)
	1600, 2000	1815 (4000)	2286 (90.00)	1270 (50.00)	1552 (61.10)
	2500, 3000	2268 (5000)	2286 (90.00)	1270 (50.00)	1857 (73.10)
	4000	3311 (7300)	2286 (90.00)	1372 (54.00)	2032 (73.00)

* Height does not include lifting eyes on 150–1200 amp models.

Figure 2-1 Transfer Switch Weights and Dimensions, NEMA Type 1 Enclosures (See the dimension drawings in Section 5 for other enclosure dimensions.)

2.3 Electrical Wiring

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before servicing. Install the barrier after adjustments, maintenance, or servicing.

All internal electrical connections are prewired. The only wiring necessary when installing the transfer switch is the connections from the transfer switch to the external devices. Cable sizes are shown in Figure 2-2.

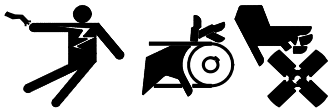
Note: For easy access during installation wiring, the front door of the enclosure can be removed. Simply disconnect the cable plug that connects the front door components to the internal components and then lift the door off its hinge pins.

Al/Cu UL-Listed Solderless Screw-Type Terminals for External Power Connections		
Switch Rating (amps)	**Normal, Emergency, and Load Terminals**	
	Cables/Pole	**Range of Wire Sizes**
150–400	2	1/0 to 250 MCM
	1	#4 AWG to 600 MCM
600	2	#2 AWG to 600 MCM
800–1200	4	#2 AWG to 600 MCM
1600–4000	Bus Bar Connection	

Figure 2-2 Cable Sizes

2.3.1 Power Connections

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before servicing. Install the barrier after adjustments, maintenance, or servicing.

Making line or auxiliary connections. Hazardous voltage can cause severe injury or death. To prevent electrical shock deenergize the normal power source before making any line or auxiliary connections.

Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

Schematic diagrams are furnished in Section 5 of this manual.

Some models allow top cable entry only. Refer to the enclosure drawings in Section 5 for cable entry requirements. When drilling entry holes for any conductors, cover the transfer switch components for protection from metal chips and construction grit. Remove any debris from the enclosure with a vacuum cleaner—*using compressed air for this purpose can lodge contaminants in components and cause damage.*

Connection points for the normal power, emergency power, and load are clearly marked on contactor assembly and are also shown on the drawings in Section 5. Be sure to follow the phase markings (A, B, C, and N).

Note: Connect source and load phases as indicated by the markings and drawings. Improper connections may cause short circuits. Improper connections can also cause phase-sensitive load devices to run backwards or prevent load devices from starting.

Connect the Normal, Emergency, and Load conductors to the clearly marked terminals on the transfer switch. Remove surface oxides from cables by cleaning with a wire brush. Verify that all connections are correct before tightening the lugs. Tighten all cable lug connections to the torque values shown in Figure 2-3.

In cases where the Normal, Emergency, and Load connections are made to a rear connected bus bar, a compression washer, flat washer, and a grade 5 bolt (minimum) must be used and torqued to the values in Figure 2-4.

Socket Size Across Flat	Torque		
	lb.-in.	lb.-ft.	Nm
1/8	45	4	5.1
5/32	100	8	11.3
3/16	120	10	13.6
7/32	150	12	17.0
1/4	200	17	22.6
5/16	275	23	31.1
3/8	375	31	42.3
1/2	500	42	56.5
9/16	600	50	67.8

Figure 2-3 Tightening Torque for Lugs

Bolt Size	Torque Bolt (Grade 5)		
	in. lb.	ft. lb.	Nm
1/4-20	72	6	8.1
5/16-18	132	11	14.9
3/8-16	300	25	33.9
1/2-13	720	60	81.4

Figure 2-4 Tightening Torque for Bus Bars

2.3.2 Start Generator Connection

The generator start signal connections are located on a terminal block on the transfer switch contactor. The terminal block location is marked by a red decal inside the enclosure. Connect the generator conductors for the start signal to terminals 3 and 4 and tighten the connections to 19 in. lb.

2.3.3 Other Accessory Connections

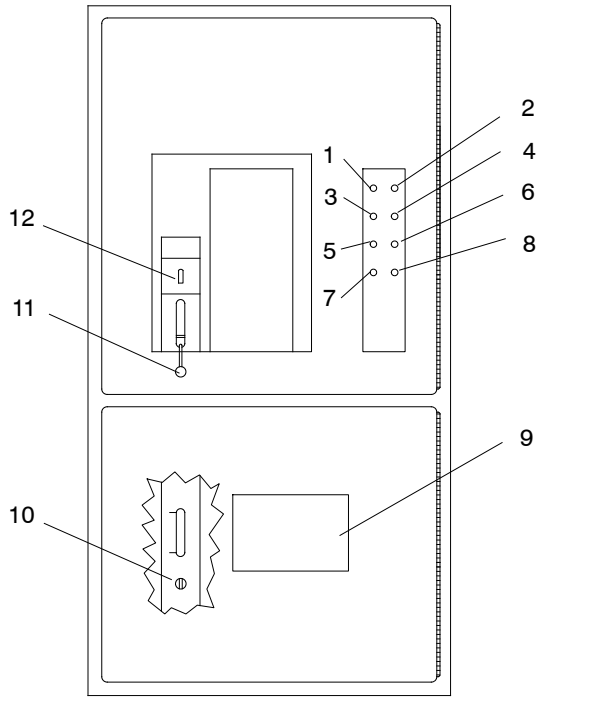
Any external connections necessary for accessories are described in the applicable Logic Controller Operation and Installation Manual. See List of Related Manuals in the Introduction.

3.1 Introduction

This manual describes the operation of the power switching device. Refer to the Controller Operation Manual for transfer switch operation instructions. See List of Related Materials for manual part numbers.

3.2 Bypass/Isolation Switch Description

See Figure 3-1 for the locations of the transfer switch components described in the following sections.



1. LBE
2. LEA
3. LBN
4. LNA
5. LAT
6. LAI
7. LIT/LAH
8. LDS
9. Logic controls
10. Disconnect switch
11. Manual bypass handle
12. Bypass selector switch

Figure 3-1 Bypass/Isolation Switch

3.2.1 Switches and Indicators

Disconnect Switch. The disconnect switch controls the ATS coil operation. In the auto position, the ATS operation is controlled by the logic controller. In the inhibit position, the logic controller cannot energize the ATS coils. See Figure 3-1.

ATS Location Pointer. The ATS location pointer indicates the three positions of the ATS switch:

Auto: The ATS is connected to all of the buses.

Test: The ATS is disconnected from the load bus but connected to the normal and emergency buses.

Isolate: The ATS is disconnected from all buses.

3.2.2 Bypass/Isolation Cabinet Lamps

See Figure 3-1 for the locations of the cabinet lamps.

Bottom Door

The switches and indicators for the automatic transfer switch are determined by the controller used in that switch. For details on this subject, refer to the Logic Controller Operation and Installation Manual. See List of Related Materials in the Introduction.

Top Door

Lamps marked with an asterisk (*) will illuminate when any of the following are true.

- The disconnect switch is in the inhibit position.
- The bypass selector switch is in the normal or emergency position.
- The ATS is not in the auto location.

LNA Lamp. Lamp illuminates when the normal power source is available.

LEA Lamp. Lamp illuminates when the emergency power source is available.

LBN Lamp.* Lamp illuminates when the normal bypass contacts are closed.

LBE Lamp.* Lamp illuminates when the emergency bypass contacts are closed.

LAT Lamp.* Lamp illuminates when the ATS is in the test location.

LAI Lamp.* Lamp illuminates when the ATS is isolated from the switch.

LAH Lamp.* Lamp illuminates when the ATS is not in the automatic mode (600–1200 amp switches only).

LIT Lamp.* Lamp illuminates when the ATS is not in the automatic mode (all except 600–1200 amp switches).

LDS Lamp.* Lamp flashes when the ATS coils are prevented from operating by the disconnect switch.

3.2.3 Bypass/Isolation Switch Components

Bypass Normal Contacts. The bypass normal contacts connect the load directly to the normal source, bypassing the ATS.

Bypass Emergency Contacts. The bypass emergency contacts connect the load directly to the emergency source, bypassing the ATS.

Bypass Operator. The bypass operator opens and closes the bypass normal or emergency contacts.

Manual Bypass Handle. The manual bypass handle actuates the bypass operator. In the lower (open) position, the bypass normal and emergency contacts are open. In the upper (bypass) position, the bypass normal or emergency contacts are closed.

Bypass Selector Switch. The bypass selector switch determines which contacts the manual bypass handle actuates. Turn the bypass selector switch to the right to close the bypass normal contacts, center to open the bypass normal and emergency contacts, and left to close the bypass emergency contacts.

ATS Location Handle (150- to 400-amp switches only). The position of the ATS location handle determines the ATS mode of operation: auto, test, or isolate. The ATS location handle can be moved only when the manual bypass handle is in the bypass position.

Crank Mechanism (600- to 3000-amp switches only). The crank mechanism determines the ATS mode of operation: auto, test, or isolate. Turn the crank mechanism clockwise to raise the ATS and counterclockwise to lower the ATS through the three positions. The crank mechanism can be rotated only when the manual bypass handle is in the bypass position.

3.3 ATS Sequence of Operation

Operation of the typical automatic transfer switch is divided into two separate sequences: (1) failure of normal power and the resulting transfer to emergency power and (2) restoration of normal power and the resulting transfer back to normal power. A brief description of both sequences is provided below and illustrated in Figure 3-2.

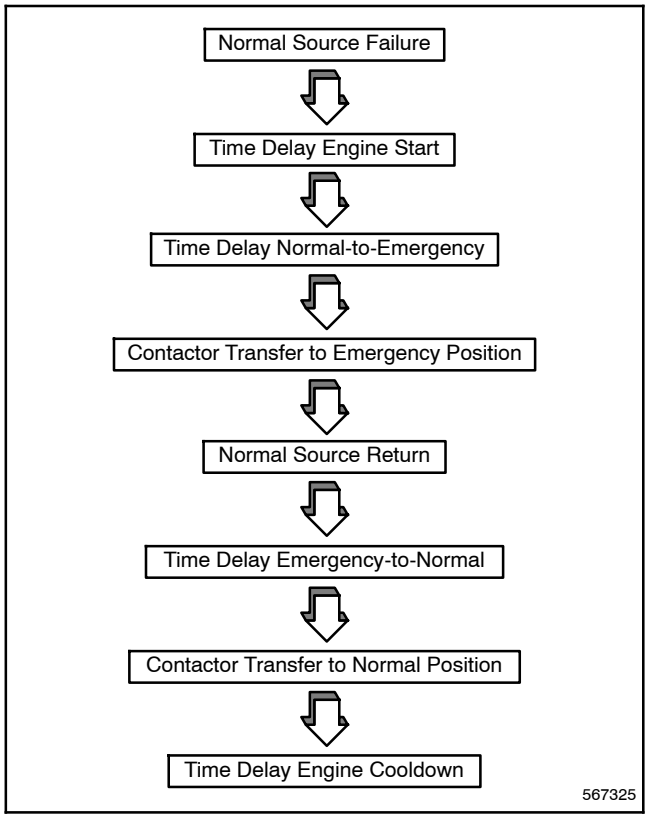


Figure 3-2 Logic Board Operation

Note that these sequences may be affected by accessories described in the applicable controller operation and installation manual. In addition, for more specific details on circuit operation including time delays, refer to the applicable Logic Controller Operation and Installation Manual. See List of Related Materials in the Introduction.

3.3.1 Failure of Normal Power

Failure of normal power, either loss or deterioration of one or more phases (logic depending), is detected by monitors within the controller. The monitor that detects the failure starts the Time Delay Engine Start (TDES). If power is restored before the time delay expires, the timer is reset. But, if the failure persists and the time delay expires, the controller issues a signal to start the standby (emergency) generator set. This time delay scheme is used to prevent starting of the generator set during short power interruptions.

A second set of monitors within the controller checks the status of the emergency power. When the voltage and frequency of the emergency (generator) power are acceptable, these monitors start a timing cycle called Time Delay Normal to Emergency (TDNE), which allows the generator outputs to stabilize. At the end of this timing cycle, the controller issues a signal to the transfer switch operators to remove normal power and then connect emergency power to the load.

Once the power is switched, the transfer switch is mechanically latched in the emergency position, supplying emergency source power to the load until normal power is restored.

3.3.2 Restoration of Normal Power

Restoration of normal power automatically begins a sequence that transfers the load back to the normal power source. The monitors within the controller continue to check the status of the normal power, even when the load is operating on emergency power. When these monitors detect stable normal power, the Time Delay Emergency to Normal (TDEN) is started. If the normal power fails again before the time delay expires, the time delay is reset. This timing period is included to ensure that the normal power is stabilized before it is reconnected to the load.

If the normal power remains acceptable and the time delay expires, the controller will issue a signal to the transfer switch to remove emergency power and reconnect normal power to the load. After switching, the transfer switch is mechanically latched in the normal position. The controller starts the Time Delay Engine Cooldown (TDEC) simultaneously with the power transfer. After this time delay expires, the engine start signal is removed.

3.4 Automatic Operation

3.4.1 Initial Settings

Before turning on the power for the first time or when returning from manual operation to automatic operation, manually operate the automatic transfer switch to select the normal power source as described in Section 3.5, Manual Operation of Automatic Transfer Switch. Before closing the enclosure door and activating the normal power source, return the disconnect (DS) switch to its normal position to reconnect the logic controller to the transfer switch solenoids.

3.4.2 Automatic Operation Procedures

Automatic operation is a function of the logic controller installed in the unit. For automatic operation details and procedures, refer to the Logic Controller Operation and Installation Manual. See List of Related Materials in the Introduction.

3.5 Manual Operation of Automatic Transfer Switch

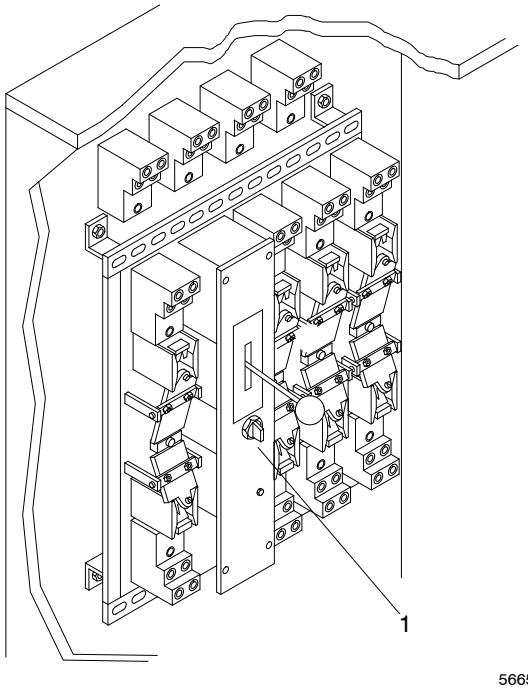
⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

An operator handle is provided for maintenance purposes only. Disconnect both power sources before manually operating the switch. Do not use the manual operation handle to transfer the load when power is connected.

1. Disconnect or turn off both the normal and emergency power sources.
2. Open enclosure door of automatic transfer switch.
3. Set the disconnect switch (DS) to disconnect the controller from the switch solenoid(s).
4. Insert the operator handle and set the switch shown in Figure 3-3 to the desired position.



1. Disconnect switch

Figure 3-3 ATS Disconnect Switch

5. Remove and stow the operator handle.
6. Close the enclosure door.
7. Reconnect or turn on the applicable (normal or emergency) power source.

3.6 Operation of Bypass/Isolation Switch

An automatic transfer switch equipped with a bypass/isolation switch allows withdrawal of the ATS for testing and/or service without interrupting power to the load.

Normally the bypass switch is open and the ATS feeds the load. See Figure 3-4. Closing the bypass switch allows withdrawal of the ATS to the TEST or ISOLATE positions. Mechanical and electrical interlocks prevent cross-servicing or bypassing to an unacceptable source.

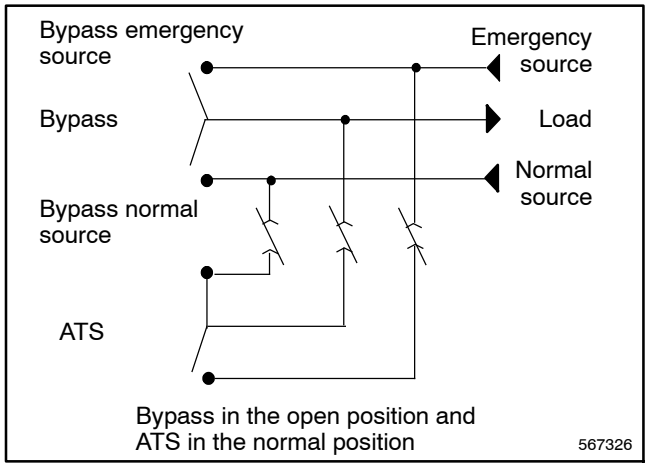


Figure 3-4 Automatic Position

In the TEST position, the ATS is disconnected from the load but the controller is powered to allow testing. See Figure 3-5.

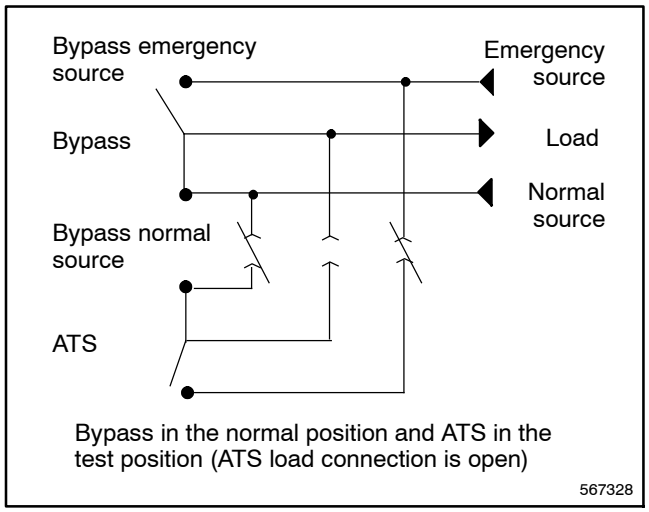


Figure 3-5 Test Position

In the ISOLATE position, the ATS is completely withdrawn and can be removed from the enclosure for maintenance or service. See Figure 3-6.

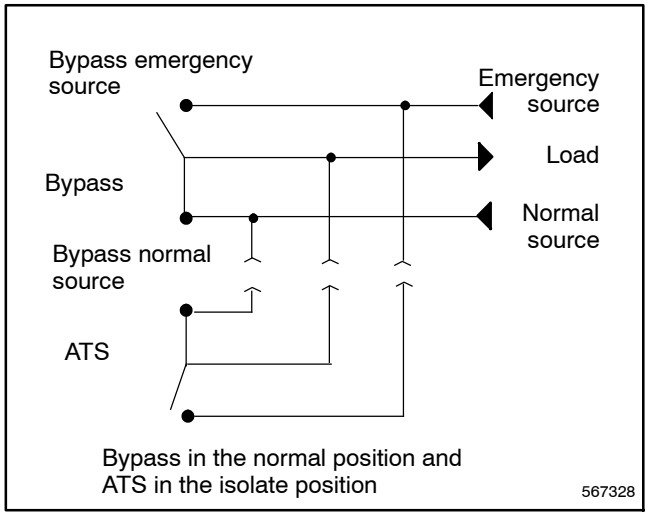


Figure 3-6 Isolate Position

If the normal source fails while the ATS is bypassed, an auxiliary contact on the bypass switch starts the generator set. Use the manual handle to transfer the load to the available source. Interlocks prevent transfer if the ATS is in the circuit and connected to the opposite source.

Interlocks prevent reconnection of the ATS after bypass if the ATS and bypass switch source positions do not match. See Figure 3-7.

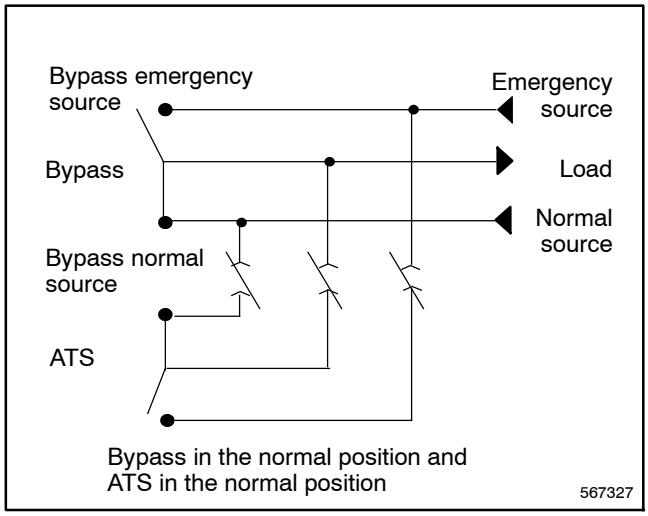


Figure 3-7 Bypass Position

3.6.1 Bypass/Isolation Switch Operation Notes

All bypass/isolation switches:

1. When the ATS is in the test or isolate position, the bypass switch acts as a manual transfer switch. The transfer from the bypass emergency contacts to the bypass normal contacts results in a momentary loss of power to the load while the bypass switch is open.

2. The ATS will not operate if any of the following are true:

   a. The harness plugs are not connected.

   b. The disconnect switch is in the inhibit position.

   c. The ATS is not in the auto or test positions.

   d. The ATS is in the auto position and the bypass switch is not open.

150- to 400-amp switches only:

3. The manual bypass handle will not close in the bypass position if any of the following are true:

   a. The ATS location handle is not engaged in one of the following positions: auto, test, or isolate.

   b. The source selected is opposite of the ATS position while in the auto position.

   c. The ATS is in the test or isolate position and the selected source is not available.

4. The ATS location handle will not operate if any of the following are true:

   a. The bypass switch and ATS are not positioned to the same source. See Figure 3-7.

   b. Power is not available.

   c. The harness plugs are not connected.

   d. The ATS has reached its limit of travel in the auto or isolate positions.

600- to 3000-amp switches only:

5. The manual bypass handle will not close in the bypass position if any of the following are true:

   a The bypass selector switch is turned to the source opposite the ATS.

   b The bypass selector switch is turned to the source opposite the ATS.

   c The ATS location handle is not engaged in one of the following positions: auto, test, or isolate.

   d The source selected is opposite of the ATS position while in the auto position. See Figure 3-7.

   e The ATS is in the test or isolate position and the source selected is not available.

6. The manual bypass handle will not open the bypass if any of the following are true:

   a. The ATS is not in one of the following positions: auto, test, or isolate.

   b. The ATS is in the test or isolate position and the opposite source is not available.

7. The crank handle will not operate if any of the following are true:

   a. The bypass switch and ATS are not positioned to the same source.

   b. Power is not available.

   c. The harness plugs are not connected.

   d. The ATS has reached its limit of travel in the auto or isolate positions (clutch device on the crank mechanism slips).

3.7 Operation, 150- to 400-Amp Switches

See Figure 3-8.

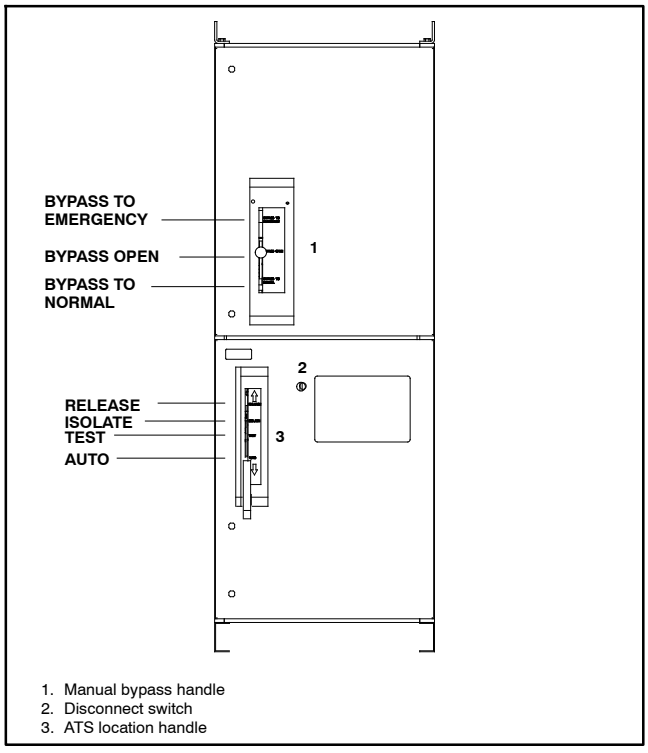


Figure 3-8 Bypass Switch Handle Positions, 150–400 Amp Switches

3.7.1 Placing ATS in Automatic Mode

1. Verify that the ATS contacts are in the same position as the bypass contacts.
2. Turn the disconnect switch to the inhibit position.
3. Move the ATS location handle to the auto position.
4. Move the manual bypass handle to the open position.
5. Turn the disconnect switch to the auto position.

3.7.2 Bypassing ATS

1. Open the bottom cabinet door and turn the disconnect switch to the inhibit position.
2. Position the manual bypass handle to the same power source as the ATS.

   Note: The bypass switch uses safety interlocks to prevent cross phasing.

3.7.3 Testing ATS

1. Open the bottom cabinet door and turn the disconnect switch to the inhibit position.
2. Position the manual bypass handle to the ATS power source.
3. Move the ATS location handle to the test position.
4. Turn the disconnect switch to the auto position.
5. Run a loaded test. Refer to the ATS controller Operation Manual for instructions.

3.7.4 Isolating ATS

1. Open the bottom cabinet door and turn the disconnect switch to the inhibit position.
2. Position the manual bypass handle to the power source that powers the ATS.
3. Move the ATS location handle to the isolate position; the ATS isolate position lamp will illuminate.

