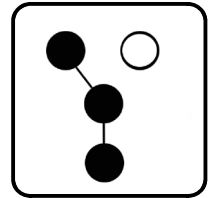


Operation

Automatic Transfer Switches



Models:

RSB

ATSR

Intelligent Transfer Switch

150-225 Amps

Electrical Controls:

MPAC™ 550

KOHLER[®]
POWER SYSTEMS

9001
IS **KOHLER**
POWER SYSTEMS
NATIONALLY REGISTERED

506092-01

TP-6487 5/08c

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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.**

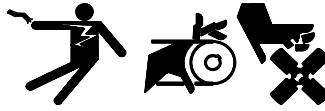
NOTICE

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.

DANGER



Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

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, 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.

⚠ WARNING



**Airborne particles.
Can cause severe injury or
blindness.**

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

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.

This manual provides operation instructions for the Kohler® Model RSB or ATSR Intelligent Transfer Switch with MPAC™ 550 electrical controls.

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.



Figure 1 Intelligent Transfer Switch

List of Related Materials

Separate manuals cover the installation of the Type 1 and Type 3R load centers and the transfer switch conversion kit. Figure 2 lists the available manuals and part numbers.

Document	Part Number
Installation Instructions, QO Indoor Load Center (Type 1)	TP-6493
Installation Instructions, QO Outdoor Load Center (Type 3R)	TP-6494
Installation Manual, Model RSB, ATSR Intelligent Transfer Switch Conversion Kit	TP-6486

Figure 2 Related Documents

Nameplate

A nameplate attached to the transfer switch includes a model designation, a serial number, ratings, and other information about the transfer switch. See Figure 3.

Check the transfer switch model number from the transfer switch nameplate and verify that it matches the model shown on the front cover of this manual before proceeding with installation.

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

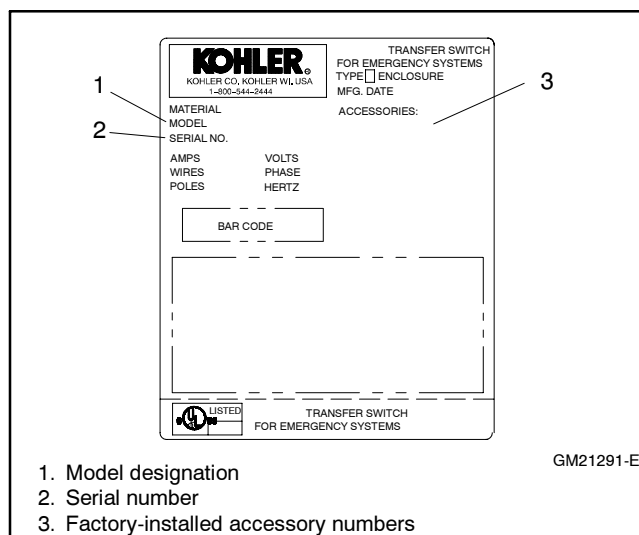
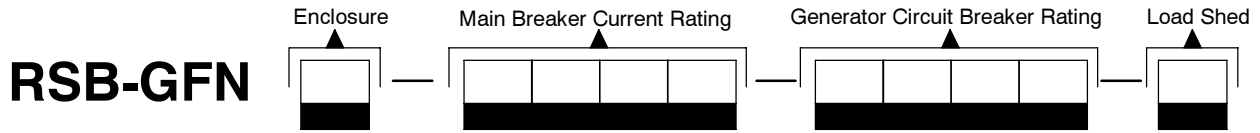


Figure 3 Typical Transfer Switch Nameplate

Model Code

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



Kohler® Model Designation Key

This chart explains the Kohler® transfer switch model designation system. The sample model designation shown is for a Model RSB Intelligent Transfer Switch with MPAC™ 550 electrical controls rated at 240 volts/60 Hz, 2 poles, 3 wires, and solid neutral in a type 1 enclosure with a 200 amp main circuit breaker, a 125 amp generator circuit breaker, and no load shed modules.

SAMPLE MODEL DESIGNATION

RSB-GFNA-0200-0125-N

Model

R: Kohler

Mechanism

SB: Intelligent Transfer Switch, Service Entrance Rated

Electrical Controls

G: MPAC™ 550 (Microprocessor ATS Controls)

Voltage/Frequency

F: 240 Volts/60 Hz

Number of Poles/Wires

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

Enclosure

A: Type 1 Complete
 B: Conversion Kit for Type 1 Indoor Load Center (no enclosure) *
 C: Type 3R Complete
 D: Conversion Kit for Type 3R Outdoor Load Center (no enclosure) *

Main Circuit Breaker Rating, in Amps:

0150 0200 0225 0000 †

Generator Circuit Breaker Rating, in Amps:

0050 0070 0090 0125
 0060 0080 00100

Load Shed

N: No Load Shed Modules
 S: With Load Shed Modules

* Order a conversion kit for locations that already have a Square D® Generator-Ready Intelligent Load Center installed.

† Conversion kits are available without a main circuit breaker for installations that already include a type QOM main circuit breaker with control taps.

Note: Load centers do not include branch circuit breakers. Obtain Square D® type QO breakers locally as required for the application.

For professional advice on generator set 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.

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

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

India, Bangladesh, Sri Lanka

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

Japan, Korea

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

Latin America

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

Notes

1.1 Transfer Switch Description

An automatic transfer switch (ATS) transfers electrical loads from a normal source of electrical power to a standby source when the normal source voltage or frequency falls below an acceptable level. The normal source is typically utility power. The standby source is usually a generator set.

