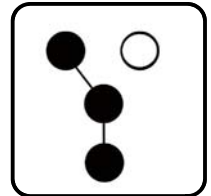


Operation and Installation

Service Entrance Rated Automatic Transfer Switches



Models:

KEP

Power Switching Devices:
Insulated-Case Circuit Breakers (ICCB)
Molded-Case Circuit Breakers (MCCB)

100-4000 Amperes

KOHLER[®]
Power Systems

9001
KOHLER
POWER SYSTEMS
NATIONALLY REGISTERED

TP-6946 3/16b

Product Identification Information

Product identification numbers determine service parts. Record the product identification numbers in the spaces below immediately after unpacking the products so that the numbers are readily available for future reference. Record field-installed kit numbers after installing the kits.

Transfer Switch Identification Numbers

Record the product identification numbers from the transfer switch nameplate.

Model Designation _____

Serial Number _____

Accessories

- Alarm Board
- Battery Module
- Controller Disconnect Switch
- Current Monitoring
- Digital Meter
- Heater
- I/O Module, Standard (max. 4) qty: _____
- I/O Module, High Power (max. 4) qty: _____
- Load Shed
- Line-Neutral Monitoring
- Seismic Certification
- Supervised Transfer Switch
- Surge Protection Device (SPD)
- _____
- _____
- _____
- _____
- _____
- _____

Controller Identification

Record the controller description from the generator set operation manual, spec sheet, or sales invoice.

Controller Description _____

Table of Contents

Safety Precautions and Instructions	5
Introduction	7
List of Related Materials	7
Service Assistance	8
Section 1 Product Description	9
1.1 General Description	9
1.2 Overcurrent Protection	10
1.3 Nameplate	10
1.4 Model Designation	11
Section 2 Installation	13
2.1 Introduction	13
2.2 Receipt of Unit	13
2.2.1 Inspection	13
2.2.2 Lifting	13
2.2.3 Storage	14
2.2.4 Unpacking	14
2.3 Multi-Tap Voltage Capability	15
2.4 Set Overcurrent Protection	16
2.5 Installation	16
2.6 Seismic Certification	17
2.7 Manual Operation Check	18
2.7.1 Manual Operation Test Procedure, 100–1200A MCCB Models	18
2.7.2 Manual Operation Test Procedure, 800–4000 A ICCB Models	19
2.8 Controller Connections	20
2.8.1 Controller Input and Output Connections	21
2.8.2 Harness Connection	21
2.8.3 Controller Ground	21
2.9 Electrical Wiring	22
2.9.1 Source and Load Connections	22
2.9.2 Engine Start Connection	24
2.9.3 Position-Indicating Contacts	25
2.10 Communication and Accessory Connections	26
2.11 Functional Tests	26
Section 3 Three-Source Systems	27
3.1 Three-Source Systems	27
3.2 Three Source Engine Start Mode	27
3.2.1 Mode 1	27
3.2.2 Mode 2	27
3.3 Preferred Source Toggle	27
3.4 Three Source System Test and Exercise	27
3.4.1 Unloaded Test	27
3.4.2 Loaded Test	27
3.4.3 Unloaded Exercise	27
3.4.4 Loaded Exercise	27
3.5 Three-Source System Connection	28
3.6 ATS1 and ATS2 System Setup	30
Section 4 Communication and Accessory Connections	31
4.1 Introduction	31
4.2 Communication Connections	31
4.2.1 USB Port SiteTech Connection	31
4.2.2 Modbus Connection	31
4.2.3 Ethernet Connection	33

4.3	Accessory Modules (Option Boards)	35
4.3.1	Accessory Module Mounting	35
4.3.2	Input/Output (I/O) Modules	36
4.3.3	External Battery Supply Module (EBSM/BOB)	37
4.3.4	Alarm Module	38
4.4	Heater	40
4.5	Other Accessories	41
Section 5 Functional Tests		43
5.1	Introduction	43
5.2	Manual Operation Test	43
5.3	Ground Fault Site Test Requirements	43
5.4	Performance Test	43
5.5	Voltage Check	44
5.6	Lamp Test	45
5.7	Automatic Operation Test	45
5.8	System Setup	45
5.9	Exerciser Setup	45
5.10	User Interface Cover	45
5.11	Startup Notification	45
Section 6 Operation		47
6.1	Transfer Switch Operation	47
6.1.1	Normal Operation	47
6.1.2	Overcurrent Trip	47
6.2	Service Disconnect Position	47
6.2.1	Service Disconnect to Emergency	47
6.2.2	Service Disconnect to OFF	47
6.2.3	Transformer Assemblies	49
6.3	Service Disconnect to Emergency Operation	49
6.3.1	Service Disconnect Procedure, Service Disconnect to Emergency	51
6.3.2	Service Reconnect Procedure, Service Disconnect to Emergency	51
6.4	Service Disconnect to OFF Operation	52
6.4.1	Service Disconnect Procedure, Service Disconnect to OFF	54
6.4.2	Service Reconnect Procedure, Service Disconnect to OFF	55
6.5	Control Circuit Isolation Switch	56
6.5.1	Control Circuit Isolation and Reconnection for Service Disconnect to Emergency Units	57
6.5.2	Control Circuit Isolation and Reconnect for Service Disconnect to OFF Units	58
Section 7 Changing the Service Disconnect Position		61
7.1	Introduction	61
7.2	Changing the Service Disconnect Position	63
7.2.1	Procedure to Change the Service Disconnect Position Setting on the Controller	64
7.2.2	Procedure to Disconnect the Engine Start Bypass Circuit	65
7.2.3	Connection Changes for Service Disconnected Lamp Operation	66
7.2.4	Final Steps	69
Section 8 Performance Test Form		71
Appendix A Abbreviations		73

Safety Precautions and Instructions

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.**

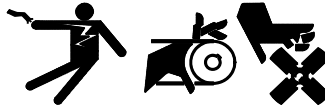
NOTICE

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 connected equipment, 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 Generator Set 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.

(RDC, DC, RDC2, DC2, Decision-Maker® 3000, 3500 and 6000 Generator Set 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.

Only authorized personnel should open the enclosure.

WARNING



Hazardous voltage. Moving parts. Can cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

WARNING



Hazardous voltage. Can cause severe injury or death.

Close and secure the enclosure door before energizing the transfer switch.

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.

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.


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 Generator Set 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.

(RDC, DC, RDC2, DC2, Decision-Maker® 3000, 3500 and 6000 Generator Set Controllers)

Testing live electrical circuits. Hazardous voltage or current can cause severe injury or death. Have trained and qualified personnel take diagnostic measurements of live circuits. Use adequately rated test equipment with electrically insulated probes and follow the instructions of the test equipment manufacturer when performing voltage tests. Observe the following precautions when performing voltage tests: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Do not touch the enclosure or components inside the enclosure. (4) Be prepared for the system to operate automatically. (600 volts and under)

⚠ WARNING

<p>Hazardous voltage. Backfeed to the utility system can cause severe injury, death, or property damage.</p> <p>Before energizing the transfer switch, verify that both the normal and emergency contacts are not left in the closed position.</p>

Heavy Equipment

⚠ WARNING

<p>Unbalanced weight. Improper lifting can cause severe injury or death and equipment damage.</p> <p>Use adequate lifting capacity. Never leave the transfer switch standing upright unless it is securely bolted in place or stabilized.</p>

Notice

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 installation instructions for the Kohler® Model KEP service-entrance rated Automatic Transfer Switch (ATS) equipped with the Decision-Maker® MPAC 1500 controller. A separate manual provided with the transfer switch covers the transfer switch controller operation. See List of Related Materials for the document part number.

Model KEP service entrance rated transfer switches have integral overcurrent protection supplied on the utility source as standard, which allows installation at the point of service entrance and eliminates the need for separate upstream overcurrent protection. Integral overcurrent protection can also be selected on the generator source. Refer to Section 1.2, Overcurrent Protection, for more information on overcurrent protection.

Information in this publication represents data available at the time of print. Kohler Co. reserves the right to change this literature and the products represented without notice and without any obligation or liability whatsoever.

Read this manual and carefully follow all procedures and safety precautions to ensure proper equipment operation and to avoid bodily injury. Read and follow the Safety Precautions and Instructions section at the beginning of this manual. Keep this manual with the equipment for future reference.

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

A separate manual covers the transfer switch controller and associated accessories. Separate manuals cover service and parts information for transfer switch power switching devices and electrical controls.

The following table lists the part numbers for related literature.

Literature Item	Part Number
Specification Sheet, Decision-Maker® MPAC 1500 Controller	G11-128
Specification Sheet, Model KEP ATS (service disconnect to emergency)	G11-133
Specification Sheet, Model KEP ATS (service disconnect to off)	G11-141
Operation Manual, Decision-Maker® MPAC 1500 Controller	TP-6883
Parts Catalog, Model KEP ATS	TP-6741
Wiring Diagram Manual, Model KEP ATS	TP-6919
Service Manual, Model KEP ATS	TP-6922

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.

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Phone: (86) 10 6518 7950
(86) 10 6518 7951
(86) 10 6518 7952
Fax: (86) 10 6518 7955

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

Section 1 Product Description

1.1 General Description

An automatic transfer switch (ATS) transfers electrical loads from a normal (preferred) source of electrical power to an emergency (standby) source when the normal source falls outside the acceptable electrical parameters. Figure 1-1 shows a typical single-line diagram. Figure 1-2 shows a typical transfer switch.

Model KEP automatic transfer switches employ two mechanically interlocked enclosed contact power switching units and the Kohler® Decision-Maker® MPAC 1500 controller to automatically transfer system load to a generator supply in the event of a utility supply failure. System load is then automatically retransferred back to the utility supply following restoration of the utility power source to within normal operating limits.

Model KEP service entrance rated transfer switches have integral overcurrent protection supplied on the utility source as standard, which allows installation at the point of service entrance and eliminates the need to have a separate upstream utility source circuit breaker or disconnect switch. Integral overcurrent protection can also be selected on the generator source. Refer to Section 1.2, Overcurrent Protection, for more information on overcurrent protection.

The Model KEP service-entrance rated automatic transfer switch uses integral overcurrent protection within the enclosed contact power switching units. The 100-1200 A rated molded case power switching devices used for the utility and generator sources are operated by an electrically driven motor mechanism in the transfer switch. The 800-4000 A rated insulated case power switching devices used for the utility and generator sources are operated by internal drive motor operators.

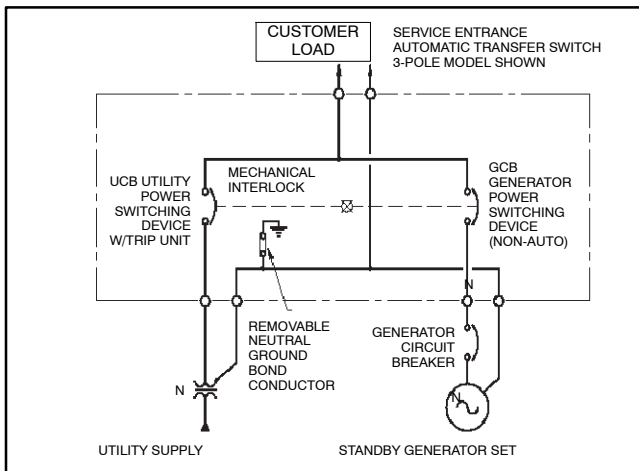


Figure 1-1 Typical Single-Line Diagram

The transfer switch mechanism provides a positive mechanical interlock to prevent both power switching units from being closed at the same time, allowing an interrupted open-transition break-before-make transfer sequence. The transfer switch controller provides a standard neutral position delay timer for programmed-transition transfer sequences to allow adequate voltage decay during transfer operation to prevent out of phase transfers.

Note: For the purpose of this manual, the following nomenclature is utilized:

- Utility or Normal to indicate the source of primary power.
- Generator or Emergency to indicate the source of standby power.
- Power switching device to indicate the automatic transfer switch power switching device [molded case (MC) or insulated case (IC) circuit breaker (CB) or switch (SW) in the ATS].

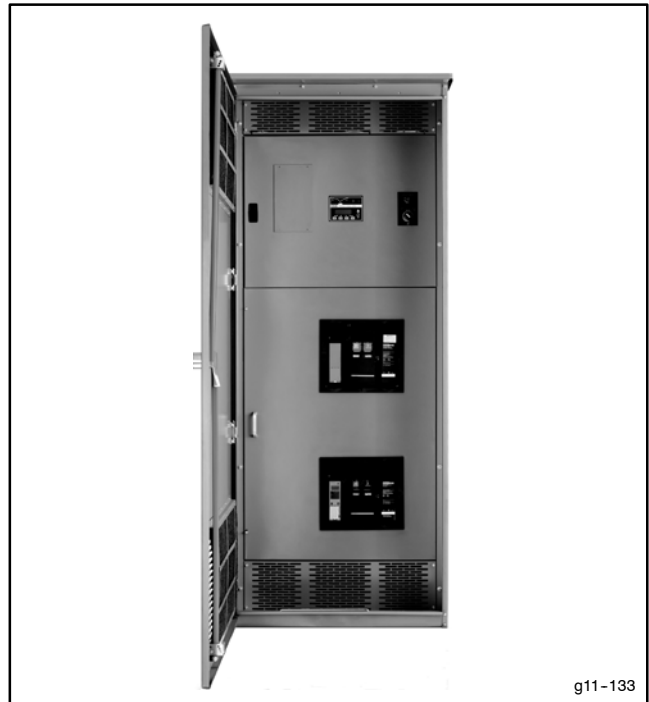


Figure 1-2 Model KEP Service Entrance ATS (ICCB type shown)

1.2 Overcurrent Protection

Model KEP service entrance rated transfer switches have integral overcurrent protection supplied on the utility source as standard. Optional integral overcurrent protection may also be selected on the generator source. An upstream overcurrent protection device is required on the generator source if the integral overcurrent protection option is not specified on the generator side of the ATS.

The type of overcurrent protection varies with ATS amperage size and optional features specified. Transfer switches rated 100 A through 200 A use nonadjustable thermal-magnetic type trip units. Transfer switches rated 250 A through 4000 A use adjustable electronic type with long time or instantaneous trip unit elements with optional ground fault protection elements.

Refer to Section 1.4, Model Designation, for the types of integral overcurrent protection that are available for the transfer switch.

See Sections 2.4 and 6.1.2 for more information on overcurrent protection.

1.3 Nameplate

A nameplate attached to the controller cover on the inside of the enclosure door includes a model designation, a serial number, ratings, and other information about the transfer switch. See Figure 1-3. The serial number is also shown on a label inside the transfer switch enclosure.

Copy the model designation, serial number, and accessory information from the nameplate to the spaces provided in the Product Identification Information section inside the front cover of this manual for use when requesting service or parts.

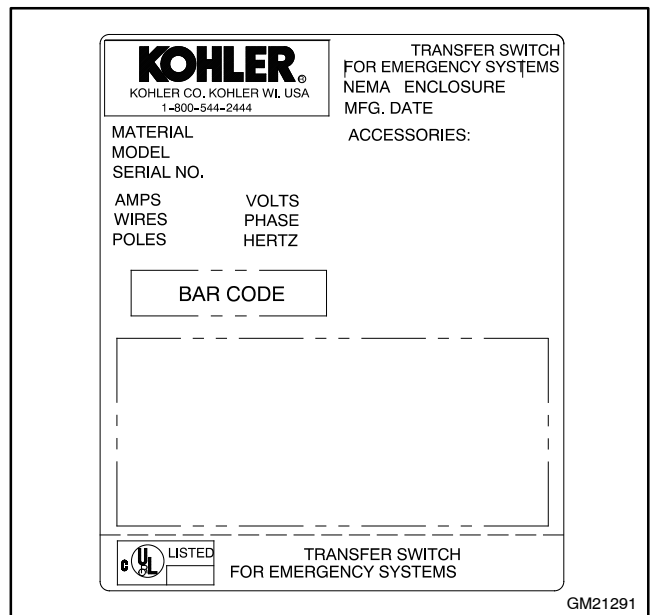
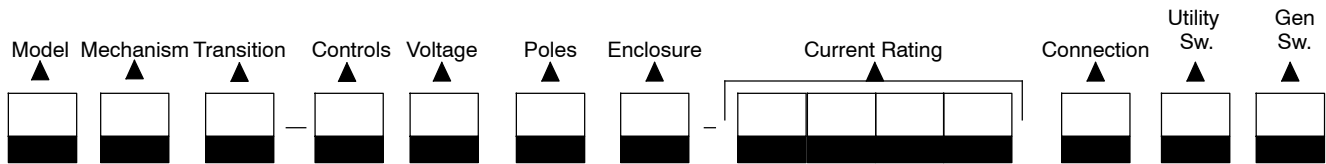


Figure 1-3 Typical Transfer Switch Nameplate

1.4 Model Designation



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

Sample Model Designation: KEP-DMTA-0400S-NK

Model

K: Kohler

Current, Amps

0100 0600 2000

0150 0800 2500

Mechanism

E: Service Entrance Rated

0200 1000 3000

0250 1200 4000

0400 1600

Transition

P: Programmed

Connections

S: Standard

Controller

D: Decision-Maker® MPAC 1500, Automatic

Utility Switching Device

M: MCCB w/thermal magnetic trip 100-200 A

N: MCCB w/electronic trip 250-800 A

P: MCCB w/electronic trip and GF 1000-1200 A

R: ICCB w/electronic trip 800 A

T: ICCB w/electronic trip and GF 1000-4000 A

Voltage/Frequency

C: 208 Volts/60 Hz M: 480 Volts/60 Hz

F: 240 Volts/60 Hz R: 220 Volts/60 Hz

K: 440 Volts/60 Hz

Number of Poles/Wires

N: 2 Poles/3 Wires, Solid Neutral

T: 3 Poles/4 Wires, Solid Neutral

V: 4 Poles/4 Wires, Switched Neutral

Generator Switching Device

K: MCSW 100-1200 A

M: MCCB w/thermal magnetic trip 100-200 A

N: MCCB w/electronic trip 250-1200 A

Q: ICSW 800-4000 A

R: ICCB w/electronic trip 800-4000 A

Enclosure

A: NEMA 1

C: NEMA 3R

MC = molded case

CB = circuit breaker

B: NEMA 12

F: NEMA 4X

IC = insulated case

SW = switch

Note: Some selections are not available for every model. Contact your Kohler distributor for availability.

Notes

2.1 Introduction

Kohler® transfer switches are shipped factory-wired, factory-tested, and ready for installation. Have the equipment installed only by trained and qualified personnel, and verify that the installation complies with applicable codes and standards. Switch installation includes the following steps:

- Unpack and inspect the transfer switch upon receipt.
- Verify that the transfer switch voltage and frequency ratings match the voltages and frequencies of the sources.
- Install the transfer switch.
- Check the manual operation.
- Connect the controller harness and ground lead.
- Connect the generator set engine start leads.
- Connect the normal power source (utility), emergency power source (generator set), and load circuits.
- Connect accessories, if provided.
- Check voltages and operation.

Protect the switch against damage before and during installation.

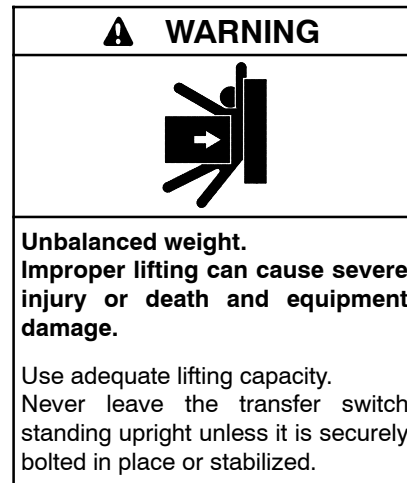
The functional tests in Section 5 are a necessary part of the installation. Be sure to perform the functional tests, which include voltage checks and operation tests, before putting the transfer switch into service.

2.2 Receipt of Unit

2.2.1 Inspection

At the time of delivery, inspect the packaging and the transfer switch for signs of shipping damage. Unpack the transfer switch as soon as possible and inspect the exterior and interior for shipping damage. If damage and/or rough handling is evident, immediately file a damage claim with the transportation company.

2.2.2 Lifting



Refer to Figure 2-1 for the approximate weight of the transfer switch in a Type 1 enclosure. For other enclosures, refer to the specification sheet or the dimension drawing.

Use a spreader bar to lift the transfer switch. Attach the bar only to the enclosure's mounting holes or lifting brackets; do not lift the unit any other way. Close and latch the enclosure door before moving the unit.

Amps	MCCB Models, Weight, kg (lb.)		
	2P	3P	4P
100-150	68 (150)	68 (150)	68 (150)
200	68 (150)	68 (150)	N/A
250	81 (178)	81 (178)	81 (178)
400	195 (430)	195 (430)	195 (430)
600-800	200 (441)	200 (441)	200 (441)
1000-1200	N/A	270 (595)	270 (595)
ICCB Models, Weight, kg (lb.)			
800	N/A	544 (1200)	635 (1400)
1000-1200	N/A	553 (1220)	644 (1420)
1600	N/A	598 (1320)	625 (1380)
2000	N/A	607(1340)	644 (1420)
2500	N/A	625 (1380)	662 (1460)
3000	N/A	644 (1420)	680 (1500)
4000	N/A	907 (2000)	1270 (2800)

Figure 2-1 Approximate Weights with Type 1 Enclosures

2.2.3 Storage

Store the transfer switch in its protective packing until final installation. Protect the transfer switch at all times from moisture, construction grit, and metal chips. Avoid storage in low-temperature and high-humidity areas where moisture could condense on the unit. See Figure 2-2 for acceptable storage temperatures.

Environmental Specifications	
Operating Temperature	-15°C to 50°C (5°F to 122°F)
Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Humidity	5% to 95% noncondensing

Figure 2-2 Environmental Specifications

2.2.4 Unpacking

Allow the equipment to warm to room temperature for at least 24 hours before unpacking to prevent condensation on the electrical apparatus. Use care when unpacking to avoid damaging transfer switch components. Remove dirt and packing material that may have accumulated in the transfer switch or any of its components.

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

2.3 Multi-Tap Voltage Capability

The transfer switch voltage is factory-set. Check the nameplate and confirm that the transfer switch has been configured for the correct system voltage prior to installation.

Note: Verify that the transfer switch voltage matches the system voltage.

The transfer switch has multi-tap voltage capability at the voltage transformers. See Figure 2-3 for a typical transformer assembly. Figure 2-4 shows typical connections. Refer to the wiring diagram provided with the transfer switch for complete connection information for your model.

To change the transfer switch voltage configuration, if necessary:

- Before connecting power to the transfer switch, change the voltage taps of the potential transformers (PT's) to match the system voltage. Refer to the wiring diagram provided with the transfer switch.
- After the voltage taps have been set to correct operating voltage, but before applying power to the transfer switch, connect the contactor harness to the controller through the control circuit isolation switch on the transformer assembly. See Figure 2-3 and Section 2.8.
- When power is connected to the ATS controller, change the system voltage setting on the controller.

Refer to the transfer switch controller Operation Manual, provided with the ATS, for instructions. See the List of Related Materials in the Introduction section for the document part number.

- Order a new nameplate from the Aftermarket Parts department. Provide the ATS model and serial numbers and the new voltage setting.