3.7.5 Removing ATS

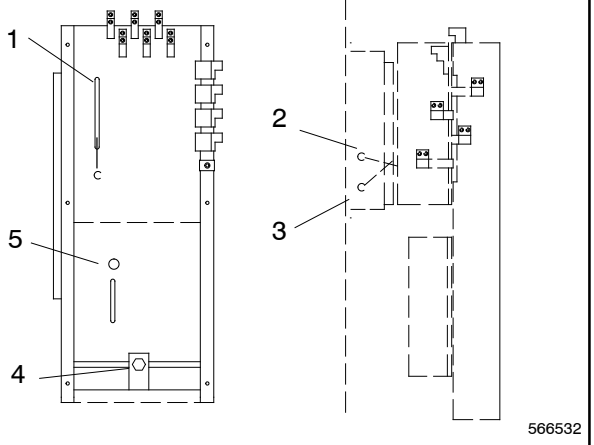
1. Open the cabinet door and turn the disconnect switch to the inhibit position. See Figure 3-3.
2. Position the manual bypass handle to the same power source as the ATS.
3. Move the ATS location handle to the release position.
4. Disconnect the multipin plugs and external connections from the ATS.
5. Lift the ATS out of its drawer.

3.7.6 Reconnecting ATS

1. Turn the disconnect switch to the inhibit position.
2. Place the ATS into its drawer slots (front rollers first).
3. Manually position the ATS to the same source as the bypass switch.
4. Reconnect the multipin plugs and external connections to the ATS.
5. Push the ATS inward to engage the carriage.
6. Move the ATS location handle to the test position.
7. Turn the disconnect switch to the auto position and use the test switch on the logic controller to electrically operate the ATS.
8. Move the ATS location handle to the auto position.
9. Turn the disconnect to the auto position and move the manual bypass handle to the open position.
10. To ensure correct ATS operation, run a test of the automatic operation. Refer to the controller Operation Manual for the automatic operation test procedure.

3.8 Operation, 600- to 1200-Amp Switches

See Figure 3-9.



1. Bypass selector switch
2. Bypass selector switch BYPASS POSITION
3. Bypass selector switch OPEN POSITION
4. Crank mechanism
5. Disconnect switch

Figure 3-9 Bypass Switch Crank Mechanism Location, 600–1200 Amp Switches

3.8.1 Placing ATS in Automatic Mode

1. Verify that the ATS contacts are in the same position as the bypass contacts.
2. Turn the disconnect switch to the inhibit position.
3. Rotate the crank mechanism clockwise until the ATS is in the auto position.
4. Move the manual bypass handle to the open position.
5. Turn the bypass selector switch to the off position.
6. Turn the disconnect switch to the auto position.

3.8.2 Bypassing ATS

1. Open the bottom cabinet door and turn the disconnect switch to the inhibit position.
2. Position the bypass selector switch to the same power source as the ATS.

   Note: The bypass switch uses safety interlocks to prevent cross phasing.

3. Move the manual bypass handle to the BYPASS POSITION.

3.8.3 Testing ATS

1. Open the bottom cabinet door and turn the disconnect switch to the inhibit position.
2. Position the bypass selector switch to the source that powers the ATS.
3. Move the manual bypass handle to the bypass position.
4. Rotate the crank mechanism counterclockwise until the ATS location pointer is aligned with isolate; the ATS isolate position lamp will illuminate.
5. Turn the disconnect switch to the auto position.
6. Run a loaded test. Refer to the ATS controller Operation Manual for instructions.

3.8.4 Isolating ATS

1. Open the bottom cabinet door and turn the disconnect switch to the inhibit position.
2. Position the bypass selector switch to the source that powers the ATS.
3. Move the manual bypass handle to the bypass position.
4. Rotate the crank mechanism counterclockwise until the ATS location pointer is aligned with isolate; the ATS isolate position lamp will illuminate.

3.8.5 Removing ATS

1. Open the cabinet door and turn the disconnect switch to the inhibit position. See Figure 3-3.
2. Move the bypass selector switch to the source that powers the ATS.
3. Move the manual bypass handle to the BYPASS position.
4. Rotate the crank mechanism counterclockwise until the ATS location pointer is aligned with isolate.
5. Disconnect the multipin plugs and external connections from the ATS.

6. Rotate the four panel latches to the vertical position. See Figure 3-10.

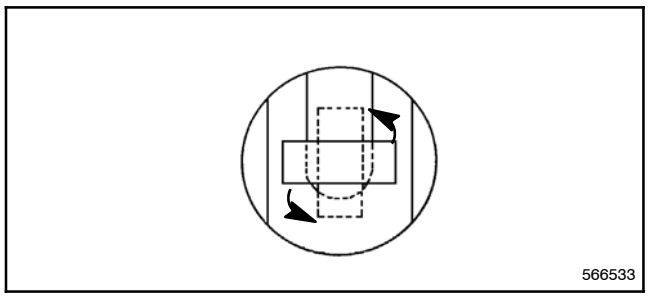


Figure 3-10 Rotation Of The Panel Latch

7. Pull the ATS outward until the slide brackets are fully extended.
8. Engage the slide locks to prevent movement of the brackets.
9. Connect a lift bar to the ATS lifting brackets.

3.8.6 Reconnecting ATS

1. Turn the disconnect switch to the inhibit position.
2. Seat the ATS on the slide brackets.
3. Remove the lift bar assembly.
4. Release the slide locks. Raise the slide locks approximately 60° to disengage. See Figure 3-11.

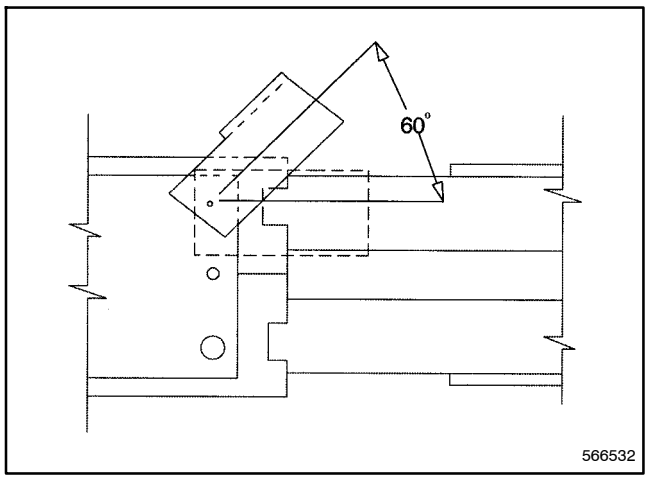


Figure 3-11 Slide Locks

5. Push the ATS in until the power panel latches can be engaged and rotated to the horizontal position.
6. Confirm that the bypass switch is in the isolate position.
7. Reconnect the multipin harness plugs.
8. Rotate the crank mechanism clockwise until the ATS is in the auto position.
9. Move the manual bypass handle to the AUTO position.
10. Turn bypass selector switch to the off position.
11. Turn the disconnect switch to the auto position.
12. To ensure correct ATS operation, run a test of the automatic operation. Refer to the controller Operation Manual for the automatic operation test procedure.

3.9 Operation, 1600- to 3000-Amp Switches

See Figure 3-12.

3.9.1 Placing ATS in Automatic Mode

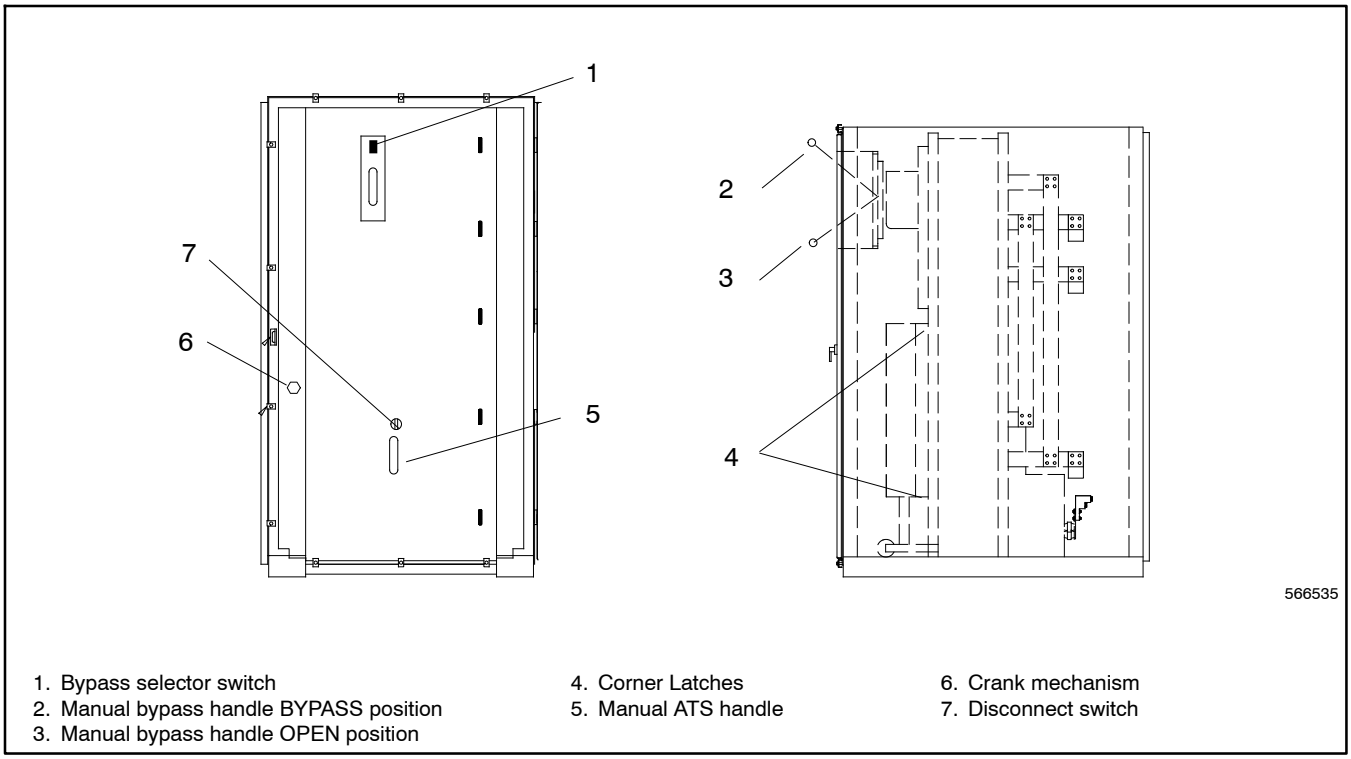
1. Verify that the ATS contacts are in the same position as the bypass contacts.
2. Turn the disconnect switch to the inhibit position.
3. Rotate the crank mechanism clockwise until the ATS is in the auto position.
4. Move the manual bypass handle to the open position.
5. Turn the bypass selector switch to the off position.
6. Turn the disconnect switch to the auto position.

3.9.2 Bypassing ATS

1. Open the bottom cabinet door and turn the disconnect switch to the inhibit position.
2. Position the bypass selector switch to the same power source as the ATS.

   Note: The bypass switch uses safety interlocks to prevent cross phasing.

3. Move the manual bypass handle to the BYPASS POSITION.



1. Bypass selector switch
2. Manual bypass handle BYPASS position
3. Manual bypass handle OPEN position
4. Corner Latches
5. Manual ATS handle
6. Crank mechanism
7. Disconnect switch

Figure 3-12 1600–3000 Amp Bypass Handle Positions

3.9.3 Testing ATS

1. Open the bottom cabinet door and turn the disconnect switch to the inhibit position.
2. Position the bypass selector switch to the source that powers the ATS.
3. Move the manual bypass handle to the bypass position.
4. Rotate the crank mechanism counterclockwise until the ATS location pointer is aligned with isolate; the ATS isolate position lamp will illuminate.
5. Turn the disconnect switch to the auto position.
6. Run a loaded test. Refer to the ATS controller Operation Manual for instructions.

3.9.4 Isolating ATS

1. Open the bottom cabinet door and turn the disconnect switch to the inhibit position.
2. Position the bypass selector switch to the source that powers the ATS.
3. Move the manual bypass handle to the bypass position.
4. Rotate the crank mechanism counterclockwise until the ATS location pointer is aligned with isolate; the ATS isolate position lamp will illuminate.

3.9.5 Removing ATS

1. Open the cabinet door and turn the disconnect switch to the inhibit position. See Figure 3-3.
2. Move the bypass selector switch to the source that powers the ATS.
3. Move the manual bypass handle to the bypass position.
4. Rotate the crank mechanism counterclockwise until the ATS location pointer is aligned with isolate.
5. Disconnect the multipin plugs and external connections from the ATS.
6. Slide the four corner latches of the ATS to the innermost position.
7. The ATS can now be rolled out of the cabinet on the built-in cart.

3.9.6 Reconnecting ATS

1. Turn the disconnect switch to the inhibit position.
2. Roll cart back into the cabinet.
3. Slide the four corner latches of the ATS to the outermost position.
4. Turn the disconnect switch to the inhibit position.
5. Manually position the ATS to the same source as the bypass switch.
6. Reconnect the multipin harness plugs.
7. Rotate the crank mechanism clockwise until the ATS is in the auto location.
8. Move the manual bypass switch to the OPEN position.
9. Turn the disconnect switch to the auto position.
10. To ensure correct ATS operation, run a test of the automatic operation. Refer to the controller Operation Manual for the automatic operation test procedure.

Scheduled preventive maintenance ensures safe and reliable operation and extends the life of the transfer switch. Preventive maintenance includes periodic testing, cleaning, inspection, and replacement of worn or missing components.

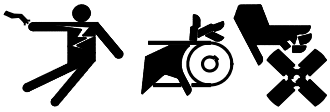
A local authorized distributor or dealer can provide complete preventive maintenance and services to keep the transfer switch in top condition. Contact a local distributor or dealer for additional information. See the Service Assistance section in this manual for how to locate a local distributor or dealer.

Read this entire section carefully before attempting any maintenance or service. Unless otherwise specified, have maintenance or service performed by an authorized service center that has trained and qualified personnel who follow all applicable codes and standards.

Keep records of all maintenance or service.

Replace all barriers and close and lock the enclosure door after maintenance or service and before reapplying power.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before servicing. Install the barrier after adjustments, maintenance, or servicing.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

Servicing the transfer switch. Hazardous voltage can cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

NOTICE

The transfer switch may use both American Standard and metric hardware. Use the correct size tools to prevent rounding of the bolt heads and nuts.

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

NOTICE

Improper operator handle usage. Use the manual operator handle on the transfer switch for maintenance purposes only. Return the transfer switch to the normal position. Remove the manual operator handle, if used, and store it in the place provided on the transfer switch when service is completed.

Screws and nuts are available in different hardness ratings. To indicate hardness, American Standard hardware uses a series of markings and metric hardware uses a numeric system. Check the markings on the bolt heads and nuts for identification.

4.1 Inspection and Service

Contact an authorized distributor/dealer to inspect and service the transfer switch when any wear, damage, deterioration, or malfunction of the transfer switch or its components is evident or suspected.

4.1.1 General Inspection

External Inspection Keep the transfer switch clean and in good condition by performing a weekly general external inspection of the transfer switch for any signs of vibration, leakage, unusual noise, excessive temperature, contamination, or deterioration. Remove accumulations of dirt, dust, and other contaminants from the transfer switch's external components or enclosure with a vacuum cleaner or by wiping with a dry cloth or brush.

Note: Do not use compressed air to clean the switch because it can cause debris to lodge in the components and cause damage.

Replace any worn, missing, or broken external components with manufacturer-recommended replacement parts. Contact a local authorized distributor/dealer for specific part information and part ordering. Tighten loose external hardware.

Internal Inspection Disconnect all power sources, open the transfer switch enclosure door, and inspect internal components monthly or when any condition noticed during an external inspection may have affected internal components.

Contact an authorized distributor/dealer to inspect and service the transfer switch if any of the following conditions are found inside the transfer switch.

- Accumulations of dirt, dust, moisture, or other contaminants
- Signs of corrosion
- Worn, missing, or broken components
- Loose hardware
- Wire or cable insulation deterioration, cuts, or abrasion
- Signs of overheating or loose connections: discoloration of metal, melted plastic, or a burning odor
- Other evidence of wear, damage, deterioration, or malfunction of the transfer switch or its components.

If the power interruption required to perform an internal inspection is unacceptable in the application, have an internal inspection performed by an authorized distributor/dealer.

4.1.2 Other Inspections and Service

Have an authorized distributor/dealer perform scheduled maintenance, service, and other maintenance that ensures the safe and reliable operation of the transfer switch including annual inspection and testing. See Section 4.3, Service Schedule, for the recommended maintenance items and service intervals.

Have an authorized distributor/dealer repair or replace components inside the transfer switch enclosure with manufacturer-recommended replacement parts.

4.2 Testing

The manual operation handle is provided with the switch for maintenance purposes only. Disconnect both power sources before manually operating the switch. Do not use the manual operation handle to transfer the load with power connected.

4.2.1 Weekly Generator Set Exercise

Use a plant exerciser or manual test to start and run the generator set under a load once a week to maximize the reliability of the emergency power system. See the logic controller operation and installation manual for the procedure to exercise the generator set. See List of Related Materials in the Introduction section in this manual.

4.2.2 Monthly Automatic Control System Test

Test the transfer switch's automatic control system monthly. See the logic controller operation and installation manual for the test procedure. Verify that the expected sequence of operations occurs as the switch transfers the load to the emergency source when a normal source failure occurs or is simulated. Observe the indicators (incandescent lamps and LEDs) included on the transfer switch to check their operation. When the switch transfers the load to the emergency source (after a time delay in the off position on programmed transition units), end the test and verify that the expected sequence of operations occurs as the transfer switch retransfers to the available normal source (after a time delay in the off position on programmed transition units) and signals the generator set to shut down after a cooldown period.

4.3 Service Schedule

Follow the service schedule below for the recommended service intervals. Have all service performed by an authorized service center except for activities limited to the items designated by an X.

System Component or Procedure	See Section	Visually Inspect	Check	Change	Clean	Test	Frequency
Electrical System							
Check for signs of overheating or loose connections: discoloration of metal, melted plastic, or a burning odor	4.1.1	X	X				M
Check the contactor's external operating mechanism for cleanliness and clean and relubricate if dirty *	4.1.1	X		D, R (lubricant)	D		M
Check wiring insulation for deterioration, cuts, or abrasion and repair or replace wiring to regain the properties of the original wiring	4.1.1	X		D, R (wiring)			M
	4.1.2	D	D				Q
Check the transfer switch's main power switching mechanisms' mechanical operation and integrity	4.1.2	D	D			D	Y
Tighten control and power wiring connections to specifications	4.1.2, L		D			D	Y
Check the transfer switch's main power switching contacts' condition and clean or replace the main contacts or replace the contactor assembly as necessary	4.1.2	D		D, R	D		Y
Perform a thermal scan or millivolt drop test to check for high contact resistances on power circuits. Tighten connections, clean main contacts, adjust or replace main contacts or contactor assembly to eliminate high contact resistances	4.1.2		D	D, R	D	D	Y
Test wire and cable insulation for electrical breakdown	4.1.2					D	Every 3 years
Check calibration of voltage-sensing circuitry and setpoints, and recalibrate circuitry as necessary	4.1.2		D			D	Every 5 years
Control System							
Exercise the generator set under load	4.2.1, L					X	W
Test the transfer switch's automatic control system	4.2.2, L	X				X	M
Test all indicators (incandescent lamps and LEDs) and all remote control systems for operation	L	D	D	D, R		D	Y
General Equipment Condition							
Inspect the outside of the transfer switch for any condition of vibration, leakage, noise, temperature, contamination, or deterioration to keep the transfer switch clean and in good condition *	4.1.1	X			X		W
Check that all external hardware is in place, tightened, and not badly worn	4.1.1	X	X	R			W
Inspect the inside of transfer switch for any condition of vibration, leakage, noise, temperature, contamination, or deterioration to keep the inside of the transfer switch clean, dry, and in good condition *	4.1.1	X	X		D		M
	4.1.2	D	D		D		Y
Check that all internal hardware is in place, tightened, and not badly worn	4.1.2	X	D				M

* Service more frequently if operated in dusty or dirty areas.

See Section Read these sections carefully for additional information before attempting maintenance or service.

Visually Inspect Examine these items visually.

Check Requires physical contact with, or movement of, system components or the use of nonvisual indications.

Change May require replacement of components depending upon the severity of the problem.

Clean Remove accumulations of dirt and contaminants from external transfer switch's components or enclosure with a vacuum cleaner or by wiping with a dry cloth or brush. *Do not use compressed air to clean the switch because it can cause debris to lodge in the components and cause damage.*

Test May require tools, equipment, or training available only through an authorized service center.

L See the transfer switch logic controller operation and installation manual for more information.

D Have service performed by an authorized service center.

X Operator action.

R May require replacement of components.

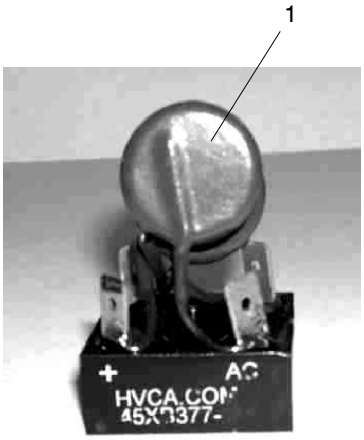
W=Weekly
M=Monthly
Q=Quarterly
S=Six Months
Y=Yearly

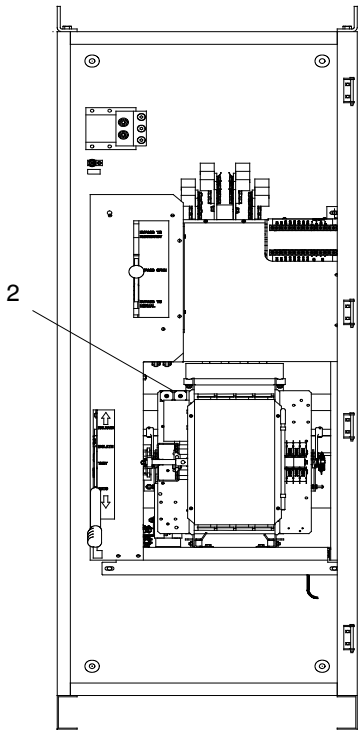
Use the table below to identify the drawing numbers for your ZCB-5 or ZCM-5 bypass/isolation switch. The drawings are arranged in alpha-numeric order on the following pages.

ATS Model	Poles	Amps	Dimension Drawing NEMA 1	Bypass Schematic	Schematic with MPAC 1500 Conversion	Wiring Diagram with MPAC 1500 Conversion
ZCB-5xx231-0150	2	150	ADV-5958A-A	321444	GM99368	GM99369
ZCB-5xx231-0225		225				
ZCB-5xx231-0260		260				
ZCB-5xx231-0400		400				
ZCM-5xx231-0150	2	150	ADV-6828A-B	GM29622 * GM55095 †	GM99366 * GM99360 †	GM99367 * GM99361 †
ZCM-5xx231-0225		225				
ZCM-5xx231-0260		260				
ZCM-5xx231-0400		400				
ZCB-5xx231-0600	2	600	ADV-5959A-D	321484	GM99362	GM99363
ZCB-5xx231-0800		800				
ZCB-5xx341-0150	3	150	ADV-5958A-A	321444	GM99368	GM99369
ZCB-5xx341-0225		225				
ZCB-5xx341-0260		260				
ZCB-5xx341-0400		400				
ZCM-5xx341-0150	3	150	ADV-6828A-B	GM29622 * GM55095 †	GM99366 * GM99360 †	GM99367 * GM99361 †
ZCM-5xx341-0225		225				
ZCM-5xx341-0260		260				
ZCM-5xx341-0400		400				
ZCB-5xx341-0600	3	600	ADV-5959A-D	321484	GM99362	GM99363
ZCB-5xx341-0800		800				
ZCB-5xx341-1000		1000				
ZCB-5xx341-1200		1200				
ZCB-5xx341-1600	3	1600	ADV-5960A-C ADV-5960D-A	321454	GM99364	GM99365
ZCB-5xx341-2000		2000				
ZCB-5xx341-2500		2500				
ZCB-5xx341-3000		3000				
ZCB-5xx341-4000		4000				
ZCB-5xx641-0150	4	150	ADV-5958A-A	321444	GM99368	GM99369
ZCB-5xx641-0225		225				
ZCB-5xx641-0260		260				
ZCB-5xx641-0400		400				
ZCM-5xx641-0150	4	150	ADV-6828A-B	GM29622 * GM55095 †	GM99366 * GM99360 †	GM99367 * GM99361 †
ZCM-5xx641-0225		225				
ZCM-5xx641-0260		260				
ZCM-5xx641-0400		400				
ZCB-5xx641-0600	4	600	ADV-5959A-D	321484	GM99362	GM99363
ZCB-5xx641-0800		800				
ZCB-5xx641-1000		1000				
ZCB-5xx641-1200		1200				
ZCB-5xx641-1600	4	1600	ADV-5960A-C ADV-5960D-A	321454	GM99364	GM99365
ZCB-5xx641-2000		2000				
ZCB-5xx641-2500		2500				
ZCB-5xx641-3000		3000				
ZCB-5xx641-4000		4000				
xx =See Figure 5-1, Voltage Codes			* Before rectifier change. † With new rectifiers. See Figure 5-2.			