When the normal source fails, the ATS signals the standby source generator set to start. When the standby source reaches acceptable levels and stabilizes, the ATS transfers the electrical load to the standby source.

The ATS continuously monitors the normal source and transfers the load back when the normal source returns and stabilizes. After transferring the load back to the normal source, the ATS removes the generator start signal, allowing the generator set to shut down.

Figure 1-1 shows a typical power system block diagram.

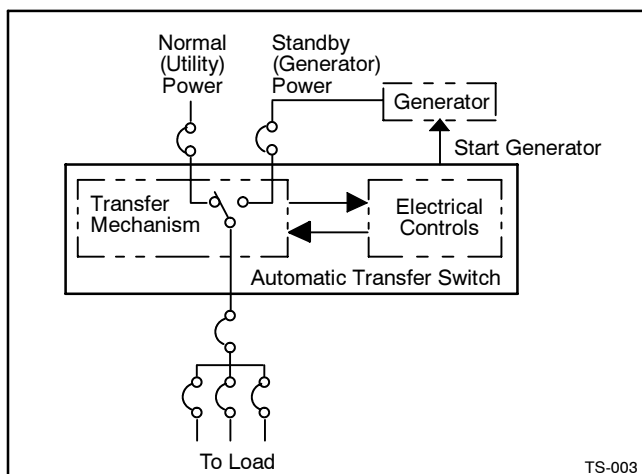


Figure 1-1 Typical ATS Block Diagram

1.2 Intelligent Transfer Switch

The Intelligent Transfer Switch is intended for use in an optional standby power system to allow a homeowner to switch between utility and generator power by means of an integrated automatic transfer mechanism.

The MPAC™ 550 controller monitors utility power for interruptions. When utility power is lost, the controller signals the generator set to start. The transfer mechanism switches predetermined electrical components to the generator.

When utility power is restored, the MPAC™ 550 controller commands the transfer mechanism to switch the electrical load back to the utility and shuts down the generator set.

The Intelligent Transfer Switch is available in two enclosures, accommodating up to 40 (Type 1) or 28 (Type 3R) branch circuits selected by the user for backup power. It is suitable for service entrance or sub-panel use.

1.3 FCC Statement

This transfer equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This transfer equipment generates and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this transfer equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the transfer equipment and the receiver.
- Connect the receiver into an outlet on a different circuit.
- Consult the receiver dealer or an experienced radio/TV technician for help.
- Do not make changes or modifications to the transfer equipment that are not expressly approved by Kohler Co. Any changes or modifications may result in the loss of authority to operate the equipment.

1.4 Specifications

Enclosure Type	Rating, Amps	Load Center	Weight, kg (lb)	H x W x D, mm (in.)
NEMA 1	150–225	40 circuits	11.40 (25.0)	1000 x 362 x 95 (39.37 x 14.25 x 3.74)
NEMA 3R	100–200	28 circuits	19.10 (42.0)	858 x 375 x 115 (33.78 x 14.76 x 4.53)

Figure 1-2 Weights and Dimensions

Item	Specifications
Enclosures and ratings	Type 1 enclosure, 150–225 amp. Maximum rating of generator circuit breaker is 125 amp. For indoor installation, flush or surface mount. Up to 40 branch circuits.
	Type 3R enclosure, 150–200 amp. Maximum rating of generator circuit breaker is 125 amp. For indoor or outdoor installation, padlockable. Up to 28 branch circuits.
	150, 200, and 225 amp models are suitable for service entrance use.
Transfer mechanism	Two-pole, single-phase open-transition transfer mechanism.
	240 VAC 60 Hz.
	Solid neutral.
	Manually operable.
Operating temperature	–10° to 60° C (14° to 140° F) with derating –10° to 40° C (14° to 104° F) without derating.
Storage temperature	–40° to 85° C (–40° to 185° F).
Humidity	5%–95% noncondensing.
Altitude	0–2000 m (0–6560 ft.).
Vibration and shock (shipping)	ISTA-tested per ASTM 4169-1A.
Certifications, codes, and standards	UL listed per UL 67, Enclosed Panelboards.
	Tested to UL 1008, Standard for Automatic Transfer Switches for Use in Optional Standby Systems.
	NFPA 70, National Electrical Code®, Article 702.
	NEMA Standard IC10-1993, AC Automatic Transfer Switches.
EMI/EMC immunity	IEC 61000-4-2, 2001, Electrostatic Discharge, Level 3.
	IEC 61000-4-3, 2002, Radiated Immunity, Level 2.
	IEC 61000-4-4, 2001, EFT/Burst Immunity, Severity Level 3.
	IEC 61000-4-5, 2001, Surge Immunity, Severity Level 4.
	IEC 61000-4-6, 2003, Conducted RF Immunity, Level 2.
	FCC Part 15, Radiated Emissions, Class B.
	FCC Part 15 using CISPR 11 Conducted Emissions, Class B.

Figure 1-3 Specifications

2.1 Introduction

Red and green LEDs on the transfer switch controls indicate which sources are available, show which source is connected to the load, and flash to indicate fault conditions. Pushbuttons allow you to start and stop the generator set (with or without transferring the load) and set the exercise timer. See Figure 2-1.

The transfer switch uses factory-default settings for time delays, voltage and frequency pickup and dropout, and other system settings. An optional accessory board allows changes to the time delays and exerciser settings and provides connections for remote test and remote exercise inputs. See Section 4.1 for information on the accessory board.

