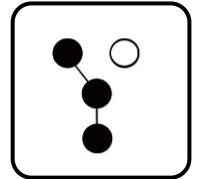


Operation

Automatic Transfer Switches



Controls:

Decision-Maker[®] MPAC 1500

Transfer Switch Models:

KCS/KCP/KCC

KBS/KBP/KBC

KAS/KAP

KGS/KGP

KEP

KUS/KUP

KOHLER[®]

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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 indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.





CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

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

 	<p>Accidental starting. Can cause severe injury or death.</p> <p>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.</p>
--	--

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

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

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.

Grounding electrical equipment. Hazardous voltage will 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 will 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 will 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 will 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 will 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 will 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)

Heavy Equipment

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

Notice

NOTICE

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

NOTICE

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 instructions for the Kohler® Decision-Maker® MPAC 1500 automatic transfer switch controller and related accessories.

The Decision-Maker® MPAC1500 controller is available for the transfer switch models shown below.

Model	Description
KCS	Standard-Transition Any Breaker ATS *
KCP	Programmed-Transition Any Breaker ATS *
KCC	Closed-Transition Any Breaker ATS †
KBS	Standard-Transition Bypass/Isolation ATS †
KBP	Programmed-Transition Bypass/Isolation ATS †
KBC	Closed-Transition Bypass/Isolation ATS †
KAS	Standard-Transition Electrically Operated Bypass/Isolation ATS †
KAP	Programmed-Transition Electrically Operated Bypass/Isolation ATS †
KGS	Standard-Transition Bypass/Isolation ATS †
KGP	Programmed-Transition Bypass/Isolation ATS †
KEP	Service Entrance ATS †
KUS	Standard-Transition Service-Entrance ATS †
KUP	Programmed-Transition Service-Entrance ATS †
* Available with automatic or non-automatic controller	
† Available with automatic controller only	

Refer to the transfer switch Installation Manual for manual operation procedures. For Bypass/Isolation models, refer to the Installation Manual for instructions to bypass and isolate the transfer switch. See List of Related Materials for document part numbers.

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.

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.

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.

List of Related Materials

A separate transfer switch installation manual provided with the unit contains transfer switch installation instructions, manual operation procedures, and bypass/isolation instructions, if applicable.

Literature Item	Part Number
Specification Sheet, MPAC 1500 Controller	G11-128
Installation Manual, Model KCS/KCP/KCC	TP-6833
Installation Manual, Model KBS/KBP/KBC	TP-6835
Installation Manual, Model KGS/KGP	TP-6836
Installation Manual, Model KEP	TP-6946
Installation Manual, Model KAS/KAP	TP-7190
Installation Manual, Model KUS/KUP	TP-7280
Operation Manual, Modbus Protocol	TP-6113

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

- Visit the Kohler Co. website at KOHLERPower.com.
- Look at the labels and decals on your Kohler product or review the appropriate literature or documents included with the product.
- Call toll free in the US and Canada 1-800-544-2444.
- Outside the US and Canada, call the nearest regional office.

Headquarters Europe, Middle East, Africa (EMEA)

Kohler EMEA Headquarters
Netherlands B.V.
Kristallaan 1
4761 ZC Zevenbergen
The Netherlands
Phone: (31) 168 331630
Fax: (31) 168 331631

Asia Pacific

Kohler Asia Pacific Headquarters
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

1.1 Introduction

This section contains operation instructions, including:

- User interface panel, with display, pushbuttons, and LED indicators
- Main menu
- System status, warnings, and faults
- Passwords
- Tests
- Warnings and Faults
- Reset Data

1.2 Source Names

Throughout this manual, the sources are referred to as follows. Source 1 (S1) is connected to the Normal side of the transfer switch and is also referred to as Source N. Source 2 (S2) is connected to the Emergency side of the transfer switch and is also called Source E. The engine start contacts are associated with Source 2.

The Preferred Source is the source that will be used if both sources are available. Typically, this is the normal utility source 1. If the transfer switch is equipped with the optional alarm module, the Set Preferred Source menu allows the operator to select either source as the preferred source. Source 2 (connected to the emergency side of the contactor) can be set as the preferred source using this menu. See Section 4.8.3 for more information about preferred source selection.

Other applications may use different configurations, such as the gen-gen configuration which uses two generator set sources and no utility.

1.3 User Interface Panel

The user interface panel is located on the transfer switch door. Figure 1 shows the user interface pushbuttons and LED indicators.

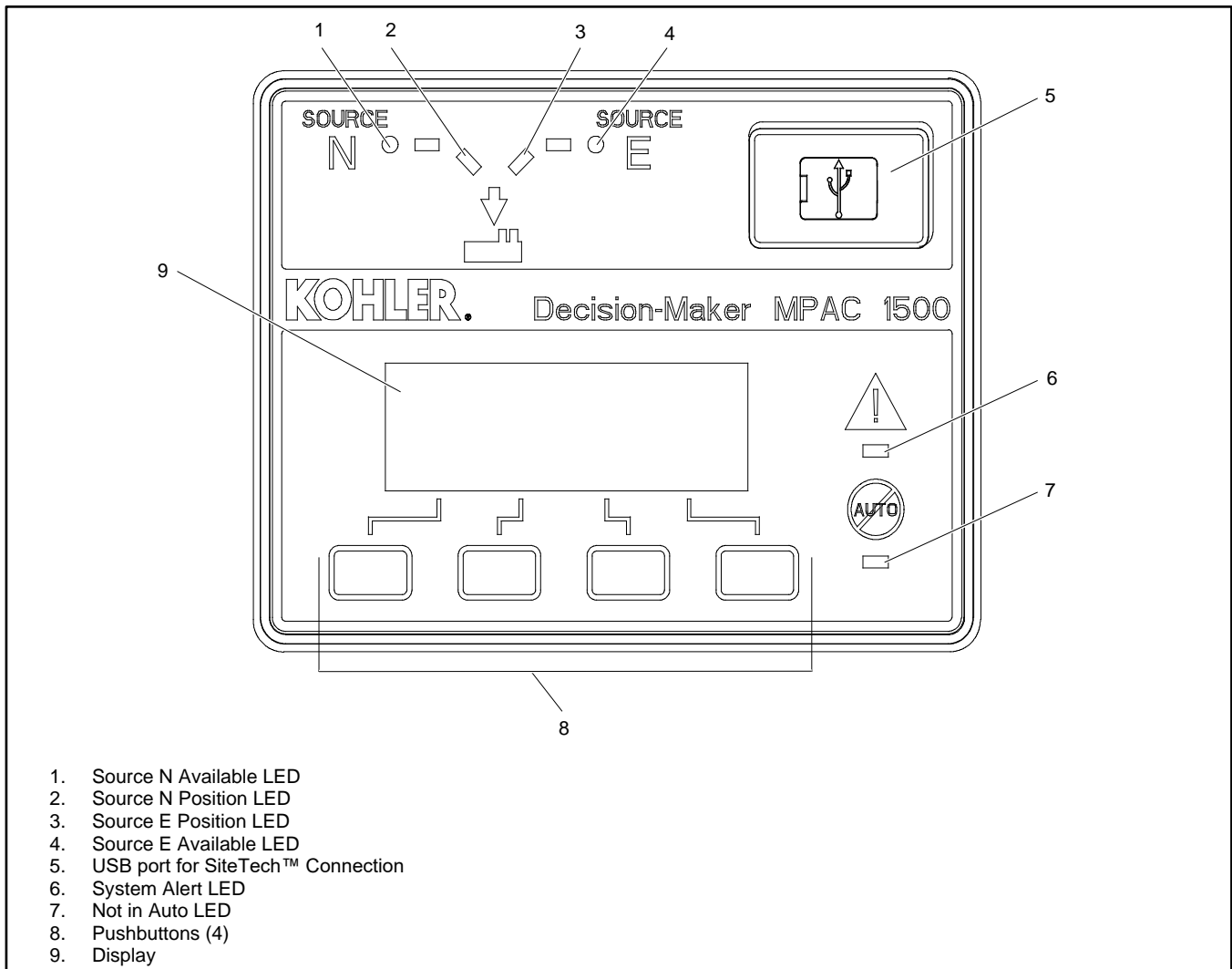


Figure 1 User Interface Panel

1.3.1 Display

The four-line display indicates transfer switch status and setup, including the following:

- System status
- Faults and warnings
- Active time delays
- Source voltages
- Source frequency (Hz)
- Current (amps)
- Source setup information
- Time and date
- Time and date of next scheduled exercise

The display also identifies the pushbutton functions, which can change from menu-to-menu.

1.3.2 Display Contrast

To adjust the display contrast, press and hold the second button until two rows of asterisks (*) appear. Then press the up-arrow button to increase the contrast or the down arrow button to decrease the contrast. The display will return to the main menu after a few seconds if no buttons are pressed.

1.3.3 Pushbuttons

The user interface panel has four pushbuttons below the display. Pushbutton functions are shown above each button in the last line of the display and can change from menu-to-menu. The pushbutton functions are defined in Figure 2.

Note:

The current can be set to zero (0) by pressing the first and last pushbuttons together. See Setting the current to zero section for instructions.

▼	Down arrow (closed). Step down to the next menu or scroll through a list.
▲	Up arrow (closed). Step back to the previous menu.
▶	Right arrow (closed). Move to the next submenu.
△	Up arrow (open). Increases the selected numerical value.
▽	Down arrow (open). Decreases the selected numerical value.
▷	Right arrow (open). Steps to the next digit in a selected numerical value.
Back	Steps back to the previous menu or submenu.
End Delay	Ends the current time delay.
End Test	Ends an active test sequence. See the Test Sequence, Standard Transition section
OK	Enters the displayed numerical value (password or setting).
Main	Returns to the main menu.
Next	Steps to the next parameter in an item with multiple settings (for example, in Exerciser Setup).
Reset	Reset the fault condition shown on the display, or reset an accessory module after connection.
Save	Saves settings shown on the display.
Set	From the main menu, moves to the first setup menu.
Start	From the test menu, starts the test sequence.
Test	From the main menu, moves to the test sequence menus. See the System Test section.
View	From the main menu, moves to the first view menu.

Figure 2 Pushbutton Functions

1.3.4 LED Indicators

LEDs on the user interface indicate contactor position, source availability, faults, and other conditions. The table in Figure 3 describes the functions of the LED indicators.

LED Indicator	Condition
Source N Available, Green	Source N is available.
Source E Available, Red	Source E is available.
Position A, Green	Contactor is in Normal position.
Position B, Red	Contactor is in Emergency position.
System Alert, Red	Fault. Identify and correct the cause of the fault condition, then reset faults at the controller. See Section Warnings and Faults.
	Input active: Low Battery Voltage or Remote Common Alarm. See Section Inputs and Outputs.
Not in Auto, Red	ATS is not set for automatic operation or a load shed (forced transfer to OFF) sequence is active.
	Flashes for manual transfer waiting.
	Input active: Inhibit Transfer, Forced Transfer to OFF. See Section Inputs and Outputs.

Figure 3 User Interface LED Indicators

See Warning and Faults Section for more information about warnings and faults.

Some programmable inputs will trigger the LEDs to light or flash. See Inputs and Outputs Section.

1.3.5 Lamp Test

To test the LEDs on the controller's user interface, go to the Main menu. Press the down arrow button once, then press the Lamp Test button and verify that the LCD menu and all 6 LEDs on the user interface illuminate. See Figure 4.

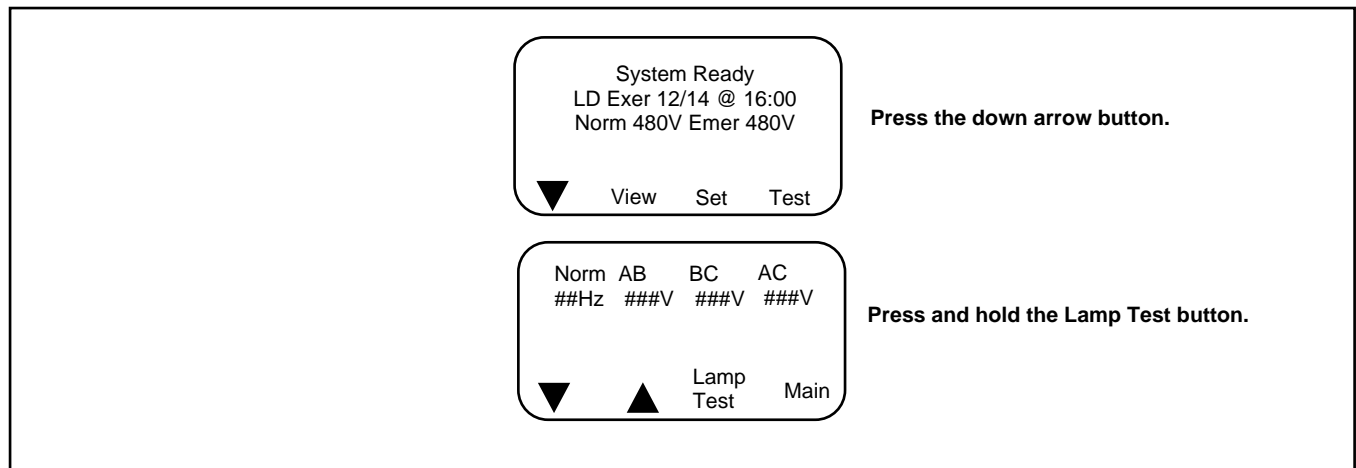


Figure 4 Lamp Test

1.3.6 Examples

Figure 5 illustrates navigation through the menus.

Figure 6 illustrates how to use the pushbuttons to step through menus and change settings. This example shows setting the time.