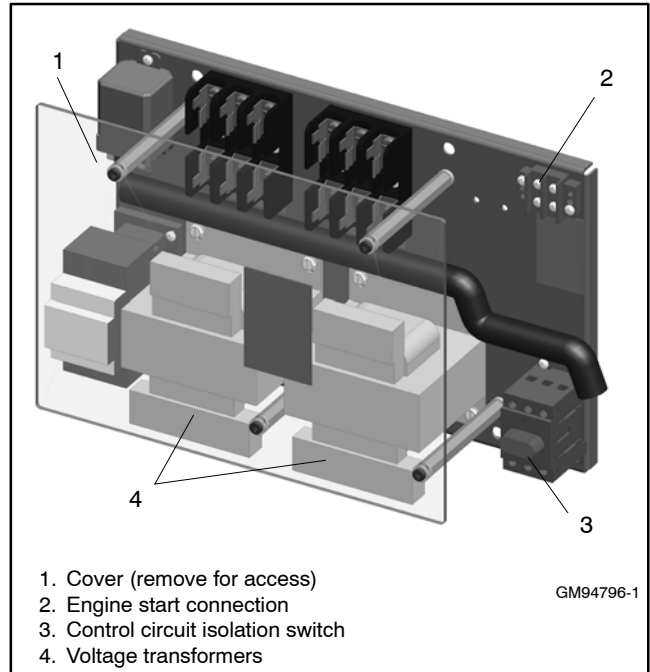


Figure 2-3 Transformer Assembly, Typical (MCCB Service Disconnect to OFF unit shown)

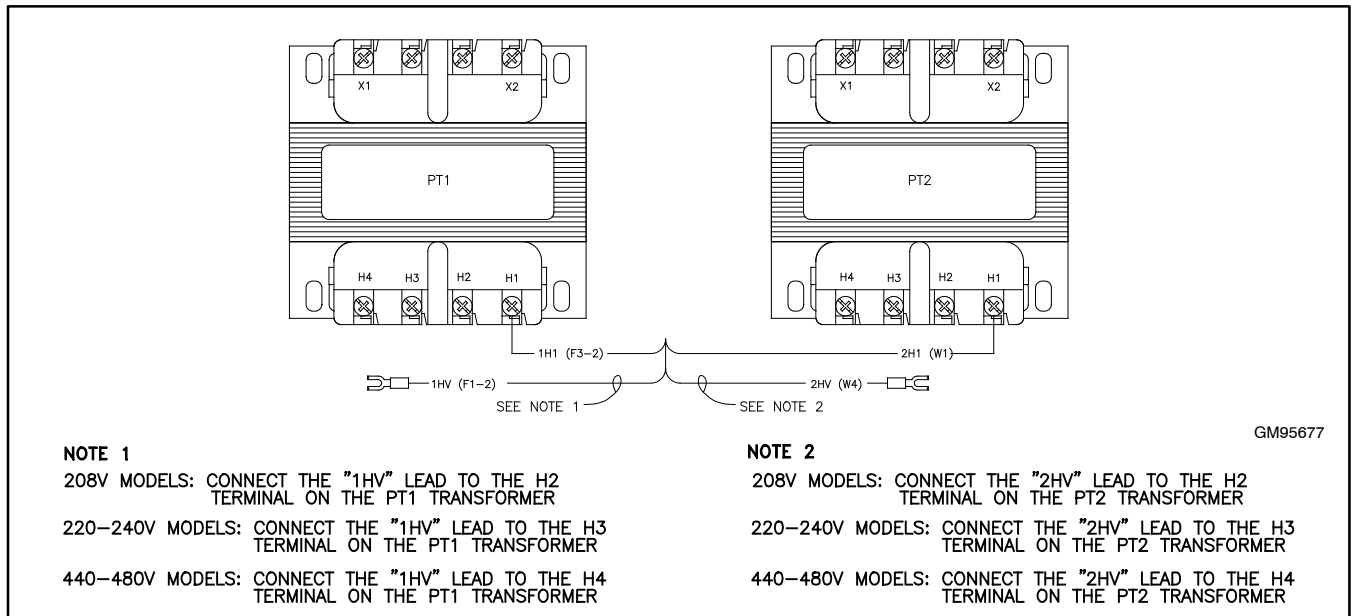


Figure 2-4 Typical Voltage Tap Connections (Refer to the wiring diagram provided with the ATS.)

2.4 Set Overcurrent Protection

For models with integral overcurrent protection, the overcurrent protection **must be set prior to operation**. The equipment is shipped from the factory with a long-time current setting of 100% (of the equipment rating) and maximum short-time/ instantaneous current and time delay settings.

Note: Do not energize this equipment until device settings have been verified to ensure proper system protection and coordination.

Refer to information supplied with the transfer switch for adjustment procedures on the power switching unit's overcurrent protection trip unit.

Refer to Section 6.1.2, Overcurrent Trip, for additional information on operation of the transfer switch following an overcurrent trip condition.

2.5 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.

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.

Check the system voltage and frequency. Compare the voltage and frequency shown on the transfer switch nameplate to the source voltage and frequency. See Section 2.3 if the system voltage is different from the nominal normal (utility) source voltage.

Plan the installation. Use the dimensions given on the enclosure dimension (ADV) drawings. 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.

Outdoor installations. Transfer switches with NEMA 3R and 4X enclosures can be installed outdoors. In locations with very high ambient temperatures, installation in a shaded area or a location with the enclosure door facing away from direct sunlight is recommended.

Prepare the foundation. Ensure that the supporting foundation for the enclosure is level and straight. Refer to the dimension drawing for required clearance.

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.

Installation of seismically certified transfer switches. Seismic certification must be requested when the transfer switch is ordered. See Section 2.6 and the transfer switch dimension (ADV) drawings for additional installation requirements for transfer switches with seismic certification.

Install the ATS. Refer to the dimension drawing supplied with the switch and mount the transfer switch according to the details and instructions on the drawing.

Smaller transfer switches have clearance holes through the back of the enclosure for mounting. Bolt the transfer switches to a wall or other rigid vertical supporting structure. Use shims to plumb the enclosure. Verify that the door hinges are vertical to avoid distortion of the enclosure or door.

Bolt larger transfer switches directly to floor mounting pads. Use shims to level the enclosure. Verify that the door hinges are vertical to avoid distortion of the enclosure or door.

2.6 Seismic Certification

Automatic transfer switches with seismic certification must be installed according to the instructions in this section. Also refer to ADV-7456, the Certificate of Compliance provided with the ATS, and the installation (ADV) drawings for the transfer switch.

Abbreviations:

ACI: American Concrete Institute

IBC: International Building Code®

S_{DS} : Design spectral response acceleration at short period, as determined in Section 1615.1.3 of the IBC

R_p : Equipment response modification factor

I_p : Equipment importance factor

a_p : In-structure equipment amplification factor

Refer to the International Building Code® for more information.

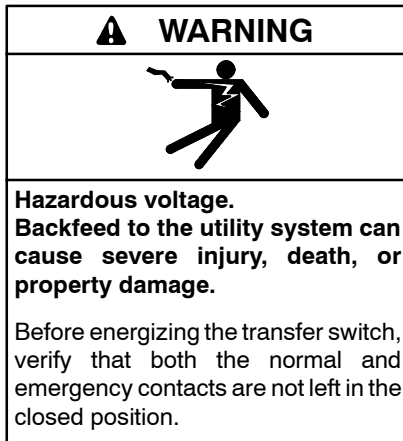
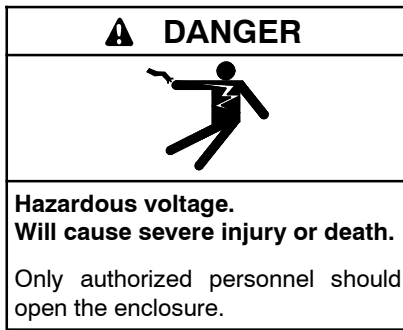
General Seismic Installation Notes:

1. Anchors used for seismic installation must be designed in accordance with ACI 355.2-04. Suggested manufacturers include Simpson, Ramset, and Hilti.
2. Anchors must be installed to a minimum embedment of 8x the anchor diameter.
3. Anchors must be installed in minimum 4000 psi compressive strength normal weight concrete. Concrete aggregate must comply with ASTM C33. Installation in structural lightweight concrete is not permitted unless otherwise approved by the structural engineer of record.
4. Anchors must be installed to the required torque specified by the anchor manufacturer to obtain maximum loading.
5. Anchors must be installed to the anchor spacing required to obtain maximum load and edge distance required to obtain maximum load unless otherwise approved by the structural engineer of record.
6. Anchors used for seismic installation must be designed and rated to resist seismic loading in

accordance with ACI 355.2-04 and documented in a report by a reputable testing agency (for example, the Evaluation Service Report issued by the International Code Council).

7. Wide washers must be installed at each anchor location between the anchor head and equipment for tension load distribution. See applicable ADV drawing for specific anchor information and washer dimensions.
8. Equipment installed on a housekeeping pad requires the housekeeping pad thickness to be at least 1.5x the anchor embedment depth.
9. All housekeeping pads must be seismically designed and dowelled or cast into the building structure as approved by the structural engineer of record.
10. Rebar reinforcing in the housekeeping pad is required for all installations.
11. Concrete and rebar reinforcing must be designed in accordance with ACI 318-05.
12. Wall mounted equipment must be installed to a rebar reinforced structural concrete wall that is seismically designed and approved by the engineer of record to resist the added seismic loads from components being anchored to the wall.
13. Floor mounted equipment (with or without a housekeeping pad) must be installed to a rebar reinforced structural concrete floor that is seismically designed and approved by the engineer of record to resist the added seismic loads from components being anchored to the floor.
14. When installing to a floor or wall, rebar interference must be considered.
15. Equipment attached to any structural floor other than those constructed of structural concrete and designed to accept the seismic loads from the mounted equipment are beyond the scope of this specification.
16. Installation to light-weight concrete over steel decking is beyond the scope of this specification.
17. Installation to concrete block or cinder block walls is beyond the scope of this specification.

2.7 Manual Operation Check



Note: A manual operation handle is provided on the transfer switch *for maintenance purposes only*. Do not use the manual operation handle to transfer the load with the power connected.

Use the manual operation handle to check the manual operation before energizing the transfer switch. Check the operation of both the Normal and Emergency operators.

A power switching device in normal and serviceable condition operates smoothly without binding. Do not place the transfer switch into service if the power switching device does not operate smoothly; contact an authorized distributor/dealer for service.

Note: Refer to Figure 2-5 through Figure 2-7 for identification of transfer switch mechanism style supplied with the transfer switch.

2.7.1 Manual Operation Test Procedure, 100-1200A MCCB Models

Manually operate the transfer switch mechanism, depending on mechanism type, as described below.

100-800 Amp Units:

See Figure 2-5. Insert the operating handle into the front of the transfer mechanism and turn the operating handle until the position indication on the mechanism clearly shows the desired position: generator, neutral, or utility.

1000 and 1200 Amp Units:

See Figure 2-6. Pull the manual release knob on the mechanism, releasing the motor drive rod from the motor drive arm. Move the knob and yoke to the marked position.

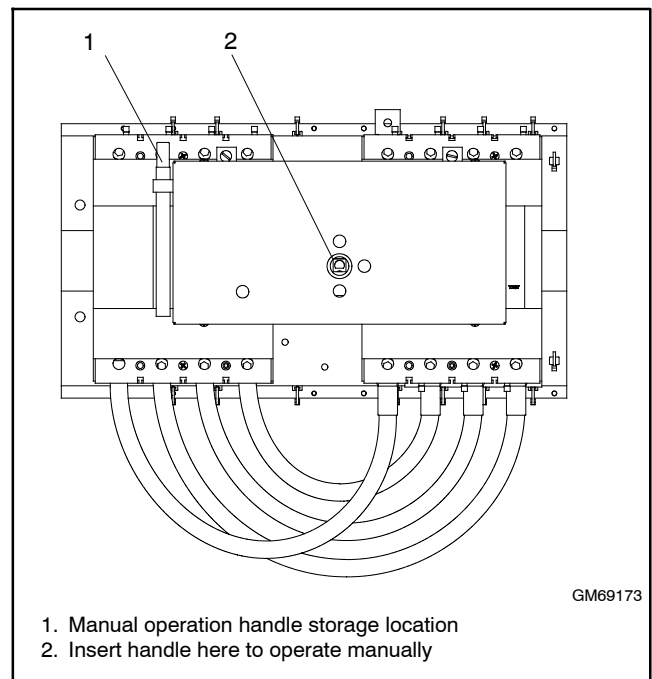


Figure 2-5 100-800 Amp MCCB Manual Operation (250 Amp model shown)

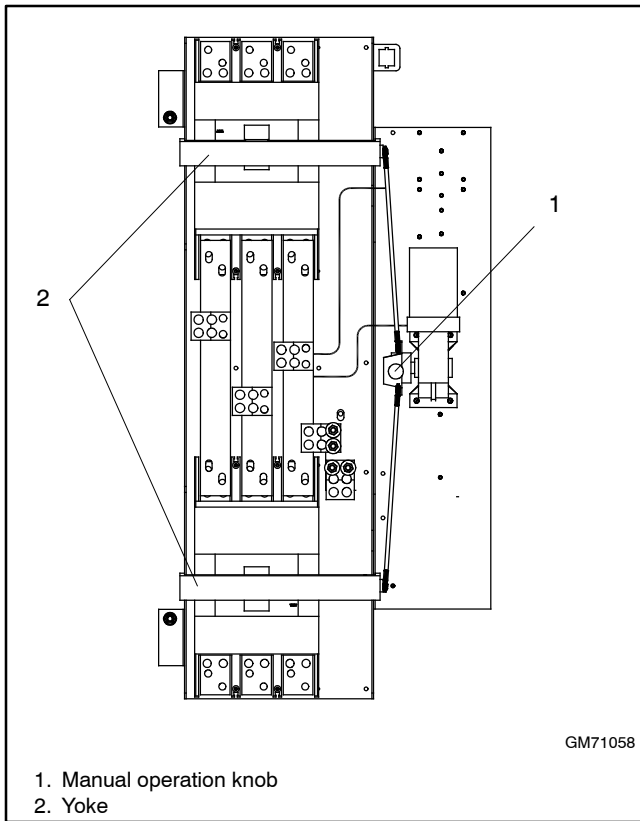


Figure 2-6 1000-1200 Amp MCCB Manual Operation

2.7.2 Manual Operation Test Procedure, 800-4000 A ICCB Models

See Figure 2-7. Manually operate the power switching units as follows: Push the breaker's TEST pushbutton. The breaker should then open. Press the reset button to reset the breaker.

Repeat for the other power switching unit.

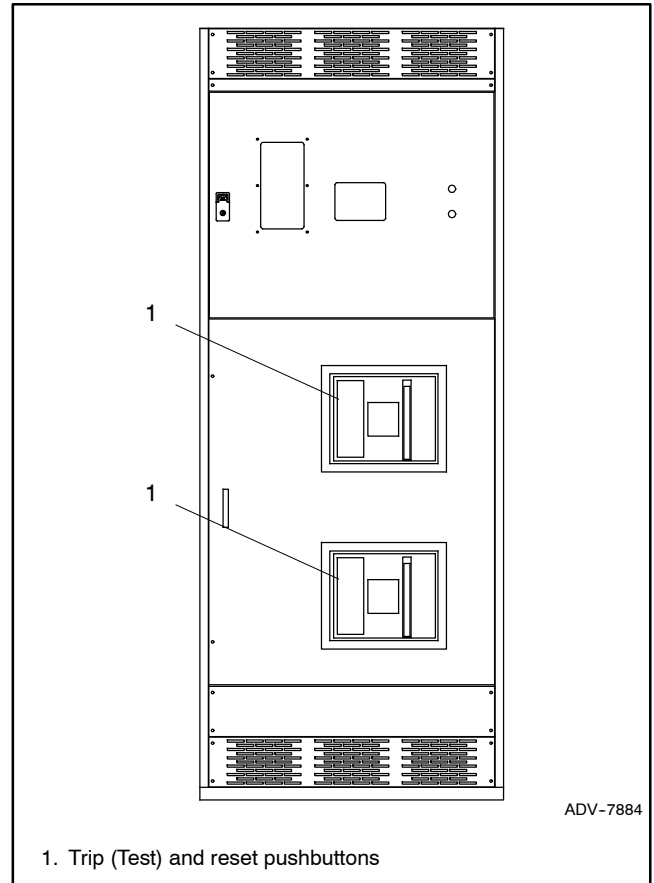
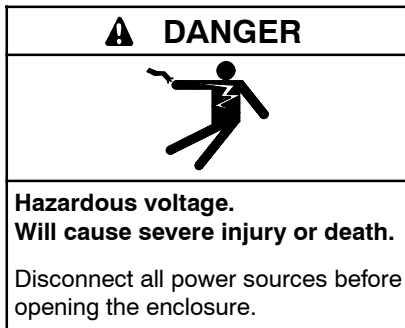


Figure 2-7 ICCB Manual Operation

2.8 Controller Connections



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.

The controller is mounted in a plastic housing on the inside of the transfer switch enclosure door.

Figure 2-8 shows the locations of the connectors on the controller. It is not necessary to open the cover to access the Ethernet, Modbus®, and input/output connectors.

Opening the cover. If necessary, open the plastic housing by pushing up on the latch on the bottom of the cover and swinging the cover up and out. The cover is hinged at the top. Lift the cover off the hinges to remove it completely, if necessary.

Note: Always replace the cover before energizing the transfer switch controls.

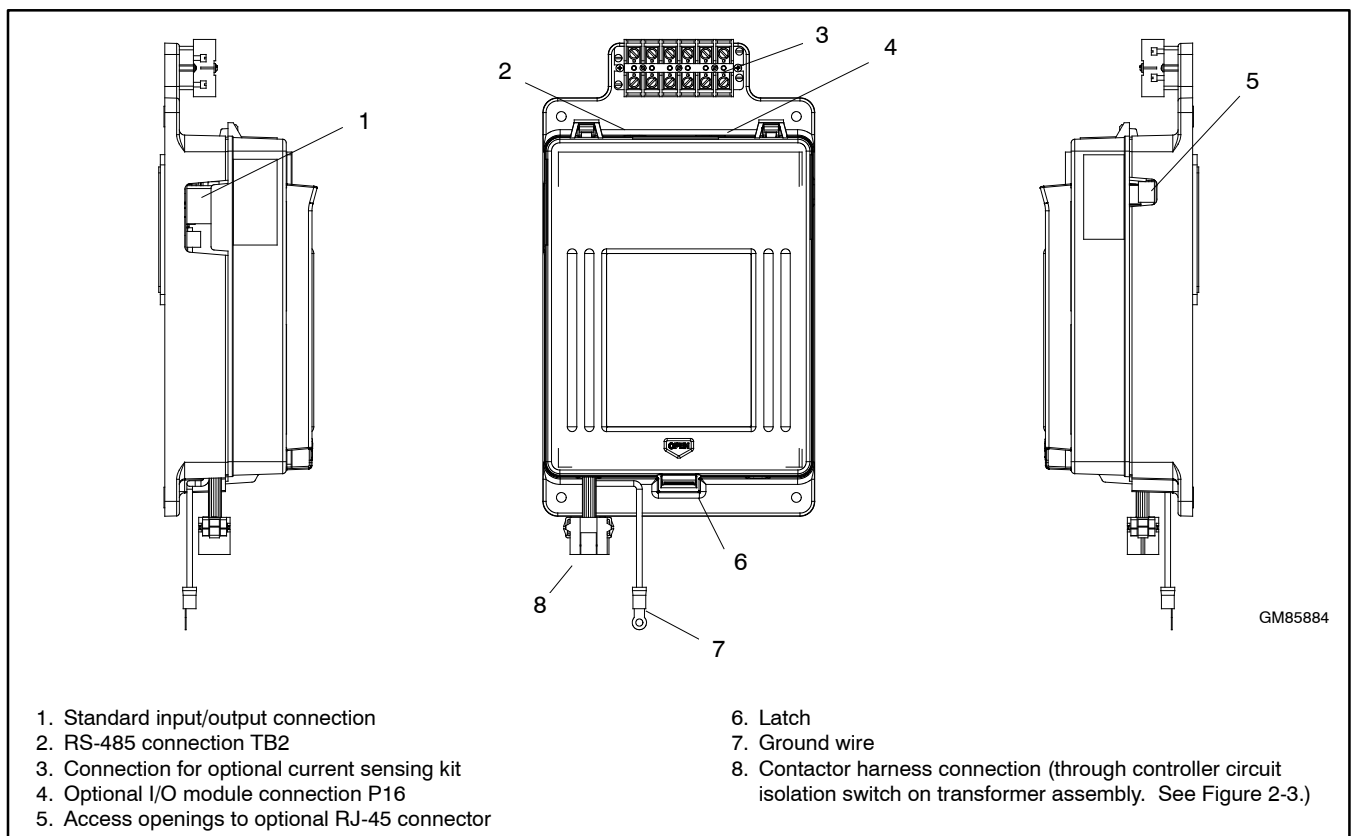


Figure 2-8 Controller

2.8.1 Controller Input and Output Connections

The controller provides connections for two programmable inputs and two programmable outputs. See Figure 2-8 for the connector location and Figure 2-9 for the I/O connection specifications.

Each input has a signal and a return connection. The outputs are C form contacts with ratings of 500 mA @ 120 VAC. See Figure 2-10 for connections. Use #12-24 AWG wire and tighten the connections to 0.5 Nm (4.4 in. lbs.).

Input 1 and output 1 are factory connected on service entrance models. Do not disconnect the factory-set inputs and outputs.

The load shed (forced transfer to OFF) function requires an external signal (contact closure) to initiate transfer to the OFF position. Connect the external contact to input #2 on connector TB1 on the controller.

For additional input and output connections, optional input/output modules are available. See Section 4.3 for instructions.

Main Board I/O Specifications	
Output contact type	Isolated form C (SPDT)
Output contact rating	1 amp @ 30 VDC, 500 mA @120 VAC
I/O terminals wire size	#12-24 AWG

Figure 2-9 Main Board I/O Specifications

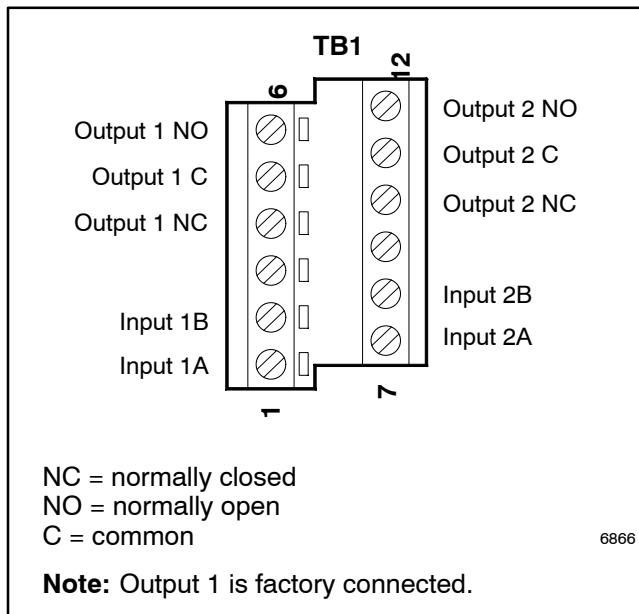


Figure 2-10 Input and Output Connections

2.8.2 Harness Connection

Verify that the contactor harness is connected at the controller base through the controller circuit isolation switch on the transformer assembly. See Figure 2-3.

Note: Verify that the power is disconnected before connecting or disconnecting the contactor harness.

2.8.3 Controller Ground

Verify that the grounding wire is connected from the controller's lower left mounting stud to the enclosure. This connection provides proper grounding that does not rely upon the door hinges.

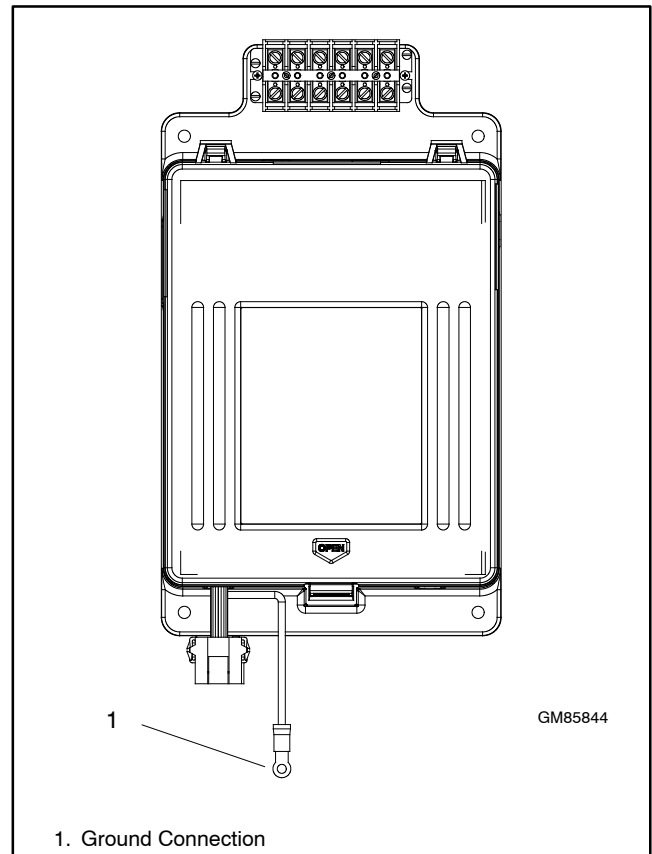


Figure 2-11 Controller Ground Connection

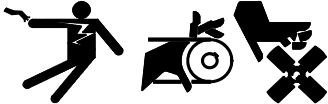
2.9 Electrical Wiring

All internal electrical connections are factory-wired and tested. Field installation includes connecting the sources, loads, generator start circuit(s), and auxiliary circuits, if used.

Refer to the wiring diagrams provided with the transfer switch. Observe all applicable national, state, and local electrical codes during installation.

Install DC, control, and communication system wiring in separate conduit from AC power wiring.

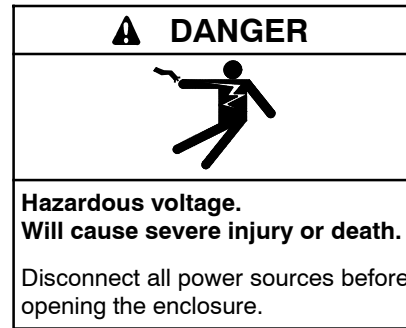
WARNING



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.

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.



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. Electrocuting 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

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.

2.9.1 Source and Load Connections

Determine the cable size. Refer to the transfer switch dimension drawing to determine the cable size and number of cables required for the transfer switch. Make sure that the cables are suitable for use with the transfer switch lugs. Watertight conduit hubs may be required for outdoor use.

