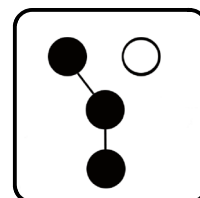


Installation

Automatic Transfer Switches



Models:

KSS/KSP

40 to 1000 Amperes

KOHLER[®]
POWER SYSTEMS

9001
KOHLER
POWER SYSTEMS
NATIONALLY REGISTERED

TP-6447 10/12d

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
- ☐ Current Monitoring
- ☐ Battery Module
- ☐ Standard I/O Module (max. 4) qty: _____
- ☐ High Power I/O Module (max. 4) qty: _____
- ☐ Line-Neutral Monitoring
- ☐ Supervised Transfer Switch
- ☐ Digital Power Meter
- ☐ Battery Charger
- ☐ Logic Disconnect Switch
- ☐ Load Shed
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Controller Identification

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

Controller Description _____

Software Version Number

Record the software version number.

Software Version Number _____

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Notes

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.**

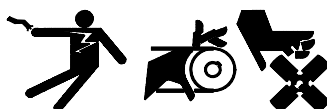
NOTICE

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.

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.

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.

Removing the transfer switch from bypass/isolation models. **Hazardous voltage can cause severe injury or death.** Bypass and isolate the transfer switch before removing it from the enclosure. The bypass/isolation switch is energized. Do not touch the isolation contact fingers or the control circuit terminals.

Installing the battery charger. **Hazardous voltage can cause severe injury or death.** An ungrounded battery charger may cause electrical shock. Connect the battery charger enclosure to the ground of a permanent wiring system. As an alternative, install an equipment grounding conductor with circuit

conductors and connect it to the equipment grounding terminal or the lead on the battery charger. Install the battery charger as prescribed in the equipment manual. Install the battery charger in compliance with local codes and ordinances.

Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death.

Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

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

Servicing the transfer switch. Hazardous voltage can cause severe injury or death.

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

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 controls and accessories within the enclosure. Hazardous voltage can cause severe injury or death. Disconnect the transfer switch controls at the inline connector to deenergize

the circuit boards and logic circuitry but allow the transfer switch to continue to supply power to the load. Disconnect all power sources to accessories that are mounted within the enclosure but are not wired through the controls and deenergized by inline connector separation. Test circuits with a voltmeter to verify that they are deenergized before servicing.

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



Airborne particles. Can cause severe injury or blindness.

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

Heavy Equipment

⚠ WARNING



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

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

Notice

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

This manual provides operation and installation instructions for Kohler® Model KSS/KSP Automatic Transfer Switches. A separate manual provided with the transfer switch covers the transfer switch controller operation. See List of Related Materials for the document part number.

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 related accessories. Separate manuals contain 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, Model KSS/KSP	G11-108
Operation Manual, MPAC™ 1500 Controller	TP-6714
Parts Catalog, Transfer Switch and Controller	TP-6433
Service Manual, Model KSS/KSP/KGS/KGP	TP-6461

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 stickers on your Kohler product or review the appropriate literature or documents included with the product.
- Call toll free in the US and Canada 1-800-544-2444.
- Outside the US and Canada, call the nearest regional office.

Headquarters Europe, Middle East, Africa (EMEA)

Kohler Power Systems
3 rue de Brennus
93200 Saint Denis
France
Phone: (33) 1 49 178300
Fax: (33) 1 49 178301

Asia Pacific

Power Systems Asia Pacific Regional Office
Singapore, Republic of Singapore
Phone: (65) 6264-6422
Fax: (65) 6264-6455

China

North China Regional Office, Beijing
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
Fax: (86) 21 6288 0550

India, Bangladesh, Sri Lanka

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

Japan, Korea

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

Latin America

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

Section 1 Product Description

1.1 Purpose

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.

When the normal (preferred) source fails, the ATS signals the emergency (standby) source generator set to start. When the emergency (standby) source reaches acceptable levels and stabilizes, the ATS transfers the load from the normal (preferred) source to the emergency (standby) source. The ATS continuously monitors the normal (preferred) source and transfers the load back when the normal (preferred) source returns and stabilizes. After transferring the load back to the normal (preferred) source, the ATS removes the generator start signal, allowing the generator set to shut down.

Figure 1-2 shows a typical installation block diagram.

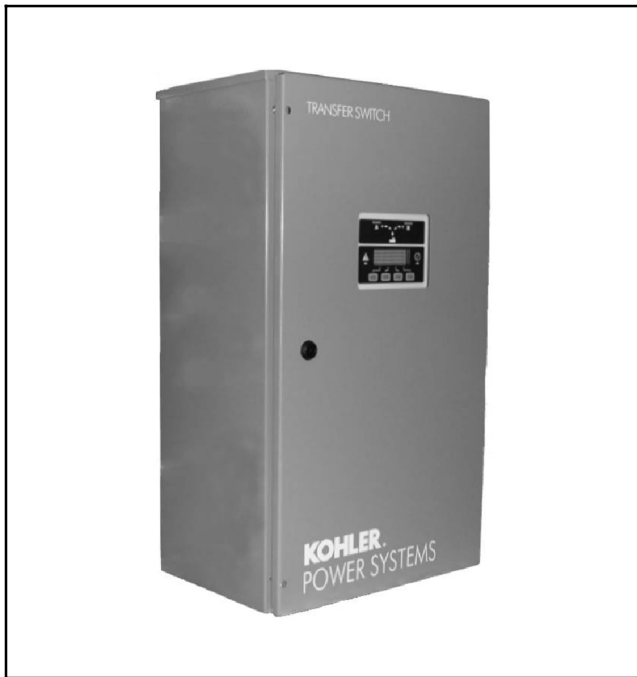


Figure 1-1 Automatic Transfer Switch

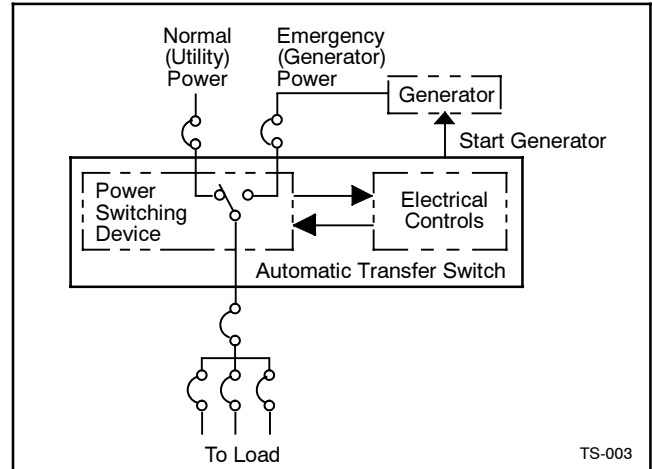


Figure 1-2 Typical ATS Block Diagram

1.2 Nameplate

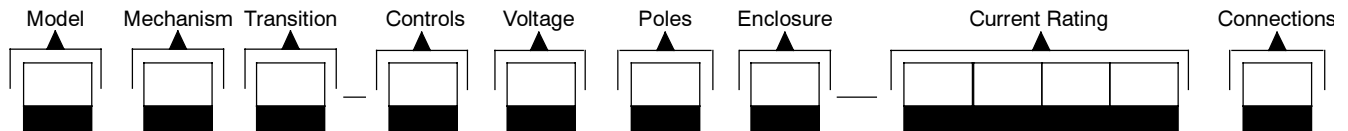
A nameplate attached to the controller cover on the inside of the enclosure door includes a model designation, a serial number, ratings, and other information about the transfer switch. See Figure 1-3. The serial number is also shown on a label inside the transfer switch enclosure.