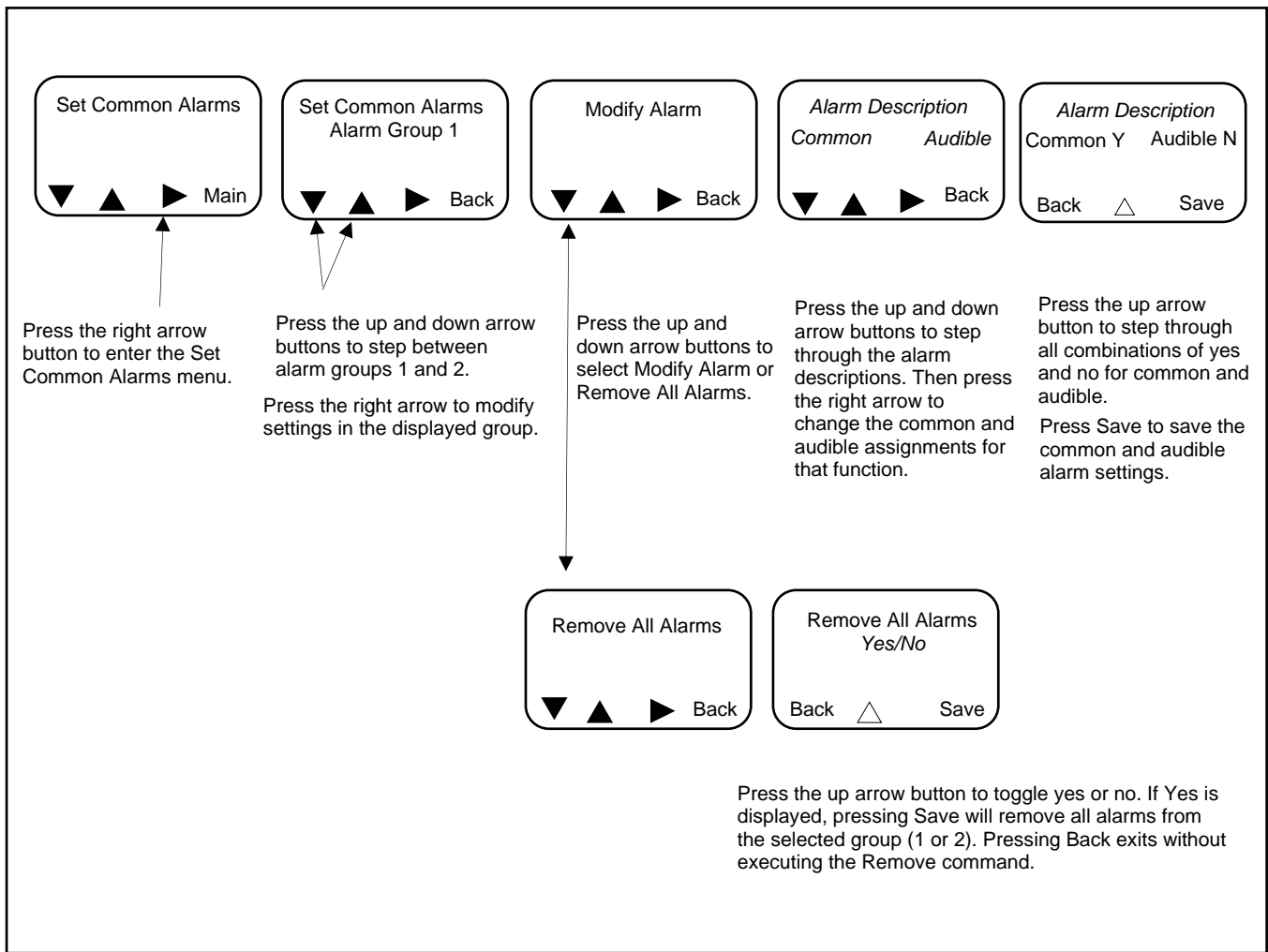


Figure 5 Example: Set Common Alarms

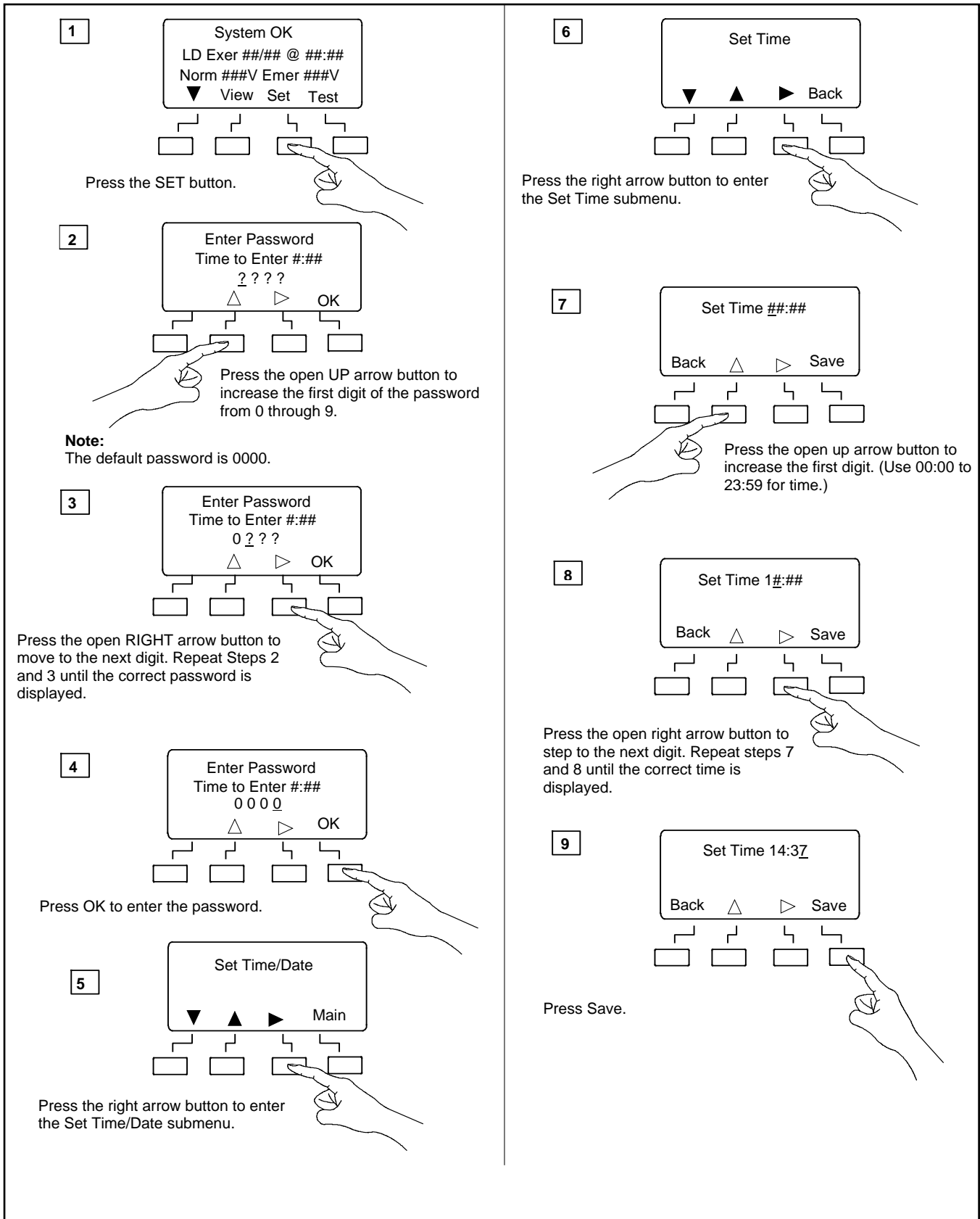


Figure 6 Example: Setting the Time

1.4 Main Menu

The main menu appears at system startup and displays the following information (see Figure 7):

- System Status (see Figure 8).
- Date and time of the next scheduled exercise run (if programmed).
- Measured source voltages.
- Pushbutton functions.

Pressing the down arrow button steps to the normal operation menus shown in Normal Operation Menu Section. Step through these menus to check the measured frequency, line voltages, current (if the current sensing accessory is installed), and other system information.

Some parameters will appear only under certain conditions. For example:

- If no exercise runs are scheduled, the second line of the main menu is blank.
- The Daylight Saving Time settings are displayed only if DST is enabled.
- Phase rotation and in-phase monitoring are displayed only for three-phase systems.
- Some parameters and time delays appear only for programmed-transition models.
- The menus displayed during a test or exercise sequence will vary depending on the time delay settings.

Pressing the View button steps to the view menus shown in View Screens Section.

Passwords are required to enter the setup and test modes. See Passwords Section for more information about passwords.

Press the Set button to enter the setup mode. A password is required. See Setup Menu Section for system setup menus.

Press the Test button to enter the Test mode. A password is required. See System Test Section.

The display returns to the main menu after 10 minutes of no activity (no buttons pressed).

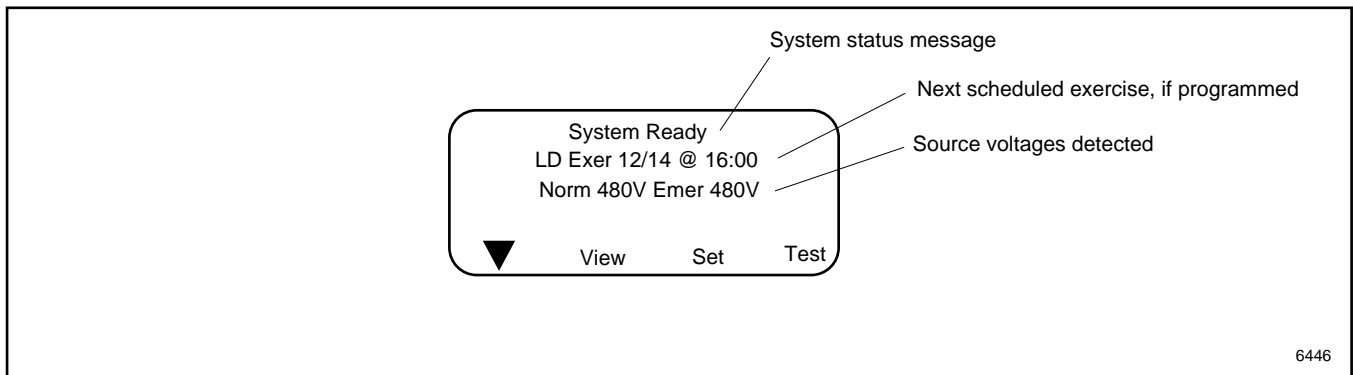


Figure 7 Main Menu

System Status Messages
Aux Switch Fault
Aux Switch Open
Exerciser Active
External Battery Low
Fail to Acquire Pref
Fail to Acquire Stby
Fail to Transfer
In Phase Waiting
Inhibit Transfer
Low Battery Voltage
Maint DIP Switch
Module Lost Comm
New Module
Peak Shave Active
Phase Rotation Error
Remote Common Alarm
System Ready
Test Mode Active

Figure 8 System Status Messages

1.5 Passwords

Passwords are required to enter the Test and Setup menus. Passwords are 4-digit numbers. See Figure 9 for instructions to enter the password using the pushbuttons on the controller's user interface.

There are two passwords:

Setup Password. The setup password controls access to the system setup menus, which allow changes to system settings, time delays, etc.

For closed-transition models, the setup password is required to initiate a transfer when the programmed transition override function is set to manual. See Closed-Transition Loaded Test Section.

Test Password. The test password controls access to the test sequence menus. The test password is required to initiate a loaded, unloaded, or auto-loaded test, and also to initiate a sync check test on closed-transition models.

If the correct password is not entered within 30 seconds, the display returns to the main menu.

The factory default password is 0000. Change the password to allow only authorized personnel to start and end tests or change settings.