Drill the entry holes. Cover the transfer switch to protect it from metal chips and construction grit. Then drill entry holes for the conductors at the locations shown on the enclosure drawings. Remove debris from the enclosure with a vacuum cleaner.

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

Install and test the power cables. Leave sufficient slack in the power leads to reach all of the power connecting lugs on the power switching device. Test the power conductors before connecting them to the transfer switch. Installing power cables in conduit, cable troughs and ceiling-suspended hangers often requires considerable force. Pulling cables can damage insulation and stretch or break the conductor’s strands.

Test the cables after pulling them into position and *before* they are connected to verify that they are not defective and that they were not damaged during installation.

Connect the cables. Be careful when stripping insulation from the cables; avoid nicking or ringing the conductor. Clean cables with a wire brush to remove surface oxides before connecting them to the terminals. Apply joint compound to the connections of any aluminum conductors.

Refer to the wiring diagram provided with the switch. The connection points on the contactor are labeled Normal, Emergency, and Load. Be sure to follow the phase markings (A, B, C, and N). For single-phase systems, connect to A and C.

Note: Connect the source and load phases as indicated by the markings and drawings to prevent short circuits and to prevent phase-sensitive load devices from malfunctioning or operating in reverse.

Tighten the lugs. Verify that all connections are consistent with drawings before tightening the lugs. Tighten all cable lug connections to the torque values shown on the label on the switch. See Figure 2-12. Carefully wipe off any excess joint compound after tightening the terminal lugs.

TIGHTENING TORQUE VALUES FOR DUAL RATED (AL-CU) SCREW CONNECTORS		
AWG. OR CIRCULAR MILL SIZE	TIGHTENING TORQUE IN INCH POUNDS	
	SCREW DRIVER	WRENCH
14	35	75
12	35	75
10	35	75
8	40	75
6	45	110
4	45	110
2	50	150
1	50	150
1/0	50	180
2/0	50	180
3/0		250
4/0		250
250		325
350		325
500		375
600		375
700		375
750		375
800		500
1000		500

297556

Figure 2-12 Torque Label

2.9.2 Engine Start Connection

⚠ 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) 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.

Prevent the generator set from starting by pressing the OFF button on the generator controller; disconnecting power to the generator engine start battery charger, if installed; and disconnecting all generator engine start battery cables, negative (-) leads first.

Connect the generator set remote starting circuit to the engine start connections located on terminal block TB1 on the transformer assembly, which is typically mounted on the right wall inside the enclosure. The engine start terminals are labeled with a red decal. See Figure 2-3 for the transformer assembly with the engine start terminal block. See Figure 2-13 and Figure 2-14 for typical locations of the engine start contacts inside the enclosure.

Refer to the generator set installation manual for wire size specifications.

Engine Start Contacts	
Contact Rating	2 A @ 30 VDC/250 VAC

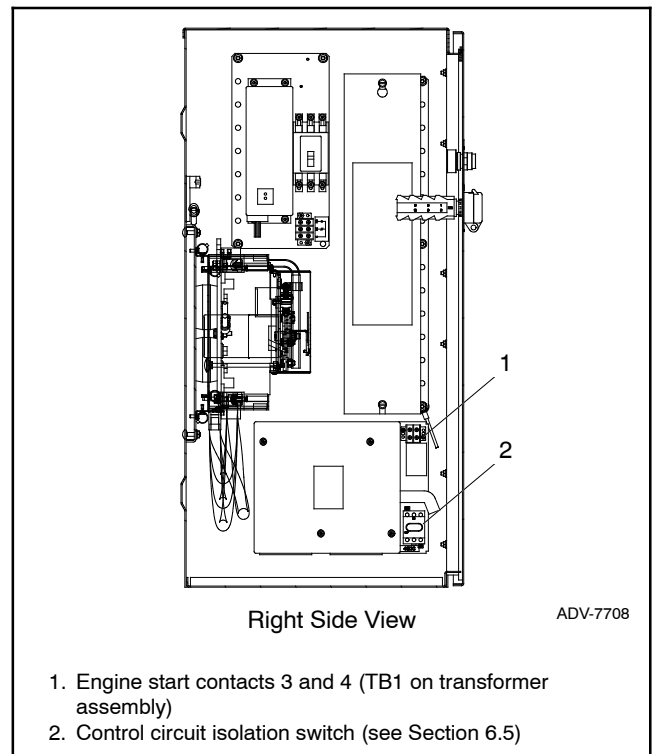


Figure 2-13 Engine Start Contact Terminal Block Location, MCCB Models (typical)

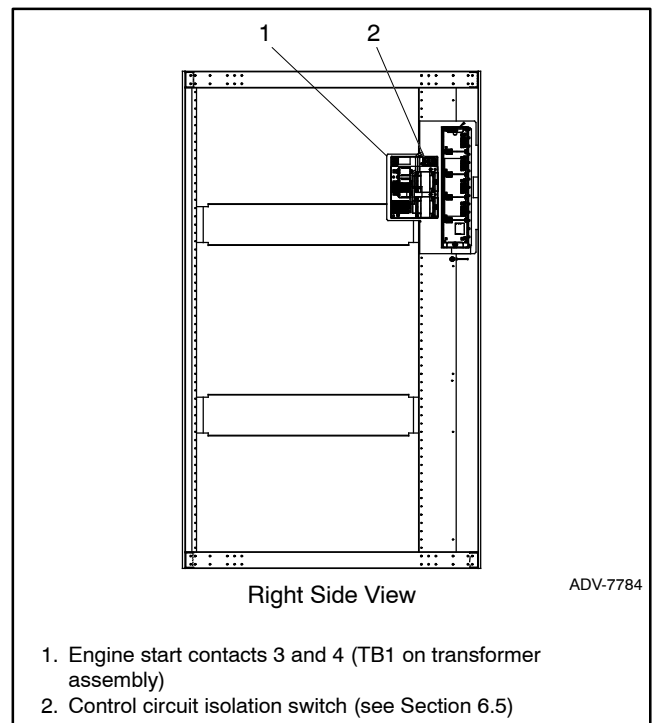


Figure 2-14 Engine Start Contact Terminal Block Location, ICCB Models (typical)

2.9.3 Position-Indicating Contacts

Auxiliary position-indicating contacts are available on the ICCB circuit breakers. See Figure 2-15 through Figure 2-17. Some contacts on the circuit breakers are used for factory connections. Refer to the transfer switch wiring diagram for connections.

For MCCB position indication, connect to a programmable output and program the output for position indication. See Section 2.8.1 for output connections on the controller. Refer to the ATS controller operation manual (provided with the transfer switch) for instructions to program the output.

Auxiliary Position-Indicating Contacts	
MCCB Models	Use programmable digital outputs.
ICCB Models	3 Normal, 2 Emergency Rated 2.5 A @ 24/48 VDC, 6 A @ 480VAC

Figure 2-15 Position Indication

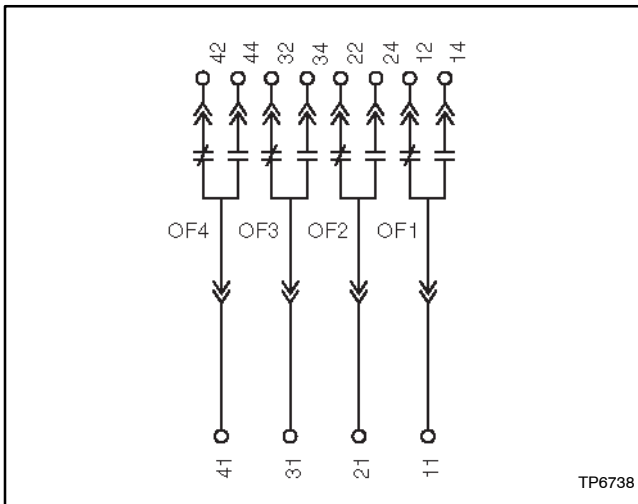


Figure 2-16 Auxiliary Switch Connections (also see the ATS wiring diagram)

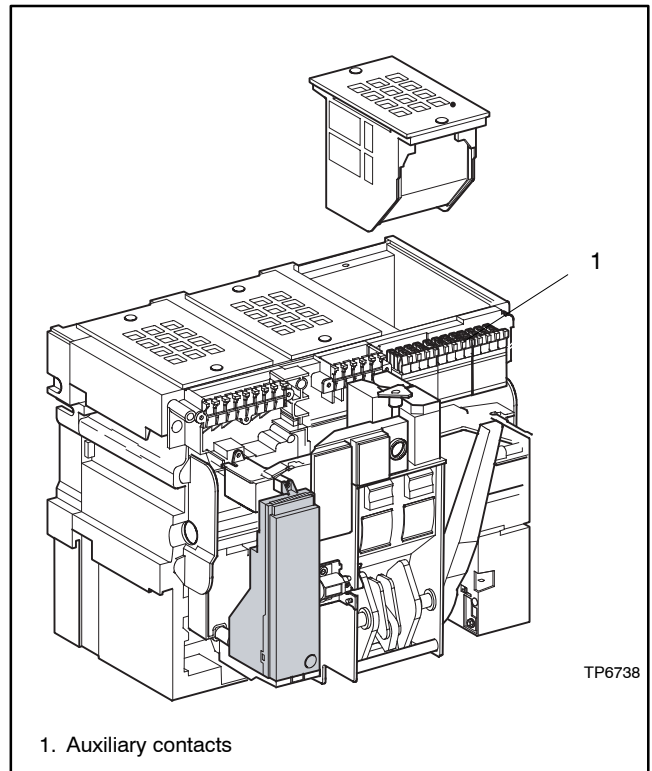
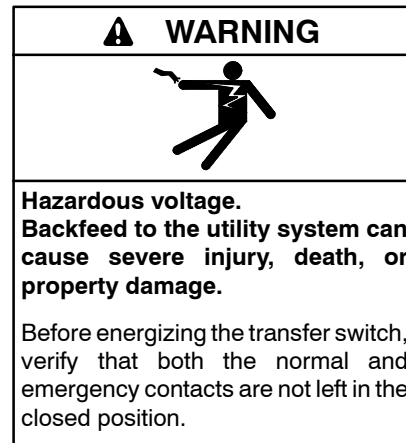


Figure 2-17 Auxiliary Contact Location on ICCB Breakers (typical)

2.10 Communication and Accessory Connections

See Section 4 for accessory and communication connection instructions.

2.11 Functional Tests



The functional tests are a necessary part of the transfer switch installation. Perform the functional tests described in Section 5.

3.1 Three-Source Systems

The Decision-Maker® MPAC 1500 controller is required for three-source systems.

A three-source system provides the means to connect a utility and two generators to a single load. See Figure 3-1. Two generators and two transfer switches are required.

Note: The second transfer switch (ATS2) requires an external battery supply module (EBSM or BOB) to provide power to the controller. See Section 4.3.3.

During normal operation, the utility source supplies the load with power. In the event of a utility failure, generator set G1 or G2 will supply the load as described in Sections 3.2 and 3.3.

3.2 Three Source Engine Start Mode

There are two modes of operation for three-source engine start. Select Mode 1 or Mode 2 on ATS2 as needed for the application.

3.2.1 Mode 1

In mode 1 there will be an attempt to start only the preferred source generator. If the preferred source does not achieve voltage and frequency within a fail to acquire time period, the standby engine start contact will close. The fail to acquire will be indicated. If the standby source subsequently fails to achieve voltage and frequency, a separate fail to acquire standby will be indicated.

3.2.2 Mode 2

In mode 2 both generators receive a start signal simultaneously. The ATS2 will transfer to the first generator set to reach proper voltage and frequency. If the first source to reach available status is the preferred source, the engine start signal to the standby source will open immediately. If the standby source is the first to reach available status, the contactor will transfer to the standby position. When the preferred source generator output reaches available status, the controller will transfer to the preferred source and open the engine start contacts to the standby generator (after the cooldown delay has elapsed).

3.3 Preferred Source Toggle

The preferred source toggle function alternates between the two generator sets each time the three-source function is activated. If G1 is the preferred source during the first run, then G2 will be preferred during the next run. The preferred source selection will continue to alternate between G1 and G2 for each subsequent run.

3.4 Three Source System Test and Exercise

3.4.1 Unloaded Test

Unloaded testing is possible at each transfer switch. Initiating the unloaded test function at ATS1 starts and runs the preferred generator set attached to ATS2. Initiating the unloaded test function at ATS2 starts and runs the standby generator set.

3.4.2 Loaded Test

Loaded testing is also allowed at each transfer switch. Loaded testing of the standby generator set is only possible during a loaded test from ATS1 because the standby generator can only be connected to the load when ATS1 is connected to emergency. To initiate a loaded test of the standby generator set, first use ATS1 to start a loaded test of the preferred source generator set. Then use ATS2 to start a loaded test of the standby generator set.

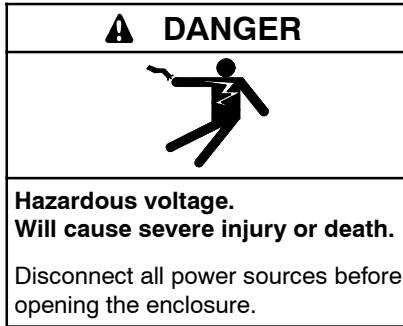
3.4.3 Unloaded Exercise

The exercise program in ATS2 controls the operation of each generator. The exercise function does not require interaction with ATS1. If the utility is lost during an unloaded exercise event, the event is canceled and the load is transferred to the preferred generator set.

3.4.4 Loaded Exercise

The exercise program in ATS2 controls the operation of each generator. The loaded exercise event requires synchronization with a loaded exercise from ATS1. Program the ATS1 exercise to start before the ATS2 exercise. Set the ATS2 exercise to end before the ATS1 exercise ends. If the utility is lost during a loaded exercise event, the event is canceled and the load is transferred to the preferred generator set.

3.5 Three-Source System Connection



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.

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.

See Figure 3-1 and Figure 3-2 for connections during the following steps.

1. Connect the power sources to the transfer switches as described below. Refer to the transfer switch dimension drawing or specification sheet for cable sizes. See Figure 3-1 for connections.
 - a. Connect the utility power source to the normal side of ATS1.
 - b. Connect the load to the load side of ATS1.
 - c. Connect the emergency side of ATS1 to the load side of ATS2.
 - d. Connect generator set 1 to the normal side of ATS2.
 - e. Connect generator set 2 to the emergency side of ATS2.
2. Three-source systems require the following input/output connections to control the engine start

commands for generator sets 1 and 2. Observe the polarity of all connections shown in Figure 3-2. Use wire sizes from #14 AWG to #20 AWG for EBSM and I/O module connections.

- a. Connect the ATS2 engine start contacts to the engine start circuit on generator set 2 (G2).

Note: See the Installation Section for the engine start contact locations. Engine start contacts are labeled with a decal.

- b. Connect one ATS1 programmable output from the controller to one ATS2 main logic board programmable input as shown in Figure 3-2. This I/O connection will be set to Three-Source System Disable.

- c. Connect one ATS2 programmable output from the controller to the engine start connection on generator set 1 (G1). The ATS1 programmable output will be set to Source N Start Signal.

3. Connect battery power. Use #14-28 AWG wire to connect the generator set engine starting battery (or batteries) to the BATT1 terminals on terminal block TB13 on the external battery supply module (EBSM; also referred to as battery option board). (Another battery(ies) can be connected to terminals BATT2 but is not required.) Follow the marking on the board for the positive (+) and negative (-) connections. See Figure 4-16 and Figure 4-17.

Note: If the battery connections are reversed, red LED1 or LED2 will light. Incorrect battery connections can damage the battery module.

4. Set voltage selector switch SW11-1 on the battery module (EBSM/BOB) to 12 or 24VDC.

Note: See Section 4.3.3 for more information on the EBSM/BOB.

5. Assign the ATS1 programmable output connected in step 2b. to Three-Source System Disable.

6. Assign the following inputs and outputs for the second transfer switch.

- a. Assign ATS2 controller programmable input 1 to Three-Source System Disable.

- b. Assign the ATS2 controller programmable output connected in step 2c. to Source N Start Signal.

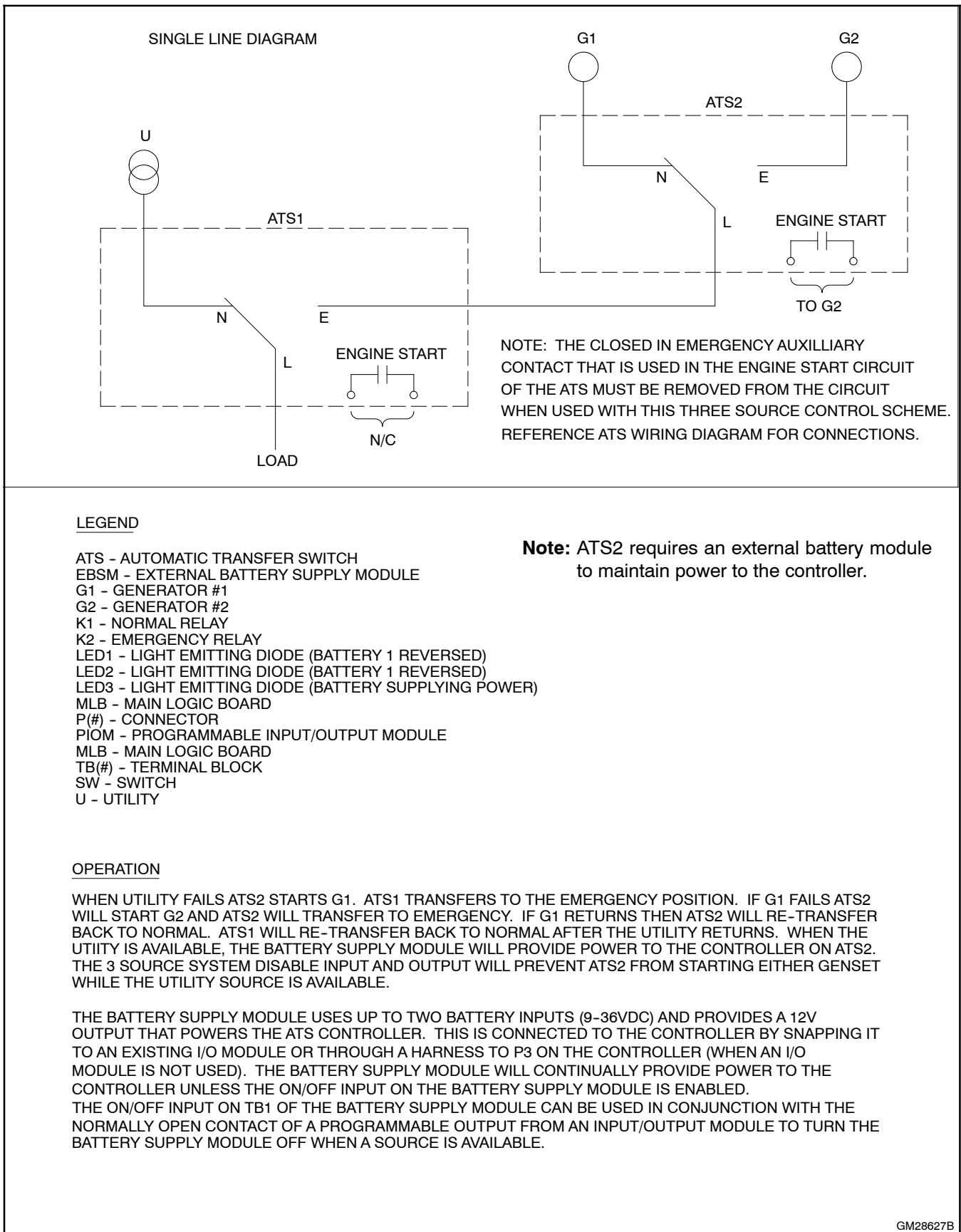


Figure 3-1 Three-Source System Transfer Switch and Source Connections

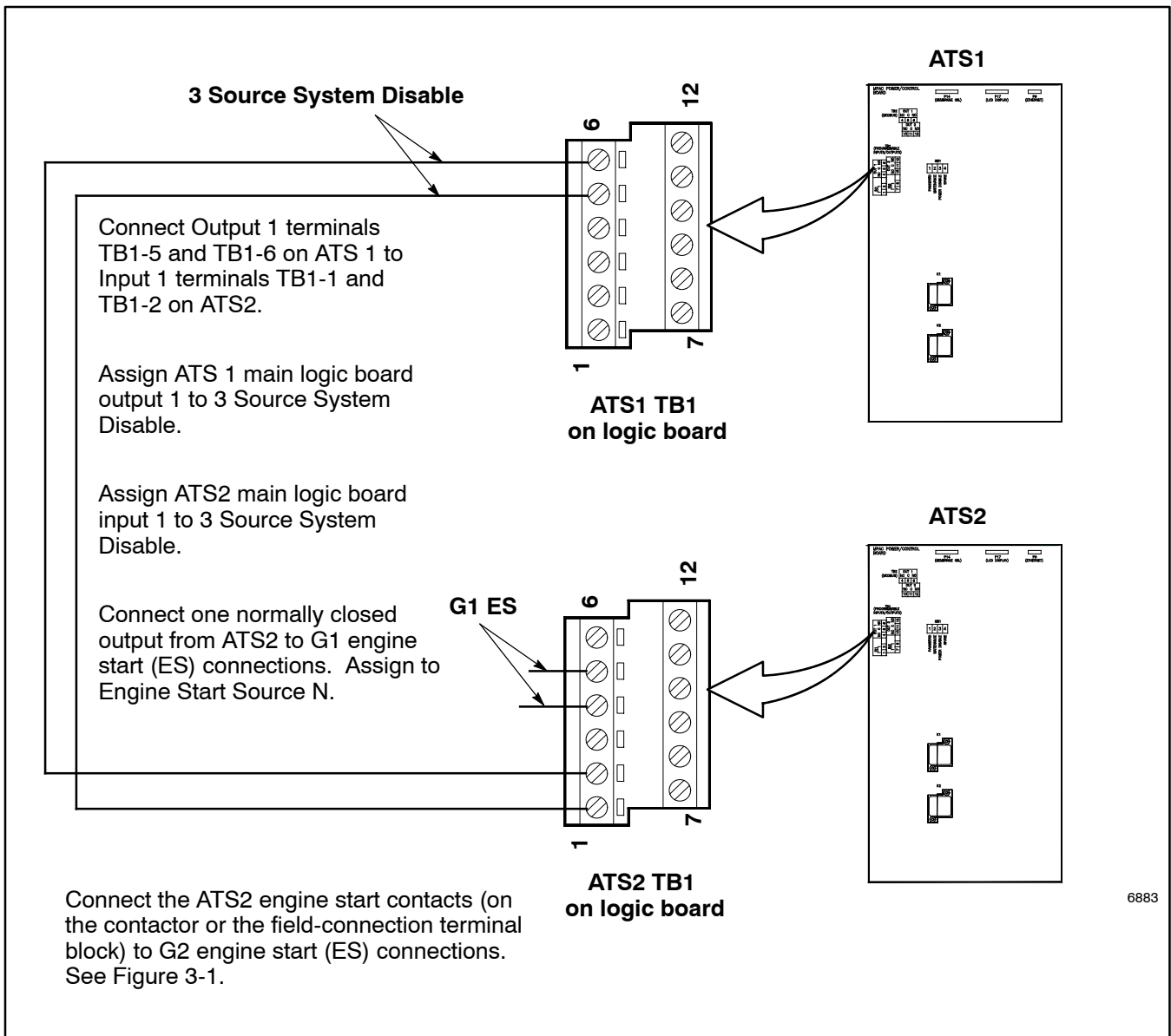


Figure 3-2 Input and Output Connections for Three-Source Systems

3.6 ATS1 and ATS2 System Setup

Set the following parameters on the transfer switches:

ATS1: Use the System Setup Menu to set the Source type to Util-Gen.

ATS2: Use the System Setup Menu to set the source type to Util-Gen-Gen. Set the 3 Src Engine Start Mode to Mode 1 or Mode 2 as described in Section 3.2. In the Set S1 Time Delay menu, verify that Fail to Acquire Preferred is enabled.

The transfer switch settings are summarized in Figure 3-3.

Transfer Switch	Source Type	3 Src Engine Start Mode	Preferred Source Toggle	Inputs	Outputs	Fail to Acquire Preferred
ATS1	Util-Gen	Not Required	Not Required	Not Required	Three Source System Disable	—
ATS2	Util-Gen-Gen	Mode 1 or Mode 2 (See Section 3.2)	Enable or Disable See Section 3.3	Three Source System Disable	Source N Start Signal	Enable

Figure 3-3 Transfer Switch Settings for Three-Source Systems

Section 4 Communication and Accessory Connections

4.1 Introduction

This section explains the connection of communication cables and factory-installed accessories.

Also refer to the following documentation for instructions to install, connect, and operate optional accessories.

- Transfer switch wiring diagrams.
- Installation instructions or diagrams provided with loose accessory kits.

4.2 Communication Connections

The Decision-Maker® MPAC 1500 controller is equipped with a USB port and a Modbus port with an RS-485 connector. An Ethernet communication board is also standard on the MPAC 1500 controller.