2.2 Pushbuttons and Indicators

Figure 2-1 identifies the controller pushbuttons and LED indicators.

The LEDs light steadily or flash to indicate different ATS conditions as shown in Figure 2-2. See Section 2.5 for more information on fault conditions.

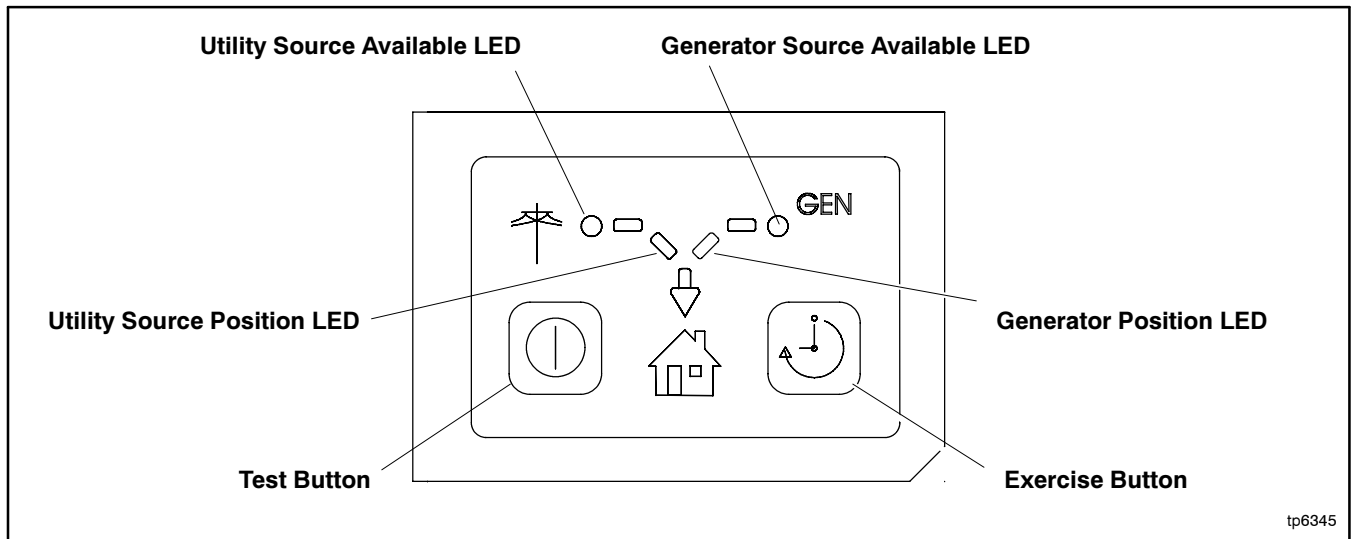


Figure 2-1 User Interface Panel

Condition	LED Indication
Utility source power available	Utility Source Available LED lights steadily.
Load connected to utility power	Utility Source Position LED lights steadily.
Generator set power available	GEN Source Available LED lights steadily.
Load connected to the generator set	GEN Position LED lights steadily.
Loaded test	GEN Available and GEN Position LEDs flash on 1 second, off 1 second.
Unloaded test	GEN Available LED flashes on 1 second, off 1 second.
Loaded exercise	GEN Available and GEN Position LEDs flash on 0.5 second, off 2 seconds.
Unloaded exercise	GEN Available LED flashes on 0.5 second, off 2 seconds.
Failure to acquire standby source fault	GEN Available LED flashes 2 times/second.
Failure to transfer fault	GEN or Utility Source Position LED flashes 2 times/second.
Auxiliary switch failure fault	GEN Position and Utility Source Position LEDs flash 2 times/second.

Figure 2-2 LED Indication

2.3 Source Sensing

The transfer switch controller monitors the utility power source voltage and initiates the transfer sequence if the source voltage falls below the voltage dropout setting. Retransfer is initiated when the utility source rises above the voltage pickup settings and remains stable for at least 6 minutes. See Figure 2-3.

Source Sensing	
Single-phase voltage sensing, both sources	± 5%
Line-line frequency sensing, standby source	± 2%
Undervoltage dropout	80%
Undervoltage pickup	85%
Voltage dropout time	0.5 second
Underfrequency dropout	90%
Underfrequency pickup	96%
Frequency dropout time	1 second

Figure 2-3 Source Sensing

2.4 Sequence of Operation

Figure 2-4 illustrates the transfer sequence when the normal source fails and Figure 2-5 illustrates the sequence when it returns. Time delays before load transfer prevent nuisance transfers during brief power interruptions.

Total transfer time depends on the generator set engine cranking time and other factors. Events such as the failure of the generator set to start can change the sequence of operation.

If the standby source fails and the normal source is not available, the transfer switch controller powers down until one of the sources returns.

Transfer will not occur if one of the source circuit breakers opens on a fault.

The time delay option board allows time delay adjustments. See Section 4.1.