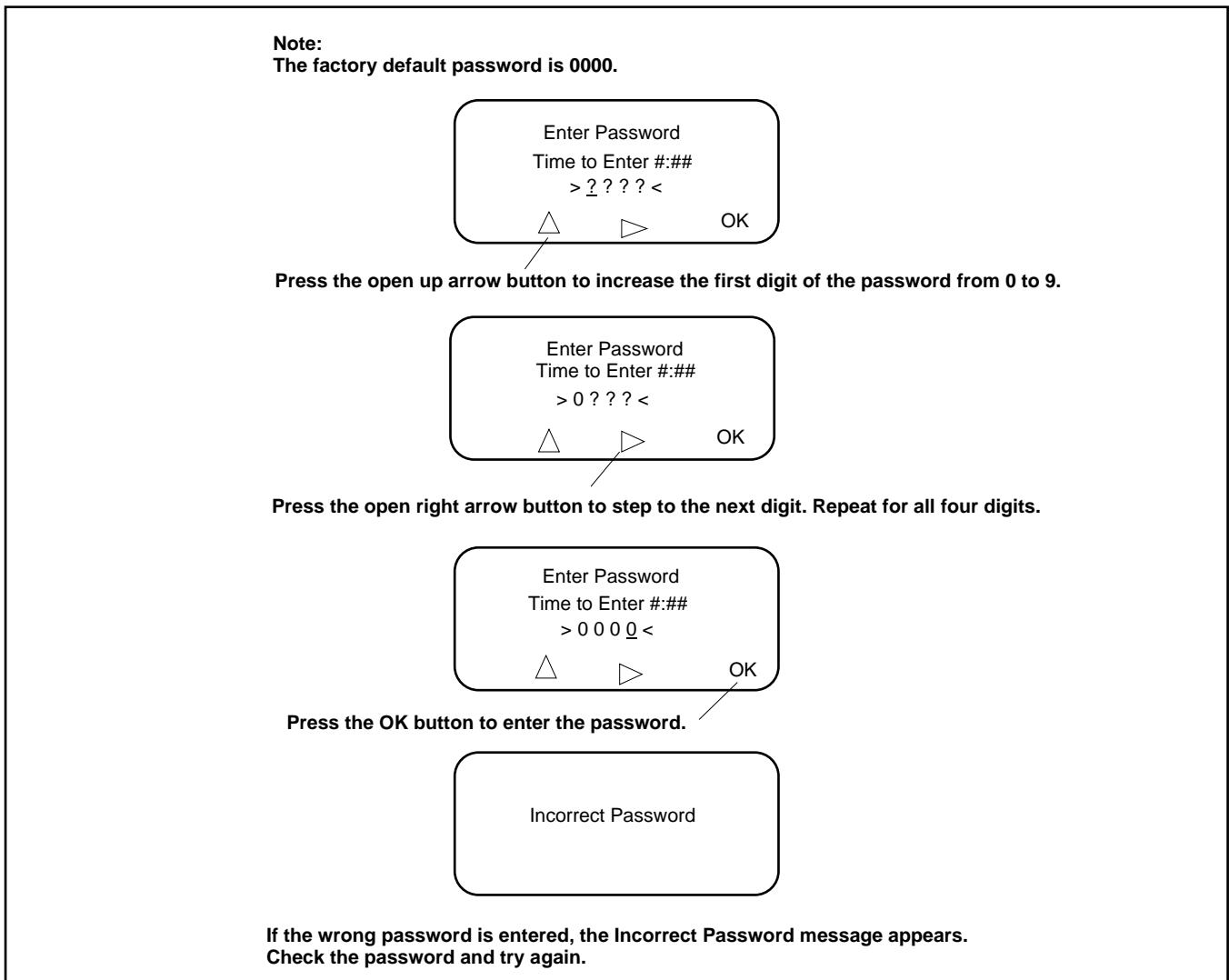


Figure 9 Entering a Password

1.5.1 Changing Passwords

Use the Passwords Setup Menu to change passwords. See Set Passwords Section.

1.5.2 Test Password Reset and Disable

The test password can be reset to the default value or disabled. Use the Setup Menu- Reset Data menu. See Figure Reset Data in Reset Data section.

Note:

Disable the test password only during service unless the transfer switch is located in a secure location.

Disabling the test password allows any user to initiate a test sequence from the controller's user interface without entering a password. Initiating a test starts the generator set and, if a loaded test is selected, transfers the load.

1.6 Normal Operation Menus

During normal transfer switch operation, the screens shown in Figure 10 or Figure 11 are displayed. Use the up and down arrow buttons to view the system status information as shown. Press Main to return to the main menu from any screen.

The Sequence of Operation descriptions in Sequence of Operation, Standard Transition Models Section through Sequence of Operation, Closed-Transition Models Section describe the transfer switch normal operation for standard, programmed, and closed transition models.

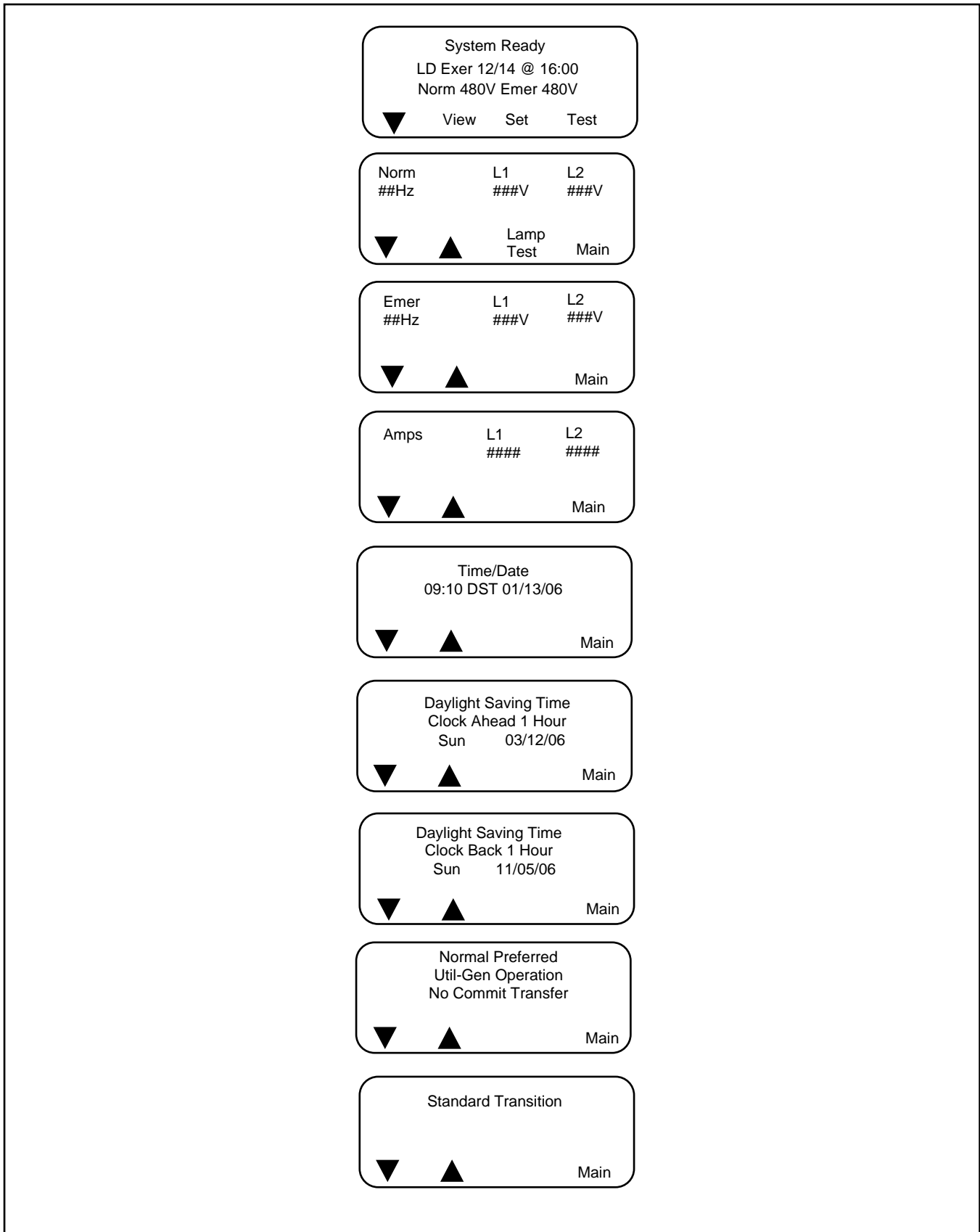


Figure 10 Single-Phase Operation

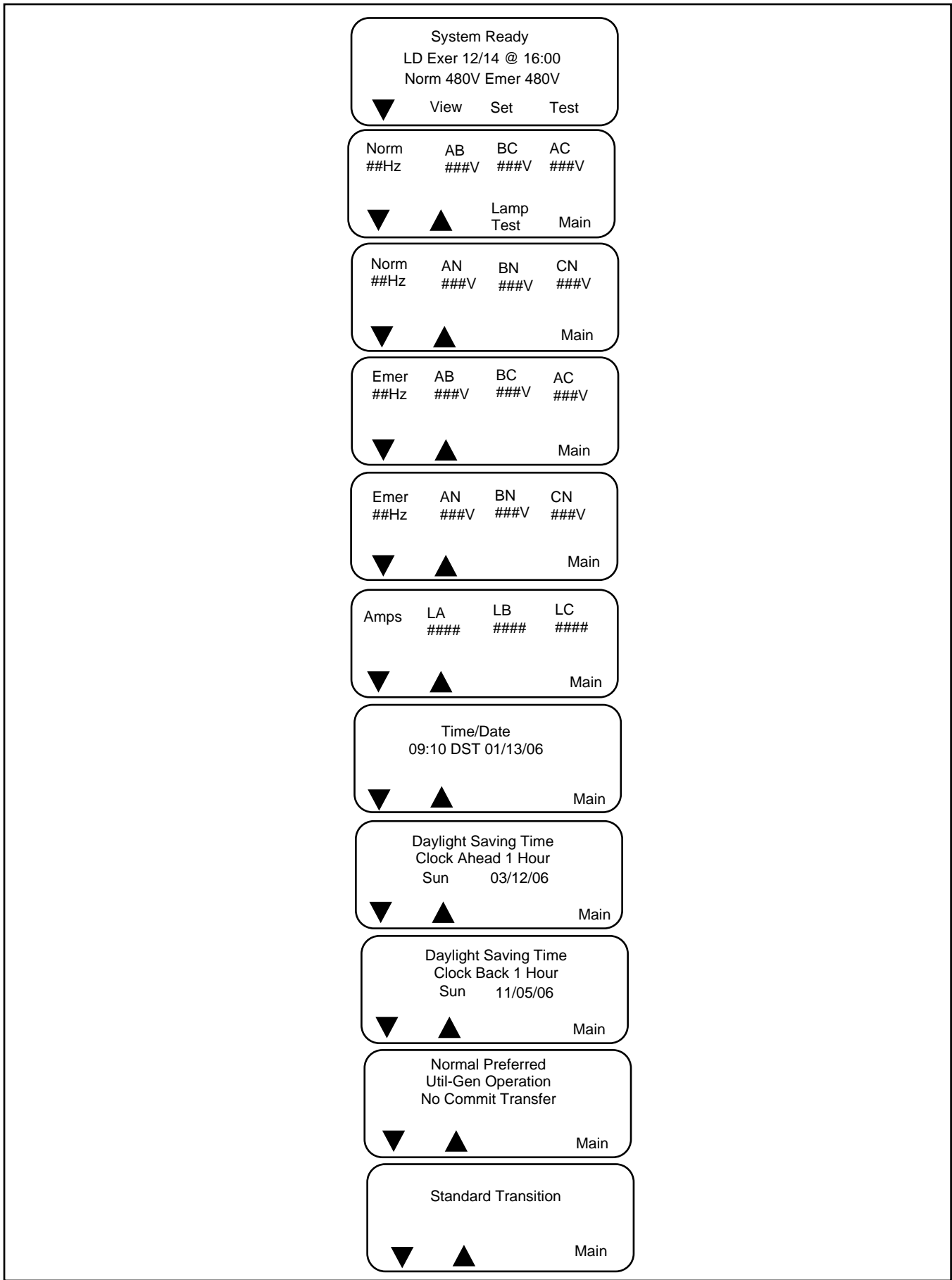


Figure 11 Three-Phase Operation

1.7 System Test

Use the system test feature to:

- Start and run the generator set.
- Simulate a preferred source failure, resulting in a transfer to the standby source.
- Check source synchronization (closed-transition models only).

See Figure 12 for the test sequence menus. From the main menu, press the Test button and then enter the password. The password ensures that only authorized personnel can start a test.

Press the down arrow button to navigate to the desired test sequence. Press the Start button to start the test.

Figure 13 shows the menus displayed during the test run. Menus are dependent on the system settings and time delays. See Figure Sync Check Menus in Sync check (closed-transition) Section for Sync Check menus for closed-transition models.

Press the End Test designated pushbutton to end the test. Time delays will execute as programmed when the test is ended. Press the End Delay button to end the currently displayed time delay, if desired.

To check the source voltage and frequency while a test is running, press the Main button. Press the Test button to return to the test sequence menus.

If the emergency source is lost during a system test, the fail to acquire standby signal is indicated immediately, and the test is terminated. If the contactor is in the standby position, it transfers immediately to the preferred position.

See Input Functions Section for additional information about the remote test input.

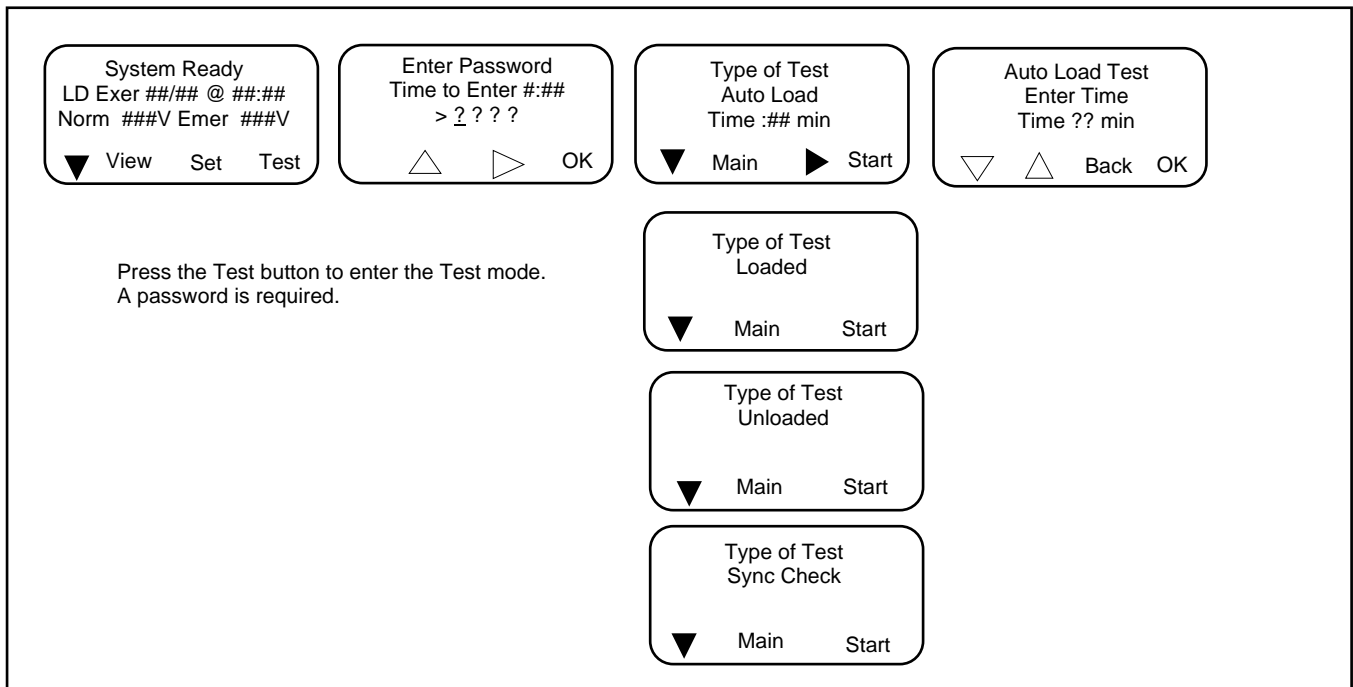


Figure 12 Test Selection Menus

Engine Start in ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

LD# Disc in ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

Appears if load control time delays are set

Xfr to Off in ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

Programmed-transition models only

Xfr to Emer in ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

Add LD# in ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

Appears if load control time delays are set

System on Test
 Norm ###V Emer ###V
 Main End End
 Delay Test

LD# Disc in ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

Appears if load control time delays are set

Xfr to Off in ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

Programmed-transition models only

Xfr to Norm in ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

Add LD# in ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

Appears if load control time delays are set

Eng Cooldown ##:##
 Norm ###V Emer ###V
 Main End End
 Delay Test

Note:
 See the Sync Check menus figure.