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.

KOHLER KOHLER CO. KOHLER WI. USA 1-800-544-2444		TRANSFER SWITCH FOR EMERGENCY SYSTEMS NEMA ENCLOSURE MFG. DATE	
MATERIAL MODEL SERIAL NO.		ACCESSORIES:	
AMPS	VOLTS		
WIRES	PHASE		
POLES	HERTZ		
BAR CODE			
<div></div>			
		TRANSFER SWITCH FOR EMERGENCY SYSTEMS	
GM21291			

Figure 1-3 Typical Transfer Switch Nameplate

1.3 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: KSP-DCTA-0100S

Model

K: Kohler Transfer Switch

Mechanism

S: Specific-Breaker Rated

Transition

S: Specific-Breaker Rated

P: Programmed-Transition

Controls

D: MPAC™ 1500

Microprocessor Controls, Automatic

F: MPAC™ 1500

Microprocessor Controls, Non-Automatic

Voltage/Frequency

C: 208 Volts/60 Hz

D: 220 Volts/50 Hz

F: 240 Volts/60 Hz

G: 380 Volts/50 Hz

H: 400 Volts/50 Hz

J: 416 Volts/50 Hz

K: 440 Volts/60 Hz

M: 480 Volts/60 Hz

P: 380 Volts/60 Hz

R: 220 Volts/60 Hz

Number of Poles/Wires

N: 2-pole, 3-wire, solid neutral

T: 3-pole, 4-wire, solid neutral

V: 4-pole, 4-wire, switched neutral

Enclosure

A: NEMA 1†

B: NEMA 12

C: NEMA 3R

D: NEMA 4

F: NEMA 4X

G: Open unit

† NEMA 1 enclosure standard. Other types available to order.

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

0040 ‡

0200

0600

0080 ‡

0225 ‡

0800 ‡

0100

0260 ‡

1000 ‡

0150 ‡

0400

‡ Standard-transition models only.

Power Connections

S: Standard

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. Verify that the installation complies with applicable codes and standards. 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.
- Mount the transfer switch.
- Check the manual operation.
- Wire the normal power source (utility), emergency power source (generator set), and load circuits.
- Connect the generator set engine start leads.
- Connect accessories, if provided.
- Connect and initialize the electrical controls, as required.
- Check voltages and operation.

Protect the switch against damage before and during installation.

Note: A protective device such as a molded-case circuit breaker or fused disconnect switch **MUST** be installed on both sources of incoming power for circuit protection and use as a disconnect device.

The functional tests in Section 3 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 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 2-1 for acceptable storage temperatures.

Item	Specification
Storage temperature	-40°C to 70°C (-40°F to 158°F)
Operating temperature	-20°C to 85°C (-4°F to 185°F)
Humidity	5% to 95% noncondensing

Figure 2-1 Environmental Specifications

2.2.3 Lifting

 **WARNING**



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

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

See Figure 2-2 or Figure 2-3 or the dimensional drawing for the weight of the transfer switch. 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	Weight kg (lb.)		
	2-Pole	3-Pole	4-Pole
40-225	28 (62)	30 (65)	31 (68)
260-400	52 (115)	56 (123)	59 (131)
600	179 (395)	183 (403)	186 (410)
800	N/A	226 (498)	236 (520)
1000	N/A	231 (509)	241 (531)

Figure 2-2 Approximate Transfer Switch Weights, Standard-Transition Models, NEMA Type 1 and 3R Enclosures

Amps	Weight kg (lb.)		
	2-Pole	3-Pole	4-Pole
100-200	52 (115)	56 (123)	59 (131)
400	52 (115)	56 (123)	59 (131)
600	179 (395)	183 (403)	186 (410)

Figure 2-3 Approximate Transfer Switch Weights, Programmed-Transition Models, NEMA Type 1 and 3R Enclosures

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 Installation

NOTICE

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

NOTICE

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

Plan the installation. Use the dimensions given on the enclosure dimension (ADV) drawings. 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, 4, or 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. 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.

Install the ATS. For easy access during installation and wiring, remove the front door of the enclosure. Open the door and disconnect the cable plug that connects the front door components to the internal components. Disconnect the grounding wire between the door and the enclosure. For NEMA type 1 and 3R enclosures, squeeze the release pins on each hinge together and remove the door. See Figure 2-4. Set the door out of the way to protect the controls. Cover the internal components of the transfer switch mechanism to keep debris out of the components.

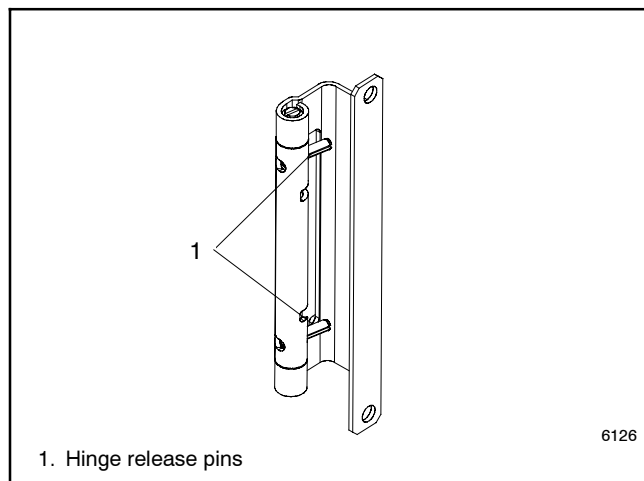
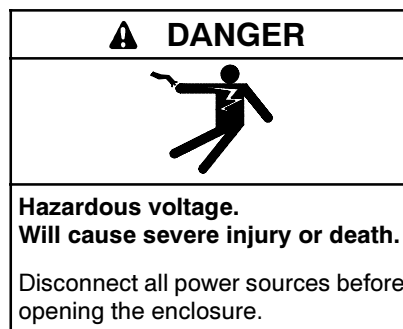


Figure 2-4 Hinge Release Pins

Vertically mount 40- through 400-amp transfer switches to a wall or other rigid vertical supporting structure. Use the template on the shipping carton to locate the mounting holes in the wall. Level the template before marking and drilling the holes. Clearance holes through the back of each enclosure are provided for mounting. Use shims to plumb the enclosure. Verify that the door hinges are vertical to avoid distortion of the enclosure or door. Vacuum any debris out of the enclosure.