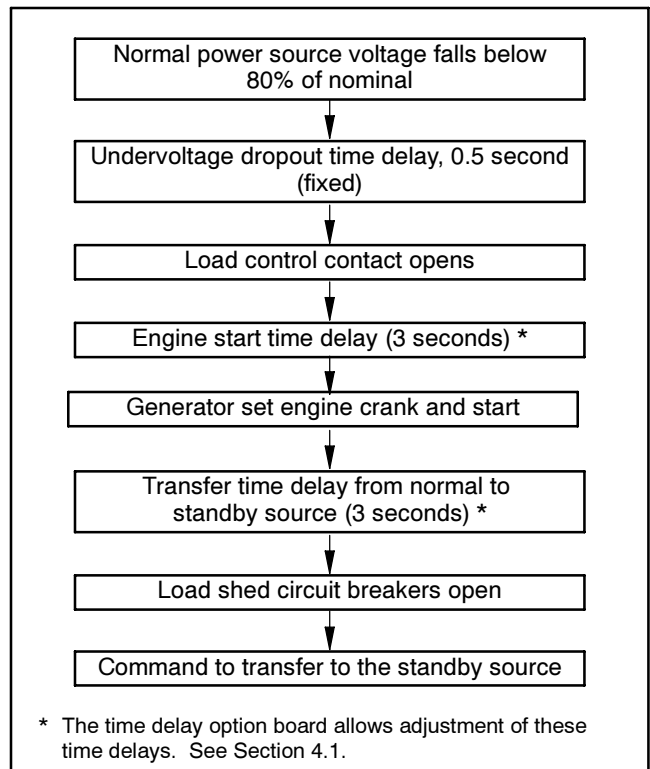


Figure 2-4 ATS Sequence of Operation, Transfer to Standby

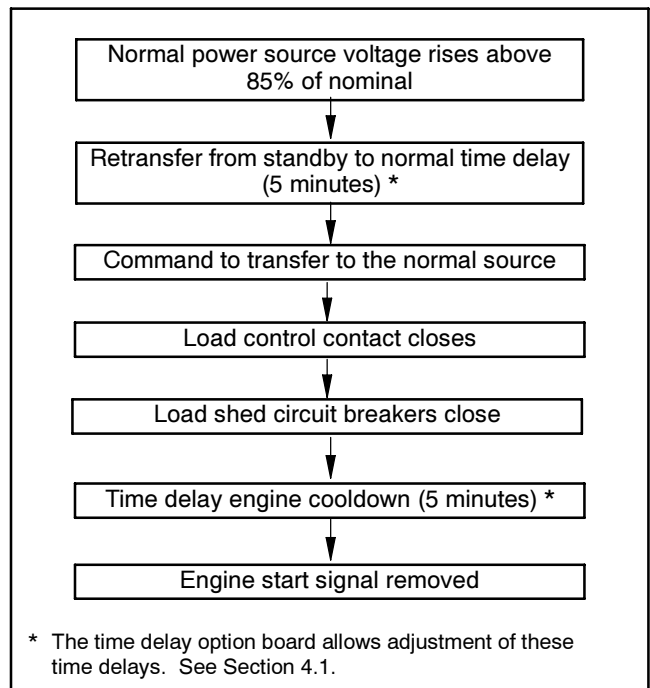


Figure 2-5 ATS Sequence of Operation, Retransfer to Normal

2.4.1 Time Delays

The controller time delays are shown in Figure 2-6. For adjustable time delays, install the accessory board. See Section 4.1.

Description	Time Delay
Engine Start	3 seconds
Transfer from Normal to Standby	3 seconds
Retransfer from Standby to Normal	5 minutes
Engine Cooldown	5 minutes
Exercise Time Duration	20 minutes
Failure to Acquire Standby	75 seconds*
* Allows for three 15-second engine starting attempts separated by 15-second rest periods.	

Figure 2-6 Time Delays

2.4.2 Load Control

The load control contact is closed when the transfer switch is in the Normal position. The contact opens when the Normal source is lost to allow disconnection of a load. The load connected to the load control contact is not powered by the standby source. The load control step in the sequence of operation is shown in Figure 2-4.

2.4.3 Load Shed

The optional load shed kit allows disconnection of selected loads before transfer to the generator set. Remote-controlled circuit breakers connected to the optional load shed module(s) open before transfer to the generator set. After transfer back to the utility source, the remote-controlled circuit breakers close.

2.5 Faults

The LEDs on the controller's user interface flash as shown in Figure 2-2 to indicate various fault conditions. Contact an authorized distributor/dealer for service if the fault persists.

2.5.1 Failure to Acquire Standby Source Warning

The Failure to Acquire Standby Source fault occurs if the transfer switch does not sense voltage from the generator set within 78 seconds after signalling the generator set to start. Check the generator set operation and the connections from the generator set to the ATS in the case of this fault.

The Failure to Acquire Standby Time Delay is set for 78 seconds to match the crank cycle of the generator set controller.

The fault clears when the system acquires the standby source.

2.5.2 Failure to Transfer Warning

The Failure to Transfer warning occurs if a signal to transfer is sent to the contactor and the position-indicating contacts do not indicate a complete transfer.

The controller will attempt to transfer three times before indicating the fault. If the transfer switch is in the Normal position, the Engine Cooldown time delay is executed and then the engine start contacts open to stop the generator set.

Reset the controller to clear the fault condition. See Section 2.6.

2.5.3 Auxiliary Switch Fault

An Auxiliary Switch fault occurs if the controller is unable to determine the transfer switch position. If the transfer switch is in the Normal position, the Engine Cooldown time delay is executed and then the engine start contacts open to stop the generator set.

Reset the controller to clear the fault condition. See Section 2.6.

2.6 Controller Reset

2.6.1 Fault Reset

Always identify and correct the cause of a fault condition before clearing the faults from the ATS controller. Press and hold the Exercise and Test buttons for approximately 3 seconds until the LEDs flash to clear all faults and warnings. Warnings reset automatically with a change in the source availability or a signal to transfer.

2.6.2 Alarm Silence

If the transfer switch is equipped with a time delay option board, pressing both buttons for 3 seconds will also silence the alarm horn.