Figure 13 Test Sequence Menus

1.7.1 Unloaded System Test

When an unloaded test is initiated, the controller immediately signals the generator to start, without waiting for the engine start time delay to expire. The contactor does not change position during an unloaded test, but if the normal source should fail, the contactor will transfer to the emergency source.

The unloaded test feature is available only with the Util-Genset and Genset-Genset modes of operation.

The load bank control output is active during an unloaded exercise or unloaded system test. If the contactor transfers to the standby position during the test, the load bank control is deactivated. (The standby source supplies power to the load.)

1.7.2 Loaded System Test

A loaded test simulates a preferred source failure, except that the engine start time delay is bypassed. The generator set is signaled to start immediately upon test activation. Load control signals are issued prior to transfer with their associated time delays. Since the loaded test transfer will be between two live sources, the in-phase monitor or closed transition feature will be activated if it is enabled. If the preferred source is lost during a loaded test with the contactor in the standby position, the test will continue to be active, even on restoration of preferred. If the standby source is lost and the preferred source is available, the test will be terminated, and the transfer switch will immediately transfer to the preferred source position, bypassing all time delays except the off-position requirements in a programmed-transition system.

When a loaded test is terminated normally, the retransfer sequence operates as though the preferred source has been restored after a failure. All time delays are executed and an in-phase transfer will occur if enabled. The loaded test feature is available with the Util-Genset, Util-Util and Genset-Genset modes of operation.

1.7.3 Closed-Transition Loaded Test

When a loaded test is initiated on a closed-transition model, the generator set is signaled to start and the controller monitors the sources for synchronization. The load is transferred when the sources are synchronized.

If the sources do not sync before the Fail to Sync time delay expires, the programmed-transition override function operates.

- If the override function is set to Automatic, a programmed-transition transfer will occur when the Fail to Sync time delay expires. The contactor stops in the OFF position for the length of the off-to standby time delay before proceeding to transfer to the standby source.
- If the override function is set to manual, the user can either initiate a programmed-transition type transfer (setup password required) or cancel the test sequence. See Figure 14. If neither action is taken, the controller will continue to check for synchronization and transfer if the sources synchronize.

See Transition Type Section for instructions to set the programmed-transition override function.

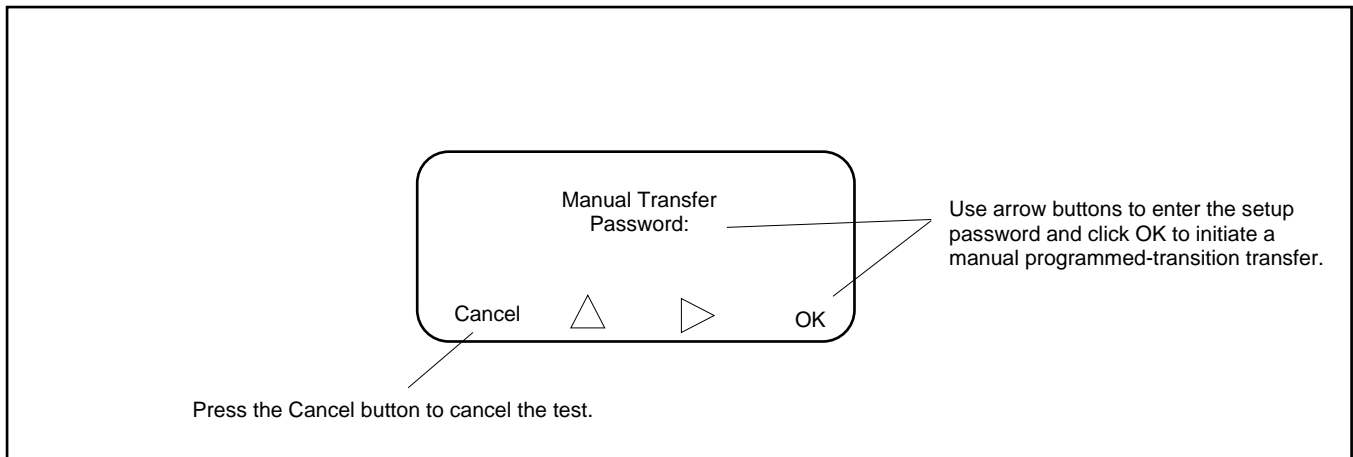


Figure 14 Manual Transfer Menu for Programmed-Transition Override

1.7.4 Auto-Loaded System Test

The auto-loaded test feature is a timed, loaded test. The auto-loaded time delay determines how long after the transfer to standby to terminate the test and transfer back to the preferred source. The time is defaulted to 30 minutes and can be adjusted from 1 minute to 60 minutes. See Figure 15.

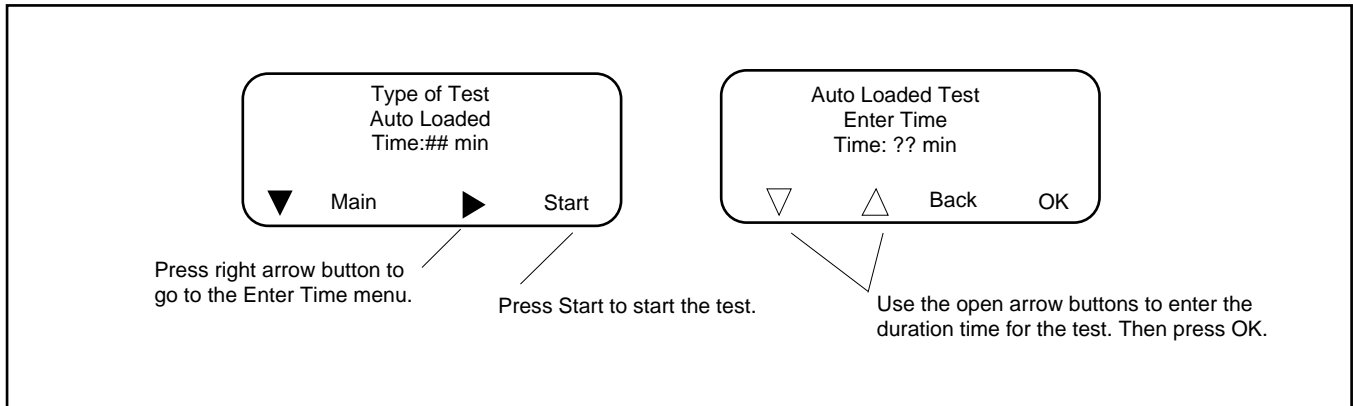


Figure 15 Auto Loaded Test Menus

1.7.5 Sync Check (closed-transition)

The Sync Check allows a test of the synchronization of two available sources without initiating a transfer. Navigate to the Type of Test, Sync Check menu and press the Start button to begin the test. The controller displays Syncing during the test, and the phase angle difference is shown between two arrows. For example, > 10 < indicates that the sources are 10 degrees out of phase. The arrows move closer together as the sources approach synchronization. When the sources synchronize, the controller indicates Synced and continues to monitor the source synchronization. The load is not transferred. See Figure 16. Press the End Test button to end the test.

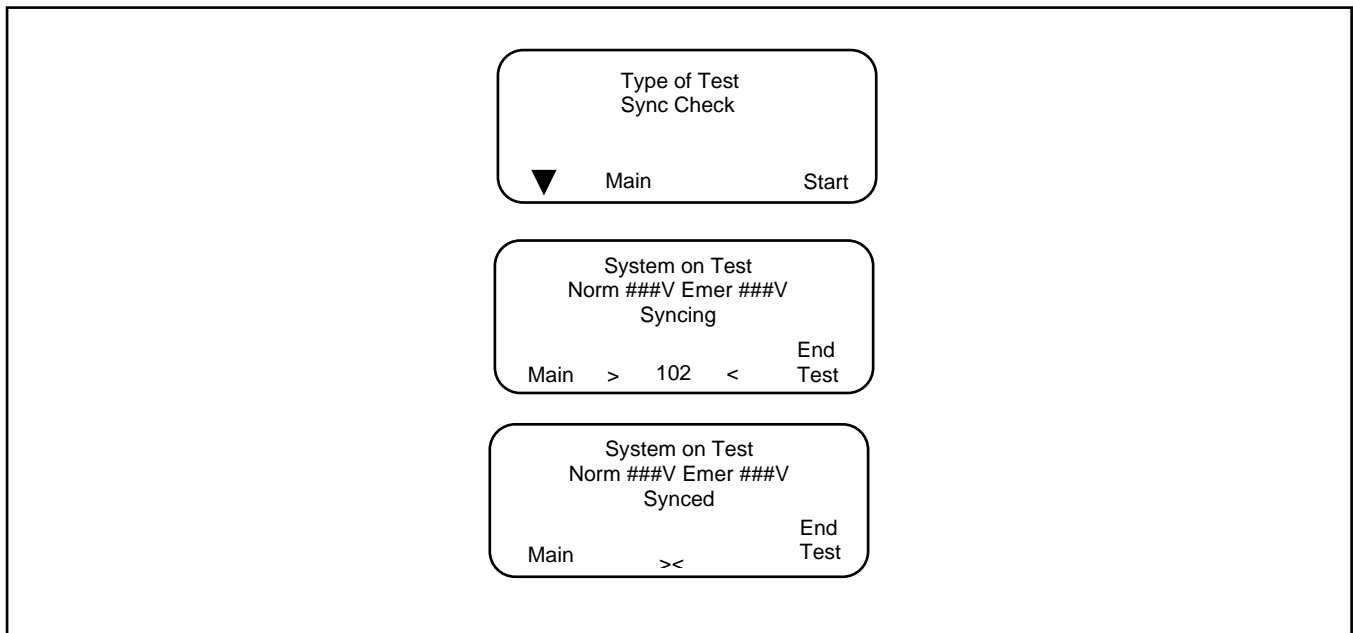


Figure 16 Sync Check Menus

1.8 Automatic Operation Test

Note:

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

Preferred Source Selection. The test procedure assumes that Source N is the preferred source. If the ATS is equipped with the alarm board accessory, check the preferred source selection before proceeding with the automatic operation test. To check the preferred source selection, use the down arrow button to step down from the main screen until Normal Preferred or Emergency Preferred is displayed. See Figure Single-Phase Operation and Three-Phase Operation in Normal Operation Menu Section.

Supervised Transfer Switch. If the transfer switch is equipped with a supervised transfer switch, verify that it is set to the Auto position.

Follow the procedure below to start a loaded test. Verify that the ATS starts the generator set and transfers the load to the emergency source, executing all time delays that are set up to operate during a loss of the normal source. End the test and verify that the transfer switch transfers the load back to the normal source and removes the engine start signal, executing all appropriate programmed time delays. Refer to Test Sequence, Standard Transition Section for a more detailed description of the test sequence of operation.

Load control time delay settings may affect the operation sequences.

Note:

If the standby source fails during a loaded test, the ATS will immediately attempt to transfer to the preferred source.

Automatic Operation Test Procedure

1. Check the controller LED indicators to verify that the Position N and Source N Available indicators are lit.
2. Verify that the generator set master switch is in the AUTO position.
3. Refer to Figure 17. From the main screen, press the Test button. Enter the test password when prompted and press OK.
4. Press the down arrow button to display Type of Test Loaded.
5. Press the Start button.
6. Verify that the generator set starts and the Source E Available LED lights.
7. Verify that the switch transfers the load to Source E. Observe the controller LEDs and display as the time delays execute and the load is transferred.
 - a. Standard-Transition Models: After the preferred-to-standby transfer time delay, verify that the Position N LED turns off and the Position E LED lights, indicating that the switch has transferred the load to Source E.
 - b. Programmed-Transition Models: After the preferred-to-off time delay, verify that the Position N LED turns off. After the off-to-standby time delay, check that the Position E LED lights, indicating that the switch has transferred the load to Source E.
 - c. Closed-Transition Models: See Closed-Transition Loaded Test Section. After the preferred-to-standby time delay, the controller monitors the sources for synchronization. When the sources are in sync, the ATS transfers the load to Source E and the Position E LED lights. Both sources will be connected for less than 100 milliseconds before Source N is disconnected and the Position N LED turns off.