Code (xx)	Voltage and Frequency
53	220 V, 60 Hz
60	600 V, 60 Hz
63	220 V, 50 Hz
64	240 V, 60 Hz
66	480 V, 60 Hz
68	208 V, 60 Hz
71	380 V, 50 Hz
72	380 V, 60 Hz
73	416 V, 50 Hz

Figure 5-1 Voltage Codes



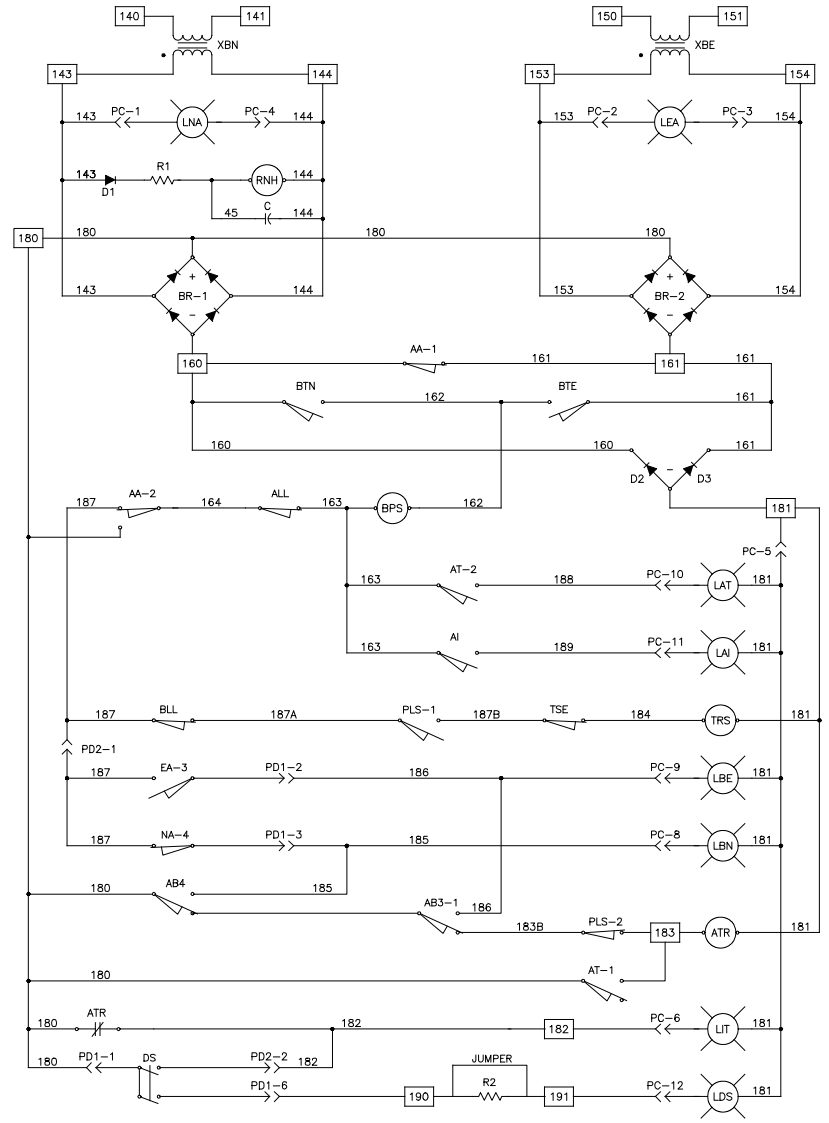


1. New rectifiers have 2 red MOVs as shown.
2. Rectifier location

5668

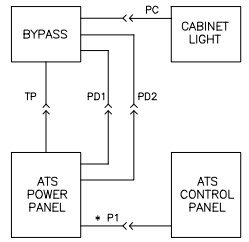
Figure 5-2 New Rectifiers with MOVs (150–400 Amp Model ZCM)

REV	DATE	REVISION	BY	M E
A	3-28-94	WIRE NUMBERS REVISED	AH	
B	8-25-09	(C-3,2) D2 AND D3 WAS BR-3, (B-3) ADDED JUMPER [85028]	FCH	



LIMIT SWITCH CHART

X = ACTUATED	ATS LOCATION				ATS MODE		BYPASS MODE		
	AUTO	TEST	ISO	REMOVE	NORM.	EMERG.	NORM	EMERG.	OPEN
AA	X								
AT		X							
AI			X	X					
ALL	X	X	X	X					
TSE	X	X	X						
AE			X	X					
NA					X				
EA						X			
AB4							X		
AB3								X	
BLL							X	X	X
PLS	ACTIVATED WHEN ALH IS OPERATED								



* SEE ATS POWER CIRCUIT SCHEMATIC, LIGHTS & PLUGS

LEGEND

AA-1,2	LIMIT SWITCH, ATS AUTO LOCATION
AB3-1	LIMIT SWITCH, BYPASS EMERGENCY
AB4	LIMIT SWITCH, BYPASS NORMAL
AI	LIMIT SWITCH, ATS IN ISOLATE
ALH	ATS LOCATION HANDLE
ALL	LIMIT SWITCH, ATS LOCK LOCATION
AT-1,2	LIMIT SWITCH, ATS TEST LOCATION
ATR	AUTO/TEST RELAY
BLL	LIMIT SWITCH, BYPASS LOCK LOCATION
BPS	BYPASS SOLENOID
BTE	LIMIT SWITCH, BYPASS TRANSFER EMERGENCY (MBH MOVEMENT TO NORMAL)
BTN	LIMIT SWITCH, BYPASS TRANSFER NORMAL (MBH MOVEMENT TO EMERGENCY)
BR	BRIDGE RECTIFIER
DS	ATS DISCONNECT SWITCH
EA-3	LIMIT SWITCH, ATS IN EMERGENCY
LBE	BYPASS EMERGENCY LIGHT
LBN	BYPASS NORMAL LIGHT
LAI	ATS ISOLATE LIGHT
LAT	ATS TEST LOCATION
LDS	DISCONNECT SWITCH INHIBIT POSITION
LEA	EMERGENCY AVAILABLE LIGHT
LIT	ATS INHIBIT LIGHT
LNA	NORMAL AVAILABLE LIGHT
NA-4	LIMIT SWITCH, ATS IN NORMAL
PLS-1,2	PERMISSIVE LIMIT SWITCH
RNH	NORMAL VOLTAGE RELAY
TRS	SOLENOID, TRANSFER RELEASE
TSE	LIMIT SWITCH, TRANSFER SWITCH ENGAGED
[81]	TERMINAL ON BYPASS SUBPANEL

MODEL ZCB-1, 5
100-400 AMP
3 & 4 POLE
FOR INTERCONNECTION DIAGRAM SEE DWG. 321558

UNLESS OTHERWISE SPECIFIED –
1) DIMENSIONS ARE IN INCHES
2) TOLERANCES ARE:
.XXX ± .010 ANGLES ± 1/2°
.XX ± .030 SURFACE FINISH
.X ± .060 √ MAX.
FRACTIONS ±

APPROVALS	DATE
DRAWN WJB	1-11-94
CHECKED AH	2-14-94
APPROVED AH	2-14-94

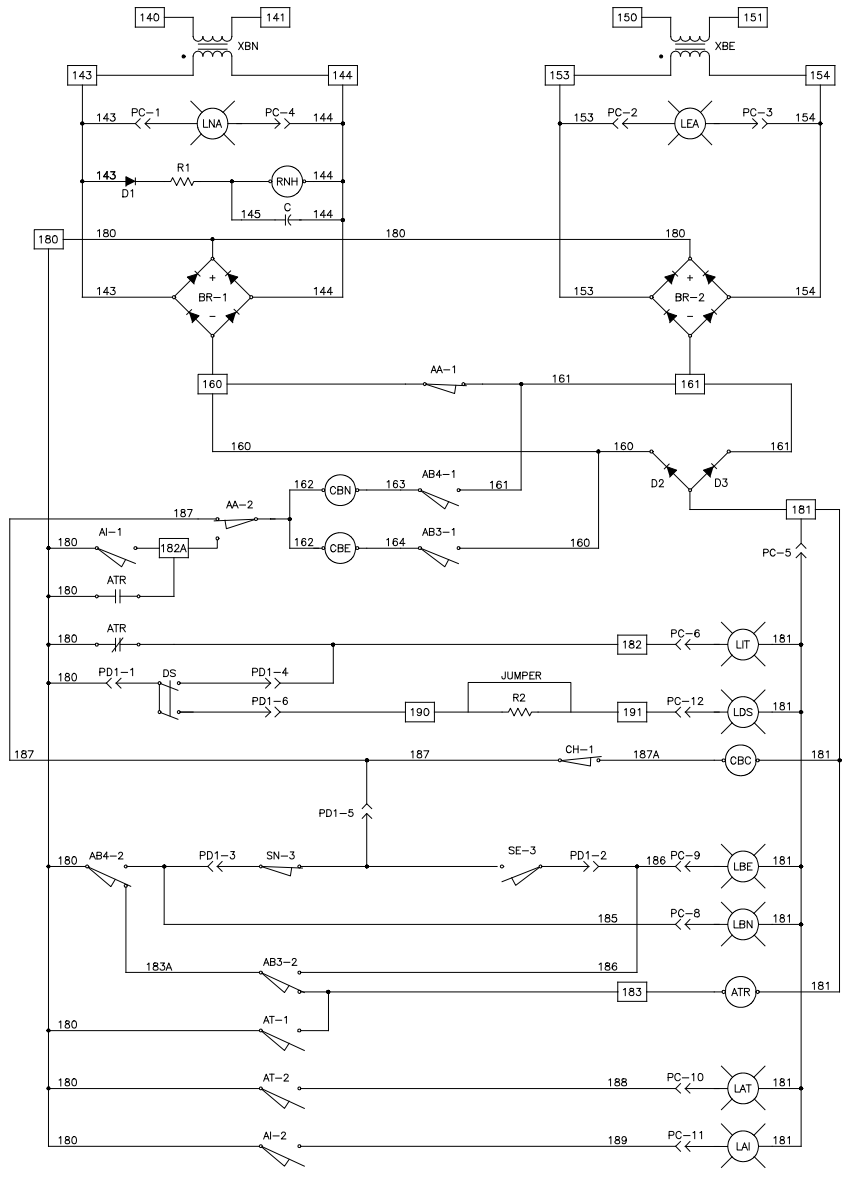
KOHLER CO.
GENERATOR DIVISION, KOHLER, WI 53044 U.S.A.

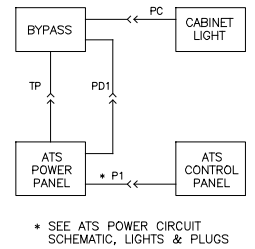
TITLE: SCHEMATIC DIAGRAM

SCALE: NONE | CAD NO.: 321444.DWG | SHEET: 1-1
PLOTTED | DWG. NO.: 321444 | E G

Bypass Schematic, Model ZCB-5, 150-400 Amps, 3 and 4 Poles, 321444

REV	DATE	REVISION	BY	M E
A	3-25-94	WIRE NUMBERS REVISED	AH	
B	12-13-05	(A-2) 321496 DIAGRAM REMOVED [76835]	SAM	
C	8-11-09	(C-3,2) D2/D3 WAS BR-3, (B-3) ADDED JUMPER [85028]	FCH	





* SEE ATS POWER CIRCUIT SCHEMATIC, LIGHTS & PLUGS

LIMIT SWITCH CHART

X = ACTUATED	ATS LOCATION				ATS MODE		BYPASS MODE	
	AUTO	TEST	ISO	REMOVE	NORM	EMERG.	NORM	EMERG.	OPEN
AA	X								
AT		X							
AI			X	X					
AE			X	X					
SN					X				
SE						X			
AB4							X		
AB3								X	

LEGEND

AA-1,2,3	LIMIT SWITCH, ATS AUTO LOCATION
AB3-1,2	LIMIT SWITCH, BYPASS EMERGENCY
AB4-1,2	LIMIT SWITCH, BYPASS NORMAL
AI-1,2,3	LIMIT SWITCH, ATS IN ISOLATE
AT-1,2	LIMIT SWITCH, ATS TEST LOCATION
ACD	LIMIT SWITCH, CRANK HANDLE ENGAGED
ACU	LIMIT SWITCH, CRANK HANDLE ENGAGED
ATR	AUTO/TEST RELAY
BR	BRIDGE RECTIFIER
CBC	CRANK SOLENOID
CBE	EMERGENCY TRANSFER OPERATOR
CBN	NORMAL TRANSFER OPERATOR
DS	ATS DISCONNECT SWITCH
LBE	BYPASS EMERGENCY
LBN	BYPASS NORMAL LIGHT
LAI	ATS ISOLATE LIGHT
LAT	ATS TEST LOCATION
LDS	DISCONNECT SWITCH
LEA	EMERGENCY AVAILABLE LIGHT
LIT	ATS INHIBIT LIGHT
LNA	NORMAL AVAILABLE LIGHT
RNH	NORMAL VOLTAGE RELAY
[81]	TERMINAL ON BYPASS SUBPANEL

MODEL ZCB-1, 5
1600-3000 AMP
3 & 4 POLE

UNLESS OTHERWISE SPECIFIED –
1) DIMENSIONS ARE IN INCHES
2) TOLERANCES ARE:
.XXX± .010 ANGLES± 1/2°
.XX ± .030 SURFACE FINISH
.X ± .060 MAX.
FRACTIONS ±

APPROVALS		DATE
DRAWN	WJB	1-11-94
CHECKED	AH	2-14-94
APPROVED	AH	2-14-94

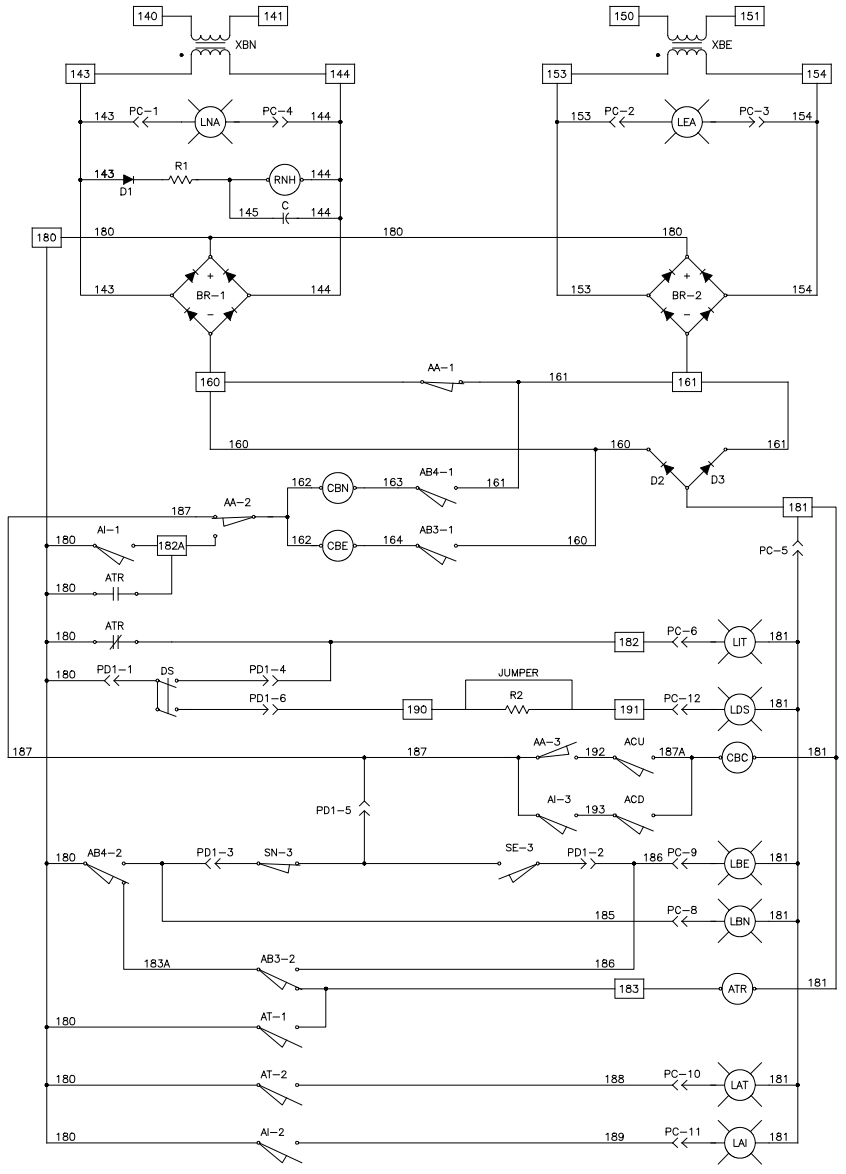
KOHLER CO.
POWER SYSTEMS, KOHLER, WI 53044 U.S.A.

TITLE: SCHEMATIC DIAGRAM

SCALE	CAD NO.	SHEET
NONE	321454.DWG	1-1
PLOTTED	DWG. NO.	
	321454	E

Bypass Schematic, Model ZCB-5 , 1600-4000 Amps, 3 and 4 Poles, 321454

REV	DATE	REVISION	BY	M F
A	3-25-94	WIRE NUMBERS REVISED	AH	
B	8-11-09	(C-3,2) D2/D3 WAS BR-3, (C-3) ADDED JUMPER [85028]	FCH	

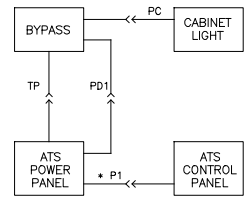


LIMIT SWITCH CHART

X = ACTUATED	ATS LOCATION			ATS MODE		BYPASS MODE	
	AUTO	TEST	ISO.	NORM.	EMERG.	NORM.	EMERG.
							OPEN
AA	X						
AT		X					
AI			X	X			
AE			X	X			
SN				X			
SE					X		
AB4						X	
AB3							X

LEGEND

AA-1,2,3	LIMIT SWITCH, ATS AUTO LOCATION
AB3-1,2	LIMIT SWITCH, BYPASS EMERGENCY
AB4-1,2	LIMIT SWITCH, BYPASS NORMAL
AI-1,2,3	LIMIT SWITCH, ATS IN ISOLATE
AT-1,2	LIMIT SWITCH, ATS TEST LOCATION
ACD	LIMIT SWITCH, CRANK HANDLE ENGAGED
ACU	LIMIT SWITCH, CRANK HANDLE ENGAGED
ATR	AUTO/TEST RELAY
BR	BRIDGE RECTIFIER
CBC	CRANK SOLENOID
CBE	EMERGENCY TRANSFER OPERATOR
CBN	NORMAL TRANSFER OPERATOR
DS	ATS DISCONNECT SWITCH
LBE	BYPASS EMERGENCY
LBN	BYPASS NORMAL LIGHT
LAI	ATS ISOLATE LIGHT
LAT	ATS TEST LOCATION
LDS	DISCONNECT SWITCH
LEA	EMERGENCY AVAILABLE LIGHT
LIT	ATS INHIBIT LIGHT
LNA	NORMAL AVAILABLE LIGHT
RNH	NORMAL VOLTAGE RELAY
81	TERMINAL ON BYPASS SUBPANEL



* SEE ATS POWER CIRCUIT SCHEMATIC, LIGHTS & PLUGS

MODEL ZCB-1, 5
600-1200 AMP
3 & 4 POLE
FOR INTERCONNECTION DIAGRAM SEE DWG. 321560

UNLESS OTHERWISE SPECIFIED -
1) DIMENSIONS ARE IN INCHES
2) TOLERANCES ARE:
.XXX± .010 ANGLES ± 1/2°
.XX ± .030 SURFACE FINISH
.X ± .060 MAX.
FRACTIONS ±

APPROVALS		DATE
DRAWN	WJB	1-11-94
CHECKED	AH	2-14-94
APPROVED	AH	2-14-94

KOHLER CO.
GENERATOR DIVISION, KOHLER, WI 53044 U.S.A.

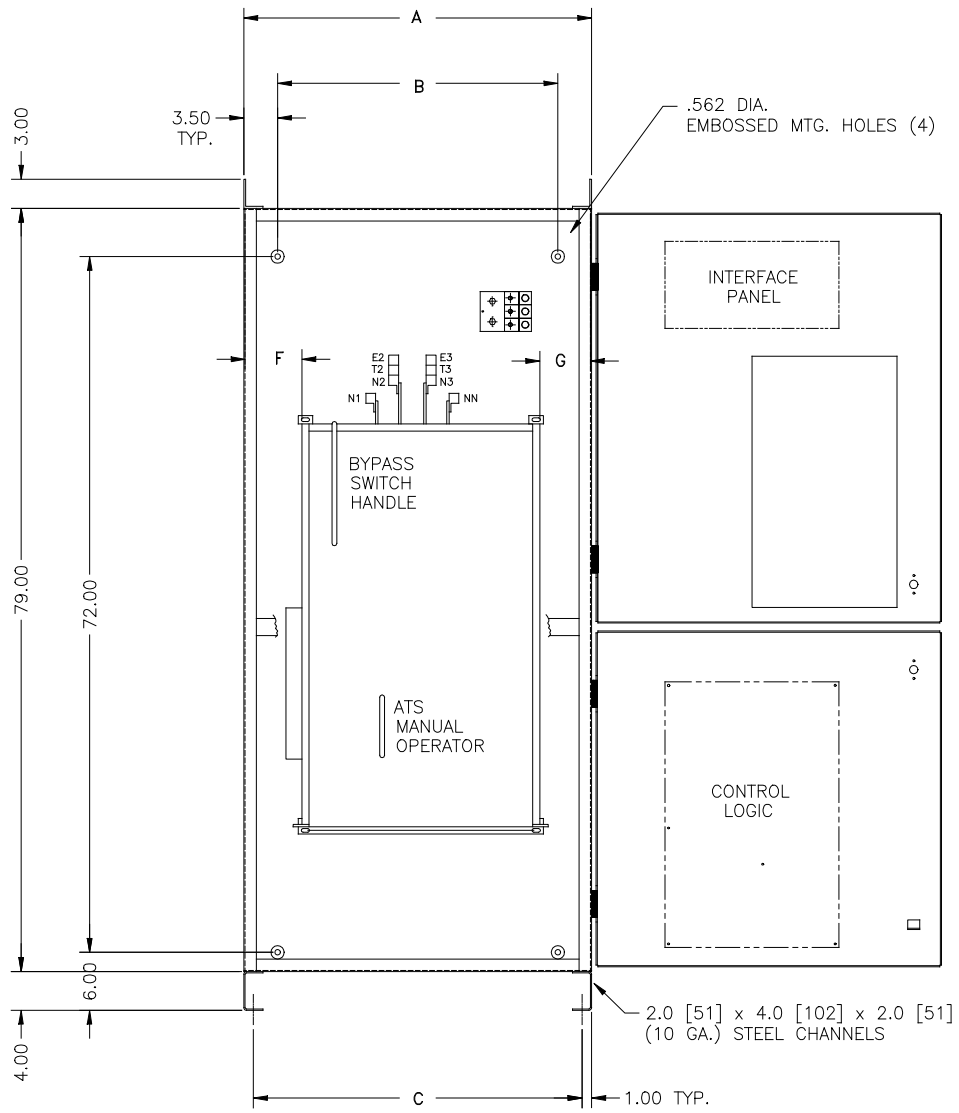
TITLE: SCHEMATIC DIAGRAM

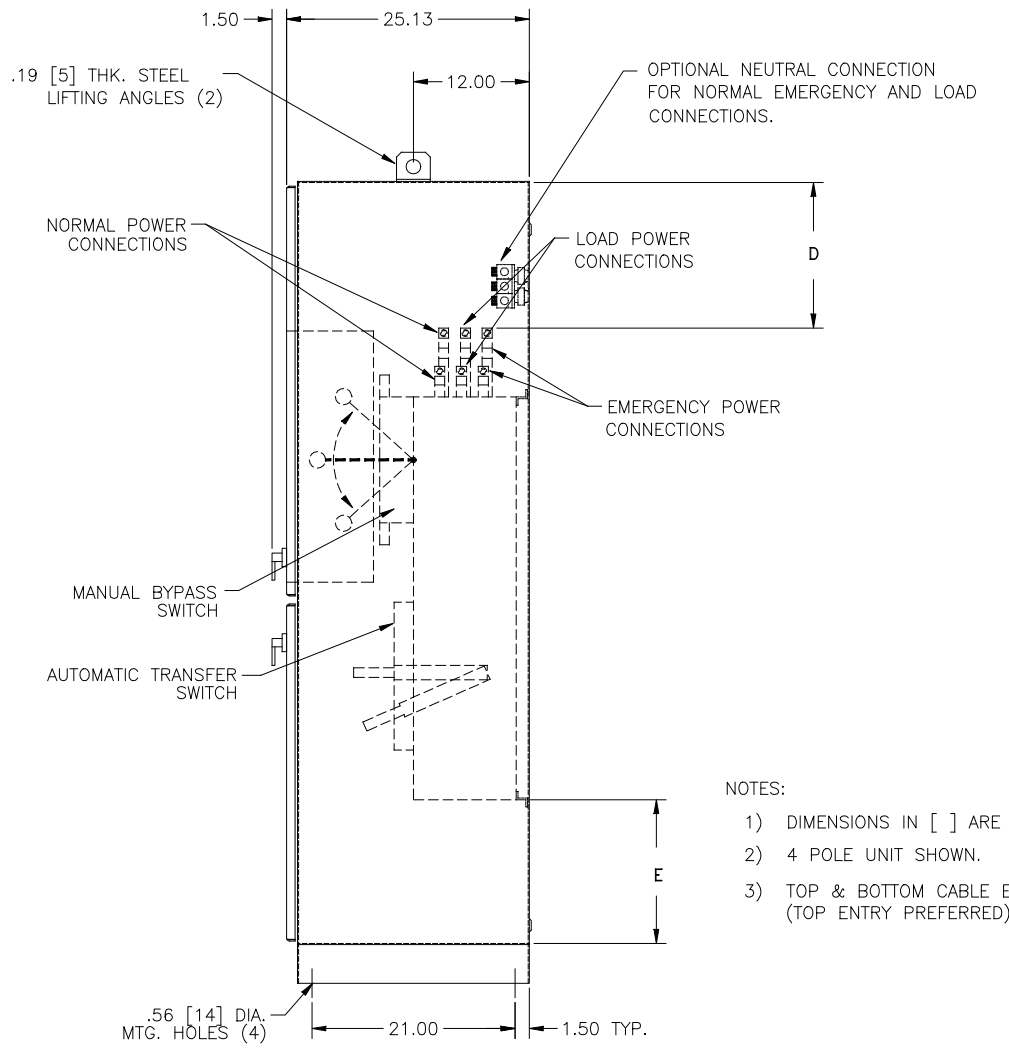
SCALE	CAD NO.	SHEET
NONE	321484.DWG	1-1
PLOTTED	DWG. NO.	
	321484	E

Bypass Schematic, Model ZCB-5 , 800-1200 Amps, 3 and 4 Poles, 321484

BYPASS STANDARD SWITCH	NO. POLES	CABINET DIMENSIONS A	B	C	LUG RANGE	WIRE BENDING SPACE D (TOP)	E (BOTTOM)	WIRE GUTTERS F (LEFT)	G (RIGHT)
100–225 AMP	2,3	30.00 [762]	23.00 [584]	28.00 [711]	3/0–250 MCM	15.25 [387]	13.88 [353]	4.38 [111]	1.38 [35]
	4	36.00 [914]	29.00 [737]	34.00 [864]					5.00 [127]
260–400 AMP	2,3	30.00 [762]	23.00 [584]	28.00 [711]	3/0–250 MCM	15.25 [387]	13.88 [353]	4.38 [111]	1.38 [35]
	4	36.00 [914]	29.00 [737]	34.00 [864]					5.00 [127]
BYPASS PROGRAMMED TRANSITION SWITCH									
100–225 AMP	2,3	30.00 [762]	23.00 [584]	28.00 [711]	3/0–250 MCM	15.25 [387]	13.88 [353]	4.38 [111]	1.38 [35]
	4	36.00 [914]	29.00 [737]	34.00 [864]					5.00 [127]
260–400 AMP	2,3	30.00 [762]	23.00 [584]	28.00 [711]	3/0–250 MCM	15.25 [387]	13.88 [353]	4.38 [111]	1.38 [35]
	4	36.00 [914]	29.00 [737]	34.00 [864]					5.00 [127]