Bolt 600-amp automatic transfer switches directly to floor mounting pads. Shim the enclosure so that the enclosure is plumb.

2.4 Manual Operation Check



NOTICE

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

A manual operation handle is provided with the transfer switch *for maintenance purposes only*. Use the manual operation handle to check the manual operation before energizing the transfer switch. Use the following manual operation procedures to verify that the contactor operates smoothly without binding.

Note: A contactor in normal and serviceable condition operates smoothly without binding. Do not place the transfer switch into service if the contactor does not operate smoothly; contact an authorized distributor/dealer to service the contactor.

2.4.1 Manual Operation Procedure, Standard-Transition Switches

Note: Never use the maintenance handle to transfer the load with the power connected. Disconnect both power sources before manually operating the switch.

1. Remove the maintenance handle from its storage location inside the enclosure. See Figure 2-5 through Figure 2-7.
2. Attach the maintenance handle:
 - a. 40–600 Amp switches: Insert the maintenance handle into the hole in the shaft on the left side of the operator as shown in Figure 2-5 or Figure 2-6.
 - b. 800–1000 Amp switches: Slide the maintenance handle over the square shaft on the left side of the operator as shown in Figure 2-7.

3. Move the maintenance handle up or down as shown in the corresponding figure to manually operate the transfer switch. It should operate smoothly without any binding. If it does not, check for shipping damage or construction debris.
4. Return the transfer switch to the Normal position.
5. Remove the maintenance handle and return it to the storage location.