If the sources do not synchronize before the fail to sync time delay expires, operation depends on the programmed transition override setting. If automatic override is enabled, the ATS will transfer the load using a programmed transition transfer. If automatic override is not enabled, the ATS will continue to monitor the source synchronization and transfer when/if the sources synchronize. The operator can initiate a programmed-transition transfer (password required) or cancel the transfer.
8. Press the End Test button.

9. Verify that the switch transfers the load back to Source N.
 - a. Standard-Transition Models: After the standby-to-preferred time delay, verify that the Position E LED goes out and the Position N LED lights, indicating that the switch has transferred the load to Source N.
 - b. Programmed-Transition Models: After the standby-to-off time delay, verify that the Position E LED goes out. After the off-top referred time delay, check that the Position N LED lights, indicating that the switch has transferred the load to Source N.
 - c. Closed-Transition Models: See Closed-Transition Loaded Test Section. After the standby-to-preferred time delay, the controller monitors the sources for synchronization. When the sources are in sync, the ATS transfers the load to Source N and the Position N LED lights. Both sources will be connected for less than 100 milliseconds before Source E is disconnected and the Position E LED turns off.

If the sources do not synchronize before the fail to sync time delay expires, operation depends on the programmed transition override setting. If automatic override is enabled, the ATS will transfer the load using a programmed transition transfer. If automatic override is not enabled, the ATS will continue to monitor the source synchronization and transfer when/if the sources synchronize. The operator can initiate a programmed-transition transfer (password required).

10. After the engine cool down time delay expires, the engine start signal is removed. Verify that the generator set stops.

Note:

The generator set may have an engine cool down time delay that causes the generator set engine to run after the transfer switch engine start signal is removed.

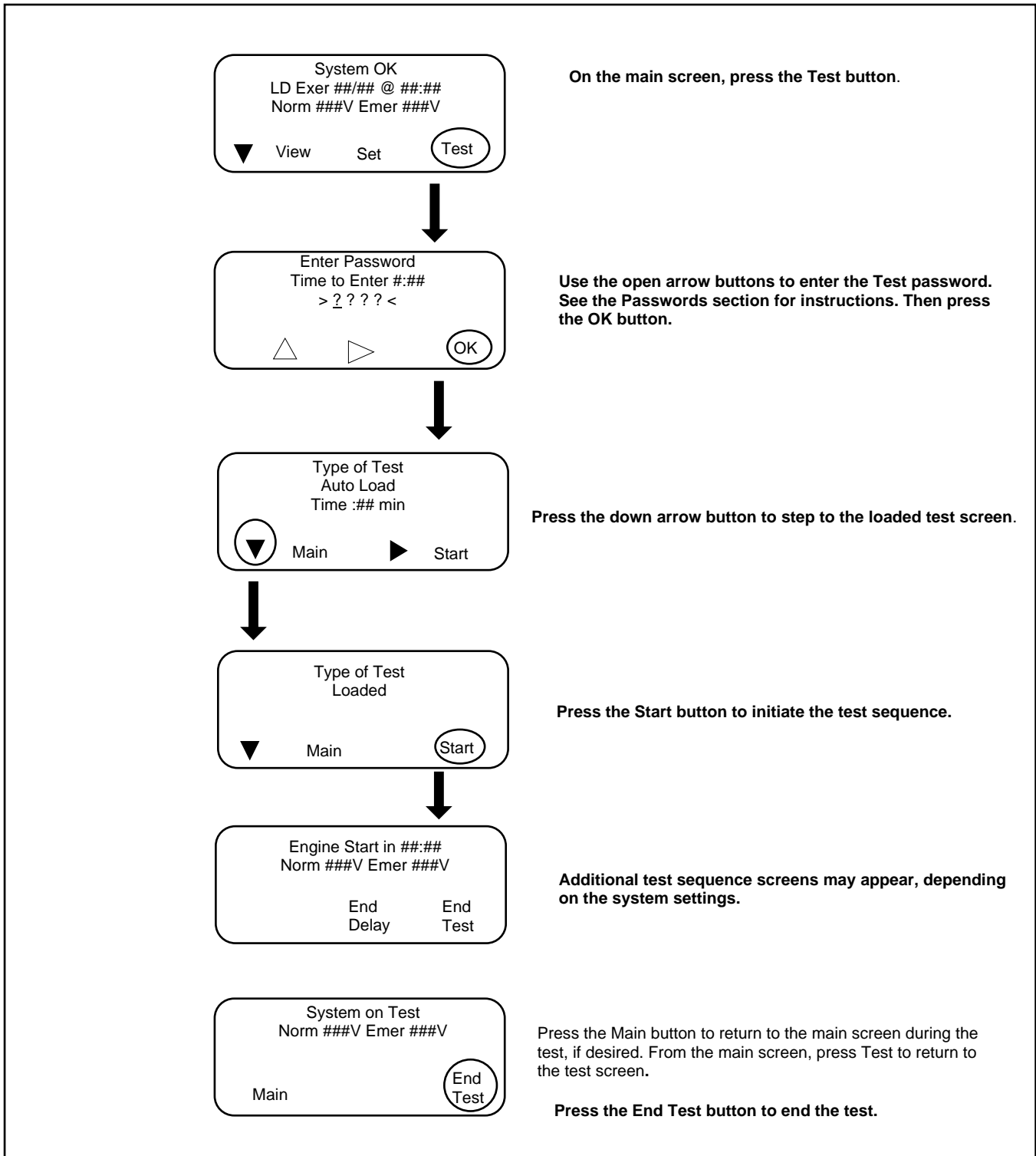


Figure 17 Starting and Stopping the Automatic Operation Test

1.9 Exercise

Schedule exercise runs through the Set Exercise menus. See Exerciser Section. To run the generator set at a time other than a scheduled exercise sequence, use the Test function. See System Test Section for instructions.

When a scheduled exercise is running, the menus shown in Figure Exercise Sequence Menus in Loaded Exercise Section. Press Main to return to the main menu, if desired. Press the End button to end the exercise sequence before the scheduled stop time, if necessary.

If a system test or peak shave is active when the exercise is scheduled to occur, the exercise is skipped. A preferred-source failure during an exerciser period causes the exercise to be terminated and normal ATS operation to resume.

An exercise event can be temporarily disabled to prevent its execution and then re-enabled later using the enable/disable setting in the Set Exercise menus. See Exerciser Section.

1.9.1 Unloaded Exercise

An unloaded exercise starts and runs the generator set without transferring the load.

1.9.2 Load Bank Control

The load bank control output is active during an unloaded exercise or unloaded system test. If the contactor transfers to the standby position, the load bank control will be deactivated. (The standby source supplies power to the load)

1.9.3 Loaded Exercise

A loaded exercise starts the generator set and transfers the load from the normal source to the standby source.

On closed-transition models, transfer will occur when the sources are synchronized. If the sources do not sync, press Cancel to end the exercise.

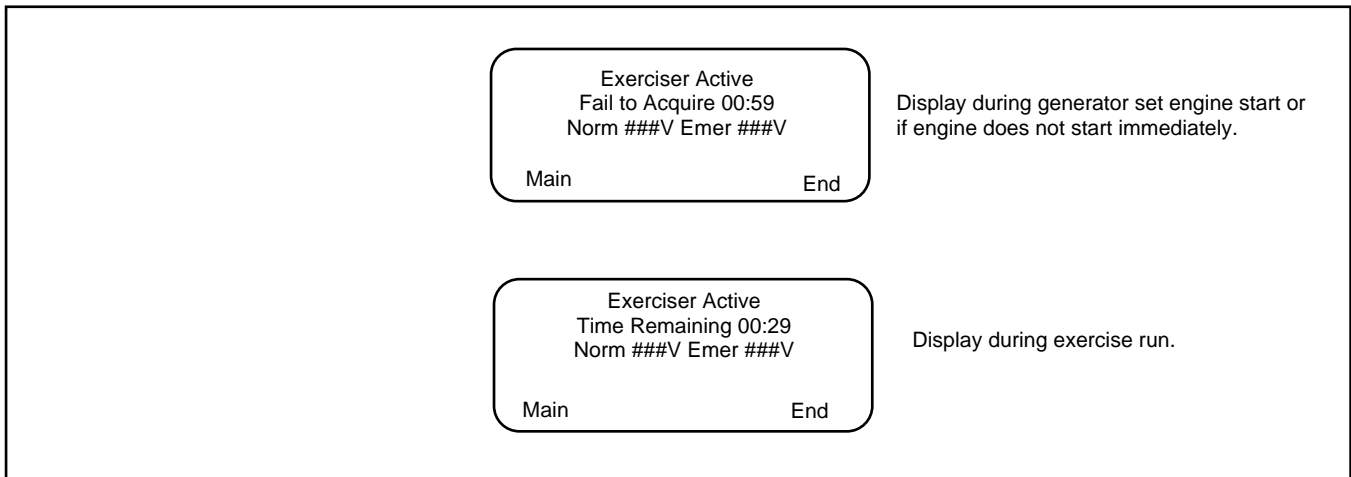


Figure 18 Exercise Sequence Menus

1.10 Warnings and Faults

When a fault exists, the System Alert indicator flashes, a designated output and the common fault output are turned on, and an appropriate message is displayed to indicate the fault. See Figure 19 for the location of the System Alert indicator.

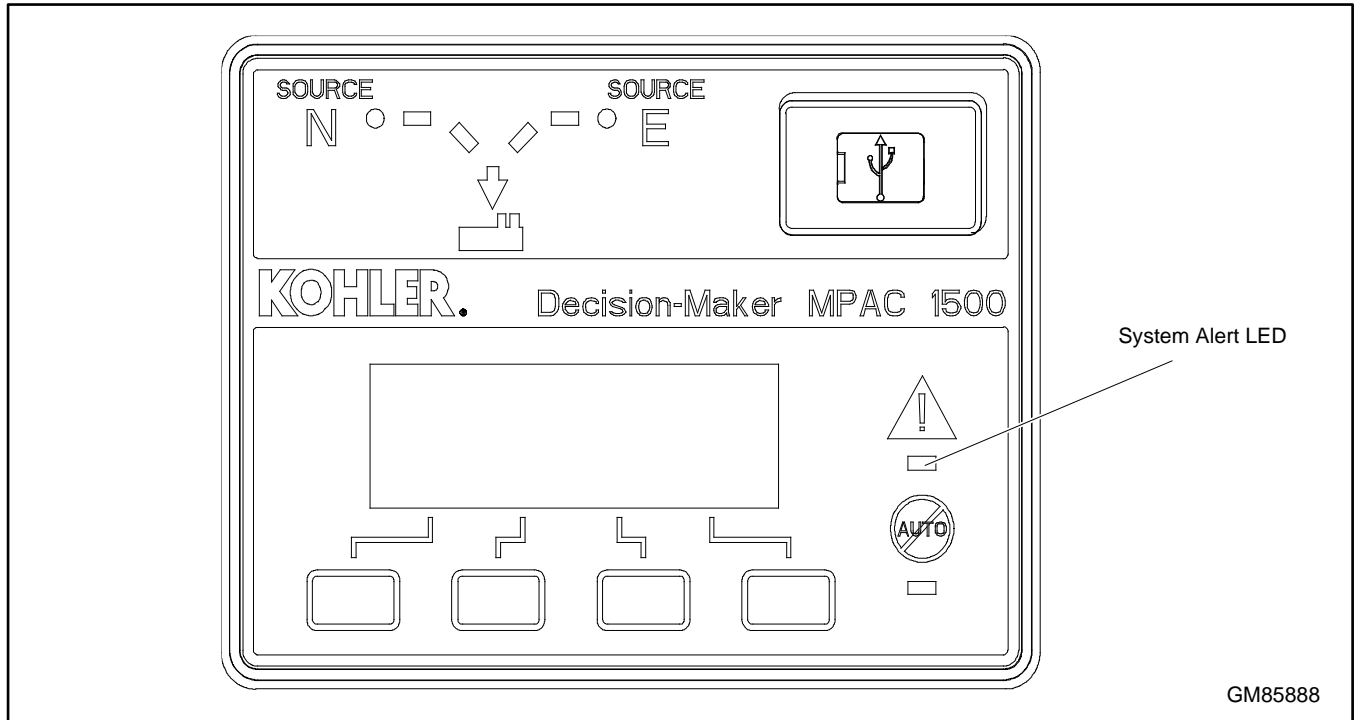


Figure 19 Fault Indication

ATS warnings and faults are shown in Figure 20. There are three types of warning/fault conditions:

Warning. Warnings automatically reset with a source availability change or a transfer request.

Fault Requiring Manual Reset. Under these conditions, normal ATS operation is halted. Active modes are turned off. If the contactor is in the preferred source position, the engine cool-down time delay executes and the engine start contacts open, allowing the generator set to shut down. See Fault Reset Section for instructions to reset faults.

Self-Resetting Faults. Under these conditions, active modes are turned off. If the contactor is in the preferred source position, the engine cool-down time delay executes and the engine start contacts open, allowing the generator set to shut down. When the fault condition is corrected, the fault is automatically cleared from the controller and normal ATS operation continues.