2.6.3 Controller Reset

Press and hold both buttons for 6 seconds to reset the controller to its original state at powerup.

Note: Resetting the controller clears the exerciser setting. Set the exercise time and day as described in Section 2.8 after resetting the controller.

2.7 Running a Test

Follow the instructions below to start and stop a loaded or unloaded test. Once started, a test sequence will continue to run until ended by the operator as described in the procedures below.

If the standby source fails during a test run and the normal source is available, the load is transferred back to the Normal source and the test function is deactivated. The standby source available LED stops flashing when the standby source is no longer available.

See Figure 2-1 for the location of the Test button.

2.7.1 Unloaded Test

During an unloaded test, the generator set starts and runs, but the electrical load is not transferred to the standby source.

To start an unloaded test:

- Press and hold the Test button for 3 seconds. The standby source available LED flashes.
- After the engine start time delay, the generator set starts. (The load is not transferred.)
- The Generator Available LED flashes at 1 Hz.

To end the test:

- Press and hold the test button for 2 seconds.
- The generator set stops.
- The Generator Available LED stops flashing when the standby source is no longer available.

2.7.2 Loaded Test

During a loaded test, the generator set starts and runs. The ATS transfers the electrical load from the normal source to the standby source. At the signal to end the test, the ATS transfers the load back to the normal source before signalling the generator set to stop.

Note: If the optional load shed kit is installed, the loads connected to the remote-controlled circuit breakers will be turned off during a loaded test.

To start a loaded test:

- Press and hold the Test button for 6 seconds, until the standby source available and standby position LEDs flash.
- After the engine start time delay, the generator starts. The Generator Available LED flashes at 1 Hz.
- The load control contact opens.
- The optional load shed circuit breakers open.
- After the normal-to-standby time delay, the ATS transfers the load to the standby source.

To end the test:

- Press and hold the test button for 2 seconds.
- After the standby-to-normal time delay, the ATS transfers the load back to the normal source.
- The load control contact closes.
- The optional load shed circuit breakers close.
- After the engine cooldown time delay, the generator set stops.
- The Generator Available LED stops flashing when the standby source is no longer available.

2.8 Exerciser

Follow the instructions below to set the exercise timer to automatically start and run the generator set for 20 minutes every week. The exerciser can be set for loaded or unloaded exercise runs. The factory settings for the exerciser are summarized in Figure 2-7.

Exerciser	
Parameter	Setting
Frequency *	Weekly
Duration *	20 minutes
Type	Unloaded: Hold Exercise button for 3-5 seconds Loaded: Hold Exercise button for 6+ seconds
* The time delay option board allows adjustment of these parameters.	

Figure 2-7 Exerciser Settings

The time delay option board allows setting the exerciser for biweekly exercise runs and adjustment of the exercise run duration from 5 to 50 minutes. See Section 4.1.

2.8.1 Unloaded Exercise

During an unloaded exercise, the generator set runs but the electrical load is not transferred from the normal source to the generator set.

Press and hold the Exercise button for approximately 3 seconds to start an unloaded exercise and set the time and date of the next exercise run.

To start an unloaded exercise AND set the exercise timer:

On the day and time that you want the exercise to run every week (for example, at 1 p.m. every Tuesday):

- Press and hold the Exercise button for 3–5 seconds, until the GEN Available LED flashes.
- The generator set starts.
- The GEN available LED continues to flash throughout the exercise run to indicate an unloaded exercise.
- After approximately 20 minutes, the ATS signals the generator set to stop.

The timer is now set to run an unloaded exercise at the same time and day every week.

2.8.2 Loaded Exercise

During a loaded exercise, the generator set runs and the ATS transfers the electrical load to the generator set.

Note: If the optional load shed kit is installed, the loads connected to the remote-controlled circuit breakers will be turned off during a loaded exercise.

To start a loaded exercise AND set the exercise timer:

On the day and time that you want the exercise to run every week (for example, at 1 p.m. every Tuesday):

- Press and hold the Exercise button for at least 6 seconds, until both the GEN available and GEN position LEDs flash.
- The generator set starts.
- The optional load shed circuit breakers open.
- The ATS transfers the load to generator set.
- The GEN available and GEN position LEDs continue to flash throughout the exercise run to indicate a loaded exercise.
- After approximately 20 minutes, the ATS transfers the load back to the normal source.
- The optional load shed circuit breakers close.
- The ATS signals the generator set to stop.

The timer is now set to run a loaded exercise at the same time and day every week.

If the standby source fails during an exercise run and the normal source is available, the load is transferred back to the Normal source. The standby source available LED stops flashing, and the Failure to Acquire Standby Source alarm is activated.

2.8.3 Stopping Exercise Run

If it is necessary to stop the generator set during an exercise run, press and hold the exercise button for 2 seconds. Ending the current exercise period early does not affect future exercise runs.

2.8.4 Resetting Exerciser

To set a new exercise time and day, just follow the instructions for setting the exerciser, above. The exerciser will then be reset for the new time and day.

To clear the exerciser setting, press and hold the Exercise *and* Test buttons for at least 6 seconds.

Notes

Section 3 Scheduled Maintenance

3.1 Introduction


Regular preventive maintenance ensures safe and reliable operation and extends the life of the transfer switch. Preventive maintenance includes periodic testing, cleaning, inspection, and replacement of worn or missing components. Section 3.4 contains a service schedule for recommended maintenance tasks.