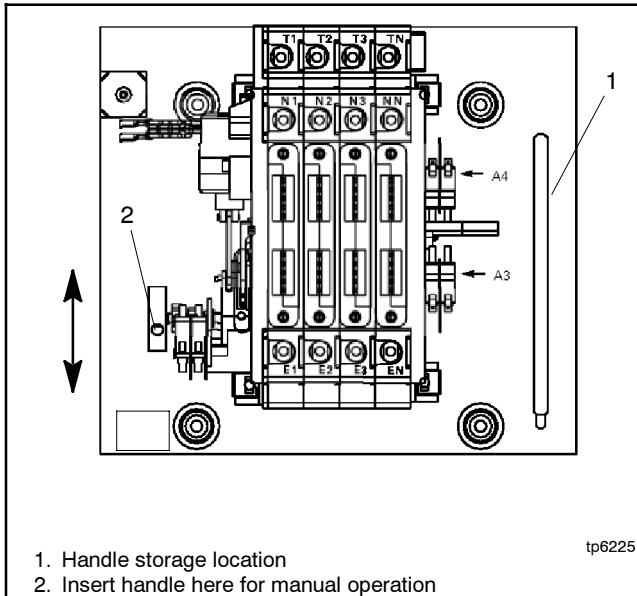


Figure 2-5 Manual Operation, 40-260 Amp Standard-Transition Switches

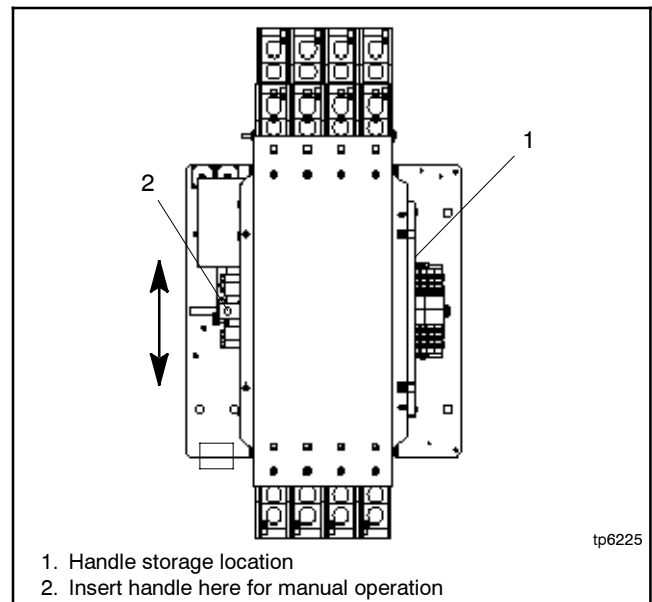


Figure 2-6 Manual Operation, 400-600 Amp Standard-Transition Switches

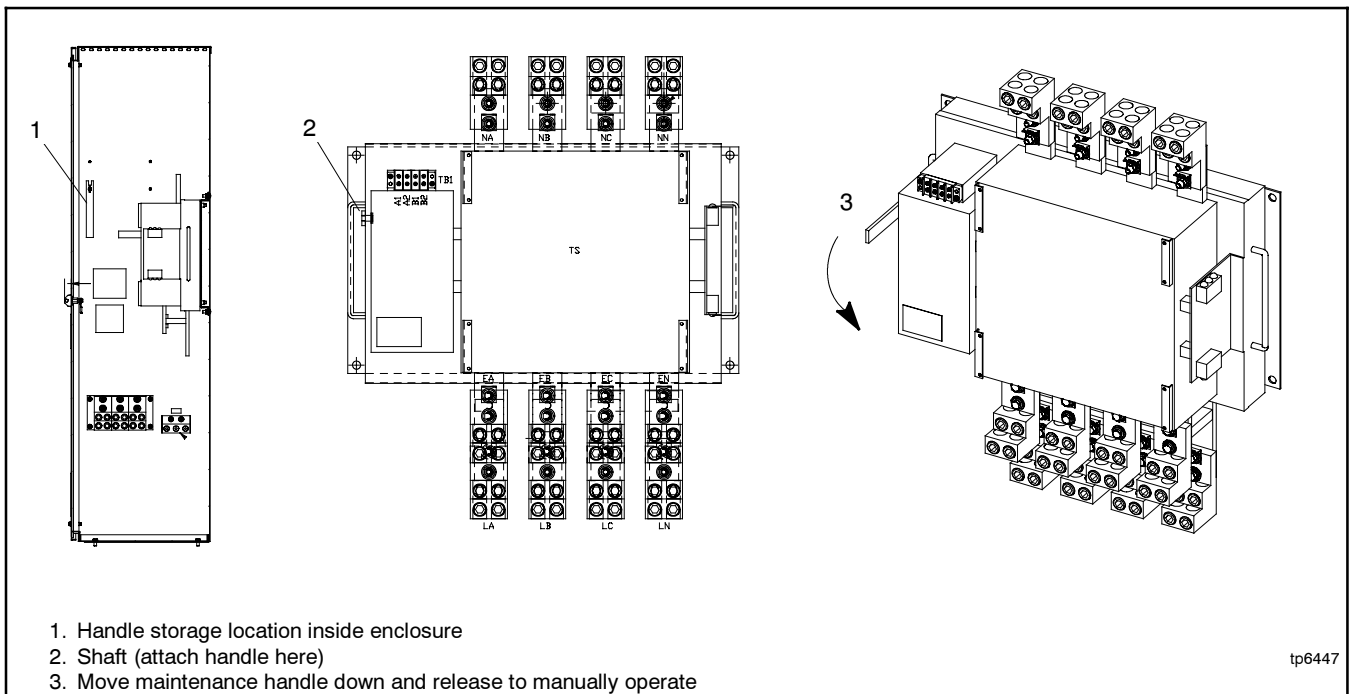


Figure 2-7 Manual Operation, 800-1000 Amp Standard-Transition Switches

2.4.2 Manual Operation Procedure, Programmed-Transition Switches

Note: Never use the manual operation handle to transfer the load with the power connected. Disconnect both power sources before manually operating the switch.

1. Check the contactor position, indicated by the A and B position indicators. See Figure 2-8. One position indicator will display ON to indicate the source position. If both indicators display OFF, the transfer switch is in the OFF position.

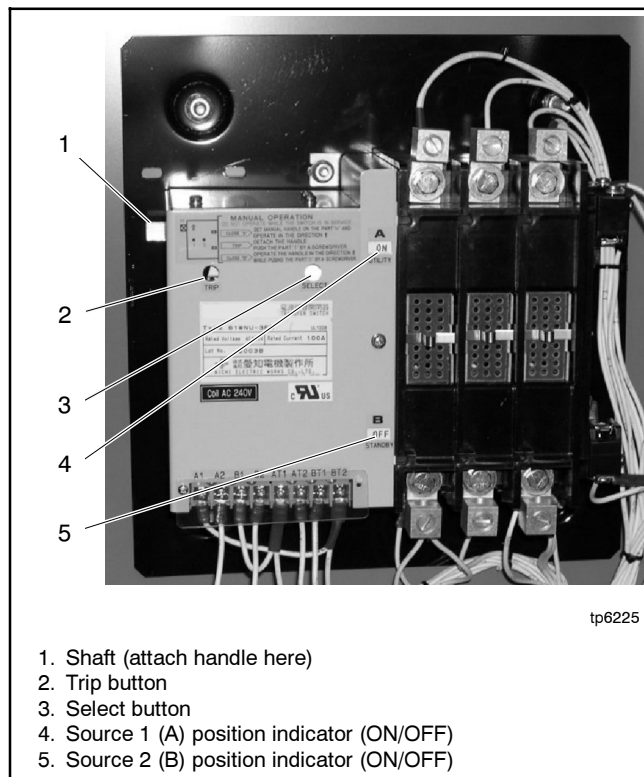


Figure 2-8 Manual Operation, Programmed-Transition Switches (handle not shown)

2. If the transfer switch is not in the OFF position, use a screwdriver or other tool to push the TRIP button.

See Figure 2-8. Check that both position indicators display OFF.

3. Slide the manual operating handle (provided with the switch) over the shaft on the left side of the switch. See Figure 2-8.
4. Move the switch to the A (Source 1) or B (Source 2) position as follows:
 - a. To move the switch to position A (Source 1), move the manual operation handle up and then release the handle. Verify that the A position indicator displays ON.
 - b. To move the switch to position B (Source 2), use a screwdriver or other tool to push the SELECT button. Hold the SELECT button in and move the manual operation handle up and then release the handle. Verify that the B position indicator displays ON.

Note: Always move the manual operation handle UP and then release it.

5. Remove the manual operation handle and store it in a convenient location.

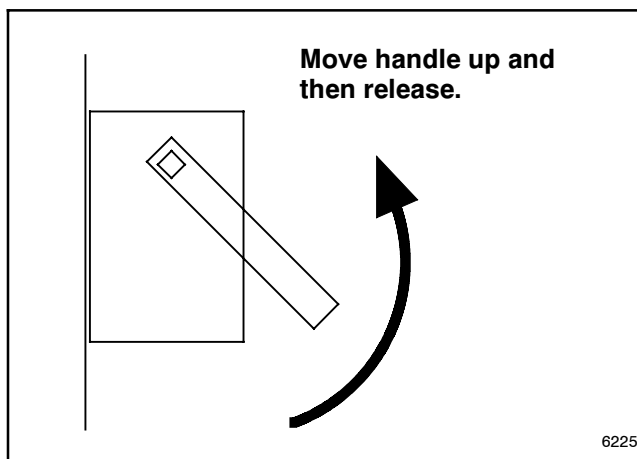
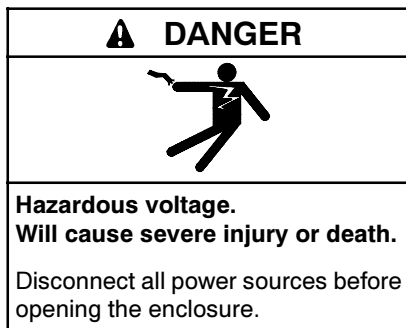


Figure 2-9 Manual Operating Handle, Programmed-Transition Switches

2.5 Controller



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's logic board is mounted in a plastic housing on the inside of the transfer switch enclosure door.

2.5.1 Controller Connection

Verify that the contactor harness is connected to the controller (through the logic disconnect switch, if equipped). See the controller Operation manual. See list of Related Materials in the Introduction for document numbers.

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

2.5.2 Controller Ground

Verify that the grounding wire is connected from the controller to the stud on the door and to the inside of the enclosure. This connection provides proper grounding that does not rely upon the door hinges.

2.5.3 Other Connections

Refer to the transfer switch wiring diagram or the controller Operation Manual for the following controller and accessory connections.

- Inputs and outputs
- Communications connections
- Accessory connections

2.6 Electrical Wiring

The transfer switch is factory-wired and tested. Field installation includes connecting the sources, loads, generator start circuit(s), and auxiliary circuits, if used.

Note: An approved protective device such as a molded-case circuit breaker or fused disconnect switch **MUST** be installed on both sources of incoming power for circuit protection and use as a disconnect device.

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.