Condition	Type	Description
Failure to Acquire Standby Source	Warning	The source voltage did not reach the acceptable range within a set time (see Time Delays). For example, the standby source generator set did not start.
Failure to Acquire Preferred Source	Warning	
IPM Synching (In-Phase Monitor Synching)	Warning (status)	The two sources did not come into phase within the Fail to Synchronize time delay. Note: If the sources do come into phase after the time delay expires, the warning is automatically cleared and normal ATS operation continues.
External Battery Low	Warning	The voltage of the battery connected to the external battery supply module (EBSM) is low.
Failure to Transfer	Warning	The signal to transfer is sent to the contactor and the main shaft auxiliary switch fails to indicate a complete ATS position change. The controller will attempt to transfer the unit three times before the fault is indicated.
Src N (or Src E) Rotation Err	Self-Resetting Fault	The detected phase rotation of one or both sources does not match the preselected setting.
I/O Module Lost Comm	Self-Resetting Fault	An I/O device has stopped communicating or does not have a correct address specified. Fault resets if communication is reestablished.
Auxiliary Switch Fault	Manual Reset Fault	The main shaft auxiliary switches indicate that the ATS is in more than one position, or the position changed when no signal was sent to initiate the change.
Auxiliary Switch Open	Manual Reset Fault	The main shaft auxiliary switches indicate that the ATS is in neither position (all inputs are open).
Breaker Trip (KUS/KUP service entrance models only)	Manual Reset Fault	The circuit breaker in the KUS/KUP service entrance transfer switch has tripped due to an overcurrent condition. Identify and correct the cause of the fault before resetting the controller
Source1/Source2 Breaker Trip (KEP service entrance models only)	Manual Reset Fault	The Source1 or Source2 circuit breaker in the KEP service entrance transfer switch has tripped due to an overcurrent condition. Identify and correct the cause of the fault before resetting the controller.
Module Status Change	Manual Reset Fault	An accessory module has been disconnected OR a new module is detected. See Module Status Change Section to reset.
Module Status Conflict	Manual Reset Fault	An accessory module has been replaced with a different type of module with the same address. See Module Status Conflict Section to reset.
External Fault	Self-Resetting Fault	The external input dedicated to this condition is closed.

Figure 20 Warnings and Faults

1.10.1 Fault Reset

To clear a fault or warning condition and reset the System Alert LED, go to the Main menu and press the down arrow button to open the Reset menu. See Figure Fault Indication in Warnings and Faults Section and Figure 21. Then press the button labeled Reset. A fault reset does not change the controller settings.

See Accessory Module Faults Section, for instructions to correct and reset faults related to the I/O modules and other accessory modules.

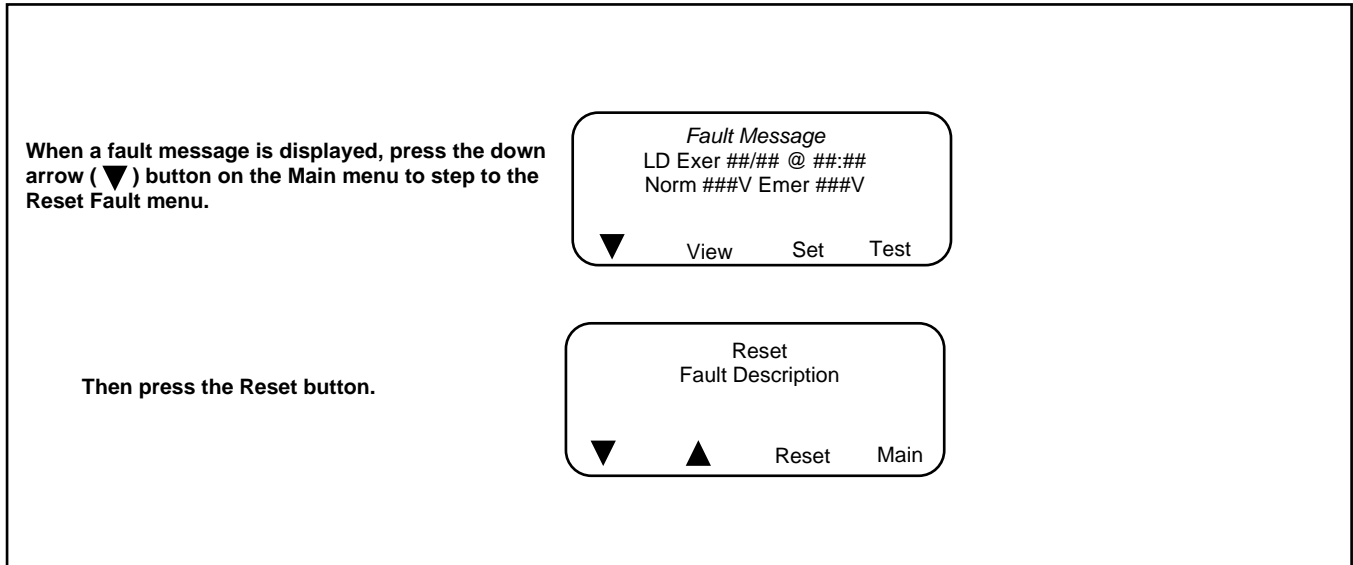


Figure 21 Fault Reset

1.11 Accessory Module Faults

Accessory modules are optional equipment.

1.11.1 Module Status Change

Connecting or disconnecting one or more accessory modules can cause the Module Status Change message to be displayed.

Module Connection (new or reconnected module)

Installing or reconnecting one or more accessory modules triggers the Module Status Change message. See Figure 22. Press the Reset button to display Reset New Module. Press the Reset button from that menu. The controller recognizes the module type(s). See Figure 23.

Navigate to the Set Input/Outputs>Set Aux I/O menu to check that the controller has recognized the connected modules.

See Inputs and Outputs Section for instructions to assign programmable inputs and outputs to I/O modules. Go to Common Alarms Section for instructions to assign functions to the audible alarm for an Alarm Module.

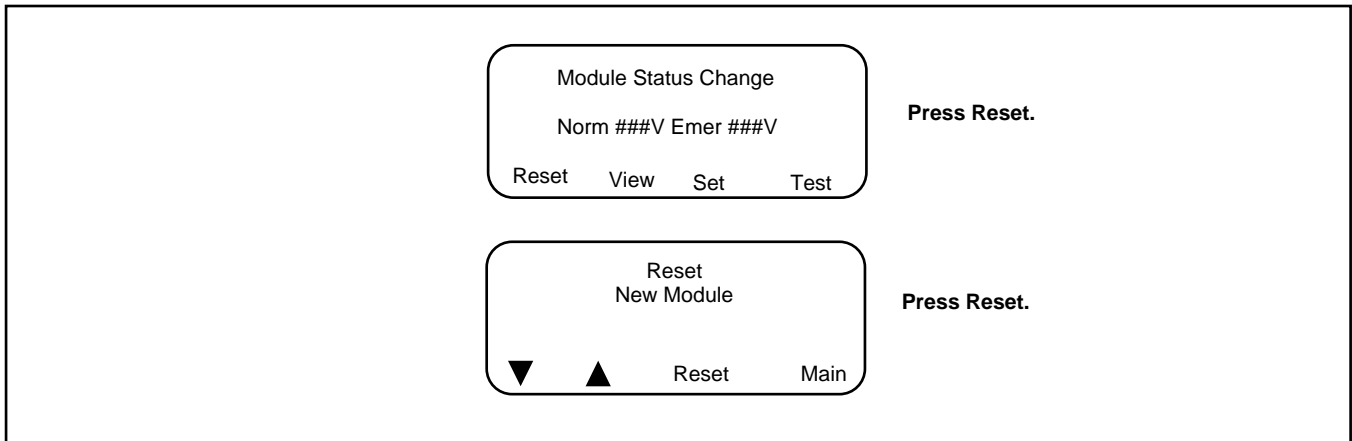


Figure 22 Menus after Module Connection

Module Type	Description
AOB	Switch/Alarm Module (alarm option board)
SOB	Standard I/O Module (standard option board)
POB	High-Power I/O Module (power option board)

Figure 23 Module Types

Disconnected Module

If one or more accessory modules are disconnected from the controller, the message Module Status Change appears. See Figure 24. Pressing the Reset button displays the message Check Module Setup to Clear Fault. Use the following Module Uninstall Procedure to uninstall modules after disconnection.

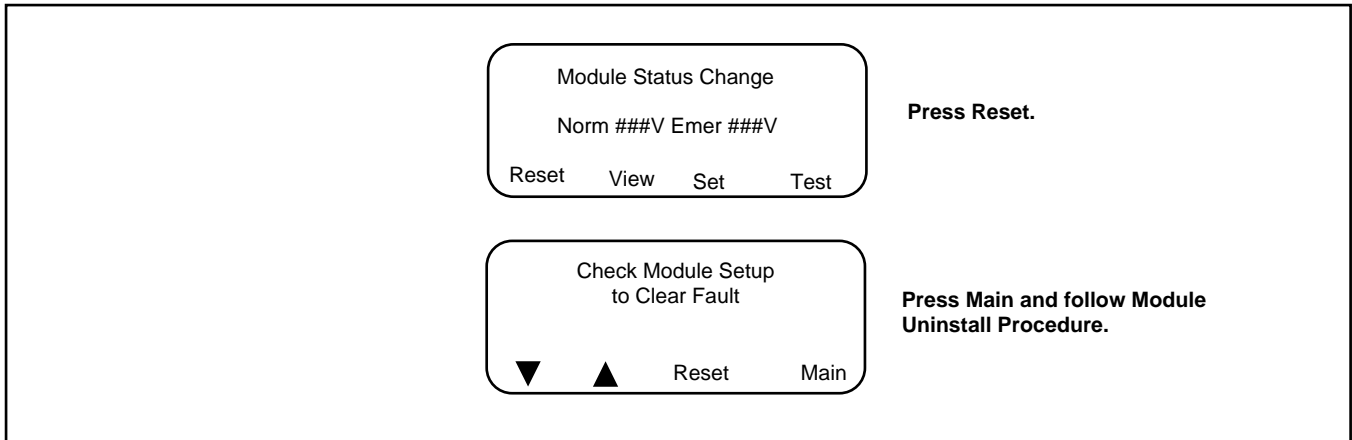


Figure 24 Menus after Module Disconnection

Module Uninstall Procedure

1. Press Main to return to the main menu.
2. Press Set to enter setup mode.
3. Enter the setup password.
4. Press the down arrow to step to the Set Inputs/Outputs menu.
5. Navigate to the Set Auxiliary I/O menu. See Figure 25. Press the right arrow button to see the status of module 1. Press the down arrow to step to the next module, if necessary, until the menu shows Status: Lost.
6. Press the right arrow button to move to the Uninstall Module menu. Verify that the menu says Uninstall Module Yes. (Press the open arrow button to toggle no/yes, if necessary.)
7. When Yes is displayed, press Save to uninstall the module.
8. Repeat the uninstall procedure for additional modules, if necessary.

Other Module Status Change Conditions

A *Module Status Change* message that cannot be cleared as described in this section may indicate a failure of the controller's real-time clock. Carefully follow the Module Connection or Module Uninstall procedures to attempt to reset the fault. If the fault cannot be reset, the controller's logic board may need to be replaced. Contact an authorized distributor/dealer for service.

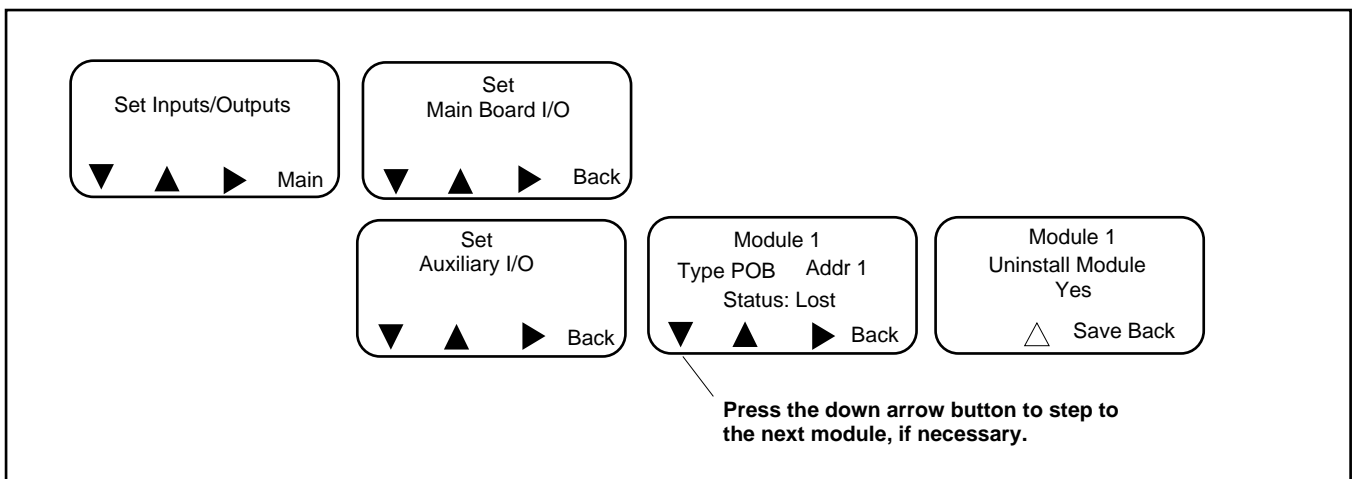


Figure 25 Uninstall Module

1.11.2 Module Status Conflict

The message Module Status Conflict appears if one type of module is replaced with another type of module that has the same address. Follow the procedure below to resolve the conflict.