REV	DATE	REVISION	BY	MFG
A	9–16–94	GENERIC TITLEBLOCK ADDED	PWH	





NOTES:

1) DIMENSIONS IN [ ] ARE MILLIMETER EQUIVALENTS.
2) 4 POLE UNIT SHOWN.
3) TOP & BOTTOM CABLE ENTRY ACCEPTABLE (TOP ENTRY PREFERRED)

NEMA 1 ENCLOSURE

BYPASS ISOLATION TRANSFER SWITCH
STANDARD & PROGRAMMED TRANSITION
100–400 AMP, 2,3 & 4 POLE

UNLESS OTHERWISE SPECIFIED – 1) DIMENSIONS ARE IN INCHES 2) TOLERANCES ARE: .XXX ± .010 ANGLES ± 1/2° .XX ± .030 SURFACE FINISH .X ± .060 MAX. FRACTIONS ±

APPROVALS		DATE
DRAWN	DFS	1–26–94
CHECKED	AJH	2–22–94
APPROVED	AJH	2–22–94

TITLE: DIMENSION PRINT

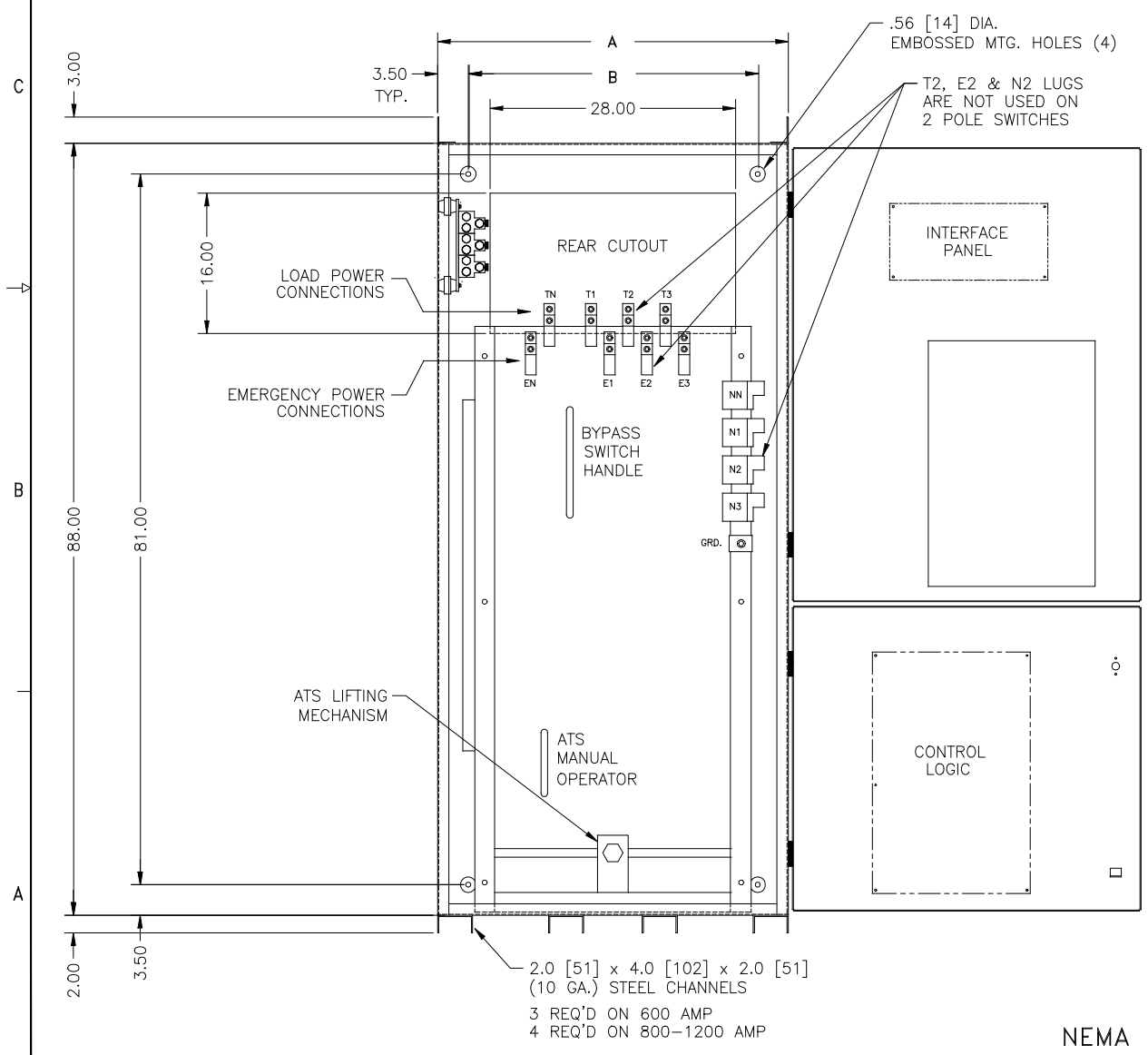
SCALE 1/8 | CAD NO. ADV5958A.dwg | SHEET 1–3

PLOTTED | DWG. NO. ADV–5958 | D

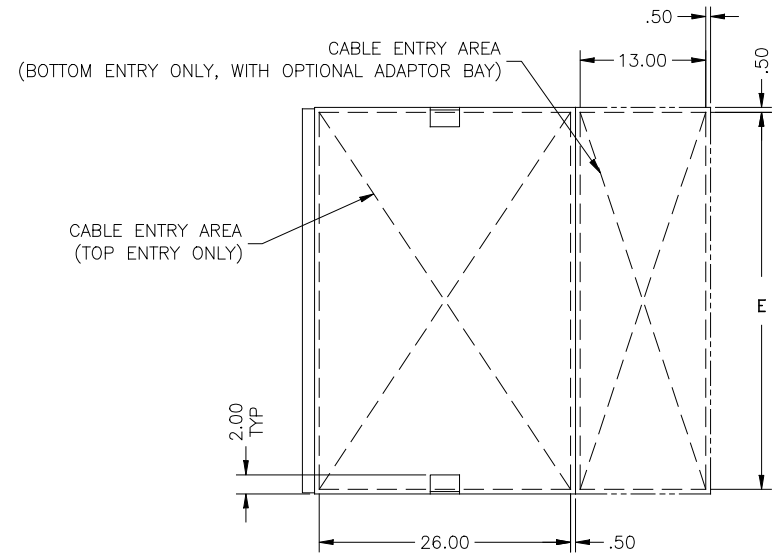
NEMA Type 1 Enclosure, 150-400 Amp Model ZCB, ADV-5958A-A (Discontinued in 2003)

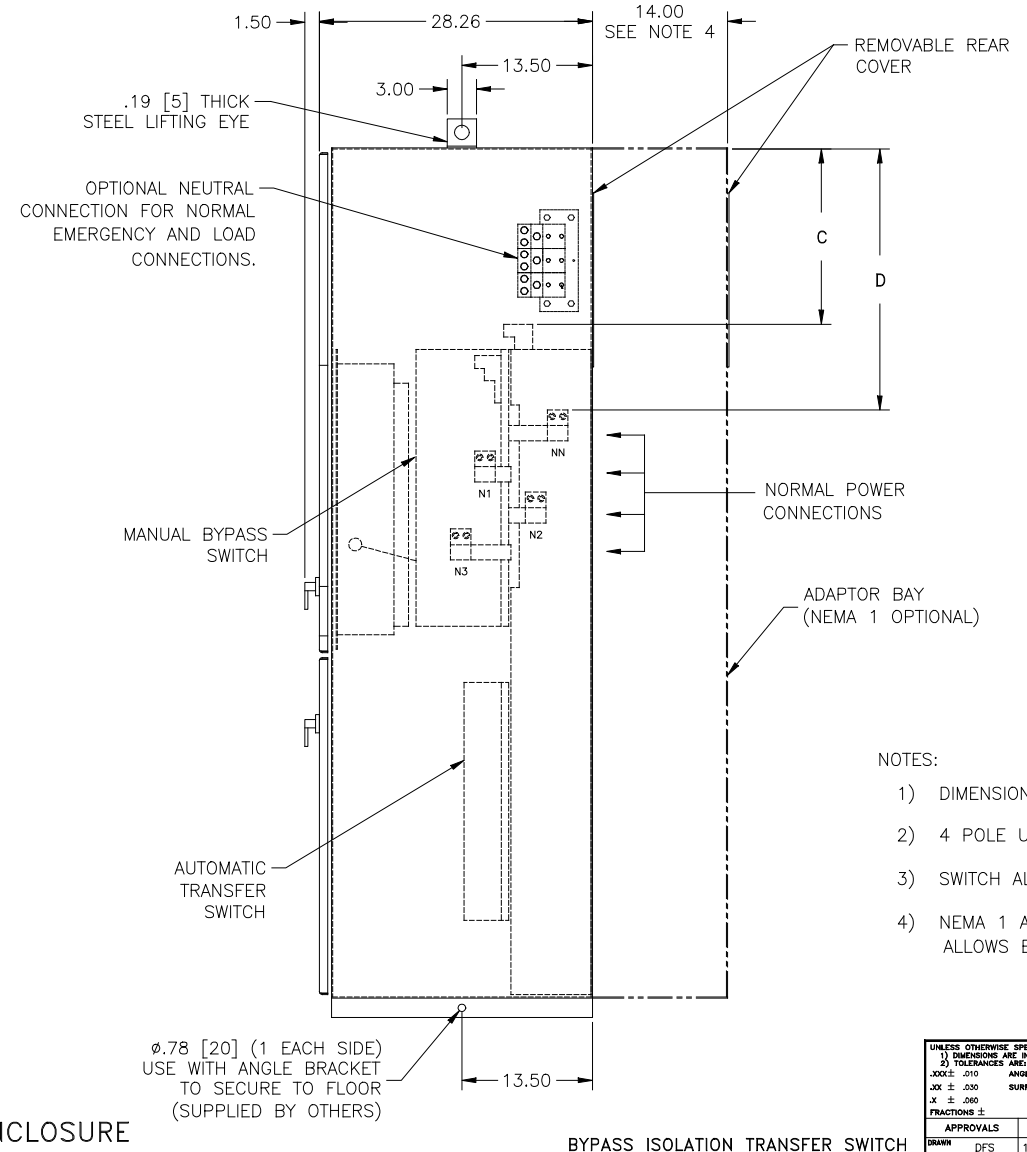
STANDARD BYPASS SWITCH	NO. POLES	CABINET DIMENSIONS A	CABINET DIMENSIONS B	LUG RANGE	WIRE BENDING SPACE C (LOAD/EMERG.)	WIRE BENDING SPACE D (NORMAL)	ENTRY WIDTH E
600 AMP	2,3	36.00 [914]	29.00 [737]	#2–600 MCM (2)	18.25 [464]	31.38 [797]	35.00 [889]
	4	40.00 [1016]	33.00 [838]		18.25 [464]	27.12 [689]	39.00 [991]
800–1200 AMP	2,3	40.00 [1016]	33.00 [838]	#2–600 MCM (4)	18.25 [464]	29.62 [752]	39.00 [991]
	4	46.00 [1168]	39.00 [991]		18.25 [464]	25.12 [638]	45.00 [1143]
PROGRAMMED TRANSITION BYPASS SWITCH							
600 AMP	2,3	36.00 [914]	29.00 [737]	#2–600 MCM (2)	18.25 [464]	31.38 [797]	35.00 [889]
	4	40.00 [1016]	33.00 [838]		18.25 [464]	27.12 [689]	39.00 [991]
800–1200 AMP	2,3	40.00 [1016]	33.00 [838]	#2–600 MCM (4)	18.25 [464]	29.62 [752]	39.00 [991]
	4	46.00 [1168]	39.00 [991]		18.25 [464]	25.12 [638]	45.00 [1143]

REV	DATE	REVISION	BY	MF
A	9–16–94	GENERIC TITLEBLOCK ADDED [39355]	PWH	
B	10–9–00	(D–3) TOP VIEW ADDED; (D–5) ENTRY WIDTH ADDED [63252]	WSD	
C	11–15–04	(B–2) ADAPTOR BAY ADDED [73831]	WSD	
D	9–8–05	(D–3) TOP VIEW UPDATED; (A–2) NOTE 4 UPDATED [76062]	WSD	



NEMA 1 ENCLOSURE





NOTES:

1) DIMENSIONS IN [ ] ARE MILLIMETER EQUIVALENTS.
2) 4 POLE UNIT SHOWN.
3) SWITCH ALLOWS TOP CABLE ENTRY ONLY.
4) NEMA 1 ADAPTOR BAY OPTIONAL, ALLOWS BOTTOM CABLE ENTRY.

UNLESS OTHERWISE SPECIFIED – 1) DIMENSIONS ARE IN INCHES 2) TOLERANCES ARE: .XXX ± .010 ANGLES ± 1/2° .XX ± .030 SURFACE FINISH .X ± .060 √ MAX. FRACTIONS ±

APPROVALS	DATE
DRAWN DFS	1–27–94
CHECKED AJH	2–2–94
APPROVED AJH	2–22–94

TITLE: DIMENSION PRINT

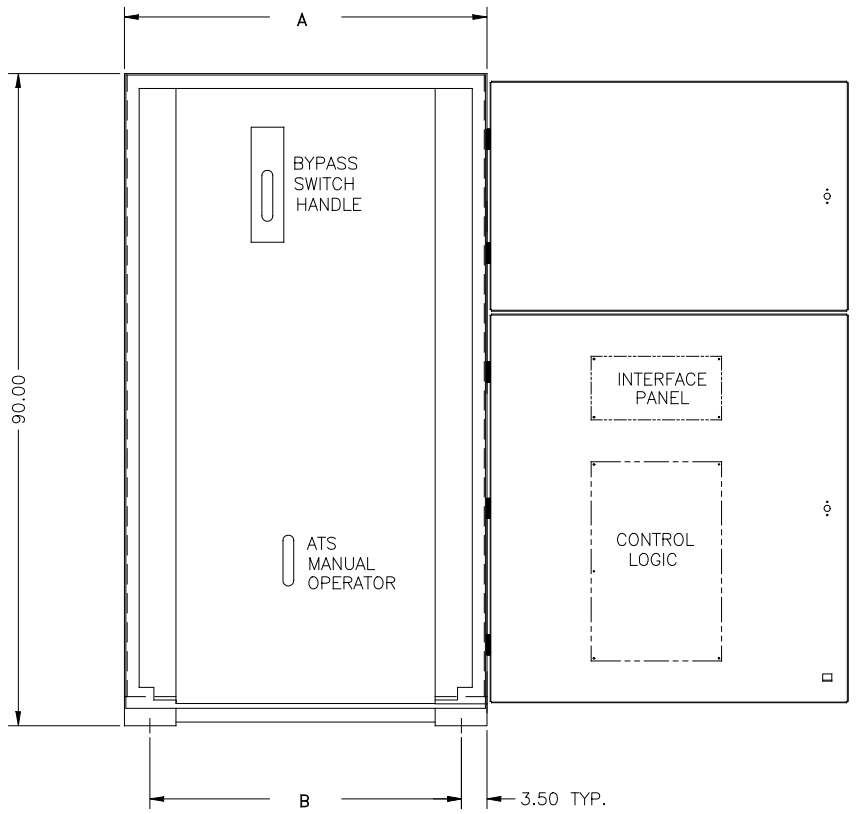
SCALE 1/8 | CAD NO. ADV5959A.DWG | SHEET 1–3 | PLOTTED | DWG. NO. ADV–5959 | D

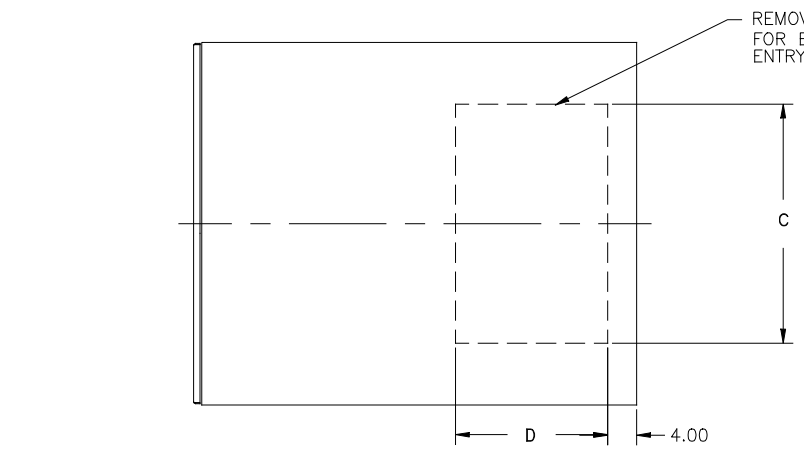
BYPASS ISOLATION TRANSFER SWITCH
STANDARD & PROGRAMMED TRANSITION
600, 800–1200A/2, 3 & 4 POLE

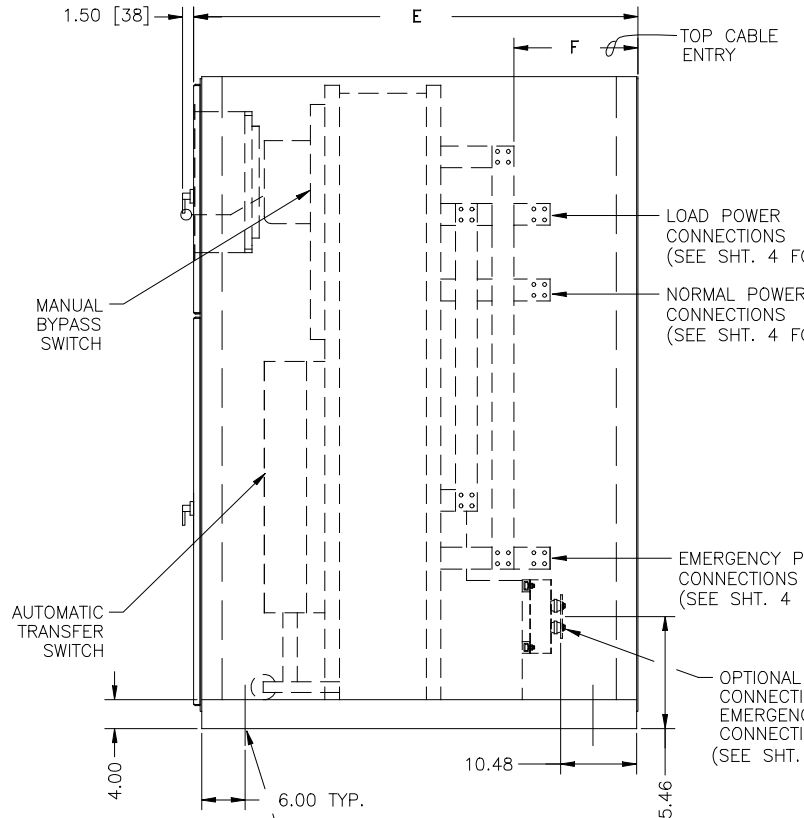
Enclosure Dimensions, NEMA Type 1, 600–1200 Amps, ADV-5959A-D

STANDARD BYPASS SWITCH	NO. POLES	CABINET DIMENSIONS A	B	C	D	E	F	WIRE BENDING SPACE (TOP ENTRY) G (LOAD)	H (NORMAL)	J (EMERG.)	WIRE BENDING SPACE (BOTTOM ENTRY) K (LOAD)	L (NORMAL)	M (EMERG.)	WIRE GUTTERS N LEFT	P (RIGHT)	R
1600–2000 AMP	2,3	40.00 [1016]	33.00 [838]	26.00 [660]	21.00 [533]	61.12 [1552]	14.00 [356]	18.76 [477]	29.16 [741]	66.16 [1680]	71.24 [1809]	60.84 [1545]	23.84 [606]	11.75 [298]	15.12 [384]	13.88 [353]
	4	50.00 [1270]	43.00 [1092]	36.00 [914]	21.00 [533]	61.12 [1552]	14.00 [356]								12.00 [305]	
3000 AMP	2,3	40.00 [1016]	33.00 [838]	26.00 [660]	33.00 [838]	73.12 [1857]	21.00 [533]	18.76 [477]	29.16 [741]	66.16 [1680]	71.24 [1809]	60.84 [1545]	23.84 [606]	11.75 [298]	15.12 [384]	11.75 [298]
	4	50.00 [1270]	43.00 [1092]	36.00 [914]	33.00 [838]	73.12 [1857]	21.00 [533]								12.00 [305]	
PROGRAMMED TRANSITION BYPASS SWITCH																
1600–2000 AMP	2,3	40.00 [1016]	33.00 [838]	26.00 [660]	21.00 [533]	61.12 [552]	61.12 [552]	18.76 [477]	29.16 [741]	66.16 [1680]	71.24 [1809]	60.84 [1545]	23.84 [606]	11.75 [298]	15.12 [384]	13.88 [353]
	4	50.00 [1270]	43.00 [1092]	36.00 [914]	21.00 [533]	61.12 [552]	61.12 [552]								12.00 [305]	
3000 AMP	2,3	40.00 [1016]	33.00 [838]	26.00 [660]	33.00 [838]	73.12 [1857]	73.12 [1857]	18.76 [477]	29.16 [741]	66.16 [1680]	71.24 [1809]	60.84 [1545]	23.84 [606]	11.75 [298]	15.12 [384]	11.75 [298]
	4	50.00 [1270]	43.00 [1092]	36.00 [914]	33.00 [838]	73.12 [1857]	73.12 [1857]								12.00 [305]	

REV	DATE	REVISION	BY	MF
B	9–6–95	(B–1,–4, A–1,–4) LUGS REMOVED FROM POWER & NEUTRAL CONNECTIONS, NEUTRAL VIEW UPDATED, 10.48 [266], 15.46 [393] ADDED; (C–2) NOTE #3 ADDED; (D–3,–4,–5) DIM.'S G THRU M UPDATED PER LUG REMOVAL; (A–1) 1–4 WAS 1–3 [43377]	KDW	
C	6–2–97	(C–2) 5.5 & "R" DIM'S. ADDED; (D–2) "R" COLUMN ADDED; (D–5) "LUG RANGE" COLUMN REMOVED [50729]	RSH	

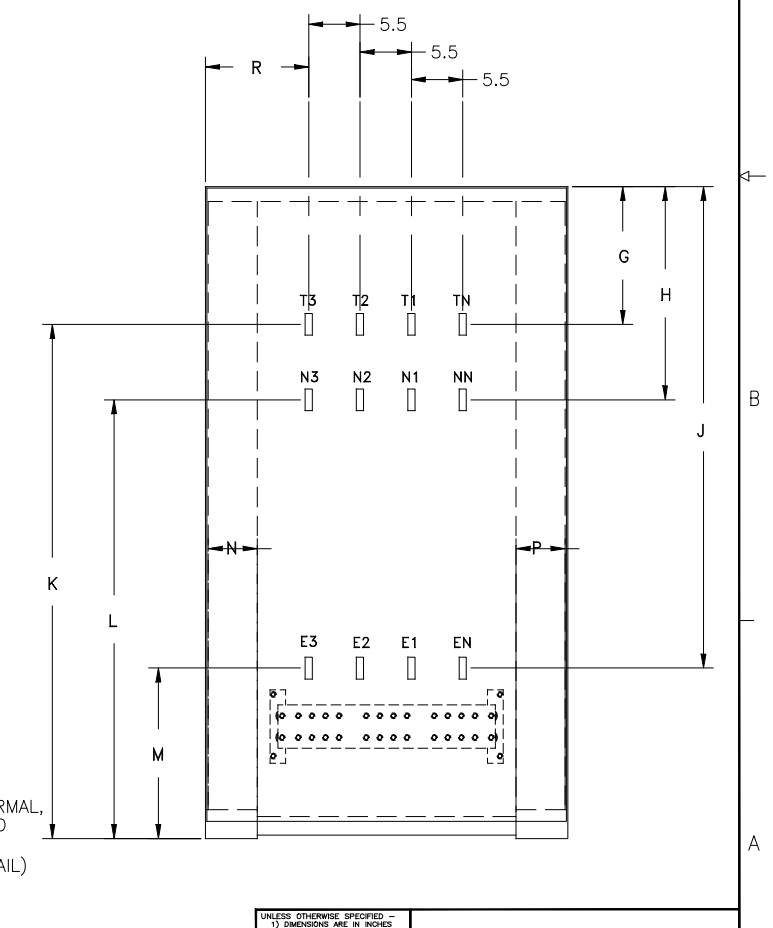






NOTES:

1) DIMENSIONS IN [ ] ARE MILLIMETER EQUIVALENTS.
2) 4 POLE UNIT SHOWN.
3) SEE SHEET 4 FOR POWER & NEUTRAL CONNECTION DETAILS.