A local authorized distributor/dealer can provide complete preventive maintenance and service to keep the transfer switch in top condition. Unless otherwise specified, have maintenance or service performed by an authorized distributor/dealer in accordance with all applicable codes and standards. See the Service Assistance section in this manual for how to locate a local distributor/dealer.

Keep records of all maintenance or service.

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

⚠ WARNING




**Accidental starting.
Can cause severe injury or death.**

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

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or 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.


⚠ 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.

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.

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.

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

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.

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

3.2 Testing

3.2.1 Weekly Generator Set Exercise

Use the exerciser or a manual test to start and run the generator set under load once a week to maximize the reliability of the standby power system. See Section 2.7 for test instructions and Section 2.8 for instructions to set the exerciser.

Optional accessories allow adjustment of the exercise schedule and duration. See Sections 2.8 and 4. Refer to the generator set operation manual for exercise recommendations.

3.2.2 Monthly Automatic Control System Test

Test the transfer switch's automatic control system monthly. See Section 2.7 for the test procedure.

- Verify that the expected sequence of operations occurs as the switch transfers the load to the standby source when a preferred source failure occurs or is simulated.
- Observe the indicator LEDs included on the transfer switch to check their operation.
- Watch and listen for signs of excessive noise or vibration during operation.

- After the switch transfers the load to the standby source, end the test and verify that the expected sequence of operations occurs as the transfer switch retransfers to the preferred source and signals the generator set to shut down after a cooldown period.

3.3 Inspection and Service

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

3.3.1 General Inspection

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

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

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

Internal Inspection. Open the door and inspect system components monthly or when any condition noticed during an external inspection may have affected internal components.

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

- Accumulations of dirt, dust, moisture, or other contaminants.
- Signs of corrosion.
- Worn, missing, or broken components.
- Loose hardware.
- Other evidence of wear, damage, deterioration, or malfunction of the transfer switch or its components.

3.3.2 Other Inspections and Service

Have an authorized distributor/dealer perform periodic inspections, scheduled maintenance, and service to ensure the safe and reliable operation of the transfer switch. See Section 3.4, Service Schedule, for the recommended maintenance items and service intervals.

Have an authorized distributor/dealer repair or replace damaged or worn internal components with manufacturer- recommended replacement parts.

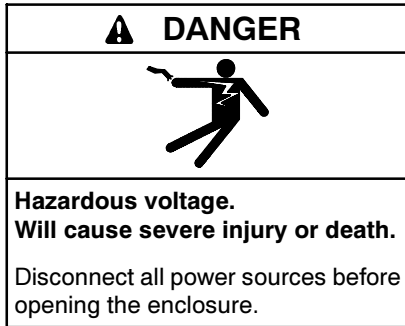
3.4 Service Schedule

Follow the service schedule below for the recommended service intervals. Activities designated by an X may be performed by the switch operator. Have all other maintenance and service performed by an authorized distributor/dealer.

System Component or Procedure	See Section	Visually Inspect	Check	Adjust, Repair, Replace	Clean	Test	Frequency
Electrical System							
Check for signs of overheating or loose connections: discoloration of metal, melted plastic, or a burning odor	3.3.1	X	X				Y
Check the operating mechanism for cleanliness; clean if dirty *	3.3.1	D			D		Y
Control System							
Exercise the generator set under load	2.8					X	W
Test the transfer switch's automatic control system	2.7	X				X	M
Test all indicators (LEDs) and all remote control systems for operation	2.2	D	D	D		D	Y
General Equipment Condition							
Inspect the outside of the transfer switch for any signs of excessive vibration, leakage, high temperature, contamination, or deterioration *	3.3.1	X			X		M
Check that all external hardware is in place, tightened, and not badly worn	3.3.1	X	X	X			M
Open the door and inspect for any signs of excessive vibration, leakage, high temperature, contamination, or deterioration *	3.3.2	D	D		D		Y
* Service more frequently if the transfer switch is operated in dusty or dirty areas.							
See Section: Read these sections carefully for additional information before attempting maintenance or service.							
Visually Inspect: Examine these items visually.							
Check: Requires physical contact with or movement of system components, or the use of nonvisual indications.							
Adjust, Repair, Replace: Includes tightening hardware. May require replacement of components depending upon the severity of the problem.							
Clean: Remove accumulations of dirt and contaminants from external transfer switch's components or enclosure with a vacuum cleaner or by wiping with a dry cloth or brush. <i>Do not use compressed air to clean the switch because it can cause debris to lodge in the components and cause damage.</i>							
Test: May require tools, equipment, or training available only through an authorized distributor/dealer.							
Symbols used in the chart:							
X=The transfer switch operator can perform these tasks.				Q=Quarterly			
D=An authorized distributor/dealer must perform these tasks.				S=Semiannually (every six months)			
W=Weekly				Y=Yearly (annually)			
M=Monthly							

Notes

4.1 Accessory Board



The optional accessory board is mounted with standoffs on the controller's main logic board. See Figure 4-1 for the accessory board location and components.