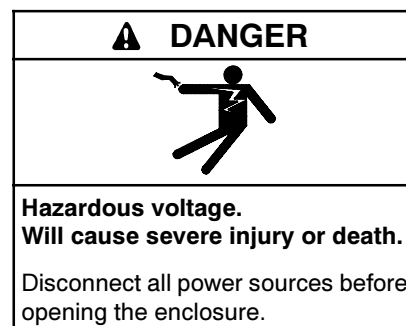
⚠ WARNING



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.

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.



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. Electrocutation 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.

2.6.1 Source and Load Connections

Determine the cable size. Refer to the transfer switch dimension drawing to determine the size and number of conductors that can be used. 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 internal components of the ATS to protect them 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 conductors. Leave sufficient slack in the conductors to reach all of the power connecting lugs on the power switching device. Test the power conductors 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.

Verify that all connections are consistent with drawings before tightening the lugs. Tighten all lug connections to the torque values shown in Figure 2-10. Carefully wipe off any excess joint compound after tightening the terminal lugs.

Socket Size Across Flats, in.	Bolt Torque	
	Nm	Ft. lb.
1/8	5	4
5/32	11	8
3/16	14	10
7/32	16	12
1/4	23	17
5/16	31	23
3/8	42	31
1/2	57	42
9/16	68	50

Figure 2-10 Tightening Torque for Lugs

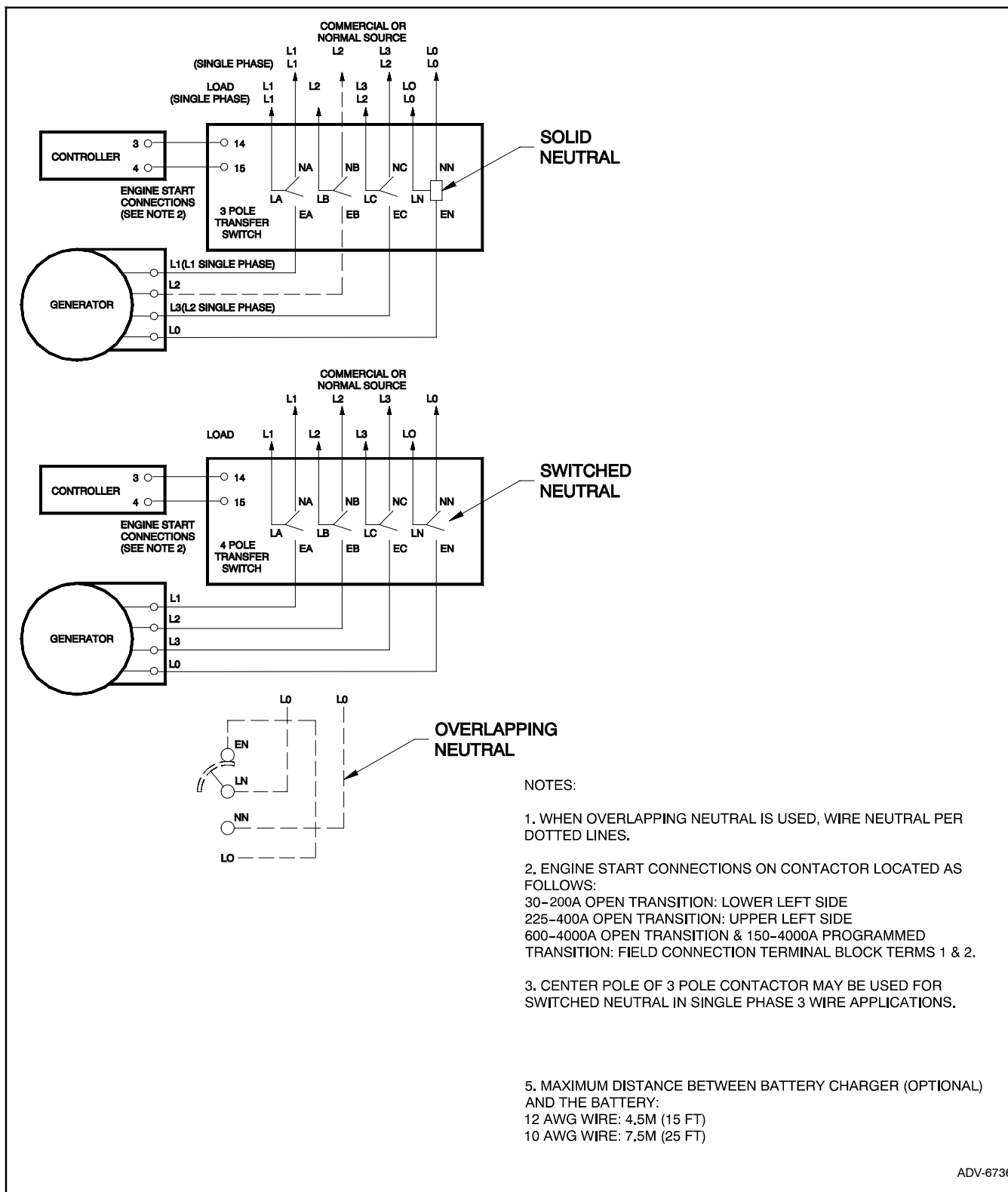


Figure 2-11 Interconnection Diagram

2.6.2 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 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.

Prevent the generator set from starting by moving the generator set master switch to the OFF position; 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 terminals located on the transfer switch contactor assembly. See Figure 2-13 through Figure 2-18 for the locations of the engine start terminals, which are labeled on the unit with a red decal. Refer to the generator set installation manual for wire size specifications.

The engine start contact ratings are shown in Figure 2-12.

2.6.3 Auxiliary Contacts

Connect the auxiliary contacts to customer-supplied alarms, remote indicators, or other devices. Auxiliary contacts provide contacts that close when the transfer switch is in the Normal position and contacts that close when the transfer switch is in the Emergency position.

Refer to the schematic diagram provided with the transfer switch to identify which auxiliary contacts are closed on Normal and which are closed on Emergency.

Figure 2-13 through Figure 2-18 show the locations of the auxiliary contacts for different models. The auxiliary contact ratings are shown in Figure 2-12.