NEMA 1 ENCLOSURE

BYPASS ISOLATION TRANSFER SWITCH
STANDARD & PROGRAMMED TRANSITION
1600–2000, 3000 AMP 2, 3 & 4 POLE

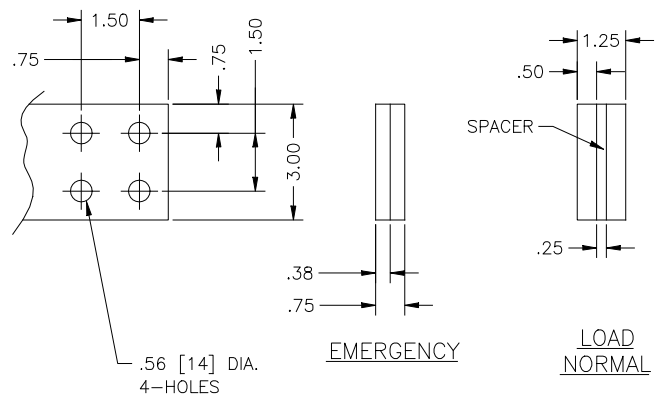
UNLESS OTHERWISE SPECIFIED – 1) DIMENSIONS ARE IN INCHES 2) TOLERANCES ARE: .XXX± .010 ANGLES± 1/2° .XX ± .030 SURFACE FINISH .X ± .060 MAX. FRACTIONS ±

APPROVALS		DATE
DRAWN	DFS	1–31–94
CHECKED	AJH	2–22–94
APPROVED	AJH	2–22–94

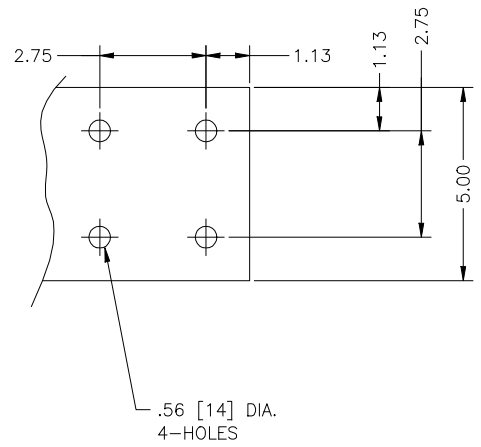
TITLE: DIMENSION PRINT
SCALE 3/32 | CAD NO. ADV5960A.dwg | SHEET 1–4
PLOTTED | DWG. NO. ADV–5960 | D

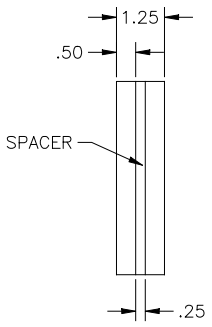
Enclosure Dimensions, NEMA Type 1, 1600-3000 Amps, ADV-5960A-C

REV	DATE	REVISION	BY	M F
A	6-3-97	(D-4, D-7) SPACER WAS SPACE [50729]	RSH	

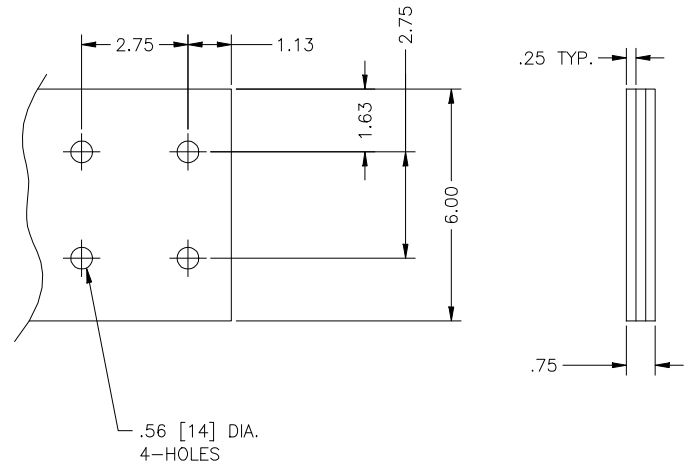


1600-2000 AMP BUS DETAIL



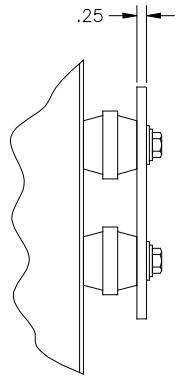


LOAD
NORMAL

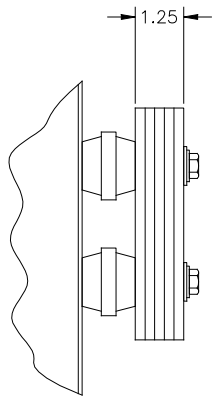


EMERGENCY

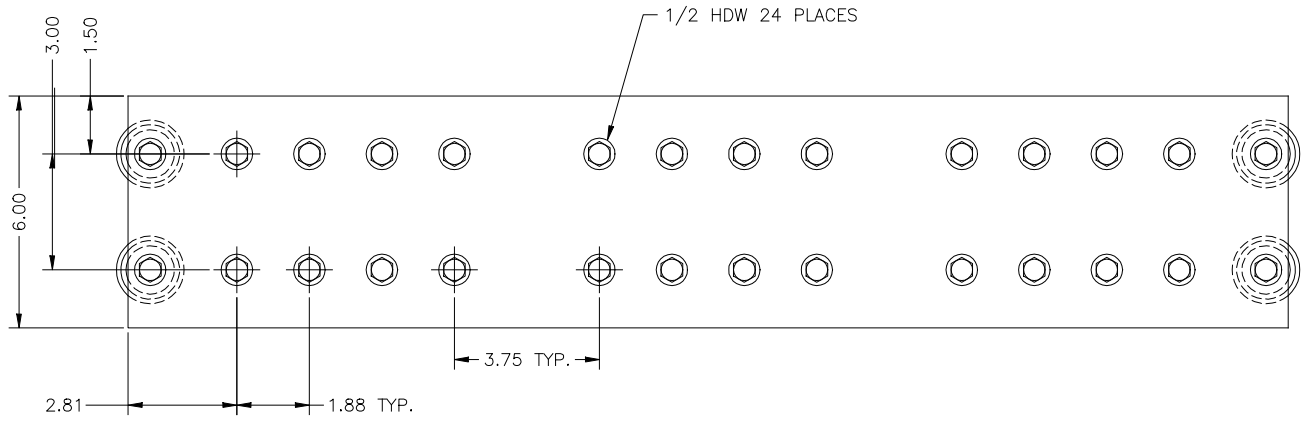
3000 AMP BUS DETAIL



1600 AMP



2000-3000 AMP



1600-3000 AMP NEUTRAL DETAIL

NOTE:
DIMENSIONS IN [ ] ARE
MILLIMETER EQUIVALENTS.

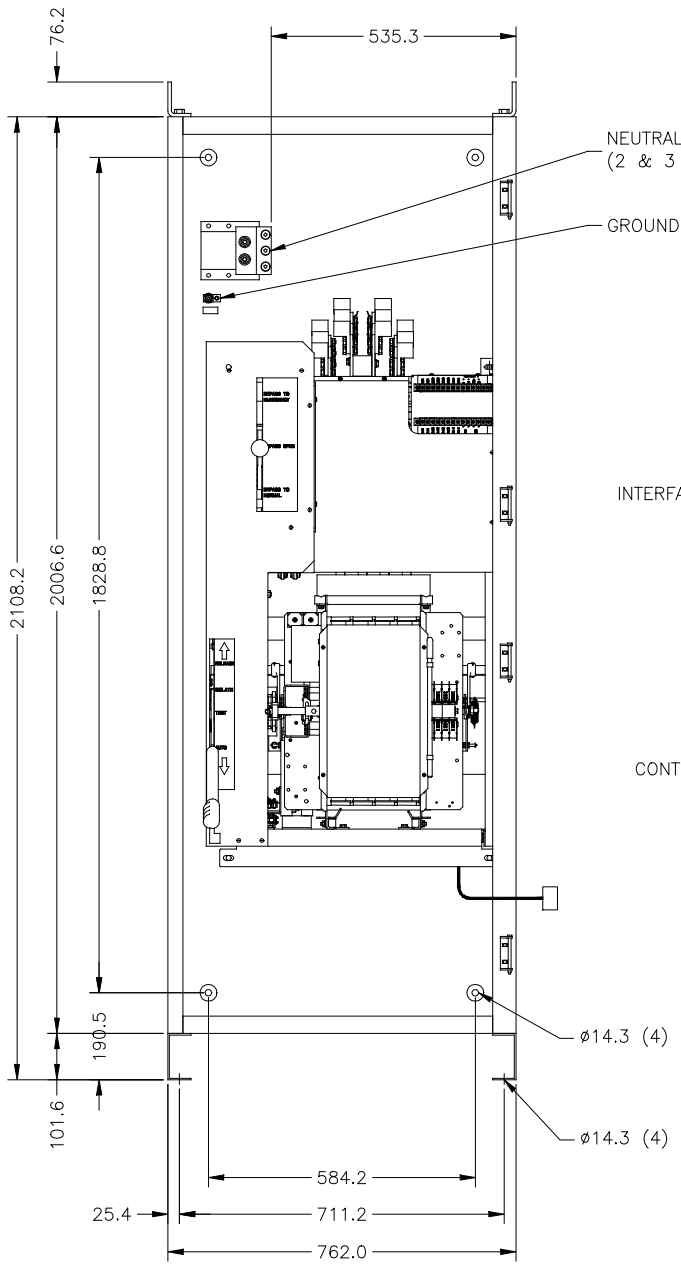
BYPASS ISOLATION TRANSFER SWITCH
STANDARD & PROGRAMMED TRANSITION
1600-2000, 3000 AMP 2, 3 & 4 POLE

UNLESS OTHERWISE SPECIFIED - 1) DIMENSIONS ARE IN INCHES 2) TOLERANCES ARE: .XXX ± .010 ANGLES ± 1/2° .XX ± .030 SURFACE FINISH .X ± .060 √ MAX. FRACTIONS ±		
APPROVALS		DATE
DRAWN	KDW	9-5-95
CHECKED	JJC	9-25-95
APPROVED	AJH	9-25-95

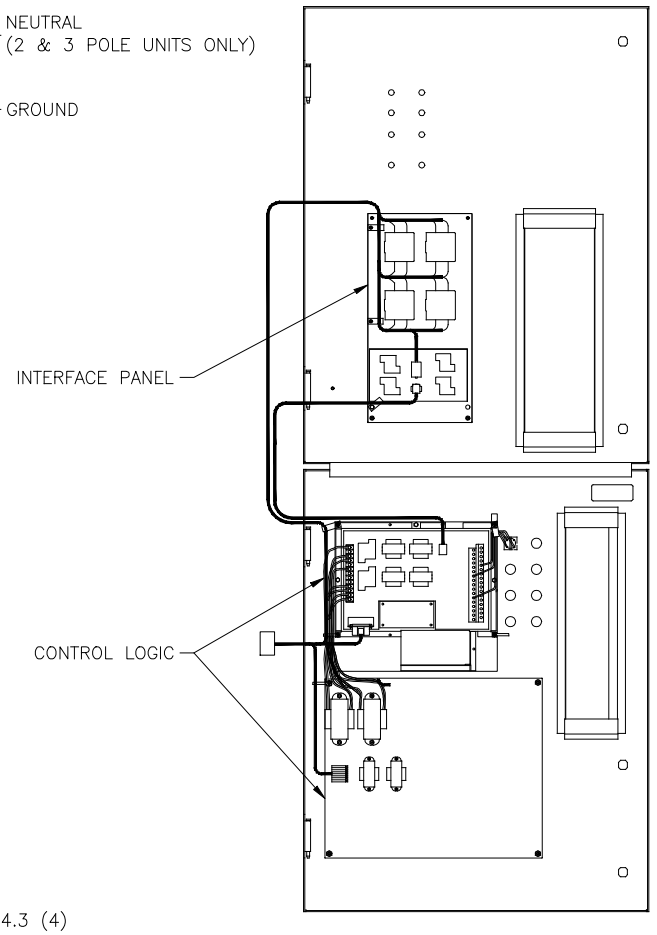
TITLE	DIMENSION PRINT		
SCALE 1/2	CAD NO. ADV5960D.DWG	SHEET 4-4	
PLOTTED	DWG. NO. ADV-5960		D

Dimensions, Neutral and Bus Details, 1600-3000 Amps, ADV-5960D-A

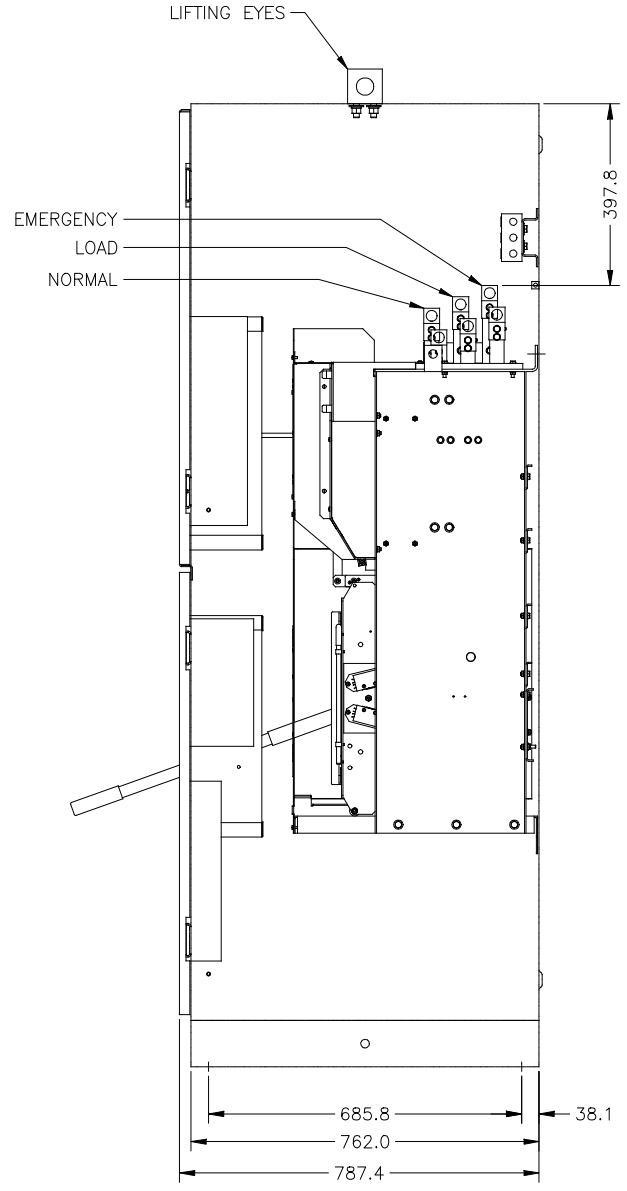
REV	DATE	REVISION	BY
–	3–25–03	NEW DRAWING [69361]	WSD
A	1–7–05	SHEET 2 ADDED [74157]	WSD
B	4–24–06	(C–1) VIEW A ADDED; (A–4) NOTE 5 UPDATED [78108]	WSD

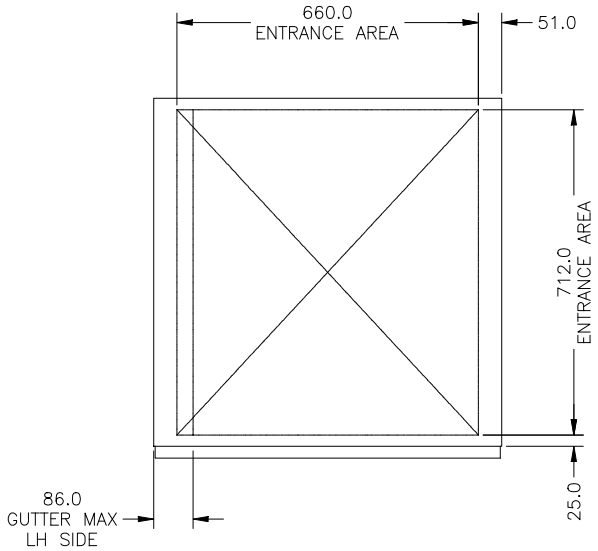


FRONT VIEW WITH DOORS REMOVED



INSIDE DOORS





VIEW A

SCREW TYPE TERMINALS FOR EXTERNAL POWER CONNECTION			
SWITCH RATING (AMPS)	RANGE OF AL–CU WIRE SIZES		
	CONTACTOR	NEUTRAL	GROUND
100–400	(2) 1/0 TO 250MCM OR (1) #4 TO 600MCM	(2) 1/0 TO 250MCM OR (1) #4 TO 600MCM	#14 TO 1/0

WEIGHTS KG [LBS]		
TRANSITION	2P & 3P	4P
OPEN	340 [750]	386 [850]
PROGRAMMED	342 [755]	388 [855]

NOTES:
1. DIMENSIONS IN [ ] ARE IN INCHES.
2. FINISH: ANSI 49 GRAY.
3. DOOR CLAMPS VARY WITH NEMA TYPE.
4. REFER TO OPERATORS MANUAL PRIOR TO INSTALLATION AND OPERATION OF SWITCH.
5. TOP & BOTTOM ENTRY, SEE VIEW A.

DO NOT ROUTE WIRES IN FRONT OF SWITCHES.

METRIC CAD FILE

100–400A 2, 3 & 4 POLE
OPEN & PROGRAMMED TRANSITION
NEMA 1 ENCLOSURE

UNLESS OTHERWISE SPECIFIED –
1) DIMENSIONS ARE IN MILLIMETERS
2) TOLERANCES ARE:
X.XX ±
X.X ±
X ±
ANGLES ±
SURFACE FINISH MAX.
THIRD ANGLE PROJECTION

APPROVALS		DATE
DRAWN	WSD	3–25–03
CHECKED	AJH	3–25–03
APPROVED	AJH	3–25–03
PLOTTED DATE		

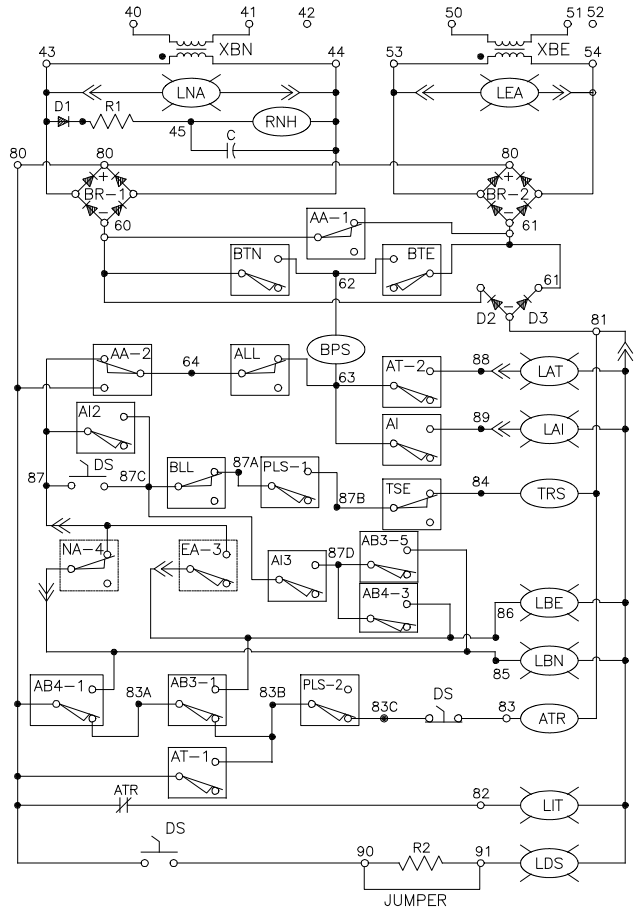
TITLE: DIMENSION PRINT

SCALE NONE | CAD NO. ADV6828A.DWG | SHEET 1–2

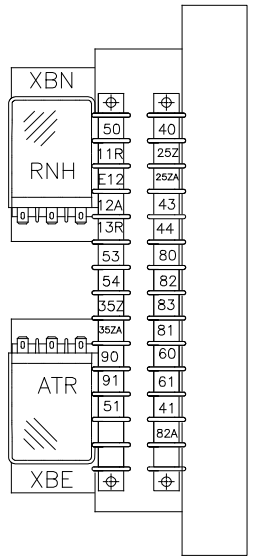
DWG. NO. ADV–6828 | D G

NEMA Type 1 Enclosure,150-400 Amp Model ZCM, Sheet 1, ADV-6828A-B

REV	DATE	REVISION	BY	M E
–	9–12–03	NEW DRAWING [69361]	AJH	
A	8–20–09	(D–4,3) D2/D3 WAS BR–3, (B,C–4) ADDED R2 [85028]	FCH	



BYPASS SUBPANEL



BYPASS/ISOLATION SCHEMATIC

AA–1 – LIMIT SWITCH, ATS AUTO LOCATION
BTN – LIMIT SWITCH, BYPASS TRANSFER NORMAL (MBH MOVEMENT TO NORMAL)
BTE – LIMIT SWITCH, BYPASS TRANSFER EMERG. (MBH MOVEMENT TO EMERGENCY)
BPS – BYPASS SOLENOID
AA–2 – LIMIT SWITCH, ATS AUTO LOCATION
ALL – LIMIT SWITCH, ATS LOCK LOCATION
AT–2 – LIMIT SWITCH, ATS TEST LOCATION
LAT – LIGHT, ATS TEST LOCATION
AI – LIMIT SWITCH, ATS ISOLATE LOCATION
LAI – LIGHT, ATS ISOLATE LOCATION
BLL – LIMIT SWITCH, BYPASS LOCK LOCATION
PLS–1 – PERMISSIVE LIMIT SWITCH
TSE – LIMIT SWITCH, TRANSFER SWITCH ENGAGED
TRS – SOLENOID, TRANSFER RELEASE
NA–4 – LIMIT SWITCH, ATS IN NORMAL
EA–3 – LIMIT SWITCH, ATS IN EMERGENCY
LBE – LIGHT, BYPASS EMERGENCY
LBN – LIGHT, BYPASS NORMAL
AB4–1 – LIMIT SWITCH, BYPASS NORMAL
AB3–1 – LIMIT SWITCH, BYPASS EMERGENCY
PLS–2 – PERMISSIVE LIMIT SWITCH
ATR – AUTO/TEST RELAY
AT–1 – LIMIT SWITCH, ATS TEST LOCATION

LIT – LIGHT, ATS INHIBIT
DS – ATS DISCONNECT SWITCH
LDS – LIGHT, DISCONNECT SWITCH INHIBIT POSITION
ALH – ATS LOCATION HANDLE
MBH – MANUAL BYPASS HANDLE

XBN – BYPASS NORMAL CONTROL TRANSFORMER
XBE – BYPASS EMERGENCY CONTROL TRANSFORMER
LNA – NORMAL AVAILABLE LIGHT
LEA – EMERGENCY AVAILABLE LIGHT
RNH – NORMALLY HELD RELAY
D1 – DIODE
R1 – RESISTOR, RNH
C – CAPACITOR, RNH
BR–1,2,3 – BRIDGE RECTIFIER

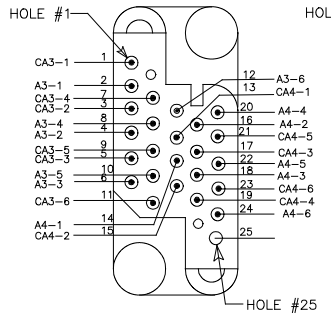
LIMIT SWITCH CHART

X = ACTUATED	ATS LOCATION				ATS MODE		BYPASS MODE		
	AUTO	TEST	ISO	REMOVE	NORM.	EMERG.	NORM.	EMERG.	OPEN
AA	X								
AT		X							
AI			X	X					
ALL	X	X	X	X					
TSE	X	X	X						
AE			X	X					
NA					X				
EA						X			
AB4							X		
AB3								X	
BLL							X	X	X
PLS	ACTIVATED WHEN ALH IS OPERATED								

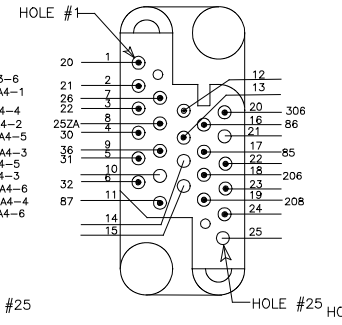
ATS TEST PLUGS (TP)

LOOKING AT PINS

TP1 ON ATS

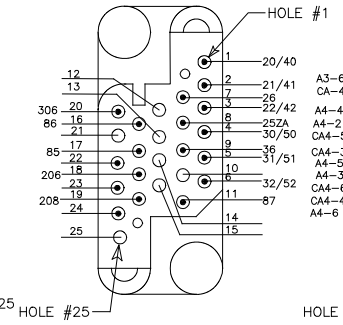


TP2 ON ATS

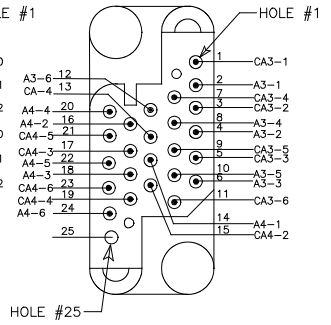


LOOKING AT SOCKETS

TP2 ON BY–PASS



TP1 ON BY–PASS



MODEL ZCM–5
150–400A
2, 3 & 4 POLE

FOR SCHEMATIC DIAGRAM SEE GM29621
FOR INTERCONNECTION DIAGRAM SEE GM29623

UNLESS OTHERWISE SPECIFIED –
1) DIMENSIONS ARE IN INCHES
2) TOLERANCES ARE:
.XXX± .010 ANGLES ± 1/2°
.XX ± .030 SURFACE FINISH
.X ± .060 MAX.
FRACTIONS ±

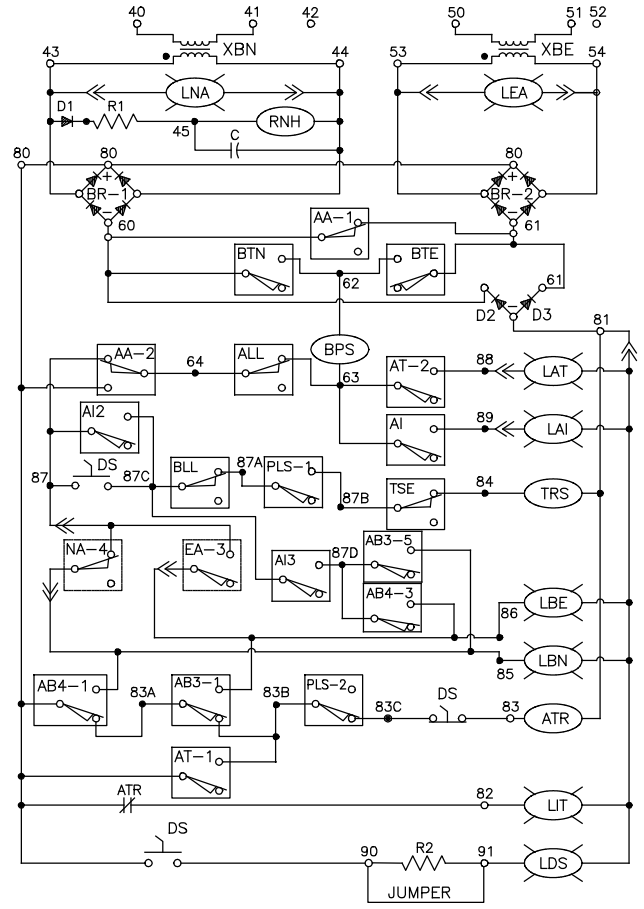
APPROVALS	DATE
DRAWN AJH	9–12–03
CHECKED WSD	10–20–03
APPROVED AJH	10–20–03

KOHLER CO.
GENERATOR DIVISION, KOHLER, WI 53044 U.S.A.