4.2.1 USB Port SiteTech Connection

A personal computer and Kohler® SiteTech™ software can be used for changing controller settings. Use a USB cable to connect the controller to a personal computer.

See Figure 4-1 for the USB port location on the front of the controller assembly. Remove the small port cover and use a USB cable with a mini-B connector to connect the controller's USB port to the computer.

See TP-6701, SiteTech Software Operation Manual, for instructions to use the software. Disconnect the USB cable from the controller and replace the port cover when finished.

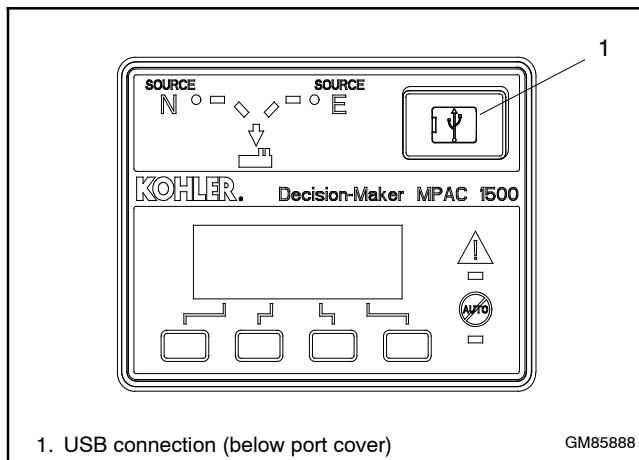
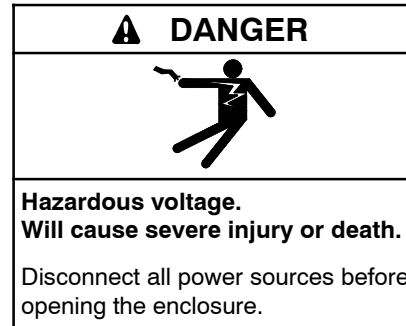


Figure 4-1 USB Connection for SiteTech (MPAC 1500 controller shown)

4.2.2 Modbus Connection



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.

See Figure 4-2 for the RS-485 Modbus connector location.

Use serial connections to TB2 on the controller to connect the transfer switch to a personal computer for system monitoring, the optional remote annunciator, or a Modbus network. See Figure 4-4.

Notice that a 121 ohm terminating resistor is recommended on the last device in a network. If there is only one device, a terminating resistor may be required depending on the cable distance and communication speed. Long cables and high speeds will increase the need for a terminating resistor.

The serial port is an isolated RS-485 port with connection speeds of 9.6, 19.2, and 57.6 kbps. Use shielded twisted-pair cable to connect to the RS-485 connectors on the controller's terminal strip TB2 for serial connections. For connection to a PC, use a USB to RS-485 converter.

Connect the Modbus input and output to the terminals shown in Figure 4-3. Use #12-24 AWG shielded, twisted-pair wire. Belden cable #9841 or equivalent is recommended. Connect one end of the shield to ground. Leave the other end of the shield disconnected. Tighten the connections to 0.5 Nm (4.4 in. lb.).

Use Modbus RTU (remote terminal unit) protocol for communication through the serial port. A map of the Modbus codes for this controller is available. Contact your local distributor/dealer.

Note: Modbus® applications require a Modbus software driver written by a trained and qualified systems programmer.

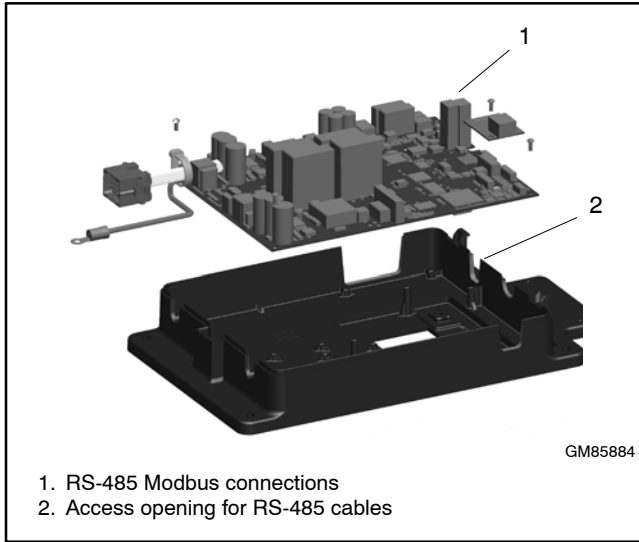


Figure 4-2 Modbus Connections (controller cover removed for illustration only)

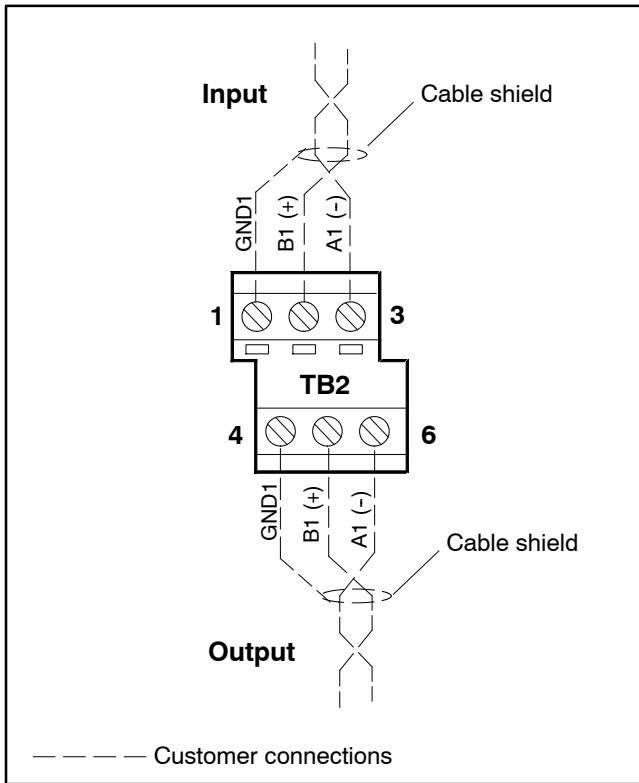


Figure 4-3 Modbus RS-485 Connections

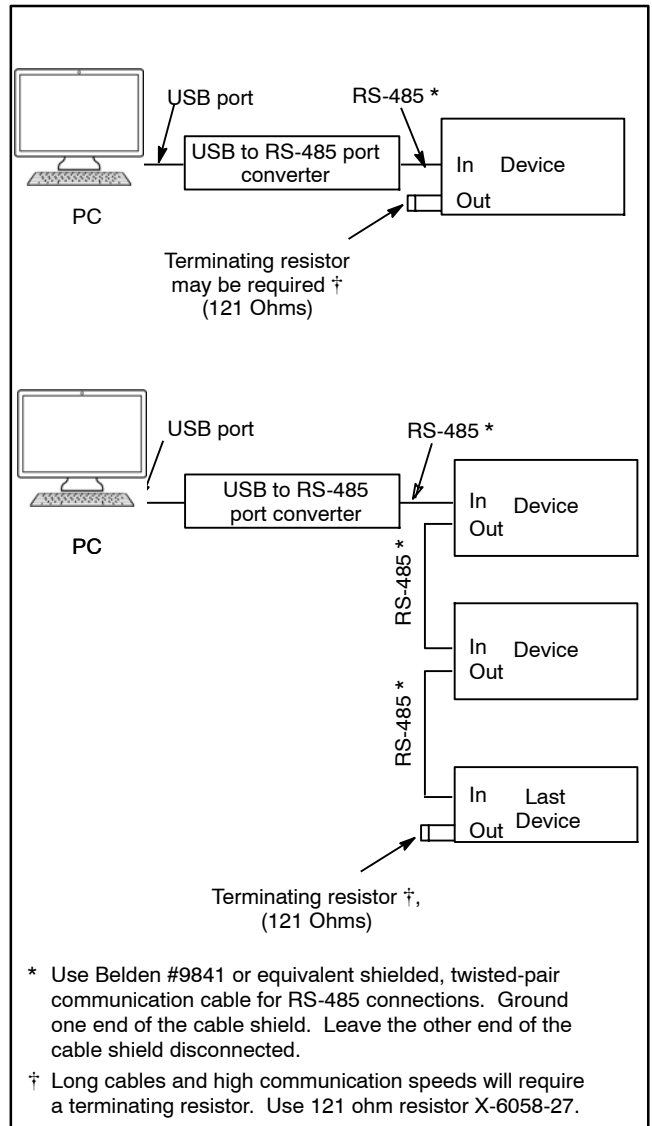
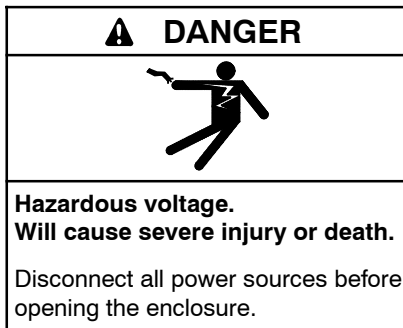


Figure 4-4 Serial Connections

* Use Belden #9841 or equivalent shielded, twisted-pair communication cable for RS-485 connections. Ground one end of the cable shield. Leave the other end of the cable shield disconnected.

† Long cables and high communication speeds will require a terminating resistor. Use 121 ohm resistor X-6058-27.

4.2.3 Ethernet Connection



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.

The Ethernet communication accessory board is required for connection to the Ethernet. The Ethernet communication board is standard on the Decision-Maker® MPAC 1500 controller. The communication board connects to the controller board as shown in Figure 4-5.

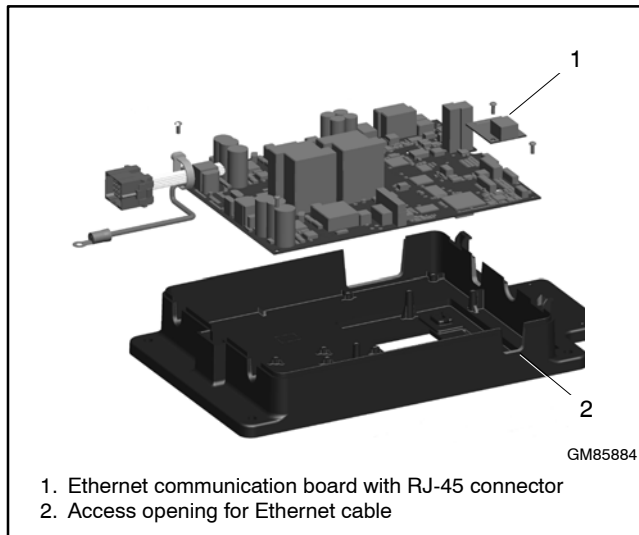


Figure 4-5 Ethernet Board (controller cover removed for illustration only)

The Ethernet communication board allows the transfer switch to be connected to a building's Ethernet network to communicate with personal computers connected to the same subnet.

Note: For an ethernet connection, obtain an IP address and subnet mask number from the local system administrator.

Ethernet Port. The ethernet port is a standard RJ-45 jack. See Figure 4-5 for the location of the Ethernet port. Use Category 5e or better cable to connect the controller to the building's network.

Use the controller's Setup menus or a personal computer connected to the controller's USB port and Kohler SiteTech software to set the communication parameters. The Ethernet communication board may have a default IP address assigned at the factory for test purposes. See Figure 4-6. **Change the IP address to an address owned by the user.** See the controller operation manual for instructions to set the communication parameters.

The transfer switch controller does not operate as a Modbus-to-Ethernet converter for other devices in a network. For multiple device networks connected to the personal computer through the Ethernet, use a Modbus-to-Ethernet converter for the other devices in the network. See Figure 4-7 and instruction sheet TT-1405, provided with the converter, for connection instructions.

The controller can communicate with up to five (5) simultaneous TCP/IP (ethernet) connections. These five connections do not include the RS-485 serial port. In the extreme case, five users may be communicating with the controller via TCP/IP network connections and another may be communicating through the serial port, for a total of six (6) communication channels. As the controller is asked to communicate with more and more outside devices, the communication will slow down.

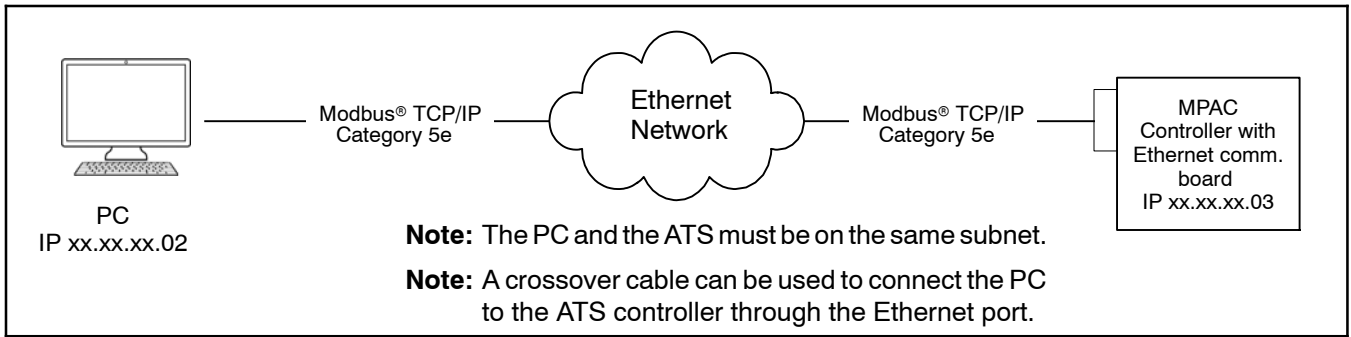


Figure 4-6 Remote Network (Ethernet) Connection

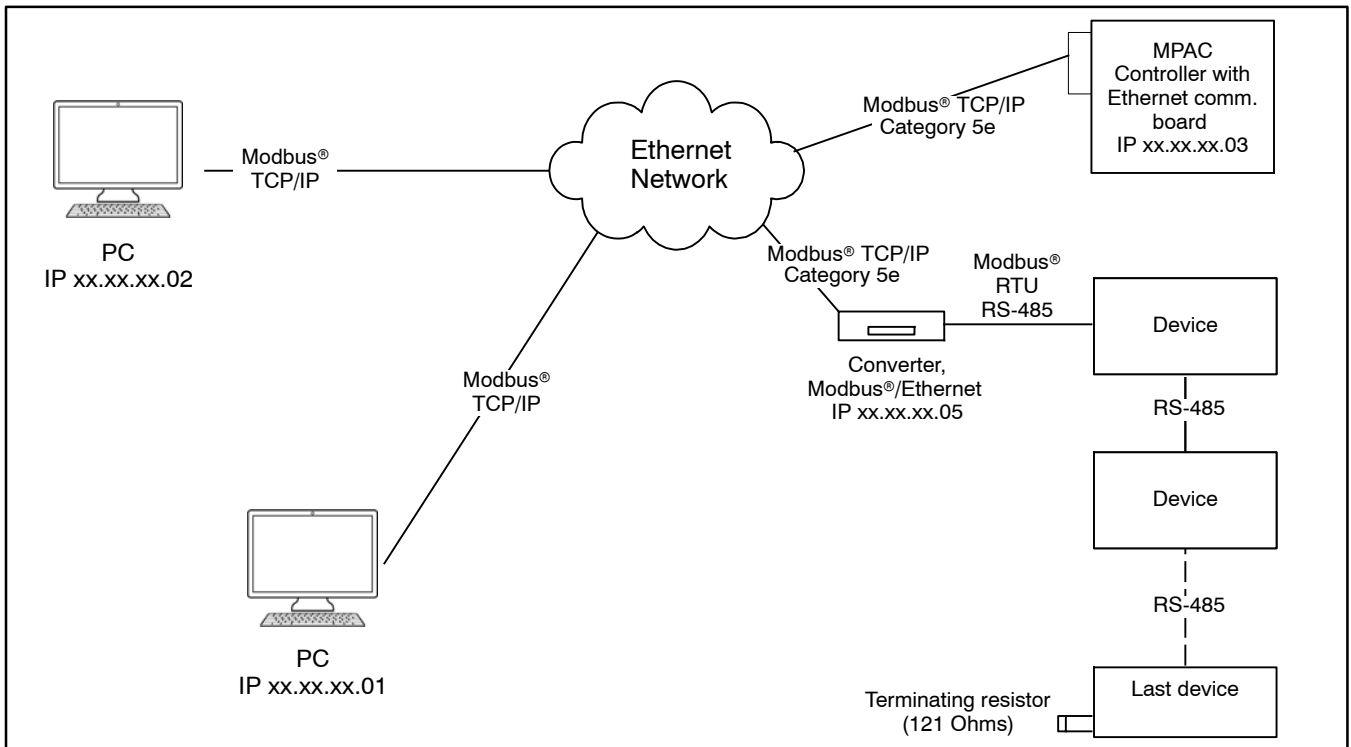
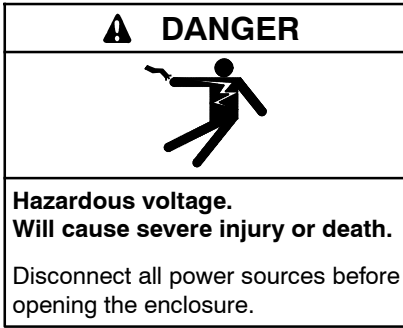


Figure 4-7 Ethernet Connections to Multiple-Device Network

4.3 Accessory Modules (Option Boards)



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.

This section provides specifications and field connection information for factory-installed accessory modules. If the modules are not factory-installed, follow the instructions provided with the kits to install the mounting assembly and modules. Accessory modules may also be referred to as option boards.

The transfer switch uses a standard bus system for connecting accessory modules to the controller. This bus incorporates a standard serial communication interface for passing data back and forth between the main logic board and the assemblies on the expansion bus.

The module mounting kit holds up to five optional boards. The total current draw of all modules must not exceed 300 mA. See Figure 4-8. Add the current draw for every module installed to determine the total current draw. If an External Battery Supply Module (EBSM or BOB) is installed and connected to a battery, there is no current restriction. The EBSM, if used, must be the last board on the bus.

Module Current Draw Specifications, mA	
Alarm Module	75
Standard I/O Module	75
High Power I/O Module	100

Figure 4-8 Accessory Module Current

4.3.1 Accessory Module Mounting

Mount the accessory modules on the module mounting plate. Starting at the end of the module mounting assembly nearest the cable connection, install any I/O modules first, then install the alarm board, if used. The external battery module, if used, must be the last module. See Figure 4-9. The alarm board has a fixed Modbus address = 5.

Note: Some models may have the I/O module assembly installed with the cable connection end pointing to the side or the bottom. Regardless of the actual orientation of the assembly, the I/O modules must be installed closest to the cable connection, followed by the alarm module and then the external battery module, if used.

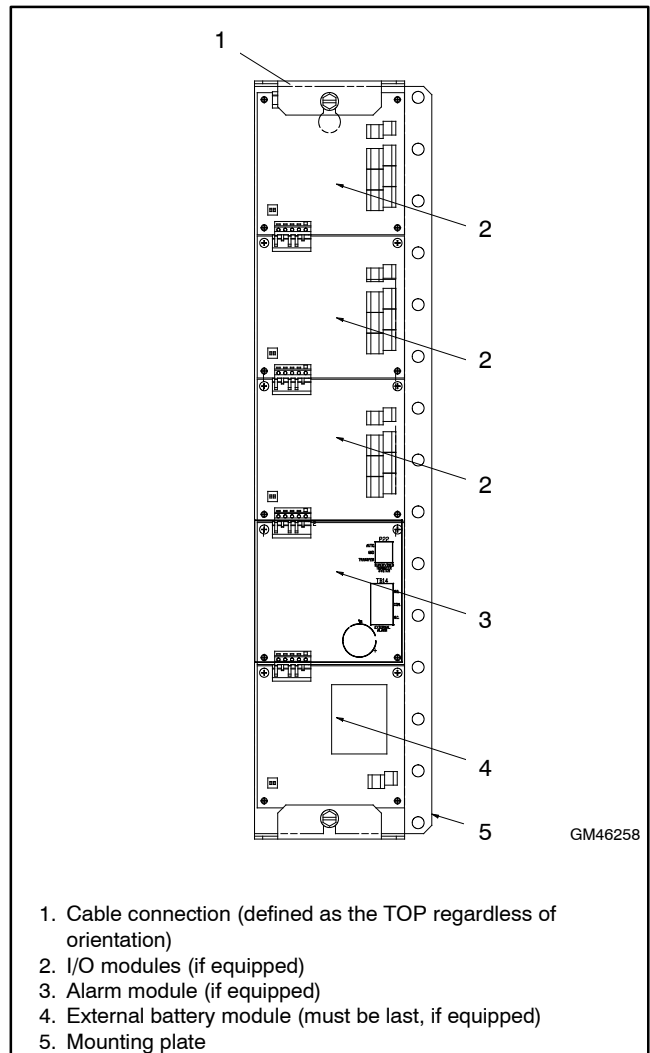


Figure 4-9 Module Mounting

4.3.2 Input/Output (I/O) Modules

Two types of input/output modules are available. The standard I/O Module has two inputs and six outputs. The high-power I/O module has two inputs and three outputs. See Figure 4-10 through Figure 4-13 for I/O module illustrations and specifications.

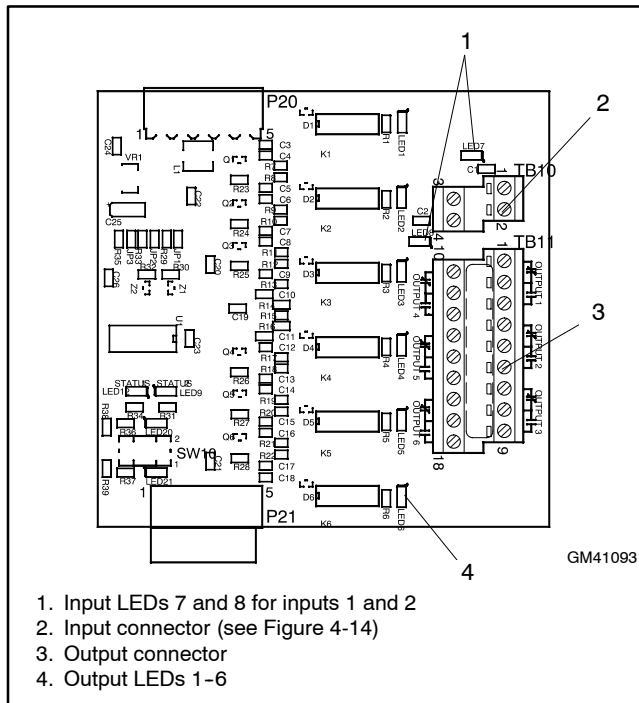


Figure 4-10 Standard Input/Output Module

Inputs	
Available Inputs	2
Input Definition	Contact Closure
Current	5 mA Max
Connection Type	Terminal Strip
Wire Size	#14-24 AWG
Max Distance	700 feet
Outputs	
Outputs Available	6
Contact Type	Form C (SPDT)
Contact Voltage Rating	2 A @ 30 VDC 500 mA @ 125 VAC
Connection Type	Terminal Strip
Wire Size	#14-24 AWG

Figure 4-11 Standard I/O Module Specifications

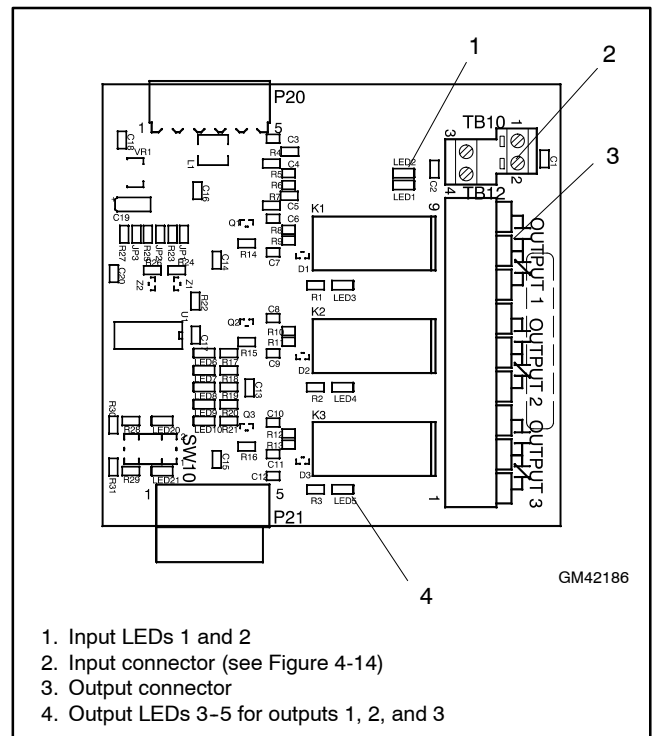


Figure 4-12 High-Power Input/Output Module

Inputs	
Available Inputs	2
Input Definition	Contact Closure
Current	5 mA Max
Connection Type	Terminal Strip
Wire Size	#14-24 AWG
Max Distance	700 feet
Outputs	
Outputs Available	3
Contact Type	Form C (SPDT)
Contact Voltage Rating	12 A @ 24 VDC 12 A @ 250 VAC 10 A @ 277 VAC 2 A @ 480 VAC
Connection Type	Terminal Strip
Wire Size	#14-24 AWG
Environmental Specifications	
Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	35% to 85% noncondensing

Figure 4-13 High-Power I/O Module Specifications

Use 14-24 AWG cable to connect to inputs and outputs. See Figure 4-14.