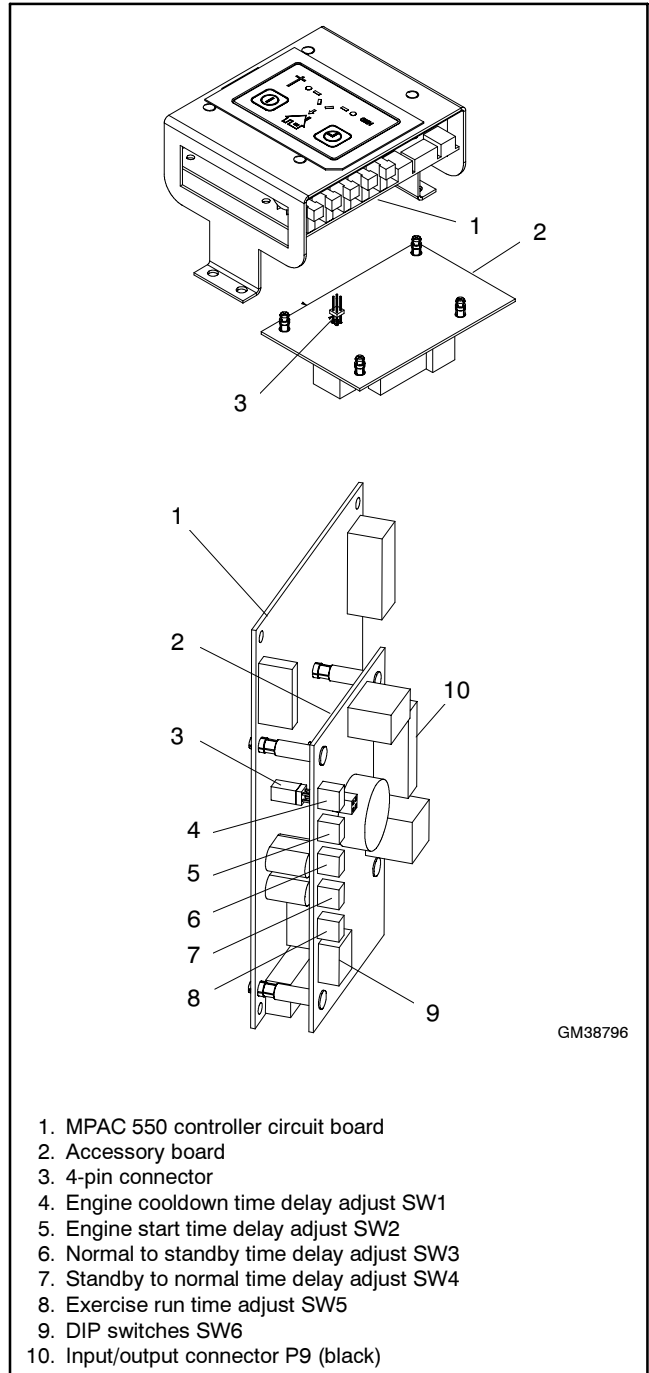
The accessory board contains the following components:

- Audible alarm to indicate system faults.
- Rotary switches for time delay adjustments.
- DIP switches for exercise, remote test switch operation, and load control functions.
- Connectors for remote test input and generator set supplying load output.

4.1.1 Accessory Board Audible Alarm

The audible alarm sounds on the fault conditions shown in Section 2.5.

Alarm Silence/Fault Reset. Press and hold the test and exercise pushbuttons on the controller to silence the alarm and reset the fault. Always identify and correct the cause of the fault condition before resetting the controller.



1. MPAC 550 controller circuit board
2. Accessory board
3. 4-pin connector
4. Engine cooldown time delay adjust SW1
5. Engine start time delay adjust SW2
6. Normal to standby time delay adjust SW3
7. Standby to normal time delay adjust SW4
8. Exercise run time adjust SW5
9. DIP switches SW6
10. Input/output connector P9 (black)

Figure 4-1 Accessory Board Location and Components

GM38796

4.1.2 Accessory Board Time Delay Adjustment Switches

The 10-position rotary switches allow adjustment of the time delays shown in Figure 4-2. Use a small screwdriver or other small tool to increase or decrease the time delays within the range shown in the table. The rotary switch positions range from 1 to 10, with position 10 labeled 0 (zero).

The factory settings are the same as the controller time delays without the optional accessory board.

4.1.3 Accessory Board DIP Switches

DIP switches on the optional accessory board control the exercise, remote test, and load control functions. The DIP switch location is shown in Figure 4-1. The DIP switch functions are summarized in Figure 4-3. Check the DIP switch settings and adjust if necessary for the application.

1 Week/2 Week Exercise, Switch 1. This switch controls the time interval for exercise runs that are set by pressing the Exercise button on the ATS controller. If the setting is changed after the exerciser has been set, the new schedule becomes effective *after* the next exercise.

Switch 2. This switch is not used.

Maintained/Momentary Test, Switch 3. Set this switch for a maintained or momentary remote test (start/stop) switch, as follows:

- **ON (maintained) position:** close a remote test switch or contact to start and run the generator set. Open the remote contact to end the test and signal the generator set to stop.
- **OFF (momentary) position:** hold the remote test switch closed for 1 second and release to start a test. The remote switch must be held closed for at least 1 second. Operate the test switch again to stop the test and signal the generator set to stop.

Note: The generator set continues to run during the engine cooldown time period after receiving the remote stop signal. See Figure 4-2 for time delays.

Switch 4. This switch is not used.

Alarm Enable, Switch 5. Enables or disables the alarm horn on the accessory board. If the alarm is disabled, the horn will not sound.

Install the enclosure cover before energizing the transfer switch.