Contacts	Resistive Load	Inductive Load	Motor Load	
			NC	NO
Engine Start Contacts	2 A @ 30 VDC	N/A	N/A	N/A
Auxiliary Contacts, KSS (40-600A)	15 A @ 250 VAC	N/A	N/A	N/A
Auxiliary Contacts, KSS (800-1000A)	15 A @ 480 VAC	15 A @ 250 VAC; 6 A @ 500 VAC	5 A @ 125 VAC; 3 A @ 250 VAC; 1.5 A @ 500 VAC	2.5 A @ 125 VAC; 1.5 A @ 250 VAC; 0.75 A @ 500 VAC
Auxiliary Contacts, KSP	15 A @ 480 VAC	15 A @ 250 VAC; 6 A @ 500 VAC	5 A @ 125 VAC; 3 A @ 250 VAC; 1.5 A @ 500 VAC	2.5 A @ 125 VAC; 1.5 A @ 250 VAC; 0.75 A @ 500 VAC

Figure 2-12 Contact Ratings

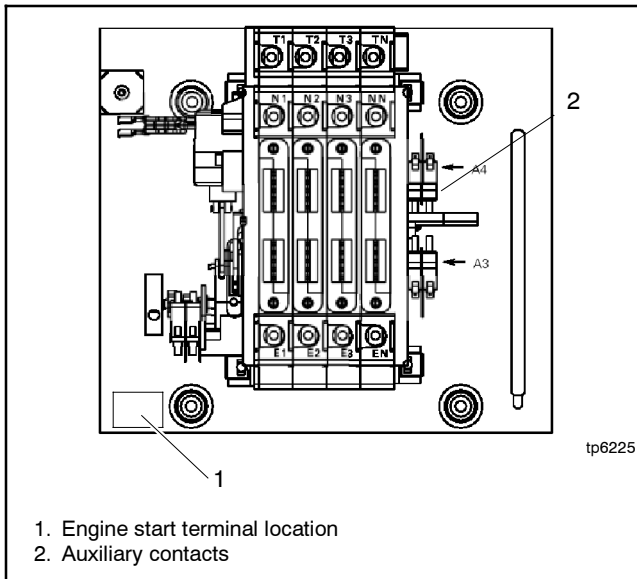


Figure 2-13 Engine Start and Auxiliary Contact Locations, 40-225 Amp Standard-Transition Switches

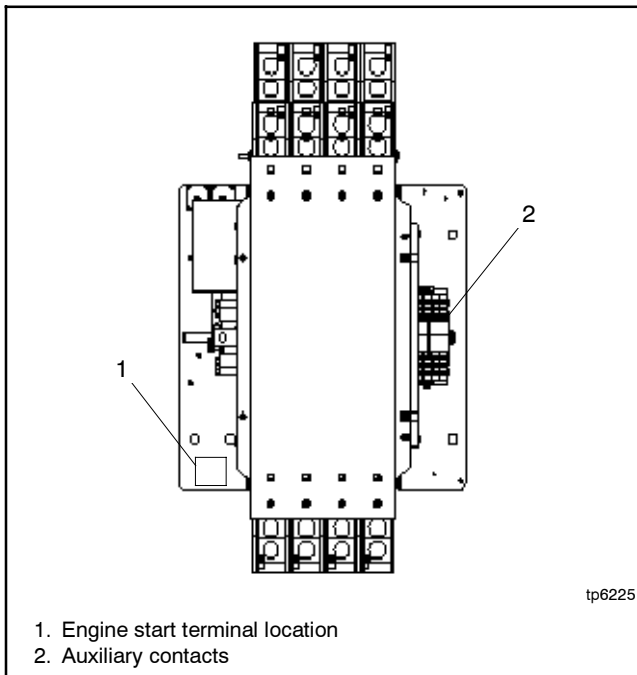


Figure 2-14 Engine Start and Auxiliary Contact Locations, 400-600 Amp Standard-Transition Switches

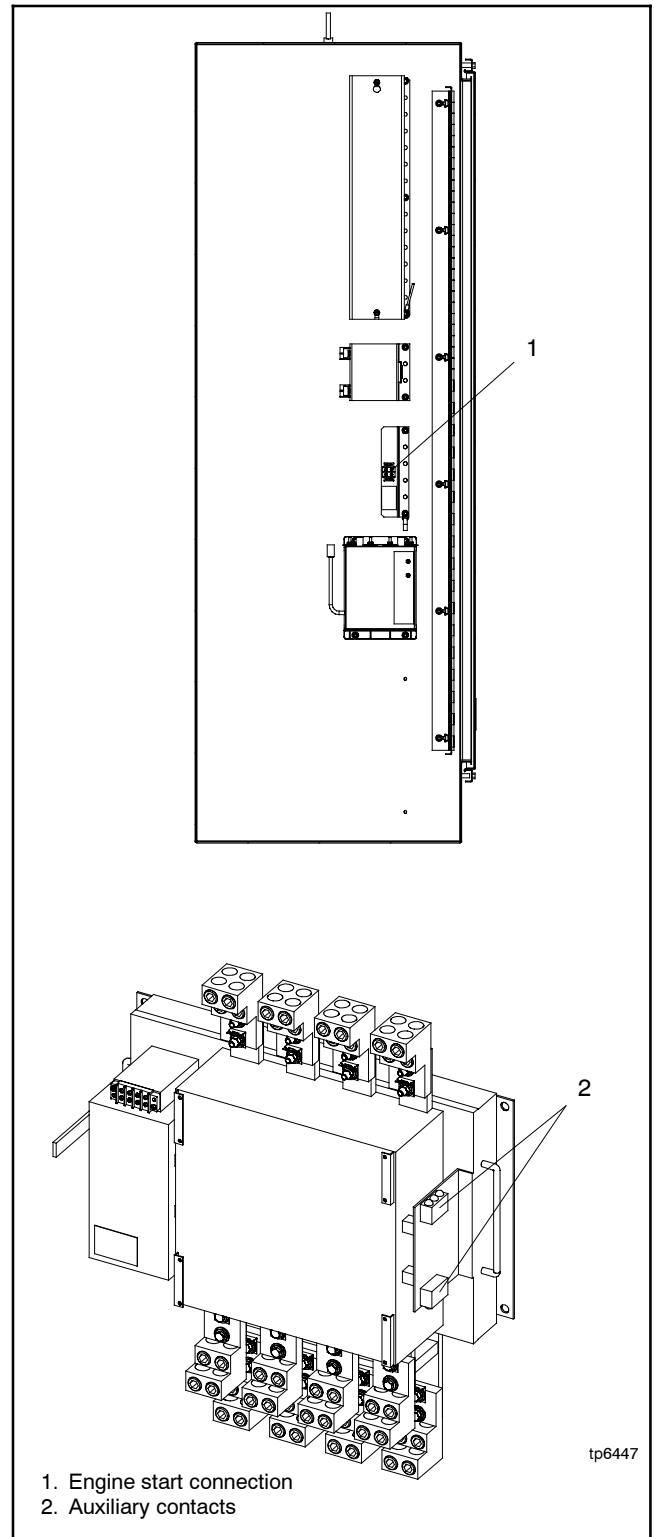


Figure 2-15 Engine Start and Auxiliary Contact Locations, 800-1000 Amp Standard-Transition Switches