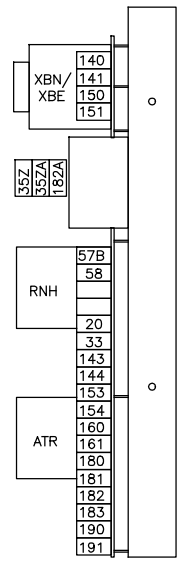
TITLE: SCHEMATIC DIAGRAM

SCALE	CAD NO.	SHEET
NONE	GM29622.DWG	1–1
PLOTTED	DWG. NO.	
	GM29622	E G

Bypass Schematic, Model ZCM-5 (before rectifier change), 150-400 Amps, 2, 3, and 4, poles, GM29622



BYPASS SUBPANEL



REV	DATE	REVISION	BY	MF
–	5–11–07	NEW DRAWING [81626]	CRS	
A	8–11–09	(D–4,3) D2/D3 WAS BR–3, (B–4) ADDED R2 [85028]	FCH	

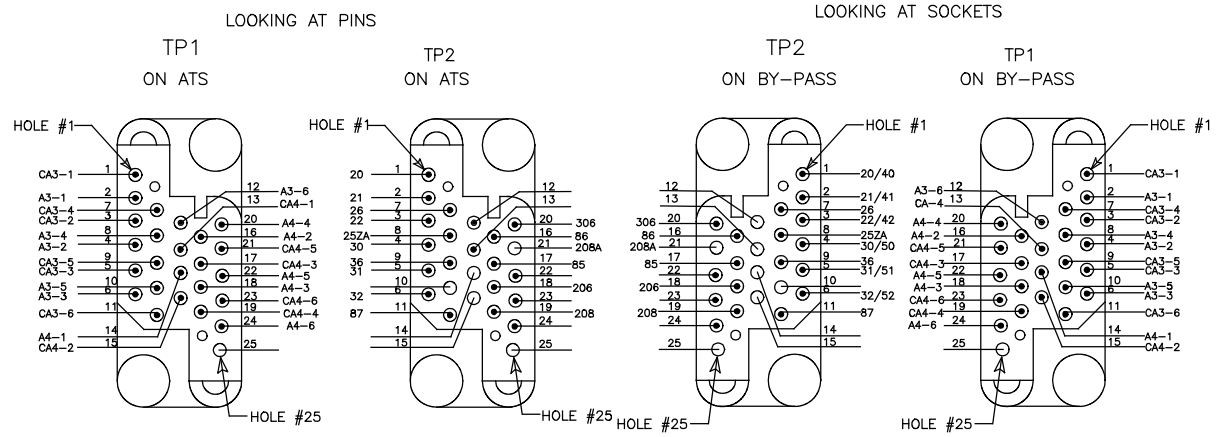
BYPASS/ISOLATION SCHEMATIC

AA–1 – LIMIT SWITCH, ATS AUTO LOCATION
BTN – LIMIT SWITCH, BYPASS TRANSFER NORMAL (MBH MOVEMENT TO NORMAL)
BTE – LIMIT SWITCH, BYPASS TRANSFER EMERG. (MBH MOVEMENT TO EMERGENCY)
BPS – BYPASS SOLENOID
AA–2 – LIMIT SWITCH, ATS AUTO LOCATION
ALL – LIMIT SWITCH, ATS LOCK LOCATION
AT–2 – LIMIT SWITCH, ATS TEST LOCATION
LAT – LIGHT, ATS TEST LOCATION
AI – LIMIT SWITCH, ATS ISOLATE LOCATION
LAI – LIGHT, ATS ISOLATE LOCATION
BLL – LIMIT SWITCH, BYPASS LOCK LOCATION
PLS–1 – PERMISSIVE LIMIT SWITCH
TSE – LIMIT SWITCH, TRANSFER SWITCH ENGAGED
TRS – SOLENOID, TRANSFER RELEASE
NA–4 – LIMIT SWITCH, ATS IN NORMAL
EA–3 – LIMIT SWITCH, ATS IN EMERGENCY
LBE – LIGHT, BYPASS EMERGENCY
LBN – LIGHT, BYPASS NORMAL
AB4–1 – LIMIT SWITCH, BYPASS NORMAL
AB3–1 – LIMIT SWITCH, BYPASS EMERGENCY
PLS–2 – PERMISSIVE LIMIT SWITCH
ATR – AUTO/TEST RELAY
AT–1 – LIMIT SWITCH, ATS TEST LOCATION

LIT – LIGHT, ATS INHIBIT
DS – ATS DISCONNECT SWITCH
LDS – LIGHT, DISCONNECT SWITCH INHIBIT POSITION
ALH – ATS LOCATION HANDLE
MBH – MANUAL BYPASS HANDLE

XBN – BYPASS NORMAL CONTROL TRANSFORMER
XBE – BYPASS EMERGENCY CONTROL TRANSFORMER
LNA – NORMAL AVAILABLE LIGHT
LEA – EMERGENCY AVAILABLE LIGHT
RNH – NORMALLY HELD RELAY
D1 – DIODE
R1 – RESISTOR, RNH
C – CAPACITOR, RNH
BR–1,2,3 – BRIDGE RECTIFIER

ATS TEST PLUGS (TP)



LIMIT SWITCH CHART

X = ACTUATED	ATS LOCATION AUTO	ATS LOCATION TEST	ATS LOCATION ISO	ATS LOCATION REMOVE	ATS MODE NORM	ATS MODE EMERG.	BYPASS MODE NORM	BYPASS MODE EMERG.	BYPASS MODE OPEN
AA	X								
AT		X							
AI			X	X					
ALL	X	X	X	X					
TSE	X	X	X						
AE			X	X					
NA					X				
EA						X			
AB4							X		
AB3								X	
BLL							X	X	X
PLS	ACTIVATED WHEN ALH IS OPERATED								

MODEL ZCM–5
150–400A
2, 3 & 4 POLE

FOR SCHEMATIC DIAGRAM SEE GM55094
FOR INTERCONNECTION DIAGRAM SEE GM55096

UNLESS OTHERWISE SPECIFIED –
1) DIMENSIONS ARE IN INCHES
2) TOLERANCES ARE:
.XXX ± .010 ANGLES ± 1/2°
.XX ± .030 SURFACE FINISH
.X ± .060 √ MAX.
FRACTIONS ±

APPROVALS	DATE
DRAWN CRS	5–11–07
CHECKED AJH	5–11–07
APPROVED AJH	5–11–07

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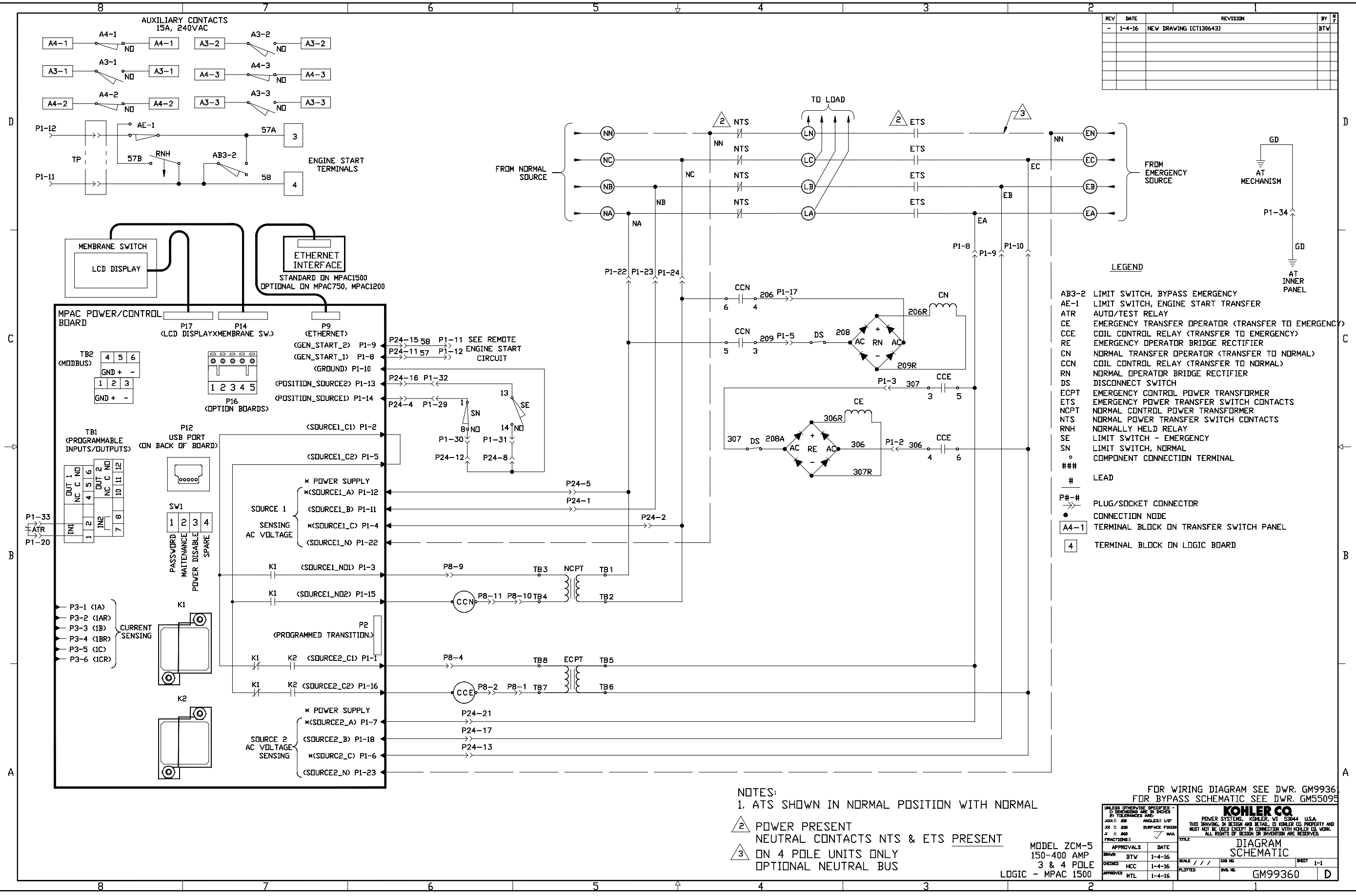
GENERATOR DIVISION, KOHLER, WI 53044 U.S.A.

TITLE: SCHEMATIC DIAGRAM

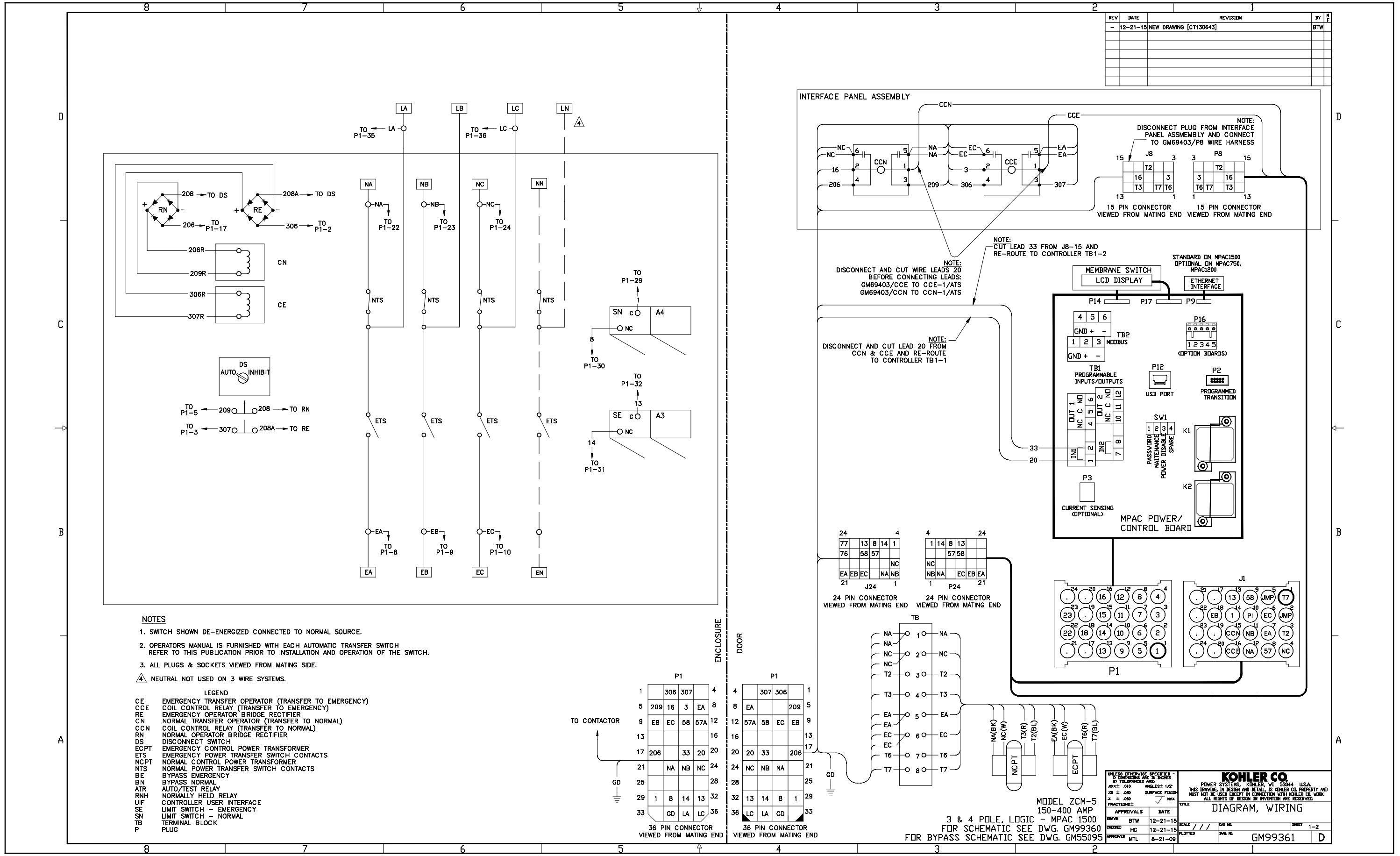
SCALE: NONE | CAD NO.: GM55095.DWG | SHEET: 1–1
PLOTTED | DWG. NO.: GM55095 | E G

Bypass Schematic, Model ZCM-5 (with new rectifiers), 150-400 Amps, 2, 3, and 4 Poles, GM55095



REV	DATE	REVISION	BY	N F
-	1-4-16	NEW DRAWING [CT1306443]	BTW	

Schematic Diagram, ZCM-5 with Decision-Maker® MPAC 1500 Controls, 150-400 Amps, GM99360 (with new rectifiers)



NOTES

1. SWITCH SHOWN DE-ENERGIZED CONNECTED TO NORMAL SOURCE.
2. OPERATORS MANUAL IS FURNISHED WITH EACH AUTOMATIC TRANSFER SWITCH REFER TO THIS PUBLICATION PRIOR TO INSTALLATION AND OPERATION OF THE SWITCH.
3. ALL PLUGS & SOCKETS VIEWED FROM MATING SIDE.
4. NEUTRAL NOT USED ON 3 WIRE SYSTEMS.

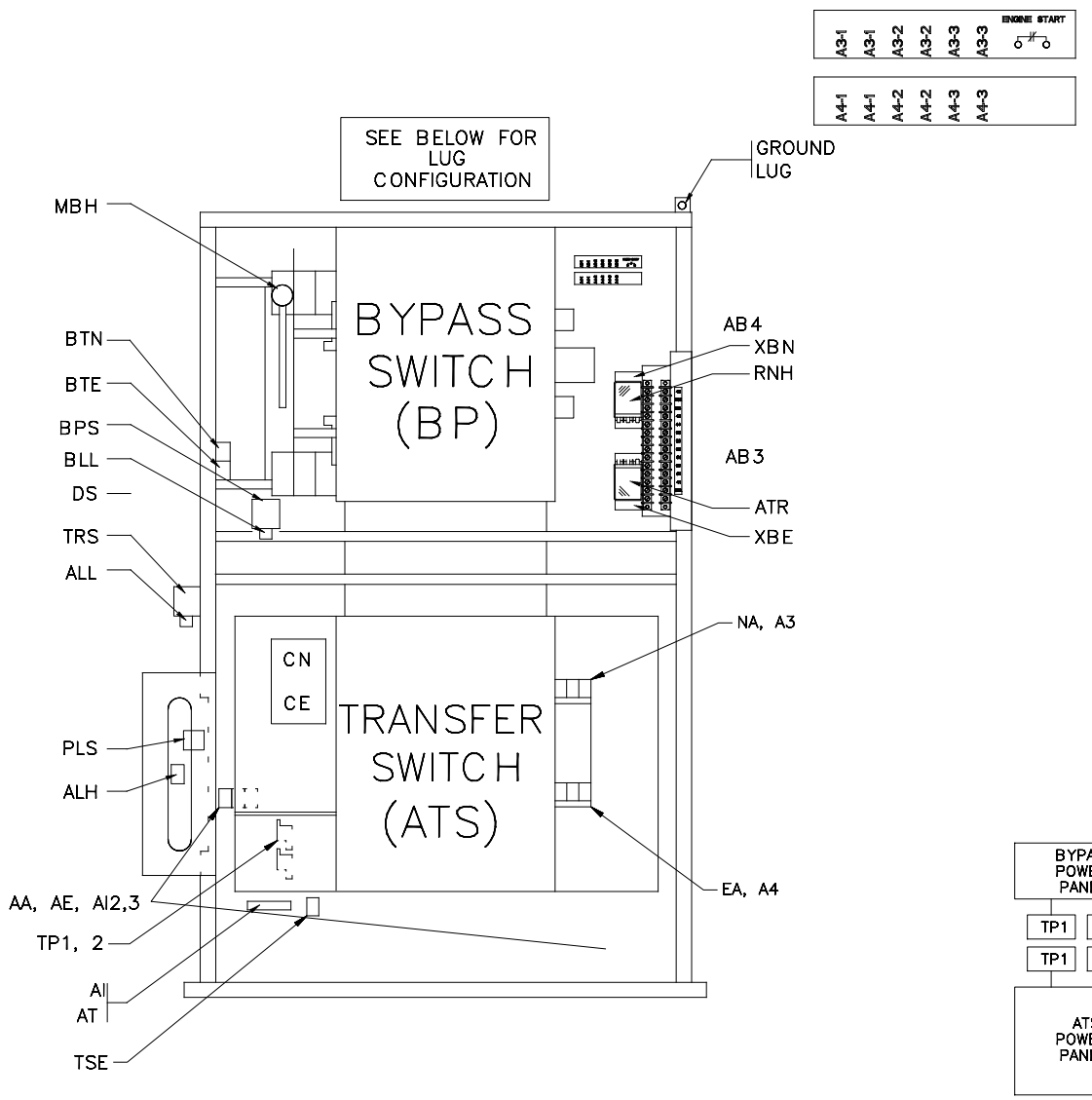
LEGEND

CE	EMERGENCY TRANSFER OPERATOR (TRANSFER TO EMERGENCY)
CCE	COIL CONTROL RELAY (TRANSFER TO EMERGENCY)
RE	EMERGENCY OPERATOR BRIDGE RECTIFIER
CN	NORMAL TRANSFER OPERATOR (TRANSFER TO NORMAL)
CCN	COIL CONTROL RELAY (TRANSFER TO NORMAL)
RN	NORMAL OPERATOR BRIDGE RECTIFIER
DS	DISCONNECT SWITCH
ECPT	EMERGENCY CONTROL POWER TRANSFORMER
ETS	EMERGENCY POWER TRANSFER SWITCH CONTACTS
NCPT	NORMAL CONTROL POWER TRANSFORMER
NTS	NORMAL POWER TRANSFER SWITCH CONTACTS
BE	BYPASS EMERGENCY
BN	BYPASS NORMAL
ATR	AUTO/TEST RELAY
RNH	NORMALLY HELD RELAY
UIF	CONTROLLER USER INTERFACE
SE	LIMIT SWITCH – EMERGENCY
SN	LIMIT SWITCH – NORMAL
TB	TERMINAL BLOCK
P	PLUG

Wiring Diagram, ZCM-5 with Decision-Maker® MPAC 1500 Controls, 150-400 Amps, GM99361 Sheet 1 (with new rectifiers)

REV	DATE	REVISION	BY	N F
–	12-21-15	NEW DRAWING [CT130643]	BTW	

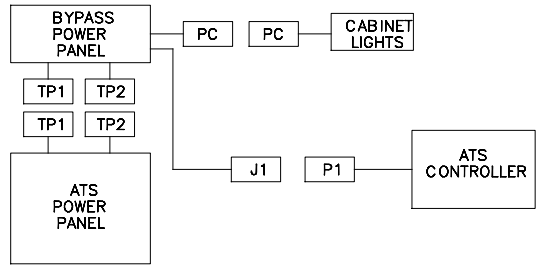
BYPASS/ISOLATION TRANSFER SWITCH



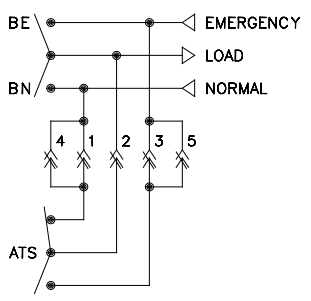
WIRE NUMBERING CHART

LIMIT SWITCHES	C	NC	NO
AA–1	60		61
AA–2	64	80	87
AB3–1	83A	83B	86
AB3–2	E12		E11
AB3–3	E12A	12A	
AB3–4	ABE		ABE
AB3–5	87D		85
AB4–1	80	83A	85
AB4–2	ABN		ABN
AB4–3	87D		86
AE–1	E11	11	11R
AE–2	E13	13	13R
AI	63		89
AI2	87		87C
AI3	87C		87D
ALL	64		63
AT–1	80		83B
AT–2	63		88
BLL	87C		87A
BTE	61		62
BTN	60		62
EA–3	86		87
NA–4	85		87
PLS–1	87A		87B
PLS–2	83B	83C	
TSE	87B		84

INTERCONNECTION PLUG DIAGRAM

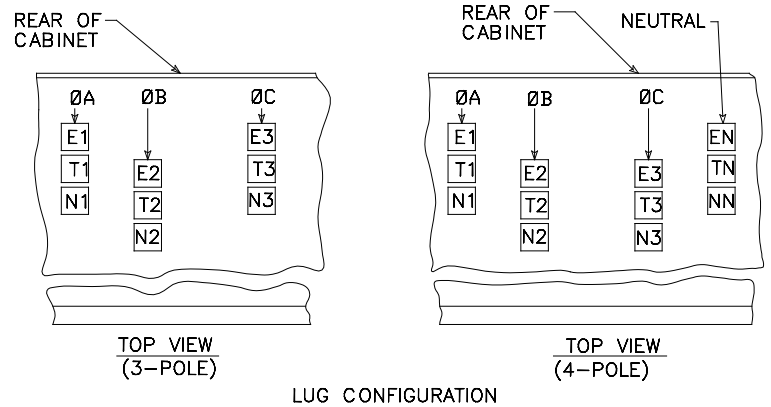


BYPASS/ISOLATION DIAGRAM



ATS LOCATION	LOAD CARRYING CONTACTS			ATS TEST PLUG (TP)	
	1	2	3	4	5
AUTO	X	X	X	X	X
TEST	O	O	O	X	X
ISOLATE	O	O	O	O	O

X = CLOSED
O = OPEN



LUG CONFIGURATION

NOTE:
ATS SHOWN IN NORMAL POSITION WITH NO POWER AVAILABLE.

MODEL ZCM-5
150-400 AMP
3 & 4 POLE, LOGIC – MPAC 1500
FOR SCHEMATIC SEE DWG. GM99360
FOR BYPASS SCHEMATIC SEE DWG. GM55095

UNLESS OTHERWISE SPECIFIED – DIMENSIONS ARE IN INCHES – TOLERANCES ARE: .XXX± .010 ANGLES± 1/2° .XX ± .030 SURFACE FINISH ± .060 MAX. FRACTIONS±

APPROVALS	DATE
DRAWN BTW	12-21-15
CHECKED MC	12-21-15
APPROVED MTL	12-21-15

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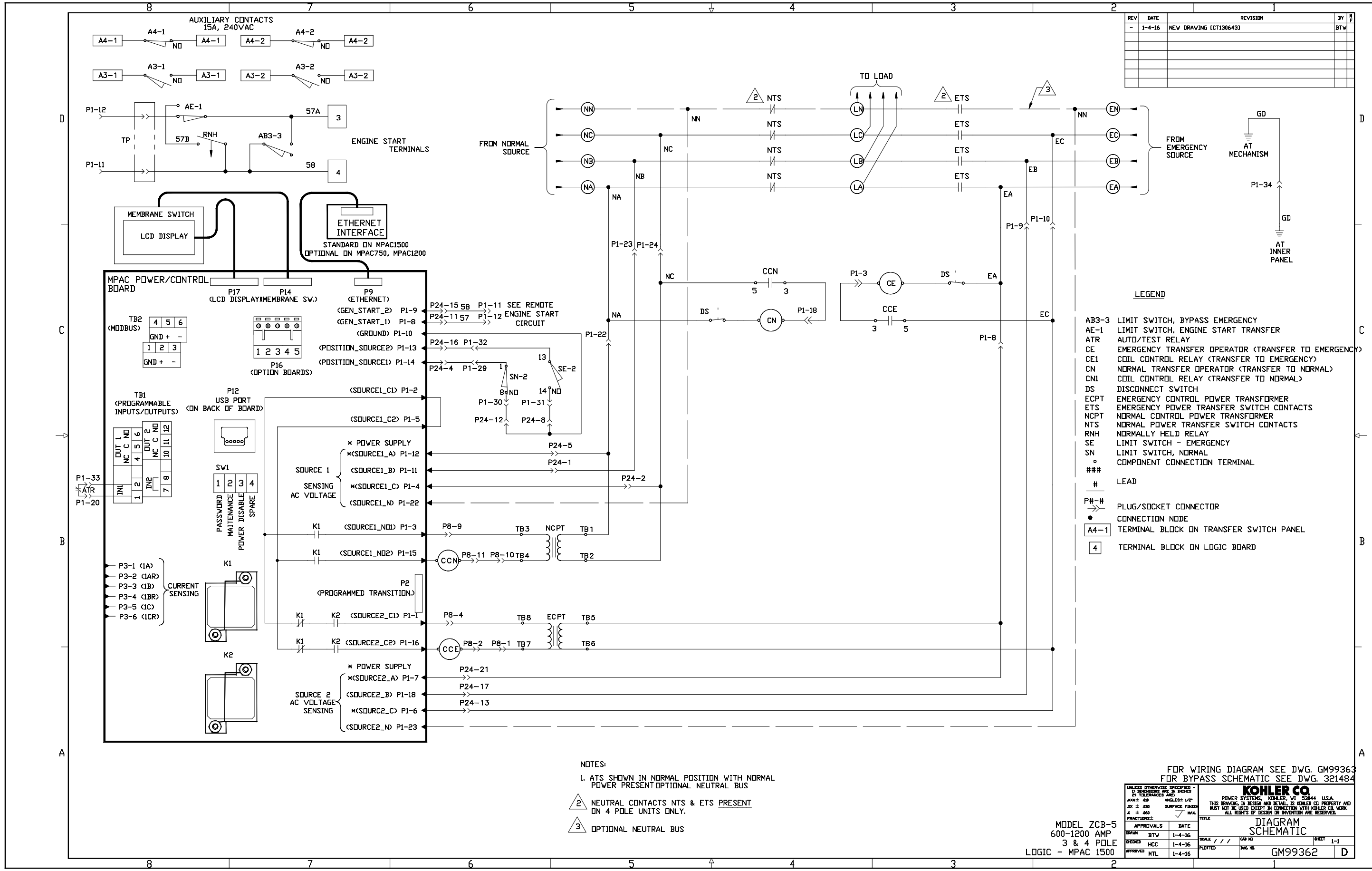
POWER SYSTEMS, KOHLER, WI 53044 U.S.A.