LEDs on the module circuit board light to indicate that each input or output is active.

Note: Each I/O module must have a unique address.

Use the address DIP switches on the I/O module to assign a unique (different) address to each module as shown in Figure 4-15. Assign addresses in order from 1 to 4. An LED for each DIP switch lights to indicate that the switch is closed.

The alarm module's fixed address is 5. The battery module's fixed address is 6.

See the controller operation manual for instructions to assign functions to each input and output. Inputs and outputs can also be assigned using a personal computer with Kohler® SiteTech™ software or over Modbus. See TP-6701, SiteTech Operation Manual, or TP-6113, Modbus Protocol Manual.

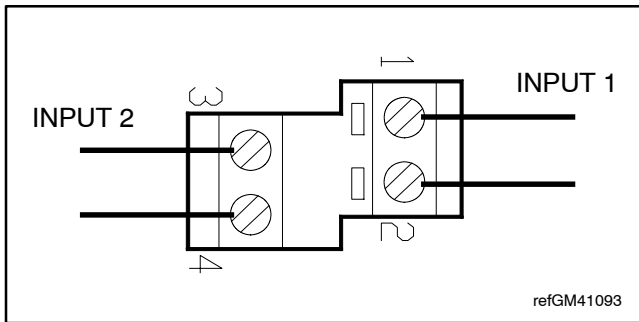
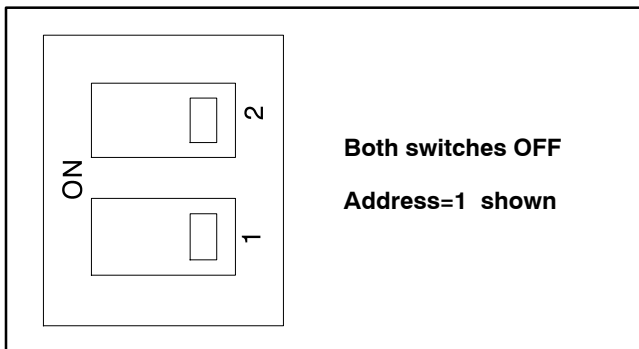


Figure 4-14 I/O Module Input Connections (TB1 or TB10)



DIP Switch		Address
1	2	
Off	Off	1
On	Off	2
Off	On	3
On	On	4

Figure 4-15 Address DIP Switch Settings

4.3.3 External Battery Supply Module (EBSM or BOB)

The external battery supply module kit allows connection to the generator set engine start battery(ies) or other batteries to provide 12 VDC power to the ATS controller. The EBSM is also referred to as the battery option board (BOB).

The EBSM/BOB kit is required for the following applications:

- **Systems using extended engine start time delays.** The EBSM/BOB provides power to the ATS controller during extended time delays longer than 15 seconds, when neither the Normal nor the Emergency source is available.
- **Installations with frequent utility power outages.** The EBSM/BOB provides power to the ATS controller when neither source is available, preserving the controller's backup battery.
- **Three-source systems.** Three-source systems use two transfer switches and two standby power sources in addition to the preferred power source. The EBSM/BOB provides power to the second ATS controller when the preferred source (connected to ATS1) is supplying the load. See Section 3.1 for instructions to set up a three-source system.

The external battery supply module kit includes one external battery supply circuit board and the circuit board mounting components. See Figure 4-16.

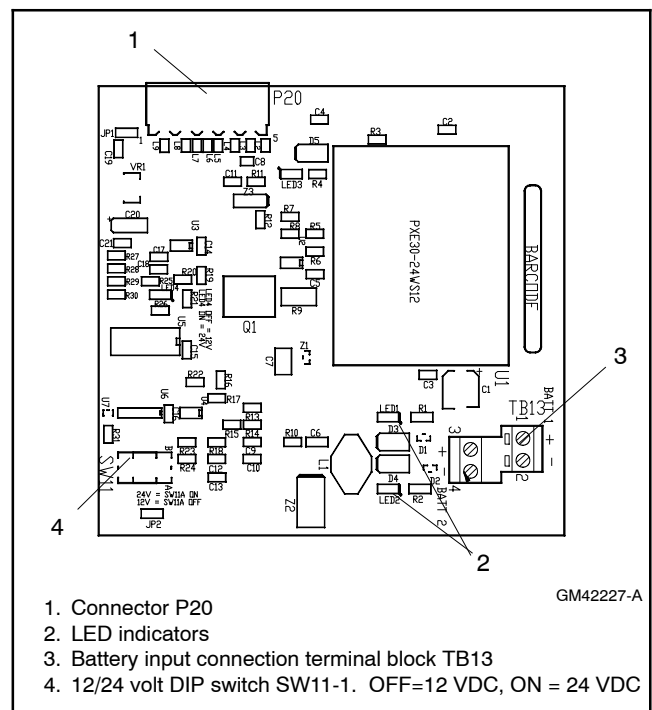


Figure 4-16 External Battery Supply Module

The EBSM/BOB produces 2 amps at 12 VDC with 9–36 VDC input. The EBSM/BOB input is reverse-polarity protected. The EBSM/BOB outputs a low battery voltage signal when the external battery voltage falls below 11 VDC for a 12-volt system or 22 VDC for a 24-volt system.

A module mounting kit is required for installation of the external battery supply module. See Section 4.3.1. Obtain a module mounting kit if one is not already installed and follow the instructions provided with the kits to install the mounting assembly and modules.

The battery voltage selection DIP switch SW11-1 allows selection between 12-volt and 24-volt systems for low battery voltage sensing and indication. Connect one or two batteries to the external battery supply module. Use a battery charger to maintain the battery(ies) connected to the EBSM/BOB.

DIP Switch SW11-1 Setting	Battery Voltage
OFF	12 VDC
ON	24 VDC

Figure 4-17 Battery Voltage Selection

EBSM/BOB Connection and Voltage Setting

1. Use #14-28 AWG wire to connect one or two batteries to terminal block TB13. (A second battery can be connected but is not required.) Follow the marking on the board for the positive (+) and negative (-) connections. See Figure 4-16 and Figure 4-17.

Note: If the battery connections are reversed, red LED1 or LED2 will light. See Figure 4-16.

2. Set voltage selector switch SW11-1 to 12 or 24VDC. See Figure 4-16 and Figure 4-17. Switch SW11-2 is not used.

Note: The EBSM/BOB has no address switches but must be the last board on the bus.

4.3.4 Alarm Module

See Figure 4-18 for the optional alarm module. A module mounting kit is required for installation of the alarm module. See Section 4.3.1.

The functions provided by this board are:

- 90 dB audible alarm (any alarm function can be programmed to trigger the audible alarm)
- Chicago alarm operation
- Preferred source selection
- Supervised transfer control (supervised transfer control switch required)
- Connection for external alarm

The alarm board has a fixed address = 5.

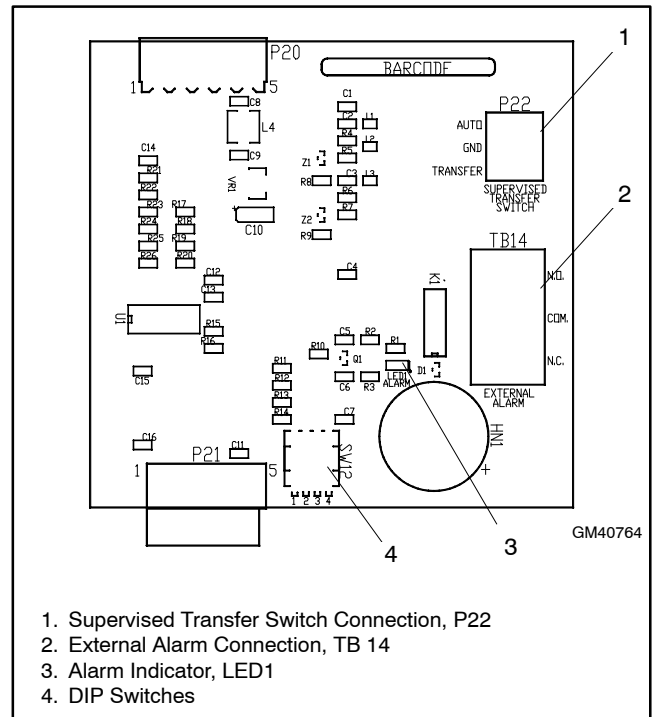


Figure 4-18 Alarm Module

Alarm Board DIP Switches

There are four DIP switches on the alarm module board. Some of the switches are not used. See Figure 4-19. To enable the preferred source selection, set DIP switch 1 to ON. If the supervised transfer switch is installed on the ATS, set DIP switch 2 to ON.

DIP Switch	Function
1	Preferred source selection
2	Supervised transfer enable
3	Not used
4	Not used

Figure 4-19 Alarm Board DIP Switches

Preferred Source Selection

The alarm module is required for preferred source selection. To enable the preferred source selection, set DIP switch 1 to ON. Then see the controller operation manual for instructions to select Source N or Source E as the preferred source.

External Alarm

A customer-supplied external alarm horn can be connected to the alarm module at terminal block TB14. Connect to the normally open or normally closed contact as recommended by the alarm manufacturer's instructions. See Figure 4-20.

Item	Specification
Wire Size	#12-22 AWG Cu
Contact Voltage Rating	500 mA @ 120 VAC
	250 mA @ 240 VAC

Figure 4-20 External Alarm Connection Specifications

Audible Alarm Setup

The alarm board is equipped with a 90 dB audible alarm. The audible alarm can be set to sound under selected fault conditions. Use the Common Alarms Setup menu to assign functions to the audible alarm. See the controller operation manual for instructions to set Audible Alarm: Y for each function that should trigger the alarm.

Alarm Operation, Normal Mode

In Normal Mode, the horn sounds anytime a fault event happens in the system. The horn continues to sound unless the alarm silence button is pressed. When the fault is cleared, the alarm silence is ended and reset for the next alarm.

Alarm Operation, Chicago Alarm Mode

Chicago Alarm mode requires the horn to sound and a lamp or LED to light when the switch is in the emergency (non-preferred) position. The horn continues to sound unless the alarm silence button is pressed. When the fault is cleared, the alarm silence is ended and reset for the next alarm.

For Chicago Alarm Mode, use the Common Alarm Setup menu to assign the necessary faults and conditions to the audible alarm. See the controller operation manual for instructions to assign common faults. Be sure to assign the Contactor in Standby condition to trigger the audible alarm.

A remote alarm or indicator light can also be connected to the alarm board to indicate the alarm condition, as described previously. See External Alarm.

Alarm Silence Mode

In Alarm Silence Mode, the horn is disabled. Alarm Silenced appears on the display and the system alert LED lights.

The Alarm Silenced condition can be assigned to a programmable output. See the controller operation manual for instructions to assign outputs.

Instructions to Silence the Alarm in Normal and Chicago Alarm Modes

When the alarm is activated, the word Alarm appears on the main display menu above the first button. See Figure 4-21. Press the Alarm button to open the Reset menu. Then press the button labeled Reset to silence the alarm.

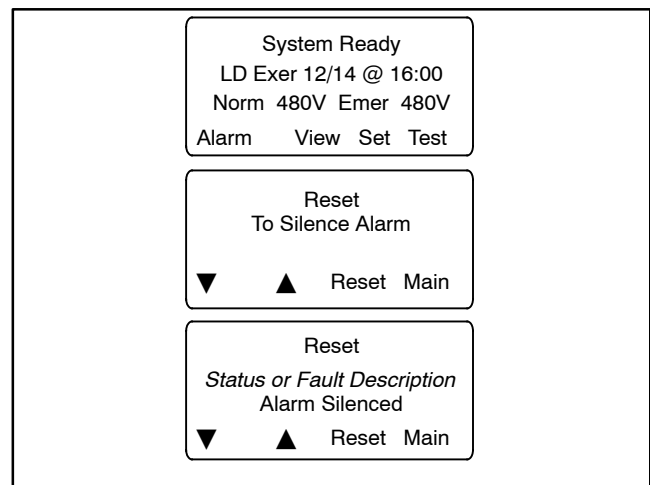
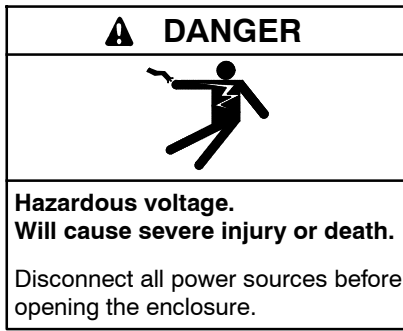


Figure 4-21 Alarm Silence

4.4 Heater



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.

An anti-condensation heater kit is available. The strip heater is controlled by a hygrostat to raise the temperature inside the enclosure above the dew point to prevent condensation. Figure 4-22 shows a typical location of the heater kit components inside the enclosure.

The installer must connect 120 VAC power to the terminal block near the hygrostat. See Figure 4-23 and Figure 4-24. The heater and hygrostat are connected to power through a 15-amp circuit breaker.

The relative humidity setting on the hygrostat is adjustable from 35% to 95%. A setting of 65% is recommended.

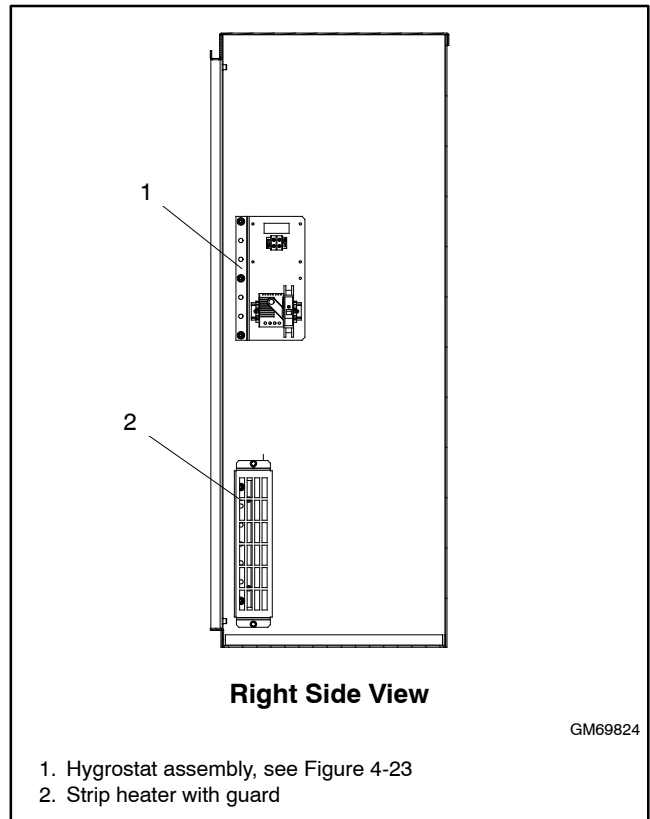


Figure 4-22 Heater Location, Typical

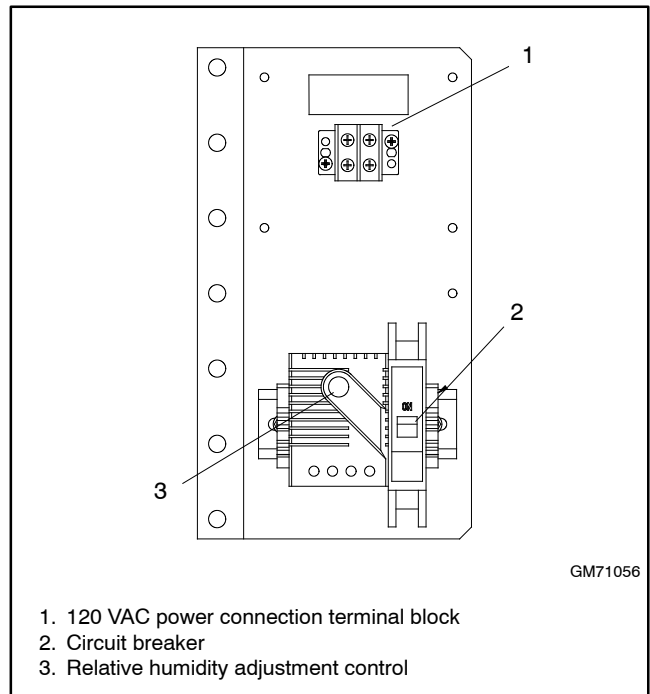


Figure 4-23 Hygrostat Assembly, Typical

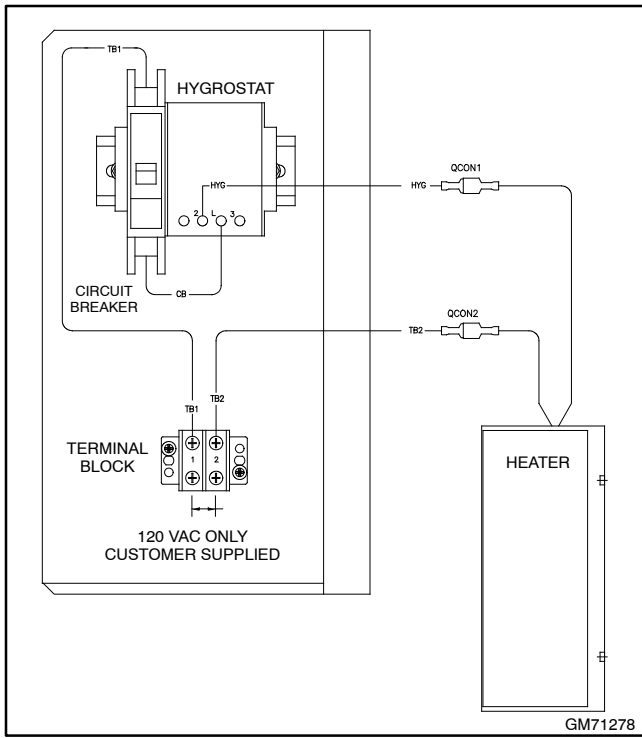


Figure 4-24 Heater Connections

4.5 Other Accessories

Refer to the following documentation for instructions to install, connect, and operate optional accessories.

- Transfer switch wiring diagrams.
- Installation instructions provided with loose accessory kits.
- Controller Operation Manual. See List of Related materials in the Introduction section of this manual for document numbers.

Notes

5.1 Introduction

Be sure to perform all of the functional tests described in this section before putting the transfer switch into operation.

Note: Perform these checks in the order presented to avoid damaging the ATS.

Read all instructions on the labels affixed to the automatic transfer switch before proceeding.

To complete the installation, follow the instructions in this section to:

- Set the time, date, and exercise schedule on the controller.
- Perform the system startup procedures listed on the startup form.
- Register the unit using the Kohler® online Warranty Processing System.

5.2 Manual Operation Test

If you have not already done so, test the power switching device manual operation before proceeding to the voltage check and electrical operation test.

Note: Disable the generator set and disconnect the power by opening the circuit breakers or switches for both sources before manually operating the transfer switch.

Follow the instructions in Section 2.7 to check the transfer switch manual operation.

A power switching device in normal and serviceable condition transfers smoothly without binding when operated manually. Do not place the transfer switch into service if the power switching device does not operate smoothly without binding; contact an authorized distributor/dealer to service the contactor.

5.3 Ground Fault Site Test Requirements

Per NEC and UL1008, a ground fault protected system must be performance tested when first installed onsite. Confirm and record the actual trip setpoints in the Performance Test Form in Section 8. The form must be available to the inspection authority having jurisdiction upon request.

5.4 Performance Test

Qualified field service technicians require a calibrated current injection test apparatus and must be knowledgeable in power switching unit testing to provide primary neutral CT injection up to or greater than the trip setpoint as selected by the responsible party. As indicated in the NEC, the maximum setting of the ground fault protection is 1200 amps, and the maximum time delay is 1 second for ground faults equal to or greater than 3000 amps.

Contact the inspection authority to confirm actual test requirements as these may vary by region or local code requirements.

Evaluate the interconnected system to ensure compliance with the appropriate schematic drawings. Determine the proper location of sensors and power cabling. Verify the grounding points of the system to determine that ground paths do not exist that would bypass the sensors. The use of high-voltage testers and resistance bridges may be required. Use a coil around the sensors to generate a simulated fault current. Observe the reaction of the circuit-interrupting device for correct response. Record the results of the test on the form provided in Section 8.

5.5 Voltage Check

The voltage, frequency, and phasing of the transfer switch and the power sources must be the same to avoid damage to loads and the transfer switch. Compare the voltage and frequency ratings of the utility source, transfer switch, and generator set, and verify that the ratings are all the same.

Use the voltage check procedure explained in this section to verify that the voltages and phasing of all power sources are compatible with the transfer switch before connecting the power switching device and controller wire harnesses together.

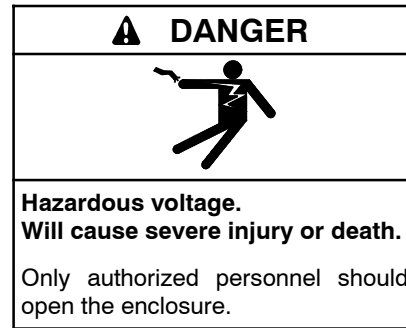
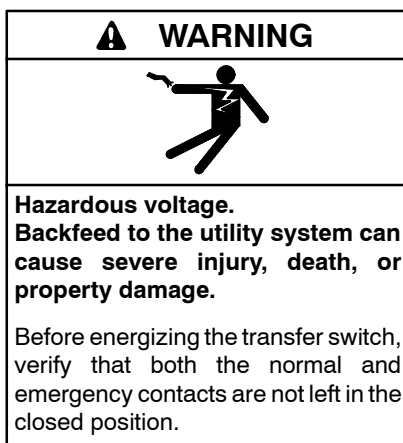
Follow the instructions provided with the generator set to prepare the generator set for operation.

Read and understand all instructions on installation drawings and labels on the switch. Note any optional accessories that have been furnished with the switch and review their operation.

Note: Source N is the source connected to the normal side of the contactor. Source E is the source connected to the emergency side of the contactor. Verify that the source leads are connected to the correct lugs before proceeding.

The voltage check procedure requires the following equipment:

- A digital voltmeter (DVM) with electrically insulated probes capable of measuring the rated voltage and frequency
- A phase rotation meter



Testing live electrical circuits. Hazardous voltage or current can cause severe injury or death. Have trained and qualified personnel take diagnostic measurements of live circuits. Use adequately rated test equipment with electrically insulated probes and follow the instructions of the test equipment manufacturer when performing voltage tests. Observe the following precautions when performing voltage tests: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Do not touch the enclosure or components inside the enclosure. (4) Be prepared for the system to operate automatically.
(600 volts and under)

Voltage Check Procedure

1. Ensure that all downstream loads are switched off.
2. If the source being measured is a generator set, start the generator set by moving the master switch to RUN.
3. Use a voltmeter to check the source phase-to-phase and phase-to-neutral (if applicable) terminal voltages and frequency.
 - a. If Source N is the utility and the measured input does not match the voltage and frequency shown on the transfer switch nameplate, **STOP!** Do not proceed further in installation because the transfer switch is not designed for the application. See Section 2.5 for instructions to correct the input voltage transformer connections and contact your distributor/dealer to order the correct nameplate.
 - b. If the source is a generator set and the generator set output voltage and frequency do not match the nominal system voltage and frequency shown on the transfer switch nameplate, follow the manufacturer's

instructions to adjust the generator set. The automatic transfer switch will only function with the rated system voltage and frequency specified on the nameplate.

4. Use a phase rotation meter to check the phase rotation at the source terminals. Rewire the transfer switch source terminals to obtain the correct phase sequence if necessary.

Note: The default setting for the phase rotation on the controller is ABC. If the application uses a phase rotation of BAC, use the Source Setup screen to change the phase rotation setting on the controller.

5. If the source is a generator set, stop the generator set by moving the master switch to the OFF/RESET position.
6. Repeat steps 2 through 5 for Source E.
7. Close and lock the transfer switch enclosure door.
8. Move the generator set master switch to the AUTO position.

Note: If the engine cooldown time delay setting is not set to zero (default setting), the generator set may start and run until the Engine Cooldown Time Delay ends.

9. Perform the lamp test and then proceed to the automatic operation test.

5.6 Lamp Test

Refer to the controller operation manual for instructions to perform a lamp test. Verify that all controller LEDs or lamps are operational.

5.7 Automatic Operation Test

Check the transfer switch's automatic control system immediately after the voltage check. Refer to the controller Operation Manual for instructions to run the automatic operation test.

Note: Close and lock the enclosure door before starting the test procedure.

5.8 System Setup

Set the controller's current time and date. See the controller Operation Manual for instructions.

The transfer switch is factory-set with default settings for time delays and other parameters. See the controller Operation Manual for instructions to view and change settings, if necessary.