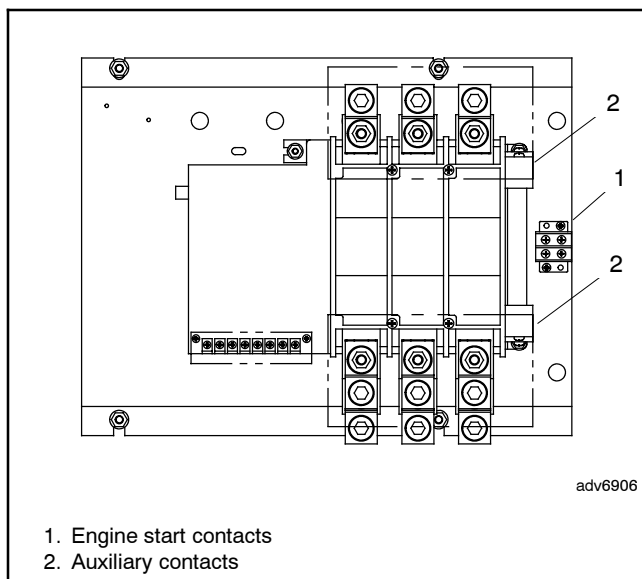


Figure 2-16 Engine Start and Auxiliary Contact Locations, 100-200 Amp Programmed-Transition Switches

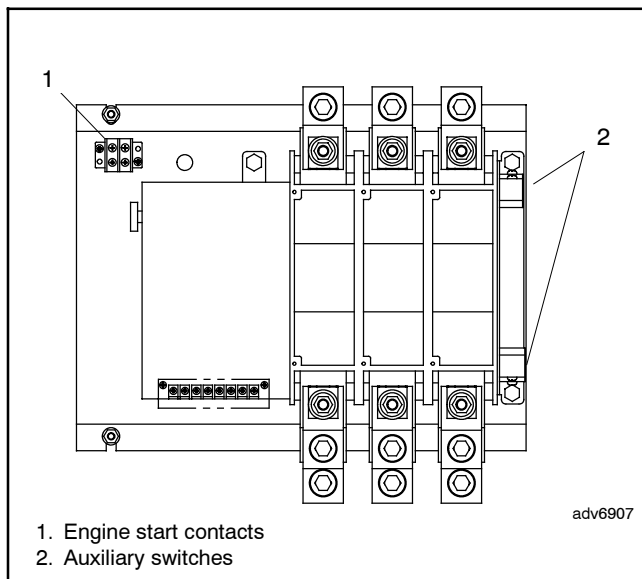


Figure 2-17 Engine Start and Auxiliary Contact Locations, 400 Amp Programmed-Transition Switches

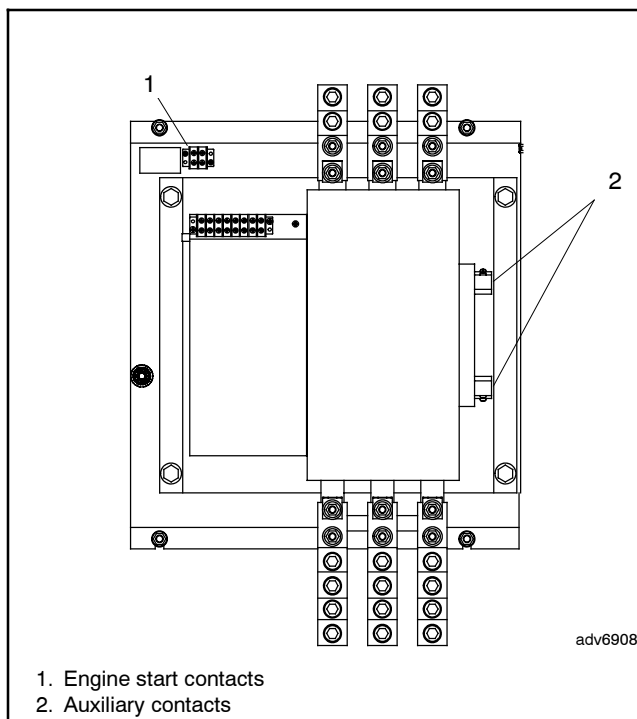


Figure 2-18 Engine Start and Auxiliary Contact Locations, 600 Amp Programmed-Transition Switches

2.7 Accessories

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

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

2.8 Programmed-Transition Interface Board (PTIB)

Programmed-transition model transfer switches use a programmed-transition contactor and a programmed-transition interface board (PTIB). The PTIB is mounted on the inside of the enclosure door.

The PTIB is factory-wired and requires no additional wiring in the field. Verify that the PTIB wiring harness is connected to the controller's main logic board. See Figure 2-19 for the PTIB connection to the MPAC 1500 controller.

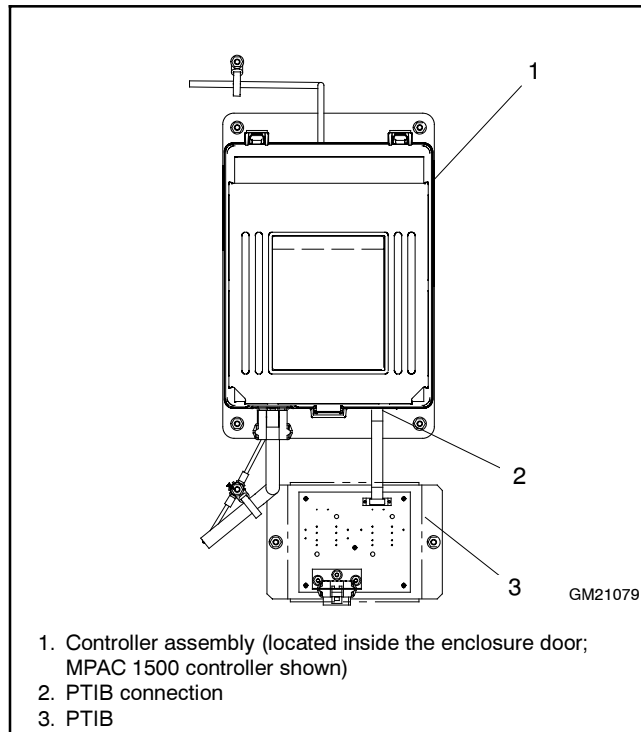


Figure 2-19 Programmed-Transition Interface Board (PTIB)

2.9 Final Equipment Inspection

Perform the following inspections before energizing the transfer switch:

1. Use a vacuum to remove any debris from the transfer switch.

2. Check the engine start connections.
3. Check the lug torque values at the power connections. Torque values are listed in Figure 2-10.
4. Check that all covers and barriers are installed and properly fastened.

2.10 Functional Tests

Perform the functional tests described in Section 3 before putting the transfer switch into operation.