TITLE: DIAGRAM, WIRING

SCALE: / / / CAD NO. SHEET 2–2
PLOTTED DWG. NO. GM99361 D

Wiring Diagram, ZCM-5 with Decision-Maker® MPAC 1500 Controls, 150-400 Amps, GM99361 Sheet 2 (with new rectifiers)



REV	DATE	REVISION	BY	N F
-	1-4-16	NEW DRAWING (CT1306443)	BTW	

LEGEND

AB3-3	LIMIT SWITCH, BYPASS EMERGENCY
AE-1	LIMIT SWITCH, ENGINE START TRANSFER
ATR	AUTO/TEST RELAY
CE	EMERGENCY TRANSFER OPERATOR (TRANSFER TO EMERGENCY)
CE1	COIL CONTROL RELAY (TRANSFER TO EMERGENCY)
CN	NORMAL TRANSFER OPERATOR (TRANSFER TO NORMAL)
CN1	COIL CONTROL RELAY (TRANSFER TO NORMAL)
DS	DISCONNECT SWITCH
ECPT	EMERGENCY CONTROL POWER TRANSFORMER
ETS	EMERGENCY POWER TRANSFER SWITCH CONTACTS
NCPT	NORMAL CONTROL POWER TRANSFORMER
NTS	NORMAL POWER TRANSFER SWITCH CONTACTS
RNH	NORMALLY HELD RELAY
SE	LIMIT SWITCH - EMERGENCY
SN	LIMIT SWITCH, NORMAL
°	COMPONENT CONNECTION TERMINAL
###	
#	LEAD
P#-#	PLUG/SOCKET CONNECTOR
•	CONNECTION NODE
A4-1	TERMINAL BLOCK ON TRANSFER SWITCH PANEL
4	TERMINAL BLOCK ON LOGIC BOARD

NOTES:

1. ATS SHOWN IN NORMAL POSITION WITH NORMAL POWER PRESENT OPTIONAL NEUTRAL BUS

2 NEUTRAL CONTACTS NTS & ETS PRESENT ON 4 POLE UNITS ONLY.

3 OPTIONAL NEUTRAL BUS

FOR WIRING DIAGRAM SEE DWG. GM99363
FOR BYPASS SCHEMATIC SEE DWG. 321484

MODEL ZCB-5
600-1200 AMP
3 & 4 POLE
LOGIC - MPAC 1500

UNLESS OTHERWISE SPECIFIED - DIMENSIONS ARE IN INCHES - TOLERANCES ARE: .XXX ± .010 ANGLES ± 1/2° .XX ± .030 SURFACE FINISH .X ± .060 MAX. FRACTIONS ±

APPROVALS	DATE
DRAWN BTW	1-4-16
CHECKED HCC	1-4-16
APPROVED MTL	1-4-16

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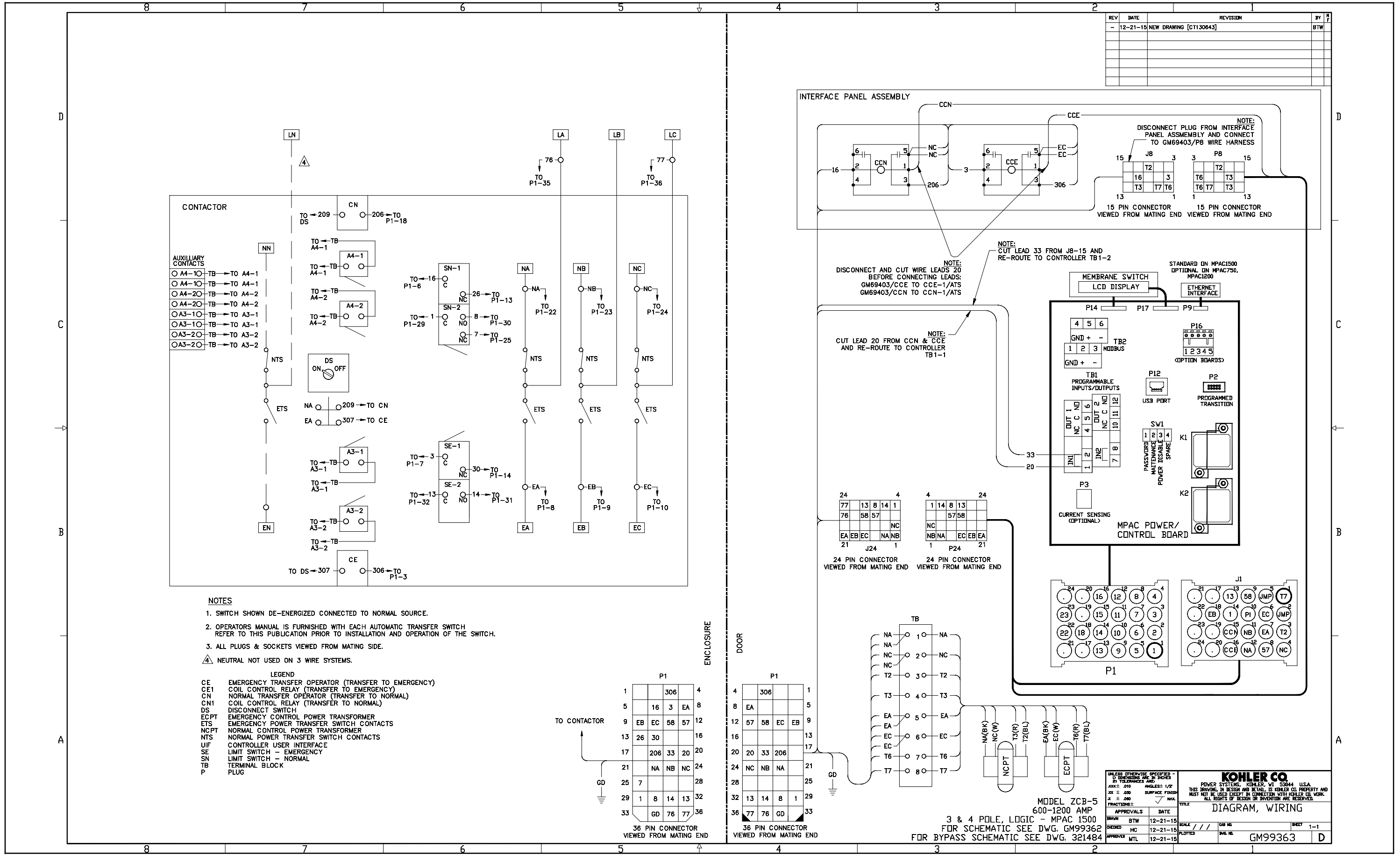
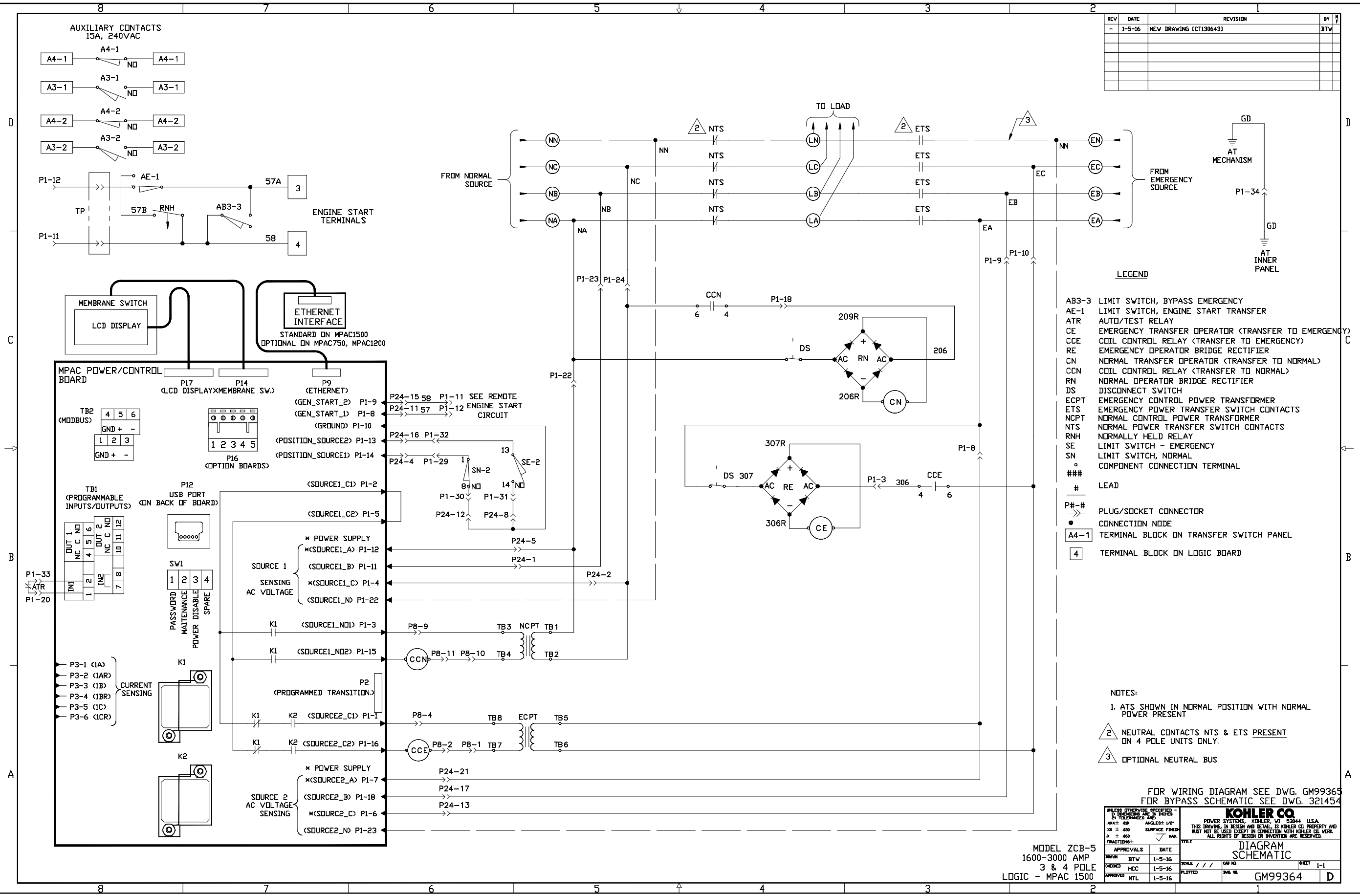
TITLE: DIAGRAM SCHEMATIC

SCALE: / / / CAD NO. SHEET 1-1
PLOTTED DWG. NO. GM99362 D

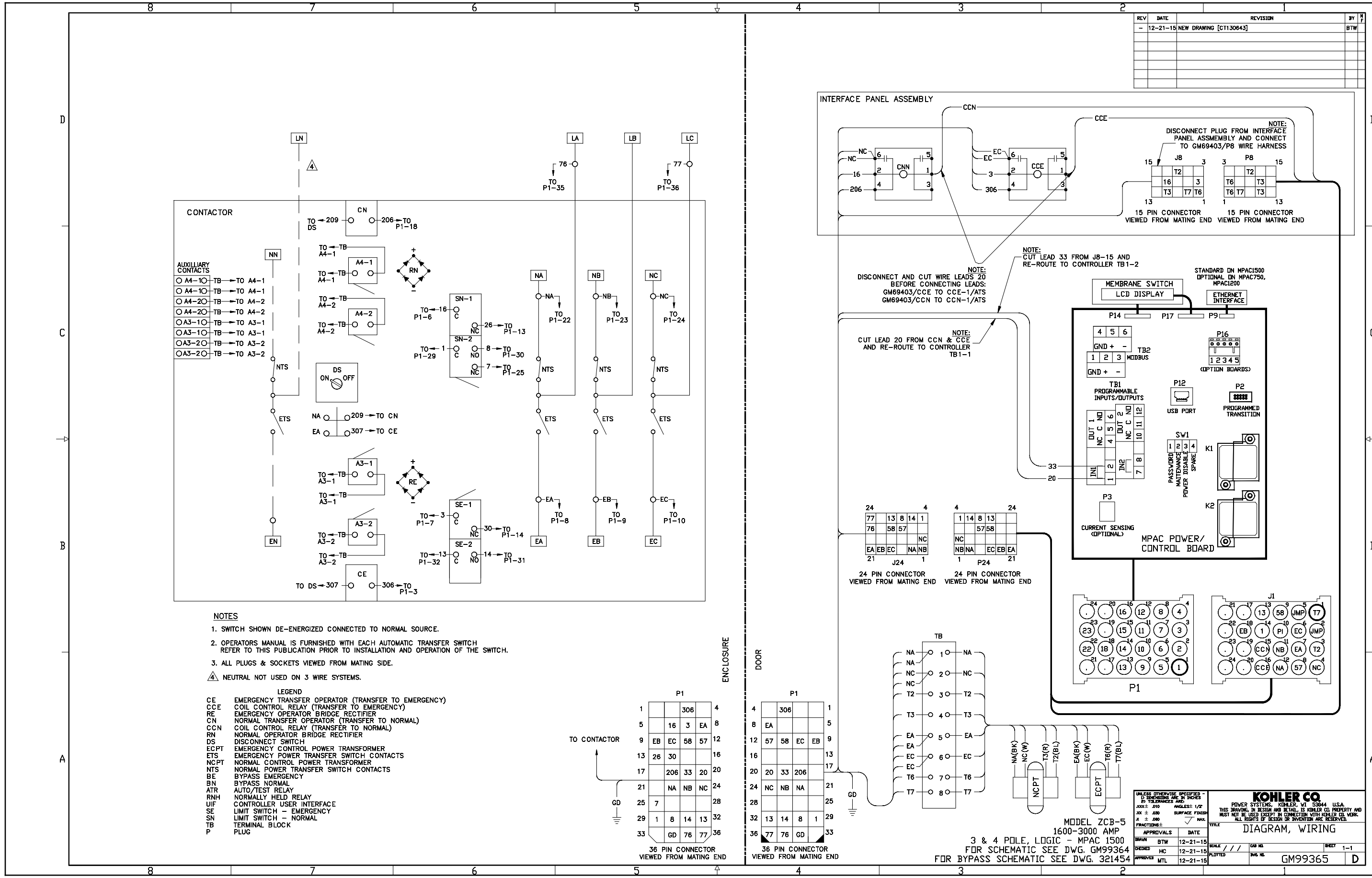
Schematic Diagram, ZCB-5 with Decision-Maker® MPAC 1500 Controls, 600-1200 Amps, 3 and 4 Poles, GM99362



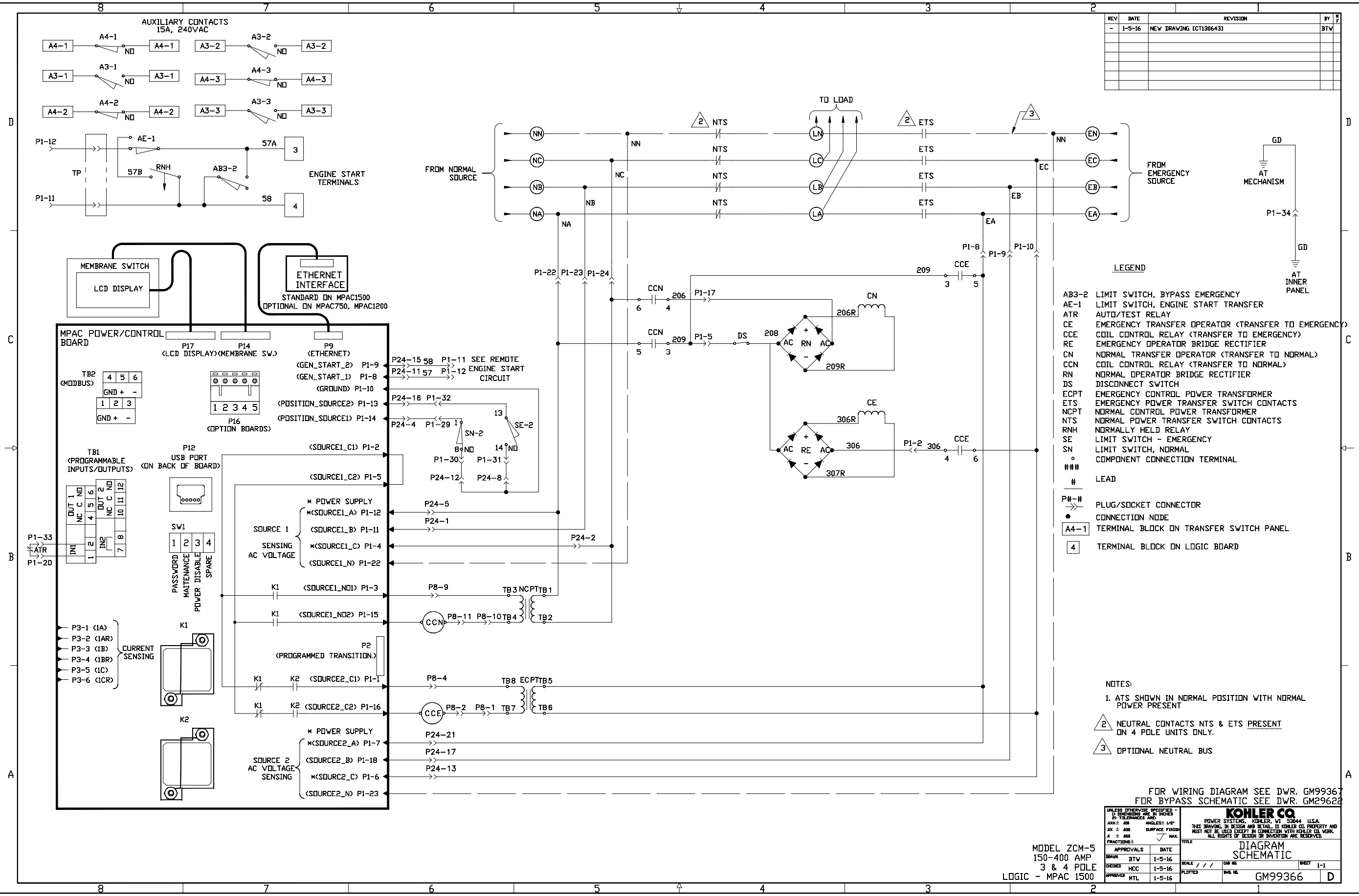
Wiring Diagram, ZCB-5 with Decision-Maker® MPAC 1500 Controls, 600-1200 Amps, 3 and 4 Poles, GM99363



Schematic Diagram, ZCB-5 with Decision-Maker® MPAC 1500 Controls, 1600-4000 Amps, 3 and 4 Poles, GM99364

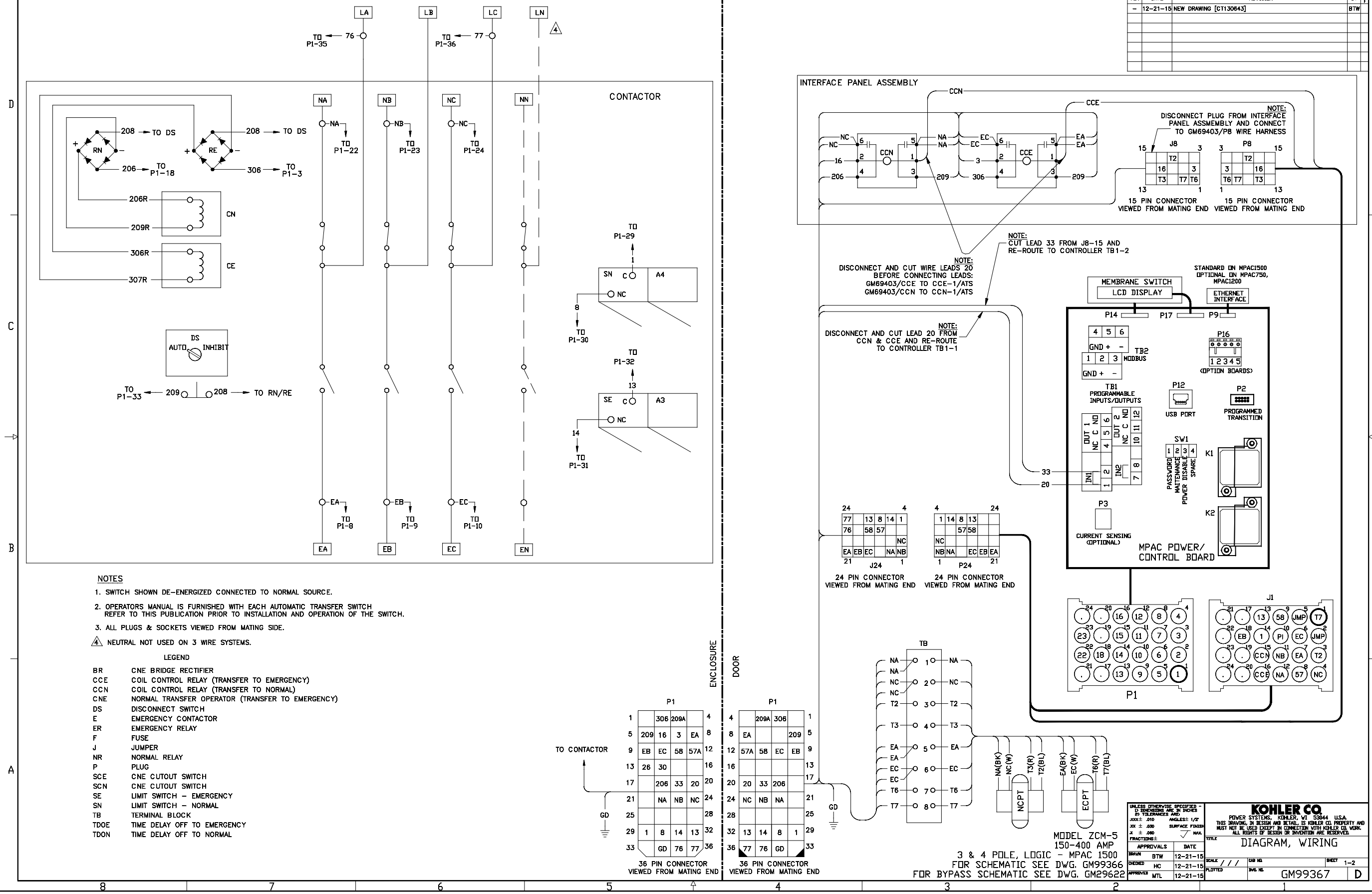


Wiring Diagram, ZCB-5 with Decision-Maker® MPAC 1500 Controls, 1600-4000 Amps, 3 and 4 Poles, GM99365



REV	DATE	REVISION	BY	N F
-	1-5-16	NEW DRAWING (CT1306433)	BTW	

Schematic Diagram, ZCB-5 with Decision-Maker® MPAC 1500 Controls, 150-400 Amps, 3, and 4 Poles, GM99366



NOTES

1. SWITCH SHOWN DE-ENERGIZED CONNECTED TO NORMAL SOURCE.
2. OPERATORS MANUAL IS FURNISHED WITH EACH AUTOMATIC TRANSFER SWITCH REFER TO THIS PUBLICATION PRIOR TO INSTALLATION AND OPERATION OF THE SWITCH.
3. ALL PLUGS & SOCKETS VIEWED FROM MATING SIDE.
4. NEUTRAL NOT USED ON 3 WIRE SYSTEMS.