Note: Use caution when changing transfer switch settings. The source voltage and frequency settings must match the values shown on the transfer switch nameplate.

5.9 Exerciser Setup

Set the exerciser to start and run the generator set at least once a week. See the controller Operation Manual for instructions.

5.10 User Interface Cover

The gasket-sealed, hinged user interface cover prevents unauthorized access to the transfer switch controls and protects the user interface from harsh environmental conditions. The cover is available as an optional accessory for NEMA 1 enclosures. NEMA 3R enclosures include the cover as standard equipment.

Use a customer-supplied padlock to lock the cover.

5.11 Startup Notification

Perform the system startup procedure explained on the Startup Notification Form. The Startup Notification Form covers all equipment in the power system. Complete the Startup Notification Form and register the power system using the Kohler® online Warranty Processing System.

Notes

6.1 Transfer Switch Operation

6.1.1 Normal Operation

Under normal conditions, the load is energized from the utility supply through the closed utility transfer power switching device. If the utility power fails, the generator will start and the load will be reenergized via the closed generator transfer power switching device. Refer to the controller operation manual for the sequence of operation.

In the normal operating mode, the service disconnect switch must be in the AUTO position. See Section 6.4 or Section 6.3 for service disconnect instructions.

6.1.2 Overcurrent Trip

If the utility source power switching circuit breaker trips open due to an overcurrent condition, the ATS controller will initiate an engine start signal and initiate transfer of the load to the generator supply. A Source1 breaker trip fault will be displayed on the ATS controller. The utility source will be locked out and the load will remain on the generator supply until the fault is manually reset.

If the emergency source power switching circuit breaker trips open due to an overcurrent condition, the load is transferred to the utility supply. A Source2 breaker trip fault will be displayed on the ATS controller. The generator source will be locked out and the load will remain on the utility supply until the fault is manually reset.

If the emergency source power switching circuit breaker trips open during a loaded test or exercise sequence, the load is transferred to normal and the test or exercise sequence ends.

Note: Contact your local distributor/dealer to identify and correct the cause of the overcurrent condition before resetting the fault.

Press the RESET button on the breaker to reset the breaker on ICCB models. Then check the controller display for fault messages. See the ATS controller operation manual for instructions to reset the fault. See the List of Related Materials in the Introduction section for the manual part number.

MCCB type breakers will automatically reset when the controller fault is reset and the transfer switch controller initiates transfer to the other source.

6.2 Service Disconnect Position

Model KEP Service Entrance rated transfer switches are configured with the service disconnect position set to either Emergency or OFF. The service disconnect position is factory set on the Decision-Maker® MPAC 1500 controller. Units that are factory-configured to use the OFF position are identified on the service disconnect switch decal, shown in Figure 6-1. Units that do not have the Service Disconnect to OFF label shown in Figure 6-1 use the Emergency position.

The two styles require different procedures to disconnect power during maintenance or service.

6.2.1 Service Disconnect to Emergency

When the service disconnect switch is moved to the SERVICE DISCONNECT position, the transfer switch signals the generator set to start and transfers to the Emergency source. **See Section 6.3 for service disconnect procedures for transfer switches with the service disconnect to Emergency position.**

Controllers with MPAC firmware versions earlier than 1.10 use the Service Disconnect to Emergency position. The service disconnect position is not displayed on controllers with firmware versions earlier than 1.10.

6.2.2 Service Disconnect to OFF

When the service disconnect switch is moved to the SERVICE DISCONNECT position, the utility breaker opens. Utility power is disconnected and the ATS is in the OFF position. **See Section 6.4 for service disconnect procedures for transfer switches with the service disconnect to OFF position.**

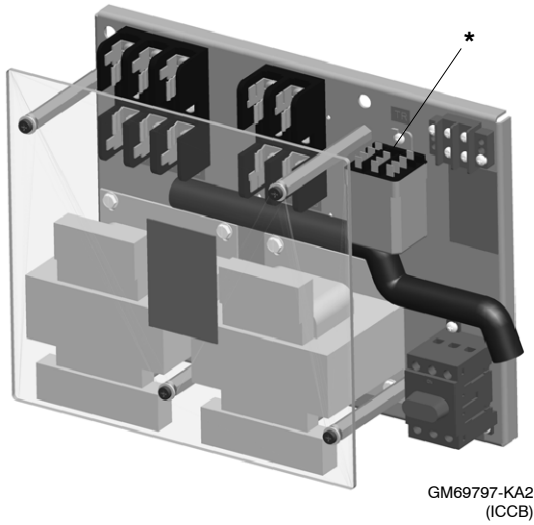
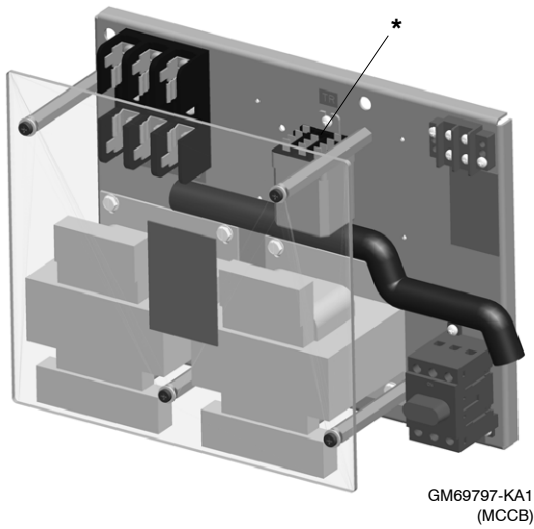
Controllers with MPAC firmware version 1.10 or higher are factory set with the Service Disconnect to OFF position. The position can be seen in the View System Setup screen on the controller. See the controller operation manual for instructions to view the system setup, if necessary.

NOTICE:
SERVICE DISCONNECT TRANSFERS TO OFF, REMOVING POWER FROM THE LOAD. POWER WILL NOT BE RESTORED UNTIL THE SWITCH IS RETURNED TO AUTO.

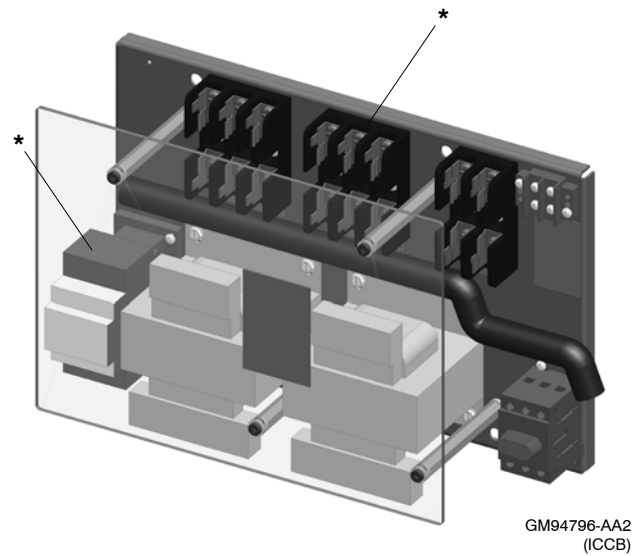
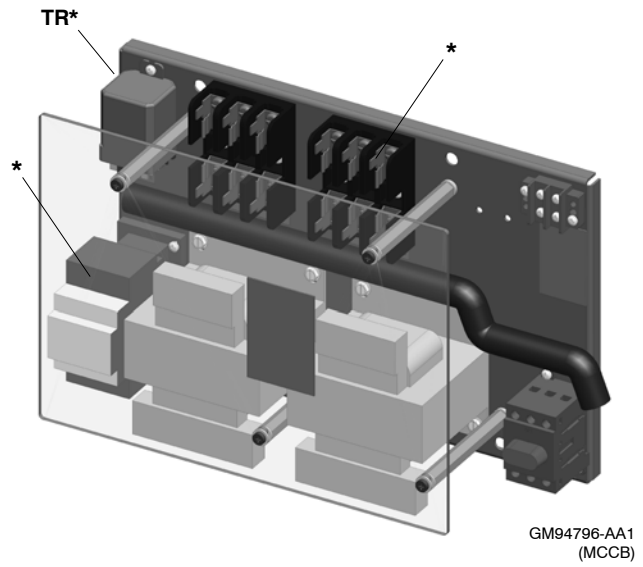
GM99262

Figure 6-1 Service Disconnect to OFF Label

**Original Transformer Assemblies
(Service Disconnect to EMERGENCY only)**



**Revised Transformer Assemblies
(Service Disconnect to OFF †)**



* Asterisk indicates differences that can be used to identify original or revised transformer assemblies.

† Transfer switches equipped with transformer assembly GM94796-AA1 or GM94796-AA2 can be reconfigured to use the Service Disconnect to Emergency position, if necessary. See Section 7 for instructions.

Figure 6-2 Transformer Assemblies

6.2.3 Transformer Assemblies

Service disconnect to OFF units are equipped with revised transformer assemblies and controller firmware version 1.10. See Figure 6-2 for illustrations of original and revised transformer assemblies.

Original Transformer Assemblies

Transfer switches equipped with an original transformer assembly GM69797-KA1 or GM69797-KA2 **must** use the **Service Disconnect to Emergency** position only. The transformer kit number is not printed on the nameplate.

If the controller is replaced or the controller firmware is upgraded on a unit that has the original transformer assembly, it will be necessary to change the service disconnect position on the controller back to Emergency as described in Section 7.

Revised Transformer Assemblies

Transfer switches equipped with revised transformer kit number GM94796-AA1 (for MCCB models) or GM94796-AA2 (for ICCB models) are factory set to use the **Service Disconnect to OFF** position. Kit number GM94796-AA1 or GM94796-AA2 will appear in the accessories section of the transfer switch nameplate and the transfer switch door will have the service disconnect label shown in Figure 6-1.

The nameplate is located on the controller cover on the inside of the enclosure door. See Figure 1-3 in Section 1.3 of this manual for an illustration of the ATS nameplate, if necessary.

Transfer switches equipped with revised transformer assemblies can be converted to use the Service Disconnect to Emergency position, if necessary. See Section 7.

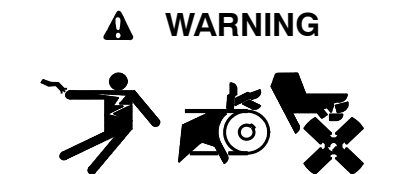
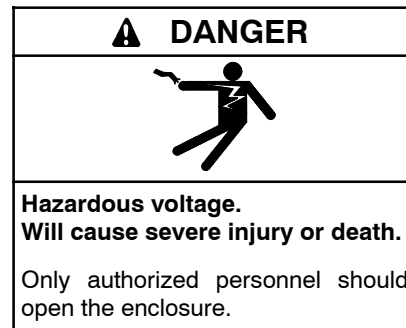
6.3 Service Disconnect to Emergency Operation

Note: This section describes service disconnect and reconnect procedures for transfer switches that use the Service Disconnect to Emergency position. Go to Section 6.4 for transfer switches that use the Service Disconnect to OFF position.

The two-position service disconnect switch disconnects the normal source from the load, transfers to emergency, and inhibits further transfer.

The service disconnect switch and utility disconnected lamp are located on the enclosure door. See Figure 6-3 for the typical service disconnect switch location.

When the switch is in the SERVICE DISCONNECT position, the controller display shows SERVICE DISCONNECT and the utility disconnected lamp on the enclosure door illuminates.



**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.

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.

Important notes about service disconnect to Emergency operation:

- **On service entrance transfer switches, the line side lugs are active at all times.**
- Service disconnect transfers to the emergency source, disconnecting the load from the utility source ONLY.
- **The engine start signal is activated.** The operator must open the generator set circuit breaker and/or disable the generator set to remove power from the load.
- Further transfer is inhibited after transfer to emergency.
- Moving the switch to the SERVICE DISCONNECT position during a test or exercise sequence ends the test or exercise sequence.
- **Controller power is not disconnected.** The service disconnect procedure does not remove power from the controller. To remove the controller for maintenance or service, perform the service disconnect procedure and then see Section 6.5 for instructions to use the control circuit isolation switch to remove power from the controller.

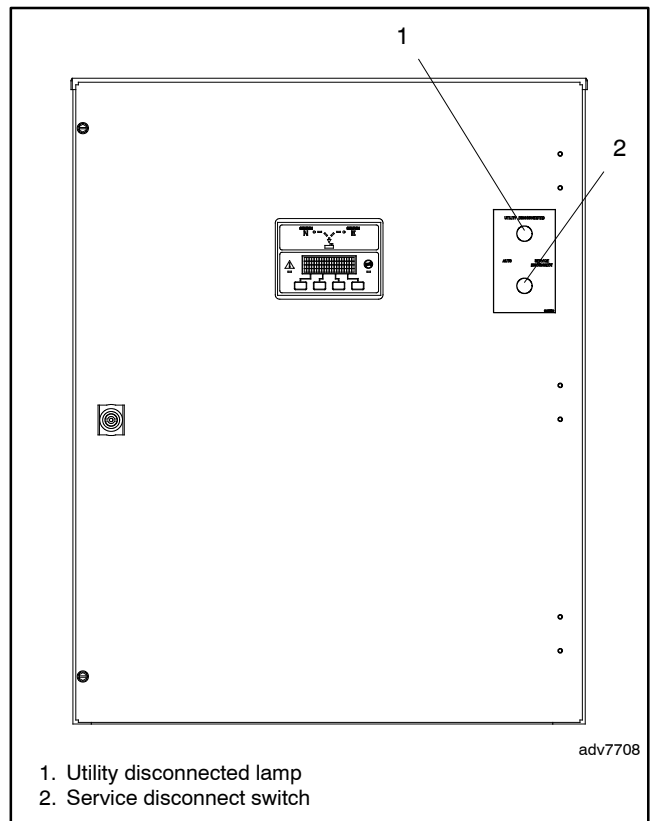


Figure 6-3 Service Disconnect Switch Location (typical)

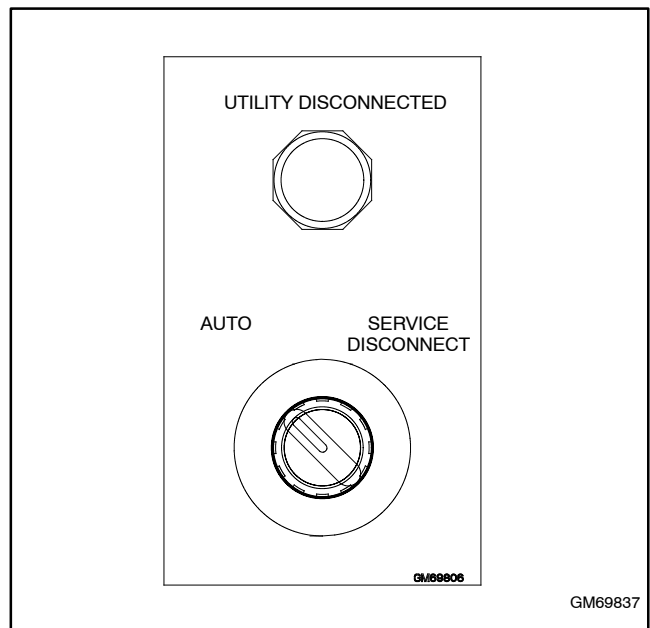


Figure 6-4 Service Disconnect Switch and Light

6.3.1 Service Disconnect Procedure, Service Disconnect to Emergency

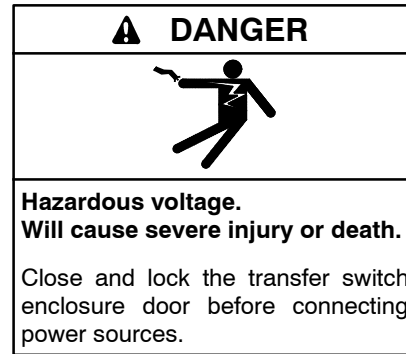
The service disconnect switch has two positions: AUTO and SERVICE DISCONNECT. Follow the procedures in this section carefully and observe the safety precautions when performing a service disconnect before maintenance or service. Watch the LED indicators on the ATS controller to check the ATS position and source status during the procedures.

1. Move the service disconnect control switch located on the door of the transfer switch to the SERVICE DISCONNECT position.
2. The engine start contacts close, signaling the generator set to start.
3. When the emergency source is available, the ATS transfers to the emergency source.

Note: The generator set is now providing power to the load.

4. Check that the utility breaker is open and the Utility Disconnected light is illuminated.
5. Disconnect emergency power from the load by opening the generator set circuit breaker and disabling the generator set as follows:
 - a. Turn the generator set off by moving the generator set master switch to the OFF/RESET position or pressing the OFF button on the generator set controller.
 - b. Disconnect power to the battery charger.
 - c. Remove the battery cables, negative (-) lead first.
6. The Utility Disconnected light will turn off at this point.
7. Use a voltmeter to verify that power is disconnected before servicing connected equipment.
8. Attach a safety lockout padlock to the service disconnect control switch to prevent unauthorized change in operating condition and verify transfer switch door is locked closed. If the door is not locked, turn and remove the door key.

6.3.2 Service Reconnect Procedure, Service Disconnect to Emergency



Service reconnect procedure with Normal source available

Do not return the generator set to service until after the ATS transfers the load to the normal source, as described in the procedure below.

1. Close the breaker between the generator and the emergency side of ATS.
2. Remove the padlock from the service disconnect control switch and move the service disconnect switch to the AUTO position.
3. Reset faults on the controller, if necessary.
4. The ATS will transfer to normal source and open the engine start contacts.
5. Verify that the ATS controller display shows normal source available and ATS in normal position. The Utility Disconnected light on the door should be off.
6. Return the generator set to service:
 - a. Reconnect the battery cables, negative lead last.
 - b. Reconnect power to the battery charger.
 - c. Put the generator set back into auto mode by moving the generator set master switch to the AUTO position or pressing the AUTO button on the generator set controller.

Service reconnect procedure when Normal source is NOT available

Manually operate the ATS to the Normal position before returning the generator set to service, as described in the procedure below.

1. Verify that the generator set master switch is in the OFF position.
2. Open the ATS enclosure and manually transfer the ATS to utility. (Open the emergency breaker and close the utility breaker. See Section 2.7 for instructions, if necessary.) Then close and secure the enclosure door.
3. Return the generator set to service:
 - a. Reconnect the battery cables, negative lead last.
 - b. Reconnect power to the battery charger.
 - c. Put the generator set back into auto mode by moving the generator set master switch to the AUTO position or pressing the AUTO button on the generator set controller.
4. When the generator source is available, the ATS transfers to emergency.
5. Remove the padlock from the service disconnect control switch and move the service disconnect switch to the AUTO position.
6. Reset faults on the controller, if necessary.
7. Verify that the ATS controller display shows emergency source available and ATS in emergency position. The Utility Disconnected light on the door should be off.

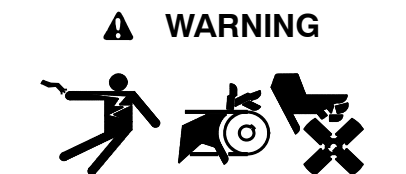
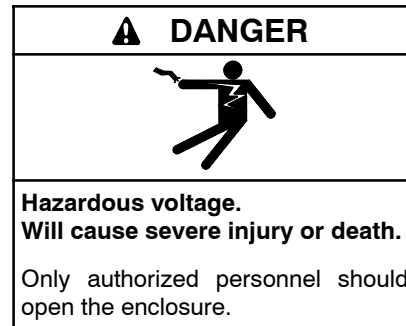
6.4 Service Disconnect to OFF Operation

Note: This section describes service disconnect and reconnect procedures for transfer switches that use the Service Disconnect to OFF position. Go to Section 6.3 for transfer switches that use the Service Disconnect to Emergency position.

The two-position service disconnect switch disconnects the source from the load, by transferring to the OFF position, and inhibits further transfer.

The service disconnect switch and utility disconnected lamp are located on the enclosure door. See Figure 6-5 for the typical service disconnect switch location. See Figure 6-6 for the service disconnect switch decal.

When the switch is in the SERVICE DISCONNECT position, the controller display shows SERVICE DISCONNECTED and the utility disconnected lamp on the enclosure door illuminates if either source is available.



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.

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 master 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.

Important notes about service disconnect to OFF operation:

- **On service entrance transfer switches, the utility line side lugs are active at all times.** The service disconnect procedure removes power from the load, but utility power is still present at the transfer switch lugs whenever the utility source is available.
- Service disconnect transfers to the OFF position, disconnecting the load from the source when a source is available.
- Service disconnect transfers to OFF immediately, ignoring all time delays.
- The generator engine start signal is *not* activated by the service disconnect to OFF procedure.
- Further transfer is inhibited after transfer to OFF.
- Moving the switch to the SERVICE DISCONNECT position during a test or exercise sequence ends the test or exercise sequence.
- **Controller power is not disconnected.** The service disconnect procedure does not remove power from the controller. To remove power from the controller for maintenance or service, perform the service disconnect procedure and then see Section 6.5 for instructions to use the control circuit isolation switch to remove power from the controller.

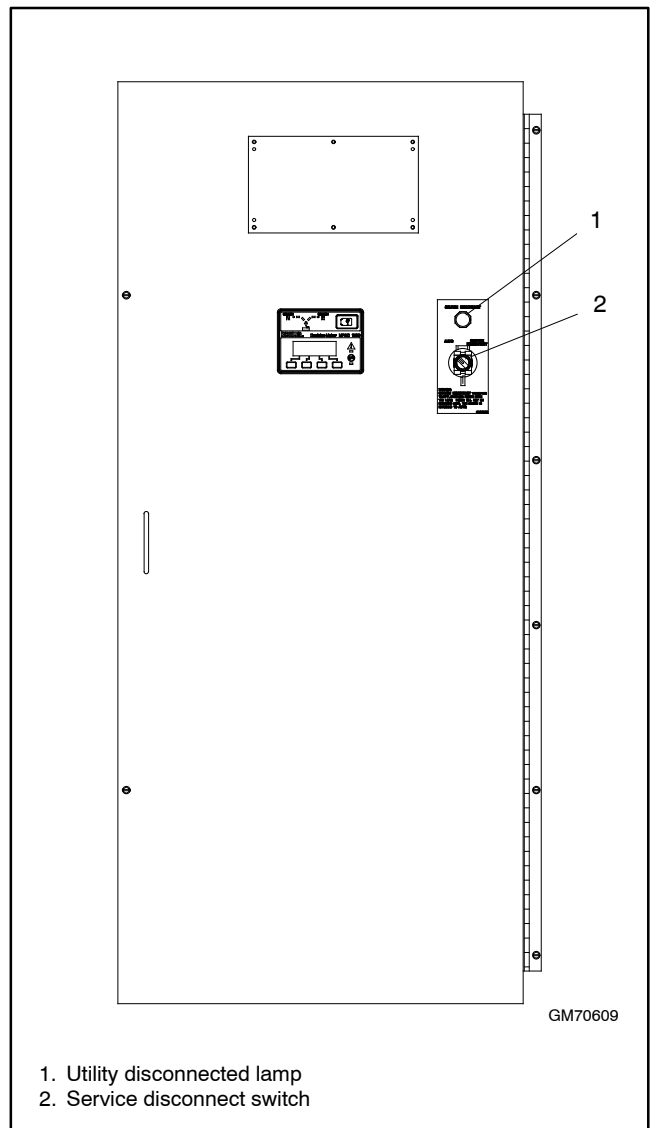


Figure 6-5 Service Disconnect Switch Location (typical)

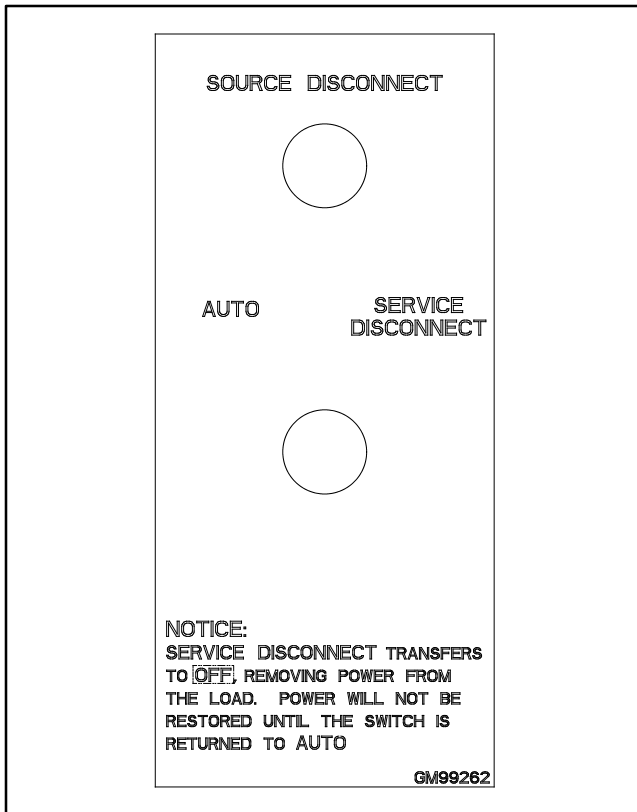


Figure 6-6 Service Disconnect to OFF Decal

6.4.1 Service Disconnect Procedure, Service Disconnect to OFF

The service disconnect switch has two positions: AUTO and SERVICE DISCONNECT. Follow the procedures in this section carefully and observe the safety precautions when performing a service disconnect before maintenance or service. Watch the LED indicators on the ATS controller to check the ATS position and source status during the procedures.