2.11 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.

2.12 Exerciser Setup

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

2.13 Warranty Registration

Complete a Startup Notification Form and submit it to the manufacturer within 60 days of the initial startup date. The Startup Notification Form covers all equipment in the power system. Power systems not registered within 60 days of startup are automatically registered using the manufacturer's ship date as the startup date.

Section 3 Functional Tests

3.1 Introduction

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

The functional tests include the following checks:

- Manual Operation Test
- Voltage Checks
- Lamp Test
- Automatic Operation Test

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.

3.2 Manual Operation Test

If you have not already done so, test the contactor 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 the Installation Section to check the transfer switch manual operation.

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

3.3 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.

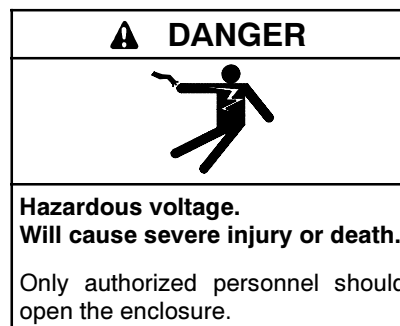
Follow the instructions provided with the generator set to prepare the generator set for operation.

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. If Source N is a generator set, move the generator set master switch to the RUN position. The generator set should start.
2. Close the Source N circuit breaker or switch.

3. Use a voltmeter to check the Source N (normal) 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—call your distributor/dealer to order the correct transfer switch.
 - b. If Source N 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 N (normal) terminals. Rewire the transfer switch Source N 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 position.
6. Disconnect Source N by opening upstream circuit breakers or switches.

7. Repeat steps 1 through 5 for Source E. Then proceed to step 8.
8. Disconnect both sources to the transfer switch by opening the circuit breakers or switches.
9. Close and lock the transfer switch enclosure door.
10. Reconnect both power sources by closing the circuit breakers or switches.
11. 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 Time Delay Engine Cooldown (TDEC) ends.

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

3.4 Lamp Test

Refer to the controller Operation Manual for instructions to perform a lamp test. Verify that all controller LEDs or lamps light during the test.

3.5 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.

This completes the functional tests.

Appendix A Abbreviations

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

A, amp	ampere	cert.	certificate, certification, certified	ESD	electrostatic discharge
ABDC	after bottom dead center	cfh	cubic feet per hour	est.	estimated
AC	alternating current	cfm	cubic feet per minute	E-Stop	emergency stop
A/D	analog to digital	CG	center of gravity	etc.	et cetera (and so forth)
ADC	advanced digital control; analog to digital converter	CID	cubic inch displacement	exh.	exhaust
adj.	adjust, adjustment	CL	centerline	ext.	external
ADV	advertising dimensional drawing	cm	centimeter	F	Fahrenheit, female
Ah	amp-hour	CMOS	complementary metal oxide substrate (semiconductor)	FHM	flat head machine (screw)
AHWT	anticipatory high water temperature	com	communications (port)	fl. oz.	fluid ounce
AISI	American Iron and Steel Institute	coml	commercial	flex.	flexible
ALOP	anticipatory low oil pressure	Coml/Rec	Commercial/Recreational	freq.	frequency
alt.	alternator	conn.	connection	FS	full scale
Al	aluminum	cont.	continued	ft.	foot, feet
ANSI	American National Standards Institute (formerly American Standards Association, ASA)	CPVC	chlorinated polyvinyl chloride	ft. lb.	foot pounds (torque)
AO	anticipatory only	crit.	critical	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)
APU	Auxiliary Power Unit	cUL	Canadian Underwriter's Laboratories	gal.	gallon
AQMD	Air Quality Management District	CUL	Canadian Underwriter's Laboratories	gen.	generator
AR	as required, as requested	cu. in.	cubic inch	genset	generator set
AS	as supplied, as stated, as suggested	cw.	clockwise	GFI	ground fault interrupter
ASE	American Society of Engineers	CWC	city water-cooled	GND, ⊕	ground
ASME	American Society of Mechanical Engineers	cyl.	cylinder	gov.	governor
assy.	assembly	D/A	digital to analog	gph	gallons per hour
ASTM	American Society for Testing Materials	DAC	digital to analog converter	gpm	gallons per minute
ATDC	after top dead center	dB	decibel	gr.	grade, gross
ATS	automatic transfer switch	dB(A)	decibel (A weighted)	GRD	equipment ground
auto.	automatic	DC	direct current	gr. wt.	gross weight
aux.	auxiliary	DCR	direct current resistance	H x W x D	height by width by depth
avg.	average	deg., °	degree	HC	hex cap
AVR	automatic voltage regulator	dept.	department	HCHT	high cylinder head temperature
AWG	American Wire Gauge	dia.	diameter	HD	heavy duty
AWM	appliance wiring material	DI/EO	dual inlet/end outlet	HET	high exhaust temp., high engine temp.
bat.	battery	DIN	Deutsches Institut für Normung e. V. (also Deutsche Industrie Normenausschuss)	hex	hexagon
BBDC	before bottom dead center	DIP	dual inline package	Hg	mercury (element)
BC	battery charger, battery charging	DPDT	double-pole, double-throw	HH	hex head
BCA	battery charging alternator	DPST	double-pole, single-throw	HHC	hex head cap
BCI	Battery Council International	DS	disconnect switch	HP	horsepower
BDC	before dead center	DVR	digital voltage regulator	hr.	hour
BHP	brake horsepower	E ² PROM, EEPROM	electrically-erasable programmable read-only memory	HS	heat shrink
blk.	black (paint color), block (engine)	E, emer.	emergency (power source)	hsg.	housing
blk. htr.	block heater	ECM	electronic control module, engine control module	HVAC	heating, ventilation, and air conditioning
BMEP	brake mean effective pressure	EDI	electronic data interchange	HWT	high water temperature
bps	bits per second	EFR	emergency frequency relay	Hz	hertz (cycles per second)
br.	brass	e.g.	for example (<i>exempli gratia</i>)	IBC	International Building Code
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
CAT5	Category 5 (network cable)	EPA	Environmental Protection Agency	in. Hg	inches of mercury
CB	circuit breaker	EPS	emergency power system	in. lb.	inch pounds
CC	crank cycle	ER	emergency relay	Inc.	incorporated
cc	cubic centimeter	ES	engineering special, engineered special	ind.	industrial
CCA	cold cranking amps			int.	internal
ccw.	counterclockwise			int./ext.	internal/external
CEC	Canadian Electrical Code			I/O	input/output
				IP	internet protocol
				ISO	International Organization for Standardization
				J	joule
				JIS	Japanese Industry Standard
				k	kilo (1000)

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

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