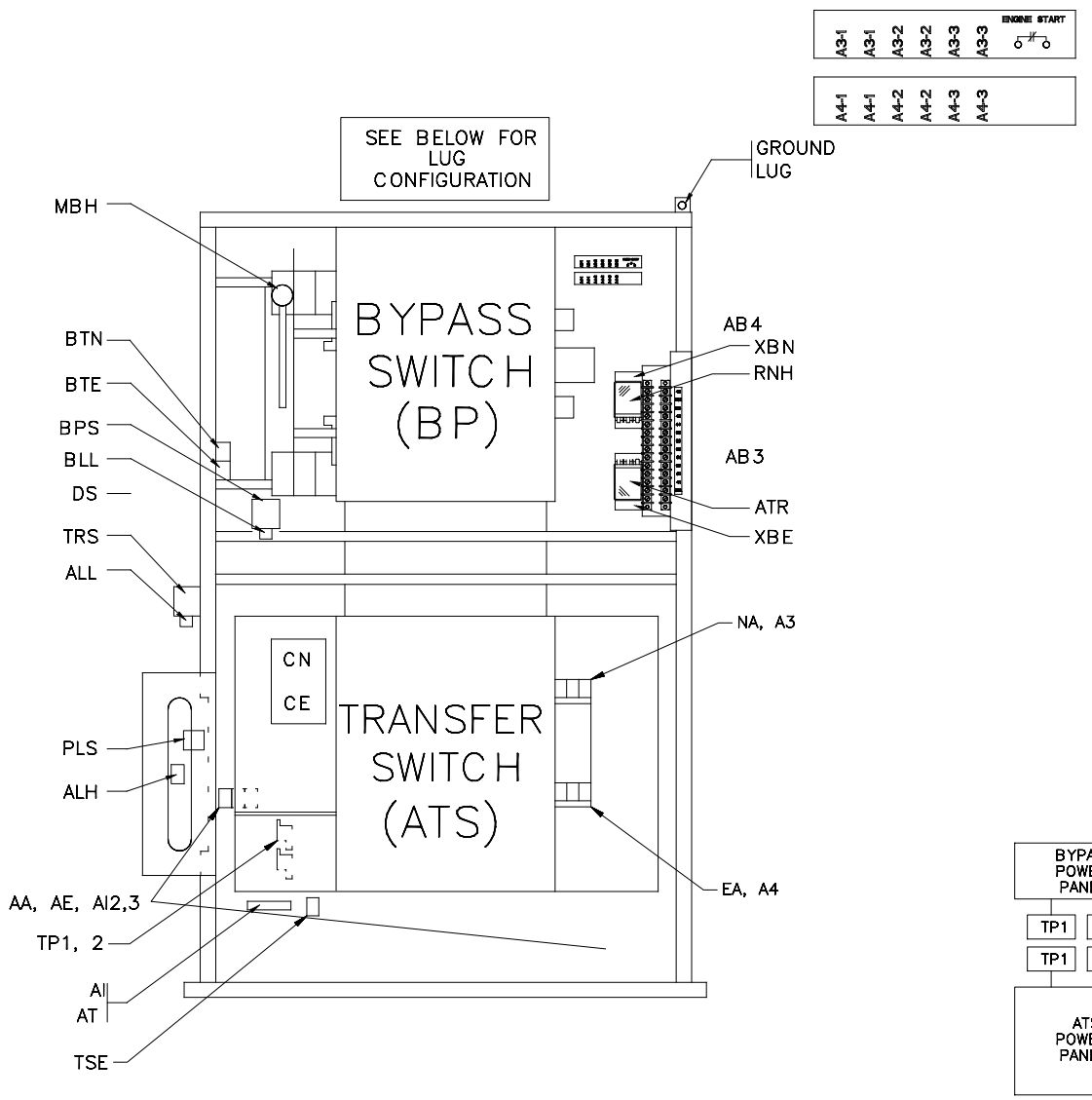
LEGEND

BR	CNE BRIDGE RECTIFIER
CCE	COIL CONTROL RELAY (TRANSFER TO EMERGENCY)
CCN	COIL CONTROL RELAY (TRANSFER TO NORMAL)
CNE	NORMAL TRANSFER OPERATOR (TRANSFER TO EMERGENCY)
DS	DISCONNECT SWITCH
E	EMERGENCY CONTACTOR
ER	EMERGENCY RELAY
F	FUSE
J	JUMPER
NR	NORMAL RELAY
P	PLUG
SCE	CNE CUTOUT SWITCH
SCN	CNE CUTOUT SWITCH
SE	LIMIT SWITCH – EMERGENCY
SN	LIMIT SWITCH – NORMAL
TB	TERMINAL BLOCK
TDOE	TIME DELAY OFF TO EMERGENCY
TDON	TIME DELAY OFF TO NORMAL

Wiring Diagram, ZCB-5 with Decision-Maker® MPAC 1500 Controls, 150-400 Amps, 2, 3, and 4 Poles, GM99367 Sheet 1

REV	DATE	REVISION	BY	N F
–	12-21-15	NEW DRAWING [CT130643]	BTW	

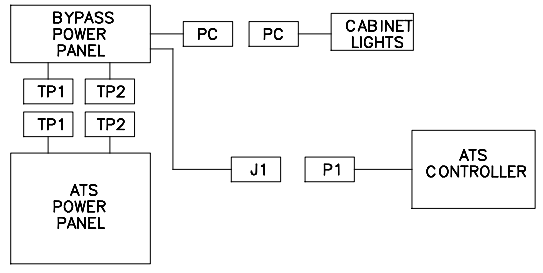
BYPASS/ISOLATION TRANSFER SWITCH



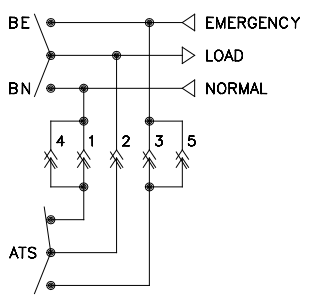
WIRE NUMBERING CHART

LIMIT SWITCHES	C	NC	NO
AA–1	60		61
AA–2	64	80	87
AB3–1	83A	83B	86
AB3–2	E12		E11
AB3–3	E12A	12A	
AB3–4	ABE		ABE
AB3–5	87D		85
AB4–1	80	83A	85
AB4–2	ABN		ABN
AB4–3	87D		86
AE–1	E11	11	11R
AE–2	E13	13	13R
AI	63		89
AI2	87		87C
AI3	87C		87D
ALL	64		63
AT–1	80		83B
AT–2	63		88
BLL	87C		87A
BTE	61		62
BTN	60		62
EA–3	86		87
NA–4	85		87
PLS–1	87A		87B
PLS–2	83B	83C	
TSE	87B		84

INTERCONNECTION PLUG DIAGRAM

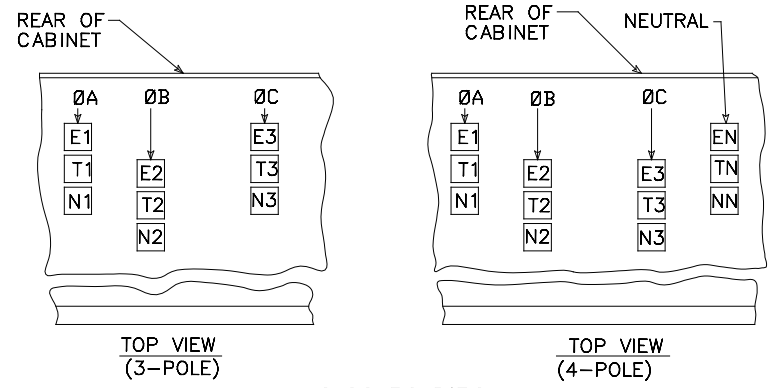


BYPASS/ISOLATION DIAGRAM



ATS LOCATION	LOAD CARRYING CONTACTS			ATS TEST PLUG (TP)	
	1	2	3	4	5
AUTO	X	X	X	X	X
TEST	O	O	O	X	X
ISOLATE	O	O	O	O	O

X = CLOSED
O = OPEN



LUG CONFIGURATION

NOTE:
ATS SHOWN IN NORMAL POSITION WITH NO POWER AVAILABLE.

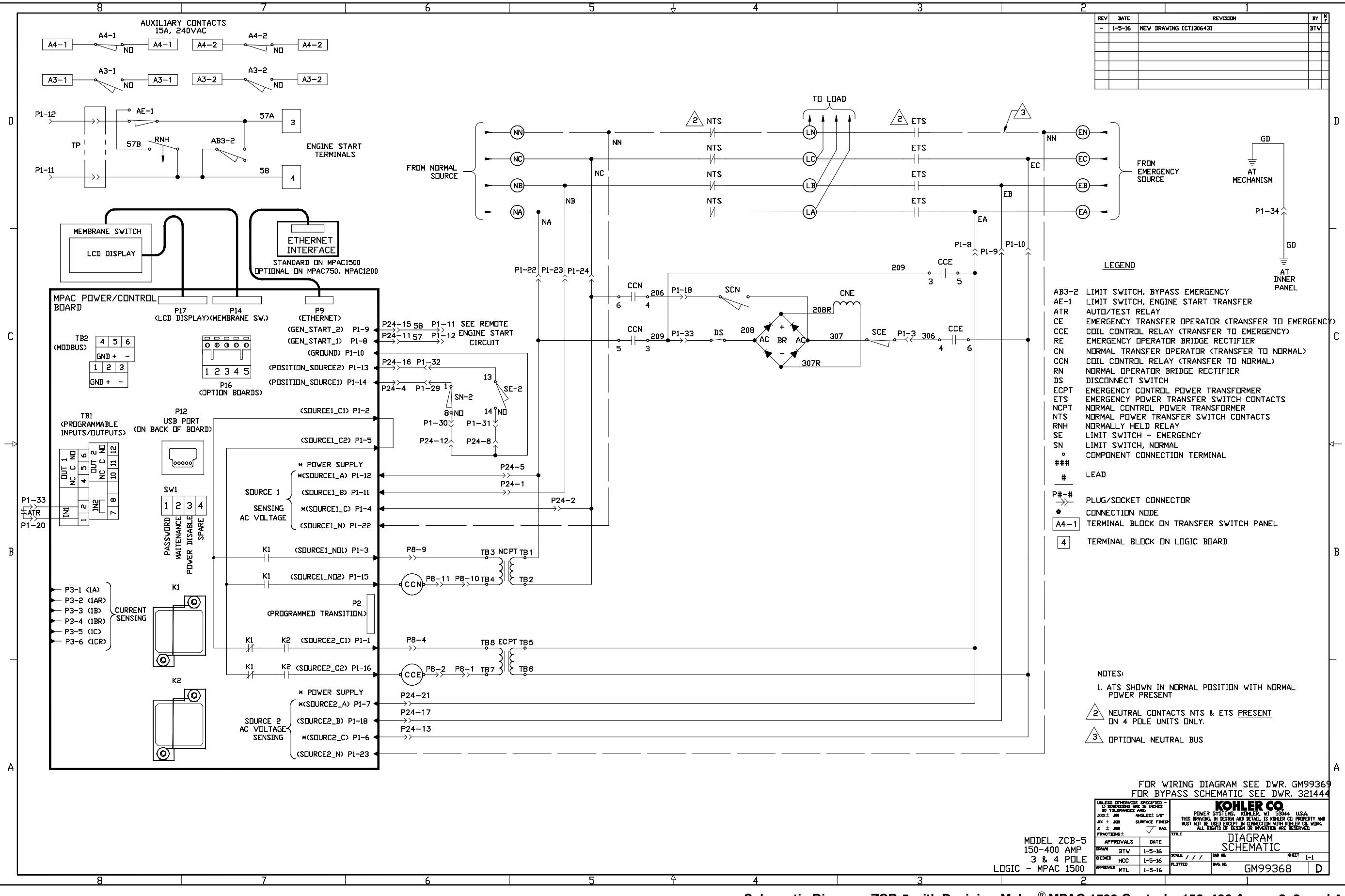
MODEL ZCM-5
150-400 AMP
3 & 4 POLE, LOGIC – MPAC 1500
FOR SCHEMATIC SEE DWG. GM99366
FOR BYPASS SCHEMATIC SEE DWG. GM29622

UNLESS OTHERWISE SPECIFIED – DIMENSIONS ARE IN INCHES – TOLERANCES ARE: .XXX± .010 ANGLES± 1/2° .XX ± .030 SURFACE FINISH .X ± .060 √ MAX. FRACTIONS±

APPROVALS	DATE
DRAWN BTW	12-21-15
CHECKED HC	12-21-15
APPROVED MTL	12-21-15

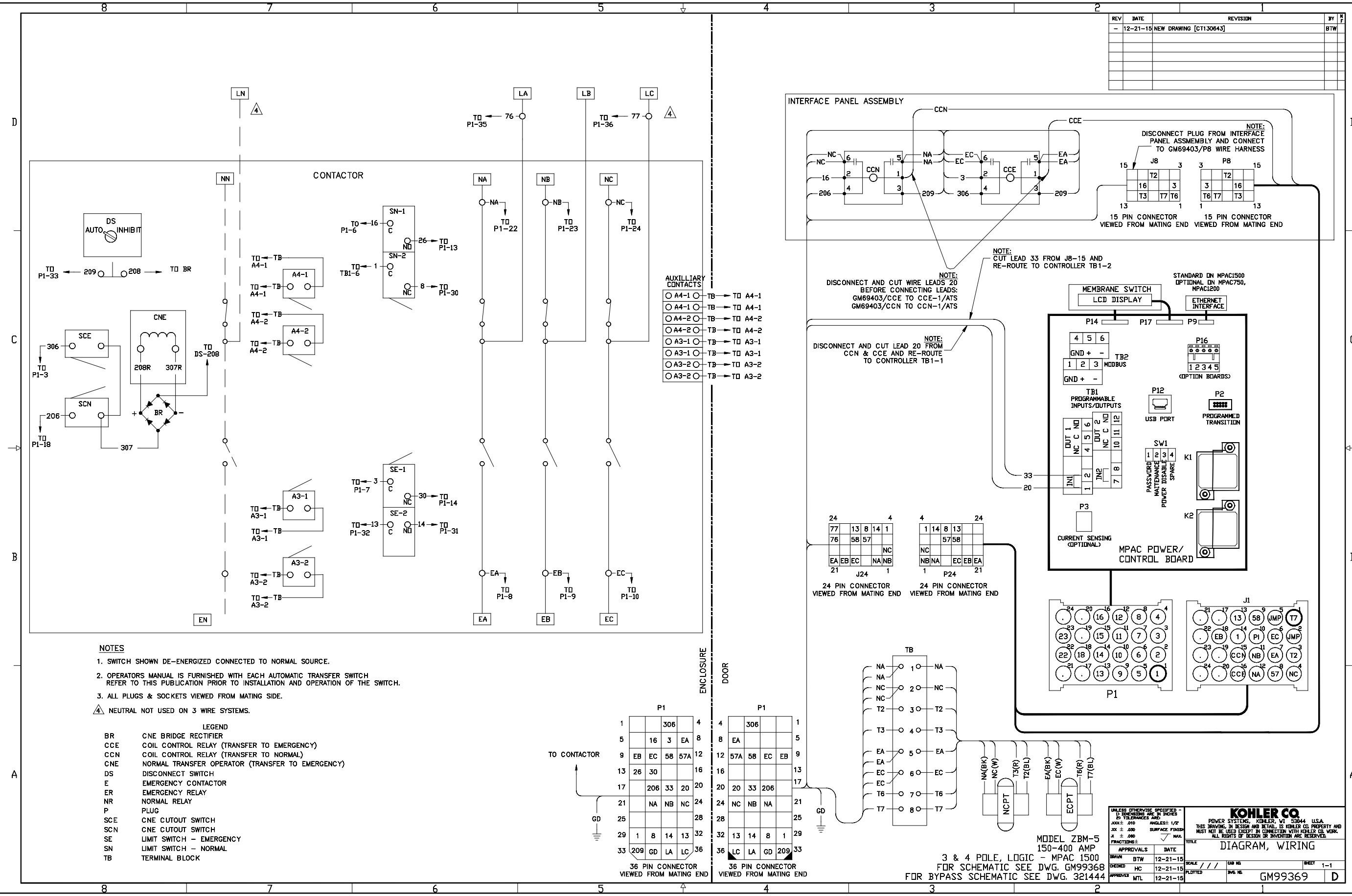
TITLE: DIAGRAM, WIRING
SCALE: / / / CAD NO. SHEET 2-2
PLOTTED DWG. NO. GM99367 D

Wiring Diagram, ZCB-5 with Decision-Maker® MPAC 1500 Controls, 150-400 Amps, 2, 3, and 4 Poles, GM99367 Sheet 2



REV	DATE	REVISION	BY	N F
-	1-5-16	NEW DRAWING (CT1306433)	BTW	

Schematic Diagram, ZCB-5 with Decision-Maker® MPAC 1500 Controls, 150-400 Amps, 2, 3, and 4 Poles, GM99368



Wiring Diagram, ZCB-5 with MPAC™ 1500 Controls, 150-400 Amps, 2, 3, and 4 Poles, GM99369

Appendix A Abbreviations

The following list contains abbreviations that may appear in this publication.

A, amp	ampere
ABDC	after bottom dead center
AC	alternating current
A/D	analog to digital
ADC	advanced digital control; analog to digital converter
adj.	adjust, adjustment
ADV	advertising dimensional drawing
Ah	amp-hour
AHWT	anticipatory high water temperature
AISI	American Iron and Steel Institute
ALOP	anticipatory low oil pressure
alt.	alternator
Al	aluminum
ANSI	American National Standards Institute (formerly American Standards Association, ASA)
AO	anticipatory only
APDC	Air Pollution Control District
API	American Petroleum Institute
approx.	approximate, approximately
AQMD	Air Quality Management District
AR	as required, as requested
AS	as supplied, as stated, as suggested
ASE	American Society of Engineers
ASME	American Society of Mechanical Engineers
assy.	assembly
ASTM	American Society for Testing Materials
ATDC	after top dead center
ATS	automatic transfer switch
auto.	automatic
aux.	auxiliary
avg.	average
AVR	automatic voltage regulator
AWG	American Wire Gauge
AWM	appliance wiring material
bat.	battery
BBDC	before bottom dead center
BC	battery charger, battery charging
BCA	battery charging alternator
BCI	Battery Council International
BDC	before dead center
BHP	brake horsepower
blk.	black (paint color), block (engine)
blk. htr.	block heater
BMEP	brake mean effective pressure
bps	bits per second
br.	brass
BTDC	before top dead center
Btu	British thermal unit
Btu/min.	British thermal units per minute
C	Celsius, centigrade
cal.	calorie
CAN	controller area network
CARB	California Air Resources Board
CB	circuit breaker
cc	cubic centimeter
CCA	cold cranking amps
ccw.	counterclockwise
CEC	Canadian Electrical Code
cert.	certificate, certification, certified
cfh	cubic feet per hour
cfm	cubic feet per minute
CG	center of gravity
CID	cubic inch displacement
CL	centerline
cm	centimeter
CMOS	complementary metal oxide substrate (semiconductor)
cogen.	cogeneration
com	communications (port)
coml	commercial
Coml/Rec	Commercial/Recreational
conn.	connection
cont.	continued
CPVC	chlorinated polyvinyl chloride
crit.	critical
CRT	cathode ray tube
CSA	Canadian Standards Association
CT	current transformer
Cu	copper
cUL	Canadian Underwriter's Laboratories
CUL	Canadian Underwriter's Laboratories
cu. in.	cubic inch
cw.	clockwise
CWC	city water-cooled
cyl.	cylinder
D/A	digital to analog
DAC	digital to analog converter
dB	decibel
dB(A)	decibel (A weighted)
DC	direct current
DCR	direct current resistance
deg., °	degree
dept.	department
DFMEA	Design Failure Mode and Effects Analysis
dia.	diameter
DI/EO	dual inlet/end outlet
DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)
DIP	dual inline package
DPDT	double-pole, double-throw
DPST	double-pole, single-throw
DS	disconnect switch
DVR	digital voltage regulator
E, emer.	emergency (power source)
ECM	electronic control module, engine control module
EDI	electronic data interchange
EFR	emergency frequency relay
e.g.	for example (*exempli gratia)*
EG	electronic governor
EGSA	Electrical Generating Systems Association
EIA	Electronic Industries Association
EI/EO	end inlet/end outlet
EMI	electromagnetic interference
emiss.	emission
eng.	engine
EPA	Environmental Protection Agency
EPS	emergency power system
ER	emergency relay
ES	engineering special, engineered special
ESD	electrostatic discharge
est.	estimated
E-Stop	emergency stop
etc.	et cetera (and so forth)
exh.	exhaust
ext.	external
F	Fahrenheit, female
fglass.	fiberglass
FHM	flat head machine (screw)
fl. oz.	fluid ounce
flex.	flexible
freq.	frequency
FS	full scale
ft.	foot, feet
ft. lb.	foot pounds (torque)
ft./min.	feet per minute
ftp	file transfer protocol
g	gram
ga.	gauge (meters, wire size)
gal.	gallon
gen.	generator
genset	generator set
GFI	ground fault interrupter
GND, ⏚	ground
gov.	governor
gph	gallons per hour
gpm	gallons per minute
gr.	grade, gross
GRD	equipment ground
gr. wt.	gross weight
H x W x D	height by width by depth
HC	hex cap
HCHT	high cylinder head temperature
HD	heavy duty
HET	high exhaust temp., high engine temp.
hex	hexagon
Hg	mercury (element)
HH	hex head
HHC	hex head cap
HP	horsepower
hr.	hour
HS	heat shrink
hsg.	housing
HVAC	heating, ventilation, and air conditioning
HWT	high water temperature
Hz	hertz (cycles per second)
IC	integrated circuit
ID	inside diameter, identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMS	improved motor starting
in.	inch
in. H_2O	inches of water
in. Hg	inches of mercury
in. lb.	inch pounds
Inc.	incorporated
ind.	industrial
int.	internal
int./ext.	internal/external
I/O	input/output
IP	iron pipe
ISO	International Organization for Standardization
J	joule
JIS	Japanese Industry Standard

k	kilo (1000)
K	kelvin
kA	kiloampere
KB	kilobyte (2^{10} bytes)
KBus	Kohler communication protocol
kg	kilogram
kg/cm^2	kilograms per square centimeter
kgm	kilogram-meter
kg/m^3	kilograms per cubic meter
kHz	kilohertz
kJ	kilojoule
km	kilometer
kOhm, kΩ	kilo-ohm
kPa	kilopascal
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt ampere
kVAR	kilovolt ampere reactive
kW	kilowatt
kWh	kilowatt-hour
kWm	kilowatt mechanical
kWth	kilowatt-thermal
L	liter
LAN	local area network
L x W x H	length by width by height
lb.	pound, pounds
lbm/ft^3	pounds mass per cubic feet
LCB	line circuit breaker
LCD	liquid crystal display
ld. shd.	load shed
LED	light emitting diode
Lph	liters per hour
Lpm	liters per minute
LOP	low oil pressure
LP	liquefied petroleum
LPG	liquefied petroleum gas
LS	left side
L_{wa}	sound power level, A weighted
LWL	low water level
LWT	low water temperature
m	meter, milli (1/1000)
M	mega (10^6 when used with SI units), male
m^3	cubic meter
m^3/hr.	cubic meters per hour
m^3/min.	cubic meters per minute
mA	milliampere
man.	manual
max.	maximum
MB	megabyte (2^{20} bytes)
MCCB	molded-case circuit breaker
MCM	one thousand circular mils
meggar	megohmmeter
MHz	megahertz
mi.	mile
mil	one one-thousandth of an inch
min.	minimum, minute
misc.	miscellaneous
MJ	megajoule
mJ	millijoule
mm	millimeter
mOhm, mΩ	milliohm
MOhm, MΩ	megohm
MOV	metal oxide varistor
MPa	megapascal
mpg	miles per gallon
mph	miles per hour
MS	military standard
ms	millisecond
m/sec.	meters per second
MTBF	mean time between failure
MTBO	mean time between overhauls
mtg.	mounting
MTU	Motoren-und Turbinen-Union
MW	megawatt
mW	milliwatt
μF	microfarad
N, norm.	normal (power source)
NA	not available, not applicable
nat. gas	natural gas
NBS	National Bureau of Standards
NC	normally closed
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Nm	newton meter
NO	normally open
no., nos.	number, numbers
NPS	National Pipe, Straight
NPSC	National Pipe, Straight-coupling
NPT	National Standard taper pipe thread per general use
NPTF	National Pipe, Taper-Fine
NR	not required, normal relay
ns	nanosecond
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OF	overfrequency
opt.	option, optional
OS	oversize, overspeed
OSHA	Occupational Safety and Health Administration
OV	overvoltage
oz.	ounce
p., pp.	page, pages
PC	personal computer
PCB	printed circuit board
pF	picofarad
PF	power factor
ph., ∅	phase
PHC	Phillips® head Crimptite® (screw)
PHH	Phillips® hex head (screw)
PHM	pan head machine (screw)
PLC	programmable logic control
PMG	permanent magnet generator
pot	potentiometer, potential
ppm	parts per million
PROM	programmable read-only memory
psi	pounds per square inch
psig	pounds per square inch gauge
pt.	pint
PTC	positive temperature coefficient
PTO	power takeoff
PVC	polyvinyl chloride
qt.	quart, quarts
qty.	quantity
R	replacement (emergency) power source
rad.	radiator, radius
RAM	random access memory
RDO	relay driver output
ref.	reference
rem.	remote
Res/Coml	Residential/Commercial
RFI	radio frequency interference
RH	round head
RHM	round head machine (screw)
rly.	relay
rms	root mean square
rnd.	round
ROM	read only memory
rot.	rotate, rotating
rpm	revolutions per minute
RS	right side
RTU	remote terminal unit
RTV	room temperature vulcanization
RW	read/write
SAE	Society of Automotive Engineers
scfm	standard cubic feet per minute
SCR	silicon controlled rectifier
s, sec.	second
SI	*Systeme international d'unites,* International System of Units
SI/EO	side in/end out
sil.	silencer
SN	serial number
SNMP	simple network management protocol
SPDT	single-pole, double-throw
SPST	single-pole, single-throw
spec	specification
specs	specification(s)
sq.	square
sq. cm	square centimeter
sq. in.	square inch
SS	stainless steel
std.	standard
stl.	steel
tach.	tachometer
TD	time delay
TDC	top dead center
TDEC	time delay engine cooldown
TDEN	time delay emergency to normal
TDES	time delay engine start
TDNE	time delay normal to emergency
TDOE	time delay off to emergency
TDON	time delay off to normal
temp.	temperature
term.	terminal
THD	total harmonic distortion
TIF	telephone influence factor
TIR	total indicator reading
tol.	tolerance
turbo.	turbocharger
typ.	typical (same in multiple locations)
UF	underfrequency
UHF	ultrahigh frequency
UL	Underwriter's Laboratories, Inc.
UNC	unified coarse thread (was NC)
UNF	unified fine thread (was NF)
univ.	universal
US	undersize, underspeed
UV	ultraviolet, undervoltage
V	volt
VAC	volts alternating current
VAR	voltampere reactive
VDC	volts direct current
VFD	vacuum fluorescent display
VGA	video graphics adapter
VHF	very high frequency
W	watt
WCR	withstand and closing rating
w/	with
w/o	without
wt.	weight
xfmr	transformer

Notes

Notes

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