Transfer Switch in NORMAL

Use this procedure if utility power is connected and the transfer switch is in the Normal position.

1. Move the service disconnect control switch located on the door of the transfer switch to the SERVICE DISCONNECT position.
2. Check that the utility (normal) breaker is open and the Utility Disconnected light is illuminated.
3. If the utility breaker is NOT open, manually operate it to the NEUTRAL (MCCB) or TEST (ICCB) position. See Section 2.7 for manual operation instructions.

Note: The service disconnect procedure removes power from the load, but utility power is still present at the transfer switch normal side lugs whenever the utility source is available.

4. The Utility Disconnected light will stay on as long as utility power is present at the normal source lugs. The controller display shows SERVICE DISCONNECTED and the NOT IN AUTO LED flashes.
5. Attach a safety lockout padlock to the service disconnect control switch to prevent unauthorized change in operating condition and verify transfer switch door is locked closed. If the door is not locked, turn and remove the door key.
6. Use a voltmeter to verify that power is disconnected from the load before servicing connected equipment.

Transfer Switch in EMERGENCY

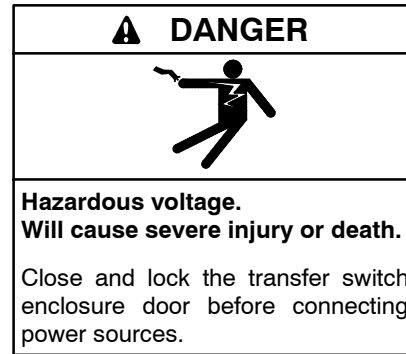
Use this procedure if the transfer switch is in the Emergency position.

1. Move the service disconnect control switch located on the door of the transfer switch to the SERVICE DISCONNECT position.
2. The engine start signal is maintained briefly to allow the emergency breaker to open. The engine start signal is then removed.
3. Wait for the generator set to shut down. The generator set may continue to run for several minutes to cool the engine.
4. The Utility Disconnected light turns on if there is utility power to the normal side transfer switch lugs.
5. Check that the emergency breaker is open. If the emergency breaker is NOT open, manually operate it to the NEUTRAL (MCCB) or TEST (ICCB) position. See Section 2.7 for manual operation instructions.

Note: The service disconnect procedure removes power from the load, but utility power is still present at the transfer switch normal side lugs whenever the utility source is available.

6. If there is no power to the normal (utility) side lugs on the transfer switch, there is no power to the controller or to the Utility Disconnected light.
 - The Utility Disconnected light will not turn on.
 - The controller display goes dark and the controller LEDs turn off.
 - If an External Battery Supply Module (EBSM) (also known as Battery Option Board, BOB) is installed, the generator set battery will continue to supply DC power to the controller. The controller display shows SERVICE DISCONNECTED and the NOT IN AUTO LED flashes.
7. Attach a safety lockout padlock to the service disconnect control switch to prevent unauthorized operation of the switch, and verify that the transfer switch door is closed and locked. If the door is not locked, turn and remove the door key.
8. Use a voltmeter to verify that power is disconnected from the load before servicing connected equipment.

6.4.2 Service Reconnect Procedure, Service Disconnect to OFF



Service reconnect procedure with Normal source available

1. Remove the padlock from the service disconnect control switch and move the service disconnect switch to the AUTO position.
2. Reset faults on the controller, if necessary.
3. The ATS will transfer to normal source.
4. Verify that the ATS controller display shows normal source available and ATS in normal position. The Utility Disconnected light on the door should be off.

Service reconnect procedure when Normal source is NOT available

1. Remove the padlock from the service disconnect control switch and move the service disconnect switch to the AUTO position.

The ATS sends a start signal to the generator.
2. Reset faults on the controller, if necessary.
3. Start the generator. When the generator source is available, the ATS transfers to emergency.
4. Verify that the ATS controller display shows emergency source available and ATS in emergency position. The Utility Disconnected light on the door should be off.

6.5 Control Circuit Isolation Switch

The two-position control circuit isolation switch removes utility power from the ATS controller assembly.

Perform the service disconnect procedure explained in Section 6.3 or 6.4 before operating the control circuit isolation switch. Review the notes and precautions in Section 6.3 or 6.4 before proceeding.

See Figure 6-7 for switch positions. The control circuit isolation switch is mounted on the transformer assembly. See Figure 6-8. The location of the transformer assembly varies with ATS model and enclosure size. See Figure 6-9 and Figure 6-10 for typical locations.

Switch Position	Utility Power to Controller
ON	Connected
OFF	Disconnected

Figure 6-7 Control Circuit Isolation Switch Positions

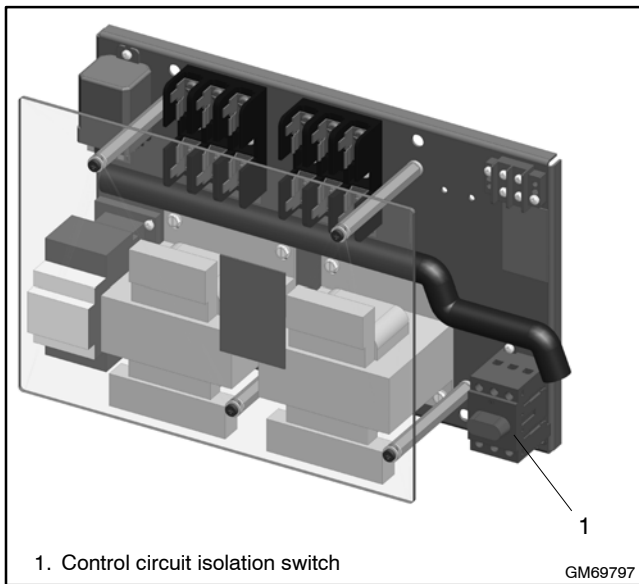


Figure 6-8 Control Circuit Isolation Switch Location on a Typical Transformer Assembly

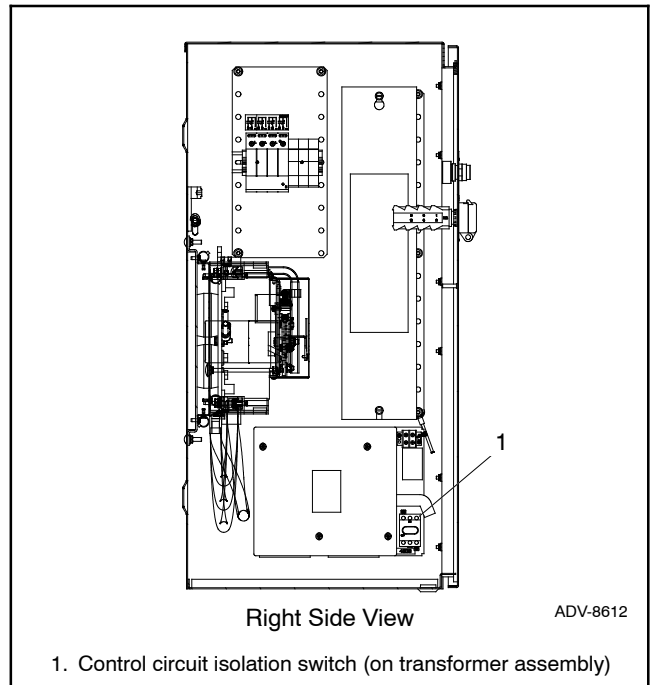


Figure 6-9 Control Circuit Isolation Switch Location, MCCB Models (typical)

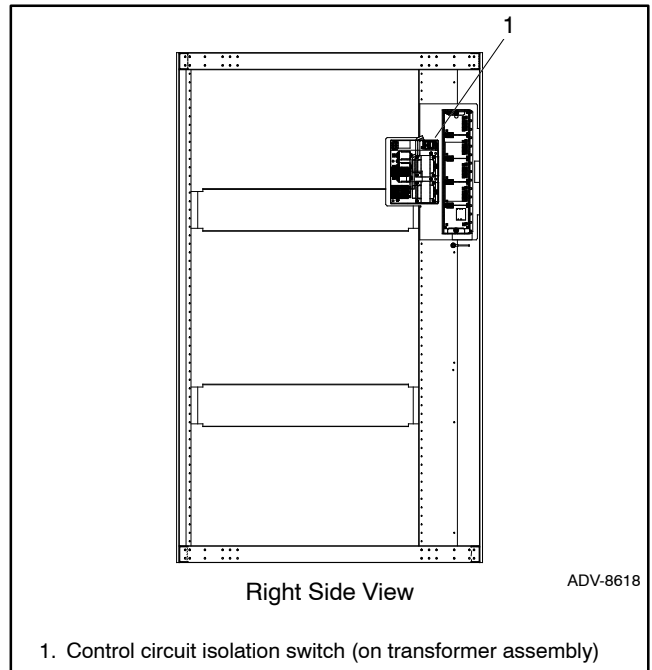
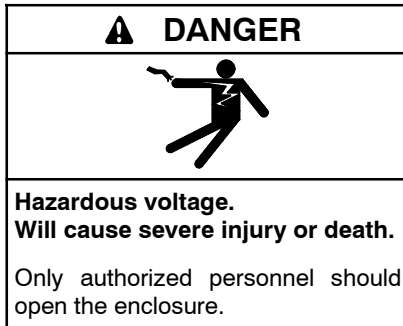


Figure 6-10 Control Circuit Isolation Switch Location, ICCB Models (typical)

6.5.1 Control Circuit Isolation and Reconnection for Service Disconnect to Emergency Units

Note: This section describes control circuit isolation and reconnection procedures for transfer switches that use the Service Disconnect to Emergency position. Go to Section 6.5.2 for transfer switches that use the Service Disconnect to OFF position.

Control Circuit Isolation Procedure



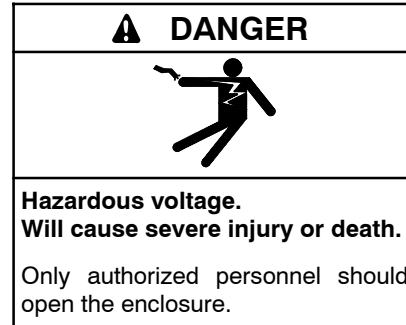
Note: Review the precautions and notes in Section 6.3 before proceeding. **On service entrance transfer switches, the line side lugs are active at all times.**

1. Perform the service disconnect procedure in Section 6.3.

Note: There is still power to the controller assembly after the service disconnect procedure is completed.

2. Open the enclosure door and move the control circuit isolation switch to the OFF position.
3. Use a voltmeter to verify that there is no power to the ATS controller assembly before removing the controller.

Control Circuit Reconnect Procedure (with normal source available)

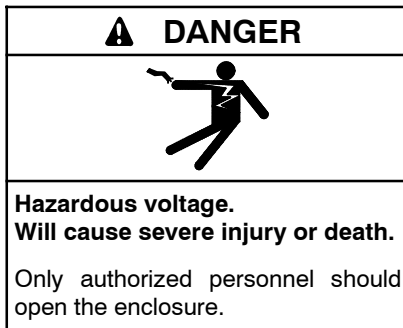


Note: Review the precautions and notes in Section 6.3 before proceeding. **On service entrance transfer switches, the line side lugs are active at all times.**

Do not return the generator set to service until instructed to do so in the procedure below.

1. Close the breaker between generator and emergency side of ATS (if present).
2. Move the control circuit isolation switch to the ON position.
3. Move the service disconnect switch to the auto position.
4. The ATS will transfer to normal source and open engine start contacts.
5. Verify that the ATS controller display shows normal source available and ATS in normal position. The Utility Disconnected light on the door should be off.
6. Return the generator set to service:
 - a. Reconnect the battery cables, negative lead last.
 - b. Reconnect power to the battery charger.
 - c. Put the generator set back into auto mode by moving the generator set master switch to the AUTO position or pressing the AUTO button on the generator set controller.

Control Circuit Reconnect Procedure (when normal source is NOT available)



Note: Review the precautions and notes in Section 6.3 before proceeding. **On service entrance transfer switches, the line side lugs are active at all times.**

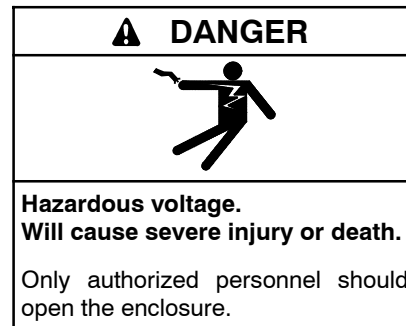
Do not return the generator set to service until instructed to do so in the procedure below.

1. Open the ATS enclosure and manually transfer to utility (IF GENERATOR WAS TURNED OFF).
2. Close the breaker between generator and emergency side of ATS (if present).
3. Move the control circuit isolation switch to the ON position.
4. Move the service disconnect switch to the AUTO position.
5. Return the generator set to service:
 - a. Reconnect the battery cables, negative lead last.
 - b. Reconnect power to the battery charger.
 - c. Move the generator set master switch to the AUTO position.
6. The engine start contacts will close because Normal is not available. Generator set will start.
7. When the generator source is available, the ATS transfers to emergency.
8. Verify that the ATS controller display shows emergency source available and ATS in emergency position. The service disconnect light on the door should be off.

6.5.2 Control Circuit Isolation and Reconnect for Service Disconnect to OFF Units

Note: This section describes control circuit isolation and reconnection procedures for transfer switches that use the Service Disconnect to OFF position. Go to Section 6.5.1 for transfer switches that use the Service Disconnect to Emergency position.

Control Circuit Isolation Procedure

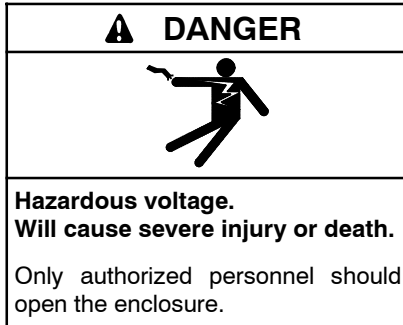


Note: Review the precautions and notes in Section 6.4 before proceeding. **On service entrance transfer switches, the line side lugs are active at all times.**

1. Perform the service disconnect procedure in Section 6.4.1.

Note: There is still power to the controller assembly after the service disconnect procedure is completed.
2. Open the enclosure door and move the control circuit isolation switch to the OFF position.
3. Use a voltmeter to verify that there is no power to the ATS controller assembly before removing the controller.

Control Circuit Reconnect Procedure (with normal source available)

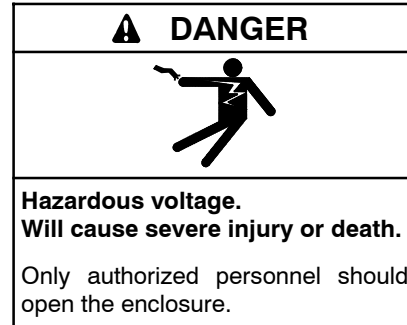


Note: Review the precautions and notes in Section 6.4 before proceeding. **On service entrance transfer switches, the line side lugs are active at all times.**

Do not return the generator set to service until instructed to do so in the procedure below.

1. Move the control circuit isolation switch to the ON position.
2. Move the service disconnect switch to the auto position.
3. The ATS will transfer to normal source.
4. Verify that the ATS controller display shows normal source available and ATS in normal position. The Utility Disconnected light on the door should be off.

Control Circuit Reconnect Procedure (when normal source is NOT available)



Note: Review the precautions and notes in Section 6.4 before proceeding. **On service entrance transfer switches, the line side lugs are active at all times.**

Do not return the generator set to service until instructed to do so in the procedure below.

1. Move the control circuit isolation switch to the ON position.
2. Move the service disconnect switch to the AUTO position.
3. The engine start contacts will close because Normal is not available. Generator set will start.
4. When the generator source is available, the ATS transfers to emergency.
5. Verify that the ATS controller display shows emergency source available and ATS in emergency position. The service disconnect light on the door should be off.

Notes

Section 7 Changing the Service Disconnect Position

7.1 Introduction

The service disconnect operation for Model KEP service entrance rated automatic transfer switches equipped with the Decision-Maker® MPAC 1500 controller has changed. When the transfer switch is put into service disconnect mode:

- The original design transfers to Emergency and signals the generator set to start.
- The new design transfers to the OFF position. Both sources are disconnected and the generator set is NOT signalled to start.

The new style switches are identified by the decal shown in Figure 7-1, located near the service disconnect switch on the outside of the enclosure door.

The new design uses controller firmware version 1.10 (or higher) and new transformer assemblies. See Figure 7-2 for illustrations of original and new transformer assemblies.

If the transfer switch is equipped with the new transformer assembly, kit number GM94796-AA1 or GM94796-AA2 will appear in the accessories section of the transfer switch nameplate. The nameplate is located on the controller cover on the inside of the enclosure door. Transfer switches equipped with an original transformer assembly GM69797-KA1 or GM69797-KA2 do not have the transformer kit number printed on the nameplate.

NOTICE:
SERVICE DISCONNECT TRANSFERS TO OFF, REMOVING POWER FROM THE LOAD. POWER WILL NOT BE RESTORED UNTIL THE SWITCH IS RETURNED TO AUTO.

Figure 7-1 Service Disconnect to OFF Decal

Original Transformer Assemblies

Transfer switches equipped with an original transformer assembly GM69797-KA1 or GM69797-KA2 **must** use the **Service Disconnect to Emergency** position only. The transformer kit number is not printed on the nameplate.

If the controller is replaced or the controller firmware is upgraded on a unit that has the original transformer assembly, it will be necessary to change the service disconnect position on the controller back to Emergency as described in Section 7.2.1.

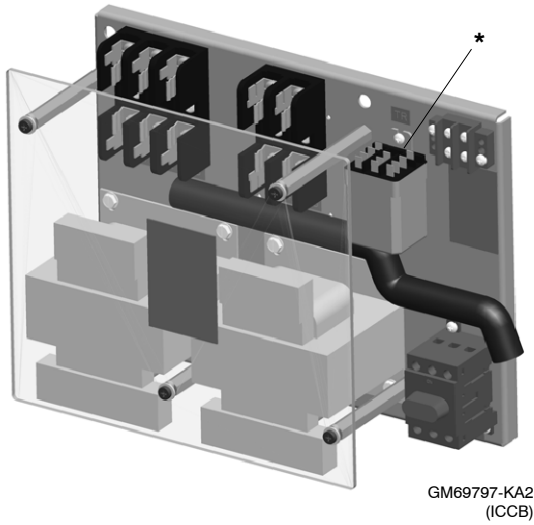
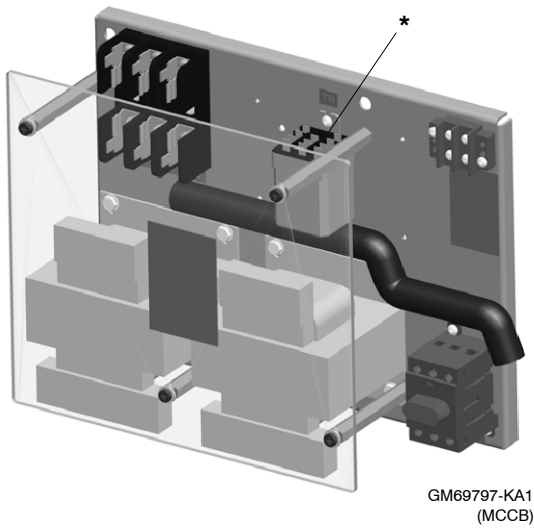
Revised Transformer Assemblies

Transfer switches equipped with revised transformer kit number GM94796-AA1 (for MCCB models) or GM94796-AA2 (for ICCB models) are factory set to use the **Service Disconnect to OFF** position. Kit number GM94796-AA1 or GM94796-AA2 will appear in the accessories section of the transfer switch nameplate and the transfer switch door will have the service disconnect label shown in Figure 6-1.

The nameplate is located on the controller cover on the inside of the enclosure door. See Figure 1-3 in Section 1.3 of this manual for an illustration of the ATS nameplate, if necessary.

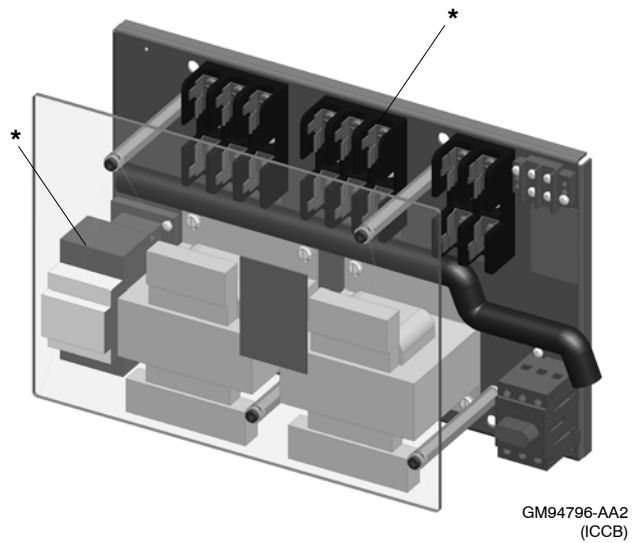
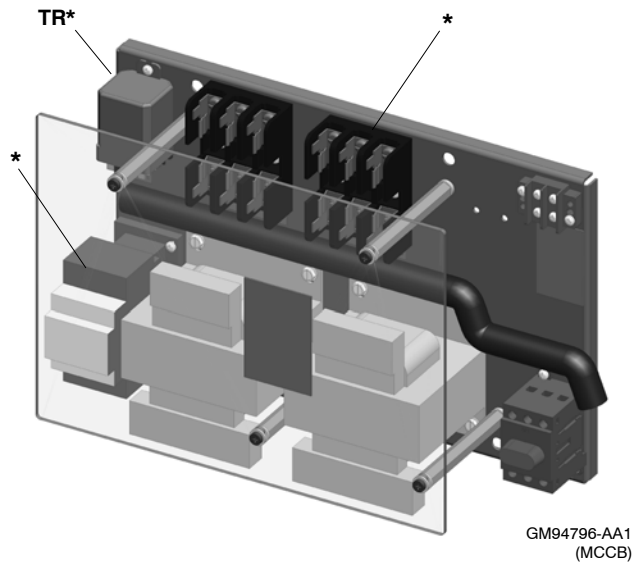
Transfer switches equipped with revised transformer assemblies can be converted to use the Service Disconnect to Emergency position, if necessary. Follow the instructions in Section 7.2.

**Original Transformer Assemblies
(Service Disconnect to EMERGENCY only) :**



* Asterisk indicates differences that can be used to identify original or revised transformer assemblies.

**Revised Transformer Assemblies
(Service Disconnect to OFF †) :**



† Transfer switches equipped with transformer assembly GM94796-AA1 or GM94796-AA2 can be reconfigured to use the Service Disconnect to Emergency position, if necessary.

Figure 7-2 Transformer Assemblies

7.2 Changing the Service Disconnect Position

In some applications, it may be necessary to change the service disconnect position on the transfer switch.

Example 1: If you update the controller firmware or replace the controller on a unit that is equipped with an original transformer assembly, GM69797-KA1 or GM69797-KA2, you will need to change the service disconnect position setting on the controller back to Emergency. Use Kohler® SiteTech™ software to change the service disconnect position setting on the controller.

Example 2: If you install a transfer switch equipped with a new transformer assembly in an application that requires the original service disconnect to emergency position, you will need to convert the transfer switch. This could be the case when an older service-entrance rated transfer switch is being replaced, or in any application that was designed to use the service disconnect to emergency operation. Conversion includes changing the service disconnect position setting on the controller and changing some connections inside the ATS.

After Updating Firmware or Replacing the Controller

If the controller firmware is updated or the controller is replaced, check the transformer assembly installed on the transfer switch and compare the illustrations Figure 7-2. If the transfer switch is equipped with an original transformer assembly (GM69797-KA1 or GM69797-KA2), you will need to change the service disconnect position setting on the controller. Use Kohler® SiteTech™ software to change the Service Disconnect position setting on the controller to Source E. See the procedure in Section 7.2.1.

Converting a New ATS to the Service Disconnect to Emergency Position

In some applications, the transfer switch may be required to operate using the original Service Disconnect to Emergency behavior. Transfer switches using the new transformer assemblies and the Service Disconnect to OFF position can be converted in the field to the original behavior. The following changes are required:

1. Use a laptop computer with Kohler® SiteTech™ software to change the Service Disconnect position setting from OFF to Source E. See the procedure in Section 7.2.1.

Note: The distributor level password is required.

2. Disconnect the engine start bypass circuit using the instructions that are given in this section. See the procedure in Section 7.2.2.
3. Change connections for correct operation of the Service Disconnected lamp. See the procedure in Section 7.2.3.