Procedure to Clear a Module Status Conflict

1. Disconnect power to the transfer switch.
2. Disconnect the module.
3. Close the enclosure door and reconnect power to the ATS. The display will show Module Status Change.
4. Press the button labeled Reset. The display will show Check Module Setup to Clear Fault.
5. Follow the procedure in Module Status Change Section to uninstall the module through the ATS controller keypad.
6. Disconnect power to the ATS.
7. Connect the new module.
8. Close the enclosure door and reconnect power to the ATS. The display will show Module Status Change. See Figure Menus after Module Connection in Module Status Change Section.
9. Press the button labeled Reset to display Reset New Module. Press the reset button from that menu. The controller will now recognize the new module type.
10. Navigate to the Set Auxiliary I/O menu to check the status and settings for the new module. See Figure Uninstall Module in Module Status Change Section. Press the right arrow button to see the status of module 1. Press the down arrow to step to the next module, if necessary,

1.12 Reset Data

Be sure to read and understand the information in this section before resetting records or parameters.

Note:

Resetting to the default parameters will reset all parameters to a factory default setting.

Use the Reset Data menus to set records or parameters back to factory default settings. See Figure 26.

1. Use the black arrow buttons to step to the desired menu.
2. Press the open up arrow button to toggle Yes or No until Yes is displayed.
3. Press Save to reset the records or parameters to the factory defaults. Pressing Back exits the menu without resetting.

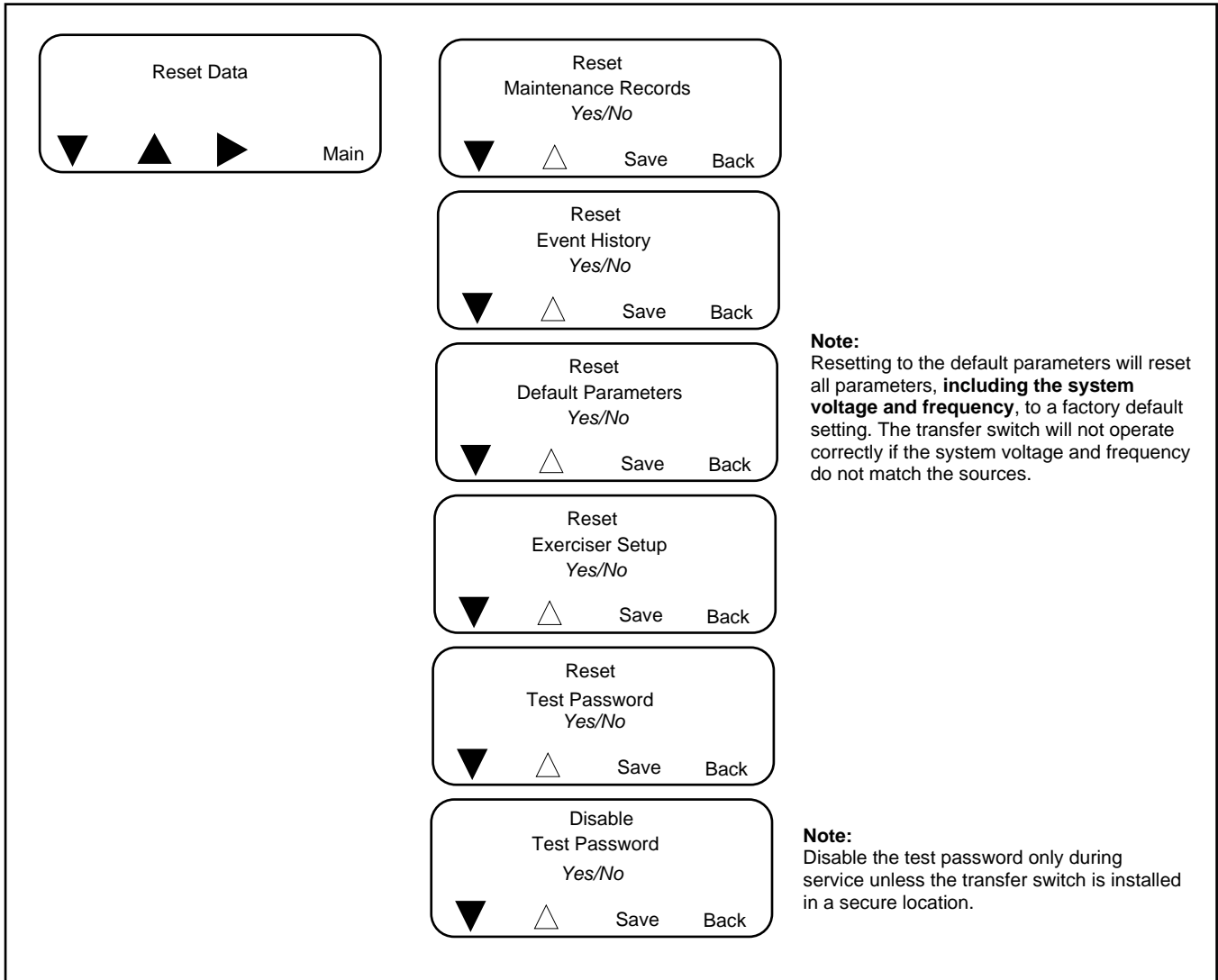


Figure 26 Reset Data

1.12.1 Reset Maintenance Records

Reset the maintenance records after transfer switch service to update the last maintenance date and totals since reset that are displayed in the maintenance records menu.

1.12.2 Reset Event History

Resetting the event history clears the events from the event history log. The history lists the 100 most recent transfer switch events, including transfers and DIP switch setting changes as well as faults and alarms.

1.12.3 Reset Default Parameters

Resetting to the default parameters will reset **all** parameters, **including the system voltage and frequency**, to a factory default setting. The default system voltage and frequency settings may not match the settings for your application.

The transfer switch will not operate correctly if the system voltage and frequency do not match the sources. Use the Set Sources menu to set the system voltage and frequency after resetting to the default parameters. See Section 6 for instructions.

Check the system operation to verify the settings after resetting.

1.12.4 Reset and Disable Test Password

Reset the Test password to return the test password to the default, 0000.

Note:

Disable the test password only during service unless the transfer switch is installed in a secure location.

Disabling the test password allows any user to initiate a test sequence from the controller's user interface without entering a password. Initiating a test starts the generator set and, if a loaded test is selected, transfers the load.

Section 2. Sequence of Operation

This section explains the transfer switch sequence of operation during the following events:

- Controller power-up or reset
- Preferred source loss and return
- Test
- Exercise
- Emergency source loss and return

The Sequence of Operation descriptions in Sequence of Operation, Standard Transition Models Section through Sequence of Operation, Closed-Transition Models Section describe the transfer switch normal operation for standard, programmed, and closed transition models. Operation can be affected by faults such as the normal or emergency contacts failing to open or close when signaled to do so.

2.1 Controller Power-up/Reset

Following is an explanation of the sequence of operation for the Decision-Maker® MPAC 1500 ATS Controller when power is initially applied to the controller or a controller reset occurs.

1. Controller self-test is executed.
2. System parameters are downloaded from nonvolatile memory.
3. Contactor position and source availability are determined.
4. If neither source is acceptable, the contactor does not change position.
5. If both sources are available, the controller immediately transfers the contactor to the preferred source.
6. If only one source is available, the controller immediately transfers the contactor to that source, executing only the off-position and load control time delays.

If the available source is the preferred source, and the contactor is in the standby position, the contactor transfers to preferred, the engine cool down time delay runs, and then the engine start contacts open.

If the available source is the preferred source and the contactor is already in the preferred position, the engine start contacts open immediately, bypassing the engine cool down time delay.

2.2 Sequence of Operation, Standard Transition Models

Operation can be affected by faults such as the normal or emergency contacts failing to open or close when signaled to do so.

2.2.1 Preferred Source Loss and Return, Standard Transition

Following is an explanation of the transfer switch sequence of operation when Preferred Source failure is detected.

Preferred Source Fails

1. Load control contacts open.
2. Engine start time delay expires.
3. The generator is signaled to start.
4. The generator starts and the standby source becomes available.
5. Preferred-to-standby time delay expires.
6. Contactor transfers to standby.
7. Post-transfer load control sequences run.
8. Load control contacts close.

Preferred Source Returns

1. Standby-to-preferred and pre-transfer load control time delays expire.
2. Load control contacts open.
3. Contactor transfers to preferred source.
4. Post-transfer load control sequences and engine cool down time delay expire.
5. Load control contacts close.
6. The engine start contacts open, signaling the generator to stop.

2.2.2 Exerciser Operation, Standard Transition

Unloaded Exercise Sequence Starts

1. Exerciser timer begins.
2. The generator is signaled to start.
3. The generator starts and the standby source becomes available.
4. The load bank control is activated.

Unloaded Exercise Sequence Ends

1. The load bank control is deactivated.
2. Engine cool down time delay expires.
3. The engine start contacts open, signaling the generator to stop.

Loaded Exercise Sequence Starts

1. Exerciser timer begins.
2. The generator is signaled to start.
3. The generator starts and the standby source becomes available.
4. Preferred-to-standby time delay and pre-transfer load control sequences run.
5. Load control contacts open.
6. Contactor transfers to standby.
7. Post-transfer load control sequences run.
8. Load control contacts close.

Emergency Source Fails (Normal Source is available)

1. Exerciser is deactivated.
2. Load control contacts open.
3. Contactor immediately transfers to preferred.
4. Immediate failure to acquire standby alarm.
5. Post-transfer load control sequences and engine cool down time delay expire.
6. Load control contacts close.
7. Engine start contacts open.

Loaded Exercise Sequence Ends

1. Pre-transfer load control sequences run.
2. Load control contacts open.
3. Contactor transfers to preferred.
4. Post-transfer load control sequences and engine cool down time delay expire.
5. Load control contacts close.
6. The engine start contacts open, signaling the generator to stop.

2.2.3 Test Sequence, Standard Transition

Unloaded Test Function is Initiated

1. The generator set is signaled to start.
2. The generator starts and the standby source becomes available.
3. The load bank control is activated.

Unloaded Test Function is Ended

1. The load bank control is deactivated.
2. Engine cool down time delay expires.
3. The generator is signaled to stop.

Loaded Test Function is Initiated

1. The generator is signaled to start (engine start contacts close).
2. The generator starts and the standby source becomes available.
3. Pre-transfer load control time delays expire and load control contacts open.
4. Preferred-to-standby time delay expires.
5. Contactor transfers to standby.
6. Post-transfer load control time delays expire and load control contacts close.

Emergency Source Fails (Normal Source is available)

1. Test function is deactivated.
2. Load control contacts open.
3. Contactor immediately transfers to preferred.
4. Immediate failure to acquire standby alarm.
5. Post-transfer load control sequences and engine cool down time delay expire.
6. Load control contacts close.
7. Engine start contacts open.

Loaded Test Function is Ended

1. Standby-to-preferred time delay and pre-transfer load control sequences run.
2. Load control contacts open.
3. Contactor transfers to preferred.
4. Post-transfer load control sequences and engine cool down time delay expire.
5. Load control contacts close.
6. The engine start contacts open, signaling the generator to stop.

2.3 Sequence of Operation, Programmed-Transition

Programmed-transition models operate with a pause in the off position during transfer. The time in the off position is set through the off-to-standby and off-to-preferred time delays.

Operation can be affected by faults such as the normal or emergency contacts failing to open or close when signaled to do so.

2.3.1 Preferred Source Loss and Return, Programmed Transition

Preferred Source Fails

1. Load control contacts open.
2. Engine start time delay expires.
3. The generator is signaled to start (engine start contacts close).
4. The generator starts and the standby source becomes available.
5. Preferred-to-standby time delay expires.
6. Contactor transfers to OFF position.
7. Off-to-standby time delay expires.
8. Contactor transfers to standby source.
9. Post-transfer load control sequences run.
10. Load control contacts close.

Preferred Source Returns

1. Standby-to-preferred and pre-transfer load control time delays expire.
2. Load control contacts open.
3. Contactor transfers to OFF position.
4. Off-to-preferred time delay expires.
5. Contactor transfers to preferred source.
6. Post-transfer load control sequences and engine cool down time delay expire.
7. Load control contacts close.
8. The generator is signaled to stop (engine start contacts open).

2.3.2 Exerciser Operation, Programmed Transition

Unloaded Exercise

The unloaded exercise sequence is the same as for standard transition. See Exerciser Operation, Standard Transition Section.

Loaded Exercise Sequence Starts

1. Exerciser timer begins.
2. The engine start contacts close, signaling the generator set to start.
3. The generator starts and the standby source becomes available.
4. Preferred-to-standby time delay and pre-transfer load control sequences run.
5. Load control contacts open.
6. Contactor transfers to OFF position.
7. Off-to-standby time delay expires.
8. Contactor transfers to standby source.
9. Post-transfer load control sequences run.
10. Load control contacts close.

Emergency Source Fails (Normal Source is available)

1. Exerciser is deactivated.
2. Immediate failure to acquire standby alarm.
3. Load control contacts open.
4. Contactor transfers to OFF position.
5. Off-to-preferred time delay expires.
6. Contactor transfers to preferred source.
7. Post-transfer load control sequences and engine cool down time delay expire.
8. Load control contacts close.
9. Engine start contacts open.

Loaded Exercise Sequence Ends

1. Pre-transfer load control sequences run.
2. Load control contacts open.
3. Contactor transfers to OFF position.
4. Off-to-preferred time delay expires.
5. Contactor transfers to preferred source.
6. Post-transfer load control sequences and engine cool down time delay expire.
7. Load control contacts close.
8. The engine start contacts open, signaling the generator to stop.

2.3.3 Test Sequence, Programmed Transition

Unloaded Test Sequence

The unloaded test sequence is the same as for standard transition. See Test Sequence, Standard Transition Section.

Loaded Test Sequence is Initiated

1. The generator is signaled to start (engine start contacts close).
2. The generator starts and the standby source becomes available.
3. Pre-transfer load control time delays expire and load control contacts open.
4. Preferred-to-standby time delay expires.
5. Contactor transfers to the OFF position.
6. Off-to-standby time delay expires.
7. Contactor transfers to standby.
8. Post-transfer load control time delays expire and load control contacts close.