Time Delay	Switch	Factory Setting		Adjustment	
		Setting	Switch Position	Range	Increment
Engine Cooldown	SW1	5 minutes	5	1-10 minutes	1 minute
Engine Start	SW2	3 seconds	3	1-10 seconds	1 second
Transfer from Normal to Standby	SW3	3 seconds	3	1-10 seconds	1 second
Retransfer from Standby to Normal	SW4	6 minutes	2	3-30 minutes	3 minutes
Exercise Run Time	SW5	20 minutes	4	5-50 minutes	5 minutes

Figure 4-2 Accessory Time Delay Adjustment Switches

Switch	Off (Open)	On (Closed)	Notes	
1	2 week exercise	1 week	2 weeks	For the exercise button on the controller's user interface.
2	—	—	—	Not used.
3	Maintained test	Momentary	Maintained	For an optional remote test (start/stop) switch.
4	—	—	—	Not used.
5	Alarm enable	Alarm Disabled	Alarm Enabled	For the alarm horn on the accessory board (inside the ATS enclosure).

Figure 4-3 Accessory Board DIP Switches

4.2 Load Shed Kit

The optional load shed kit disconnects selected loads before transfer to the emergency source, reducing the load on the generator set. See Section 2 for descriptions of the load shed operation during normal operation, test and exercise.

Transfer switches that are factory-equipped with the load shed accessory have a letter S at the end of the model designation. See the model code chart in the Introduction.

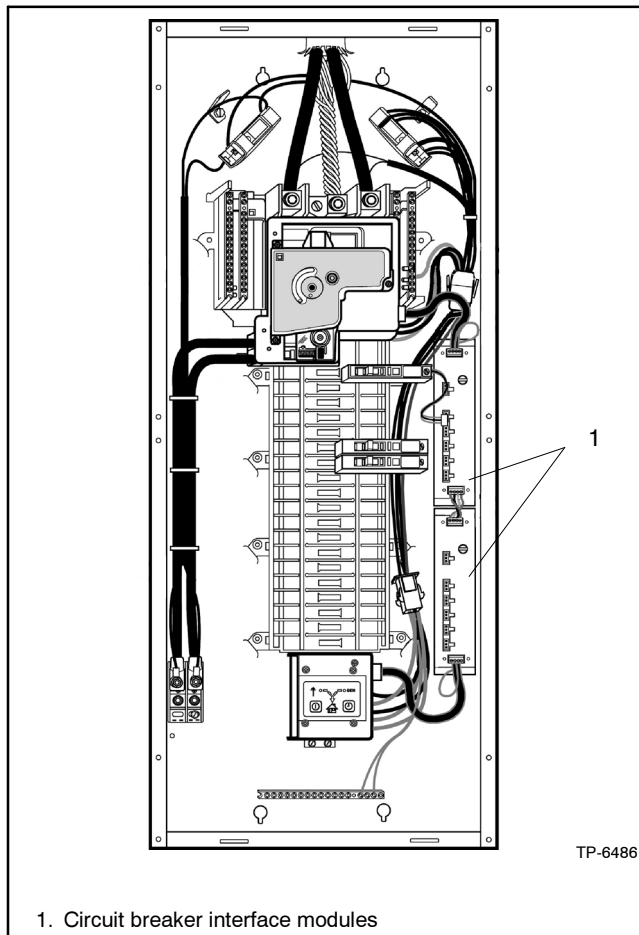


Figure 4-4 Type 1 Enclosure with Two Load Shed Modules

The load shed kit includes one or two load shed modules which connect to remote-controlled branch circuit breakers (sold separately). Type 1 enclosures can have one or two load shed modules installed. Type 3R enclosures can have one load shed module installed. Up to 6 one- or two-pole circuit breakers can connect to each module. See Figure 4-4 and Figure 4-5 for the load shed module location.

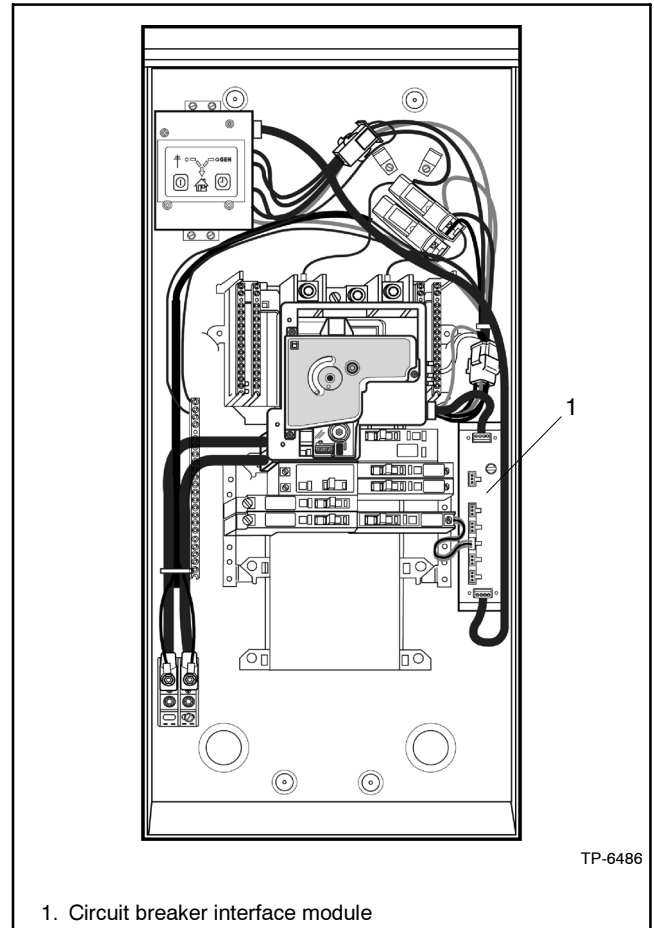


Figure 4-5 Type 3R Enclosure with One Load Shed Module

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 fur 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				

Notes

Notes

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