7.2.1 Procedure to Change the Service Disconnect Position Setting on the Controller

1. Use a USB cable to connect your laptop PC to the MPAC controller. See Figure 7-3.
2. Start SiteTech™ and wait for it to connect to the MPAC controller.
3. Click on Set Mpac Password and enter the distributor password. Obtain the password from the Kohler Power Systems Generator Service Department.
4. Find the Service Disconnect Position setting in the ATS Connection Configuration group. See Figure 7-4.
5. Change the Service Disconnect Position setting to Source E.
6. Apply changes to save the new setting.

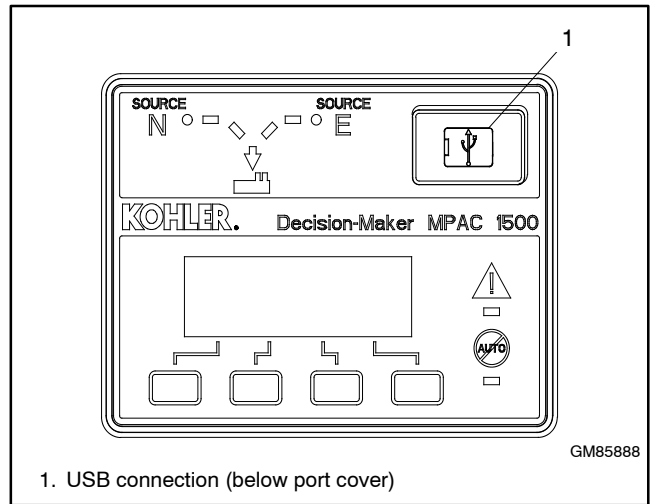
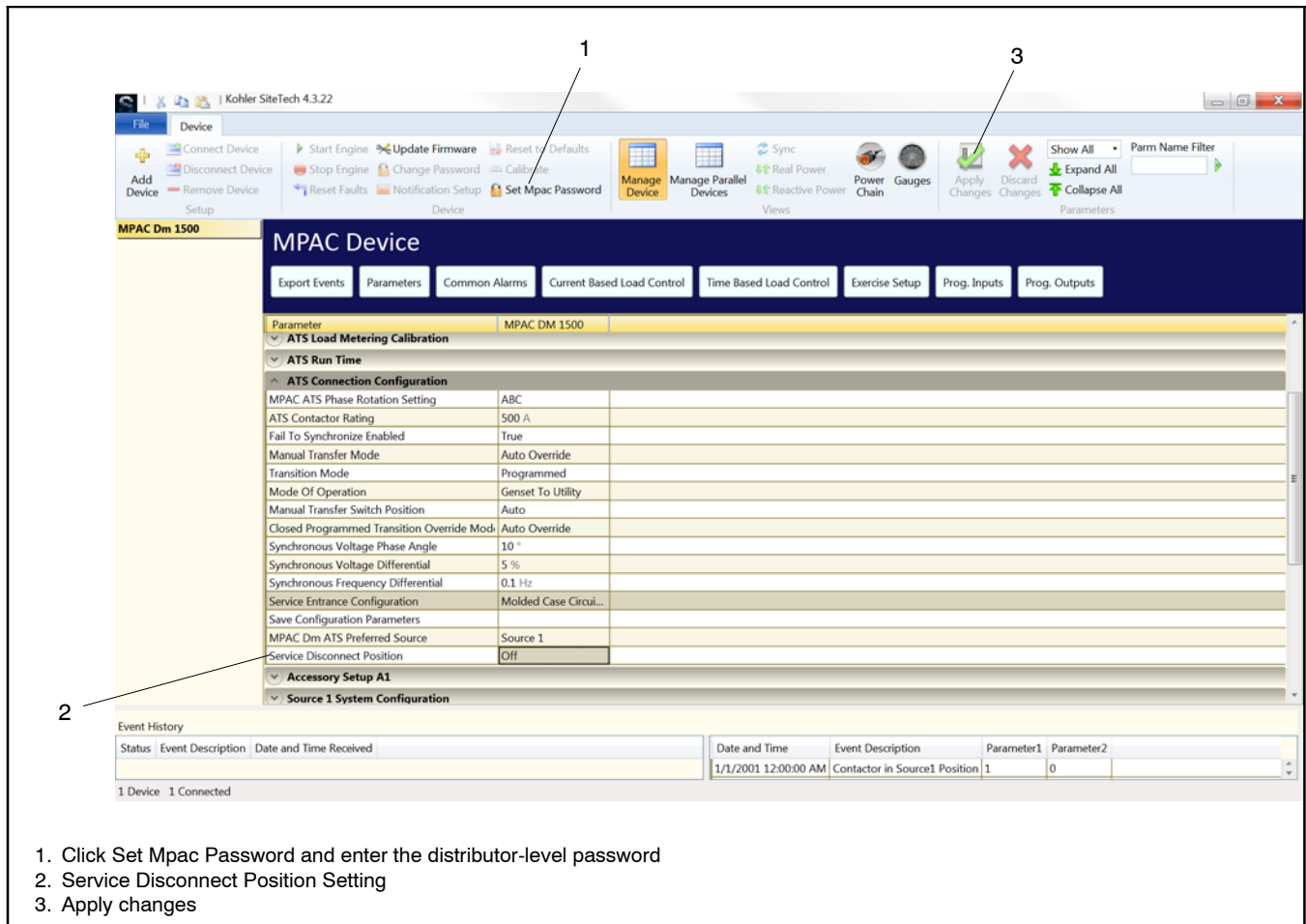


Figure 7-3 USB Connection for SiteTech



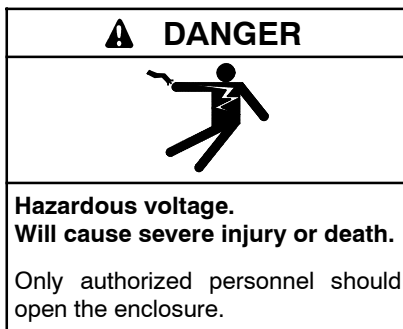
1. Click Set Mpac Password and enter the distributor-level password
2. Service Disconnect Position Setting
3. Apply changes

Figure 7-4 Service Disconnect Position Setting in SiteTech

7.2.2 Procedure to Disconnect the Engine Start Bypass Circuit

Transfer switches using the new transformer assemblies include an engine start bypass circuit that prevents the ATS from sending an engine start signal to the generator when it is placed in the Service Disconnect position. If it is necessary to configure the ATS to operate in the Service Disconnect to Emergency position, this bypass circuit must be disconnected from the controller's input connection.

After performing this procedure, programmable output #1 is available for customer use, if needed. Programmable output #1 has been factory-set to Service Disconnect Generator Control. Be sure to reset the output to the appropriate event if connecting it to customer equipment.



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.

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.

See Figure 7-5 and follow these instructions.

1. Prevent the generator set from starting:
 - a. Press the OFF button on the generator controller.
 - b. Disconnect power to the generator engine starting battery charger, if installed.
 - c. Disconnect all generator engine start battery cables, negative (-) leads first.
2. To remove power from the ATS controller, follow the instructions in Section 6 to perform the service disconnect procedure and the control circuit isolation procedure.
3. Open the ATS enclosure door and find the programmable output connections to TB1 on the back of the Decision-Maker® MPAC 1500 controller.
4. Engine start bypass circuit leads 4B and 4D are connected to programmable output #1, terminals TB1-5 and TB1-6 on the controller's main logic circuit board. Disconnect leads 4B and 4D from the controller.
5. Connect leads 4B and 4D together and tape securely.

6. Use cable ties to secure the leads out of the way.
7. Reconnect power to the control circuit. Follow the instructions in Section 6.5.
8. Use Kohler® SiteTech™ software to change the service disconnect position setting to Emergency. See the procedure in Section 7.2.1.

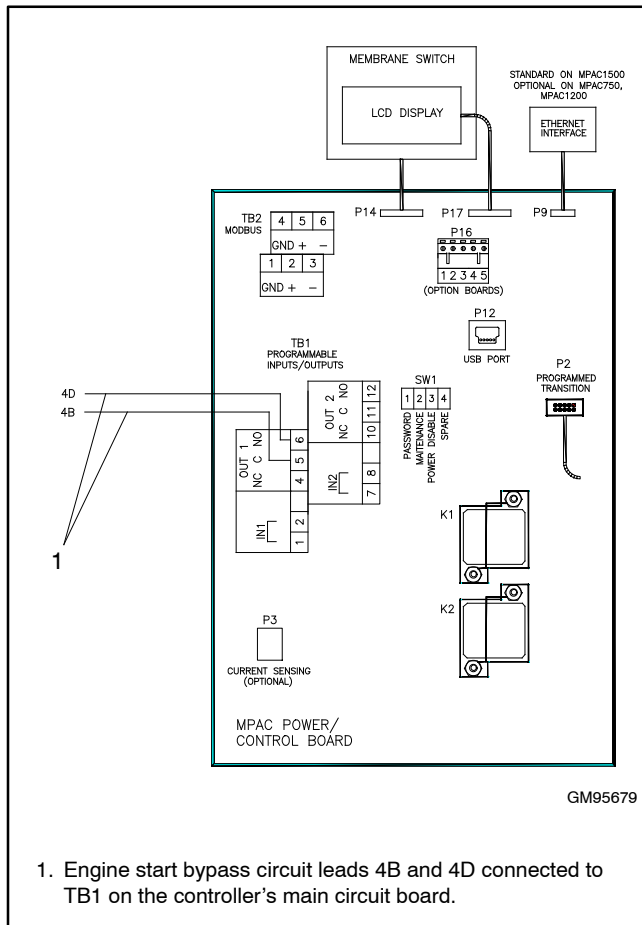


Figure 7-5 Engine Start Bypass Circuit Connection

7.2.3 Connection Changes for Service Disconnected Lamp Operation

If a transfer switch with the new transformer assembly is converted to use the Service Disconnect to Emergency position, change the connections described in this section for correct operation of the Service Disconnected lamp. Follow the instructions in the procedure for MCCB or ICCB models as applicable to your unit.

Procedure for MCCB Models

1. At the TR relay on the transformer panel, disconnect lead DL2 from terminal 3 and connect it to terminal 6. See Figure 7-6.
2. Find the quick-connect QCON1 in lead USD, located between connectors P3 and P4. See Figure 7-7. Disconnect leads USD and USD1 at the quick-connect and tape the ends.

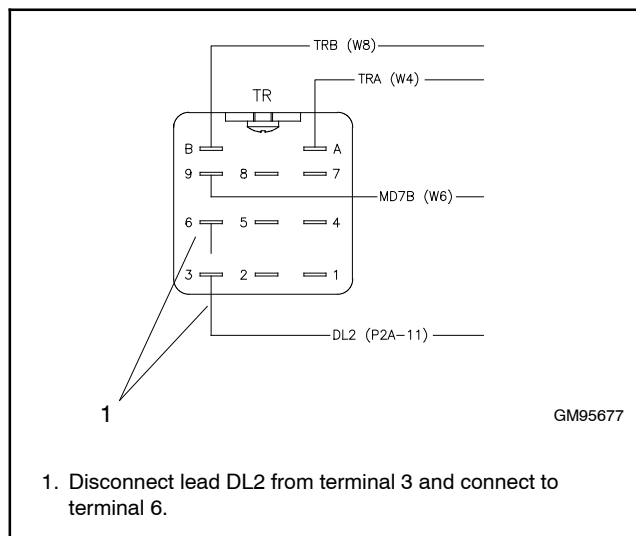


Figure 7-6 Lead DL2 Reconnection on the Transformer Panel, MCCB Models

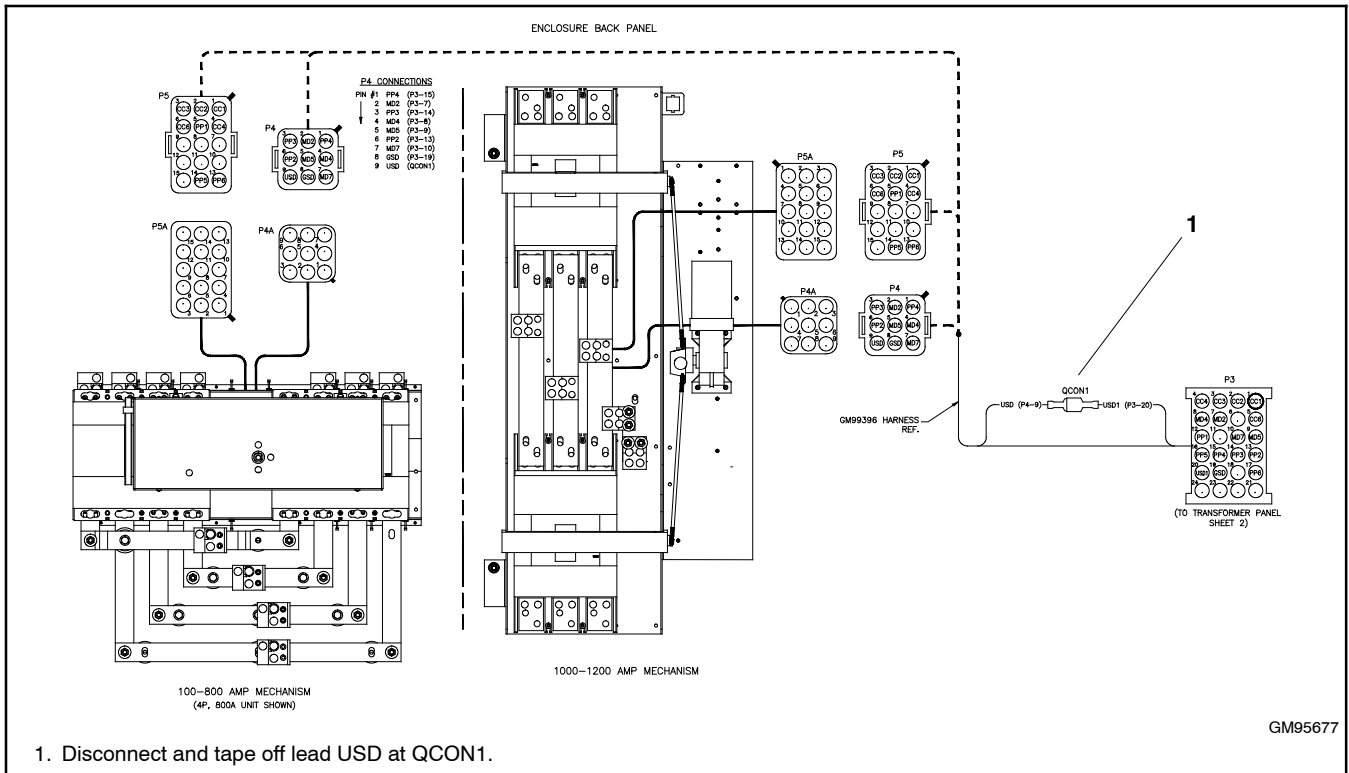


Figure 7-7 Disconnect QCON1, MCCB Models

Procedure for ICCB Models

1. At the generator (emergency) circuit breaker inside the transfer switch, find lead G-22, which is connected to terminal 22 on the circuit breaker auxiliary contact terminal block. See Figure 7-8. Disconnect lead G-22 and reconnect it to terminal 24.

2. At the utility (normal) circuit breaker, disconnect leads G-21 and U-21 from the circuit breaker auxiliary contact terminal block. Crimp leads G-21 and U-21 together.

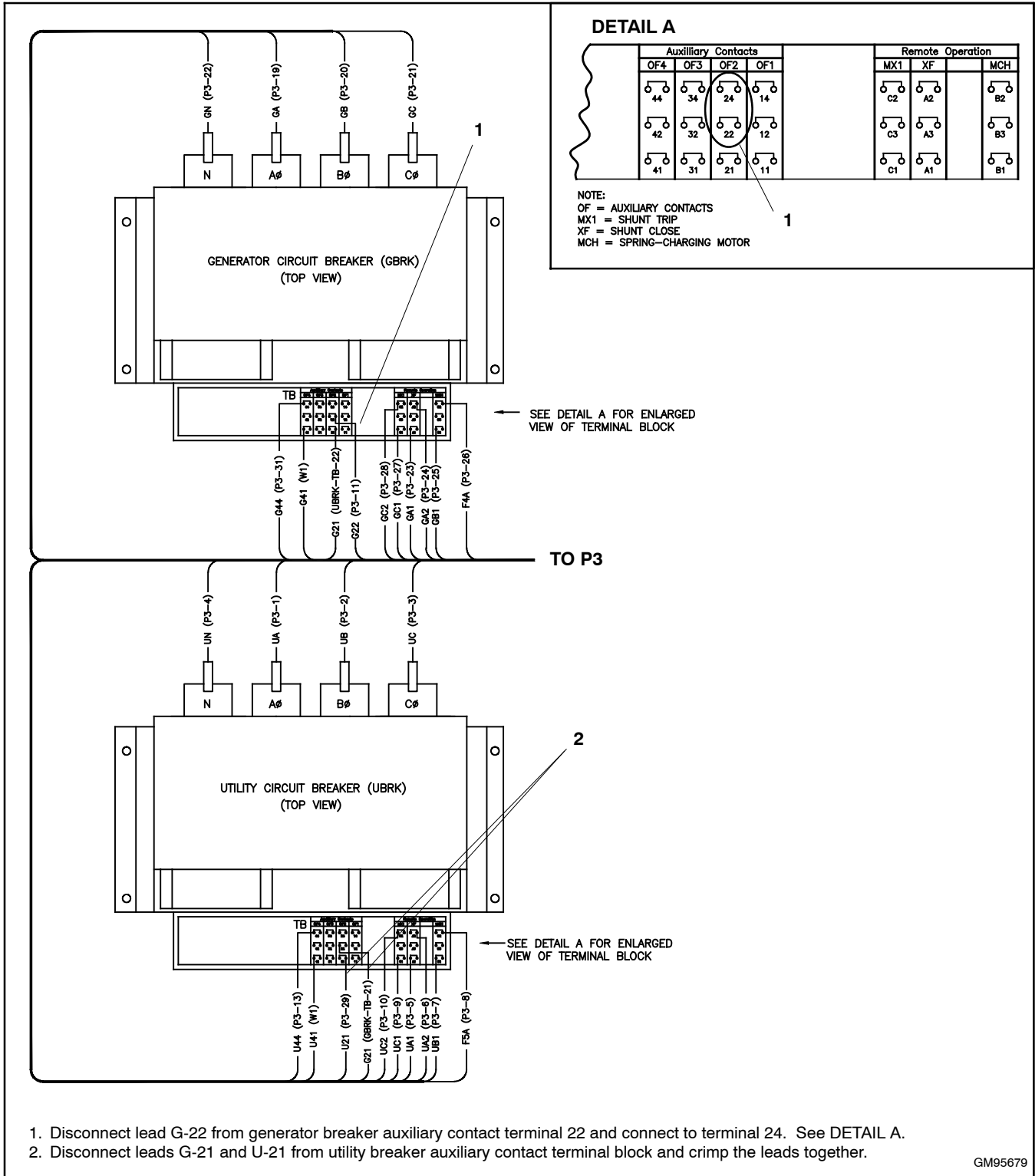


Figure 7-8 Reconnection of Leads G21, G22, and U21, ICCB Models

7.2.4 Final Steps

1. On the enclosure door, change the service disconnect switch decal to show that the ATS now uses the Service Disconnect to Emergency position. Use a permanent marker or apply a new label over the existing decal that says:

Service Disconnect transfers to EMERGENCY source and starts the generator set.

2. Return the generator set to service and place in AUTO.
3. Test the system operation.

Notes

Section 8 Performance Test Form

Conduct the performance tests outlined in Sections 5.3 and 5.4, and record the results on the following form. This form must be retained by those in charge of the

building's electrical installation in order to be available to the authority having jurisdiction.

Date	Personnel	Tests Performed	Comments
		Interconnection evaluation	
		Grounding point evaluation	
		Fault current test:	
		Ground fault settings - _____	
		Simulated current - _____	
		Results - _____	

Notes

Appendix A Abbreviations

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

A, amp	ampere	cfm	cubic feet per minute	est.	estimated
ABDC	after bottom dead center	CG	center of gravity	E-Stop	emergency stop
AC	alternating current	CID	cubic inch displacement	etc.	et cetera (and so forth)
A/D	analog to digital	CL	centerline	exh.	exhaust
ADC	advanced digital control; analog to digital converter	cm	centimeter	ext.	external
adj.	adjust, adjustment	CMOS	complementary metal oxide substrate (semiconductor)	F	Fahrenheit, female
ADV	advertising dimensional drawing	cogen.	cogeneration	fglass.	fiberglass
Ah	amp-hour	com	communications (port)	FHM	flat head machine (screw)
AHWT	anticipatory high water temperature	coml	commercial	fl. oz.	fluid ounce
AISI	American Iron and Steel Institute	Coml/Rec	Commercial/Recreational	flex.	flexible
ALOP	anticipatory low oil pressure	conn.	connection	freq.	frequency
alt.	alternator	cont.	continued	FS	full scale
Al	aluminum	CPVC	chlorinated polyvinyl chloride	ft.	foot, feet
ANSI	American National Standards Institute (formerly American Standards Association, ASA)	crit.	critical	ft. lb.	foot pounds (torque)
AO	anticipatory only	CRT	cathode ray tube	ft./min.	feet per minute
APDC	Air Pollution Control District	CSA	Canadian Standards Association	ftp	file transfer protocol
API	American Petroleum Institute	CT	current transformer	g	gram
approx.	approximate, approximately	Cu	copper	ga.	gauge (meters, wire size)
AQMD	Air Quality Management District	cUL	Canadian Underwriter's Laboratories	gal.	gallon
AR	as required, as requested	CUL	Canadian Underwriter's Laboratories	gen.	generator
AS	as supplied, as stated, as suggested	cu. in.	cubic inch	genset	generator set
ASE	American Society of Engineers	cw.	clockwise	GFI	ground fault interrupter
ASME	American Society of Mechanical Engineers	CWC	city water-cooled	GND, ⊕	ground
assy.	assembly	cyl.	cylinder	gov.	governor
ASTM	American Society for Testing Materials	D/A	digital to analog	gph	gallons per hour
ATDC	after top dead center	DAC	digital to analog converter	gpm	gallons per minute
ATS	automatic transfer switch	dB	decibel	gr.	grade, gross
auto.	automatic	dB(A)	decibel (A weighted)	GRD	equipment ground
aux.	auxiliary	DC	direct current	gr. wt.	gross weight
avg.	average	DCR	direct current resistance	H x W x D	height by width by depth
AVR	automatic voltage regulator	deg., °	degree	HC	hex cap
AWG	American Wire Gauge	dept.	department	HCHT	high cylinder head temperature
AWM	appliance wiring material	DFMEA	Design Failure Mode and Effects Analysis	HD	heavy duty
bat.	battery	dia.	diameter	HET	high exhaust temp., high engine temp.
BBDC	before bottom dead center	DI/EO	dual inlet/end outlet	hex	hexagon
BC	battery charger, battery charging	DIN	Deutsches Institut für Normung e. V. (also Deutsche Industrie Normenausschuss)	Hg	mercury (element)
BCA	battery charging alternator	DIP	dual inline package	HH	hex head
BCI	Battery Council International	DPDT	double-pole, double-throw	HHC	hex head cap
BDC	before dead center	DS	disconnect switch	HP	horsepower
BHP	brake horsepower	DVR	digital voltage regulator	hr.	hour
blk.	black (paint color), block (engine)	E, emer.	emergency (power source)	HS	heat shrink
blk. htr.	block heater	ECM	electronic control module, engine control module	hsg.	housing
BMEP	brake mean effective pressure	EDI	electronic data interchange	HVAC	heating, ventilation, and air conditioning
bps	bits per second	EFR	emergency frequency relay	HWT	high water temperature
br.	brass	e.g.	for example (<i>exempli gratia</i>)	Hz	hertz (cycles per second)
BTDC	before top dead center	EG	electronic governor	IC	integrated circuit
Btu	British thermal unit	EGSA	Electrical Generating Systems Association	ID	inside diameter, identification
Btu/min.	British thermal units per minute	EIA	Electronic Industries Association	IEC	International Electrotechnical Commission
C	Celsius, centigrade	EI/EO	end inlet/end outlet	IEEE	Institute of Electrical and Electronics Engineers
cal.	calorie	EMI	electromagnetic interference	IMS	improved motor starting
CAN	controller area network	emiss.	emission	in.	inch
CARB	California Air Resources Board	eng.	engine	in. H ₂ O	inches of water
CB	circuit breaker	EPA	Environmental Protection Agency	in. Hg	inches of mercury
cc	cubic centimeter	ES	engineering special, engineered special	in. lb.	inch pounds
CCA	cold cranking amps	ESD	electrostatic discharge	Inc.	incorporated
ccw.	counterclockwise			ind.	industrial
CEC	Canadian Electrical Code			int.	internal
cert.	certificate, certification, certified			int./ext.	internal/external
cfh	cubic feet per hour			I/O	input/output
				IP	iron pipe
				ISO	International Organization for Standardization
				J	joule
				JIS	Japanese Industry Standard

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

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