Emergency Source Fails (Normal Source is available)

1. Test function is deactivated.
2. Immediate failure to acquire standby alarm.
3. Load control contacts open.
4. Contactor moves to the OFF position.
5. Off-to-preferred time delay expires.
6. Contactor transfers to preferred.
7. Post-transfer load control sequences and engine cooldown time delay expire.
8. Load control contacts close.
9. Engine start contacts open.

Loaded Test Sequence is Ended

1. Standby-to-preferred time delay and pre-transfer load control sequences run.
2. Load control contacts open.
3. Contactor moves to the OFF position.
4. Off-to-preferred time delay expires.
5. Contactor transfers to preferred.
6. Post-transfer load control sequences and engine cooldown time delay expire.
7. Load control contacts close.
8. The engine start contacts open, signaling the generator to stop.

2.4 Sequence of Operation, Closed-Transition Models

Closed-transition transfer switches operate with no interruption of power to the load during transfer when both sources are available. The controller monitors the sources for synchronization before initiating transfer. Sources are paralleled for less than 100 milliseconds during transfer. (See Extended Transfer Time Relay Section, Extended Transfer Time Relay.)

Operation can be affected by faults such as the normal or emergency contacts failing to open or close when signaled to do so.

2.4.1 Preferred Source Loss and Return, Closed Transition

Preferred Source Fails

1. Load control contacts open.
2. Engine start time delay runs and expires.
3. The generator is signaled to start (engine start contacts close).
4. The generator starts and the standby source becomes available.
5. Preferred-to-standby time delay expires.
6. Preferred source contacts open.
7. Off-to-standby time delay expires.
8. Emergency power contacts close.
9. Post-transfer load control sequences run and load control contacts close, as programmed through the Load Add settings.

Preferred Source Returns

1. Standby-to-preferred and pre-transfer load control time delays expire.
2. Load control contacts open according to the Load Disconnect time delay settings.
3. Check/wait for source synchronization.

Note:

If the sources do not synchronize before the Fail to Sync time delay expires, the programmed-transition override function operates. See Failure to Synchronize (Programmed-Transition Override) Section.

4. When sources are synchronized, preferred source contacts close.
5. Standby source contacts open within 100 milliseconds.

Note:

If the standby source contacts do not open within 100 milliseconds, the extended transfer time relay trips the standby source breaker.

6. Post-transfer load control sequences and engine cool down time delay expire.
7. Load control contacts close as programmed through the Load Add settings.
8. The generator is signaled to stop (engine start contacts open).

2.4.2 Failure to Synchronize (Programmed-Transition Override)

If the sources do not synchronize before the Fail to Sync time delay expires, the programmed-transition override function can initiate a transfer. The override function transfers to the other source using programmed transition mode, which causes an interruption in power to the load during transfer. The contactor stops in the OFF position for a programmed period of time which is set by the off-to-preferred or off-to-standby time delay. The override function can be set to operate automatically or to require manual activation.

- If Automatic programmed-transition override is selected, a programmed-transition transfer will be initiated automatically when the Fail to Sync time delay expires.
- If Manual programmed-transition override is selected, an operator can initiate a programmed transition transfer by entering the setup password and pressing a button after the Fail to Sync time delay expires. If a manual transfer is not initiated, the controller continues to monitor the sources and transfers if synchronization occurs.

See Set System Section, to set the programmed-transition override function to automatic or manual. See Time Delays Section, to set the off-to-preferred and off-to-standby time delays.

Programmed-Transition Override Sequence

1. Fail to Sync time delay expires.
2. If Automatic programmed-transition override is enabled, go to step 4.
3. If manual programmed-transition override is enabled, the Manual Transfer screen opens. The operator enters the setup password and manually initiates programmed-transition transfer.
4. Standby source contacts open.
5. Off-to-preferred time delay runs and expires.
6. Preferred source contacts close.
7. Post-transfer load control time delays expire and load control contacts close.
8. The engine cool-down time delay expires and the generator set is signaled to stop (engine start contacts open).

2.4.3 Exerciser Operation, Closed Transition

Unloaded Exercise

The unloaded exercise sequence is the same as for standard transition. See Exerciser Operation, Standard Transition Section.

Loaded Exercise Sequence Starts

1. Exercise timer begins.
2. Engine start time delay runs and expires.
3. The generator is signaled to start (engine start contacts close).
4. The generator starts and the standby source becomes available.
5. Load control contacts open.
6. Check/wait for source synchronization.

Note:

If the sources do not synchronize before the Fail to Sync time delay expires, the programmed-transition override function operates. See Failure to Synchronize (Programmed-Transition Override) Section.

7. When sources are synchronized, emergency source contacts close.
8. Normal source contacts open within 100 milliseconds.

Note:

If the normal contacts do not open, the emergency contacts will be signaled to open and a Fail to Transfer fault will be activated.

Loaded Exercise Sequence Ends

1. Pre-transfer load control sequences run.
2. Load control contacts open.
3. Check/wait for source synchronization.

Note:

If the sources do not synchronize before the Fail to Sync time delay expires, the programmed-transition override function operates. See Failure to Synchronize (Programmed-Transition Override) Section.

4. When sources are synchronized, preferred source contacts close.
5. Standby source contacts open within 100 milliseconds.

Note:

If the standby source contacts do not open within 100 milliseconds, the extended transfer time relay trips the standby source breaker.

6. Post-transfer load control sequences and engine cool down time delay expire.
7. Load control contacts close as programmed through the Load Add settings.
8. The generator is signaled to stop (engine start contacts open).

2.4.4 Test Sequence, Closed Transition

Unloaded Test Sequence

The unloaded test sequence is the same as for standard transition. See Test Sequence, Standard Transition Section.

Loaded Test Sequence is Initiated

1. Engine start time delay runs and expires.
2. The generator is signaled to start (engine start contacts close).
3. The generator starts and the standby source becomes available.
4. Load control contacts open.
5. Check/wait for source synchronization.

Note:

If the sources do not synchronize before the Fail to Sync time delay expires, the programmed-transition override function operates. See Failure to Synchronize (Programmed-Transition Override) Section.

6. When sources are synchronized, emergency source contacts close.
7. Normal source contacts open within 100 milliseconds.

Note:

If the normal contacts do not open, the emergency contacts will be signaled to open and a Fail to Transfer fault will be activated.

Loaded Test Sequence is Ended

1. Standby-to-preferred and pre-transfer load control time delays expire.
2. Load control contacts open according to the Load Disconnect time delay settings.
3. Check/wait for source synchronization.

Note:

If the sources do not synchronize before the Fail to Sync time delay expires, the programmed-transition override function operates. See Failure to Synchronize (Programmed-Transition Override) Section.

4. When sources are synchronized, preferred source contacts close.
5. Standby source contacts open within 100 milliseconds.

Note:

If the standby source contacts do not open within 100 milliseconds, the extended transfer time relay trips the standby source breaker.

6. Post-transfer load control sequences and engine cool down time delay expire.
7. Load control contacts close as programmed through the Load Add settings.
8. The generator is signaled to stop (engine start contacts open).

2.4.5 Extended Transfer Time Relay

The extended transfer time relay is provided on closed-transition transfer switches. The relay is provided to prevent paralleling the standby and utility sources for longer than the acceptable time if the closed-transition transfer time exceeds 100 milliseconds.

The relay operation time is adjustable between 100 milliseconds and 10 seconds. The recommended setting is 1% = 0.1 seconds (100 milliseconds). If it is necessary to set the relay to a longer time, ensure that the time setting is in accordance with applicable codes. See the transfer switch installation manual for instructions to change the time setting.

The relay activates only if the closed-transition transfer time exceeds the set time. A *Fail to Open Source1 (or Source2)* fault message will display on the ATS controller. Identify and correct the cause of the source disconnect problem before resetting the fault.

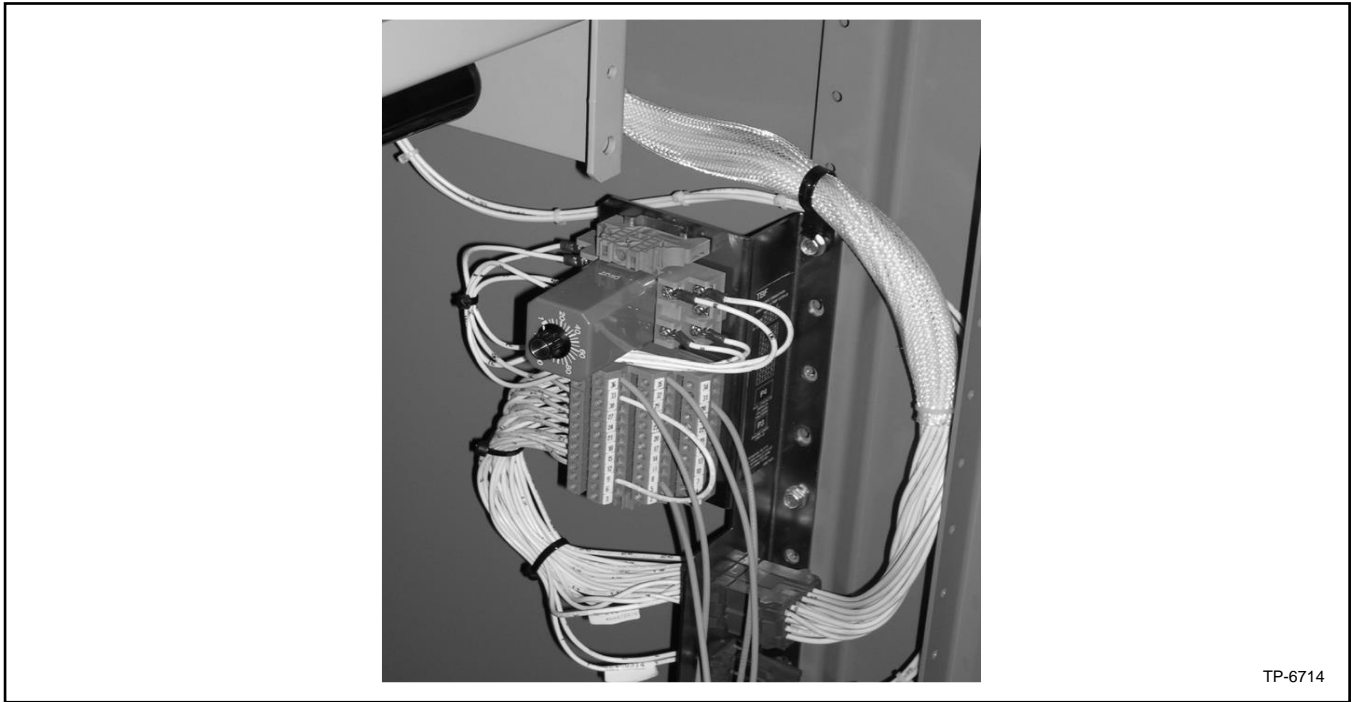


Figure 27 Extended Transfer Time Relay

2.5 Sequence of Operation, KEP Service Entrance Models

Service entrance models operate in programmed transition mode, with a pause in the off position during transfer. The time in the off position is set through the off-to-standby and off-to-preferred time delays. If the OFF time delay is shorter than the time required for the circuit breaker to open, the transfer time will be controlled by the circuit breaker operation time.

2.5.1 Preferred Source Loss and Return, Service Entrance Models

Preferred Source Fails

1. Load control contacts open.
2. Engine start time delay expires.
3. The generator is signaled to start (engine start contacts close).
4. The generator starts and the standby source becomes available.
5. Preferred-to-standby time delay expires.
6. Source 1 circuit breaker opens.
7. Off-to-standby time delay expires.
8. Source 2 circuit breaker closes.
9. Post-transfer load control time delays expire.
10. Load control contacts close.

Preferred Source Returns

1. Pre-transfer load control time delays expire.
2. Load control contacts open.
3. Standby-to-preferred time delay expires.
4. Source 2 circuit breaker opens.
5. Off-to-preferred time delay expires.
6. Source 1 circuit breaker closes.
7. Post-transfer load control sequences and engine cool down time delay expire.
8. Load control contacts close.
9. The generator is signaled to stop (engine start contacts open).

2.5.2 Exerciser Operation, Service Entrance Models

Unloaded Exercise

The unloaded exercise sequence is the same as for standard transition. See Exerciser Operation, Standard Transition Section.

Loaded Exercise Sequence Starts

1. Exerciser timer begins.
2. The engine start contacts close, signaling the generator set to start.
3. The generator starts and the standby source becomes available.
4. Pre-transfer load control time delays expire.
5. Load control contacts open.
6. Preferred-to-standby time delay expires.
7. Source 1 circuit breaker opens.
8. Off-to-standby time delay expires.
9. Source 2 circuit breaker closes.
10. Post-transfer load control time delays expire.
11. Load control contacts close.

Emergency Source Fails (Normal Source is available)

1. Immediate failure to acquire standby alarm.
2. Exerciser is deactivated.
3. Load control contacts open.
4. Source 2 circuit breaker opens.
5. Off-to-preferred time delay expires.
6. Source 1 circuit breaker closes.
7. Post-transfer load control time delays expire and load control contacts close.
8. Engine cool down time delay expires and engine start contacts open.

Loaded Exercise Sequence Ends

1. Pre-transfer load control sequences run.
2. Load control contacts open.
3. Source 2 circuit breaker opens.
4. Off-to-preferred time delay expires.
5. Source 1 circuit breaker closes.
6. Post-transfer load control time delays expire and load control contacts close.
7. Engine cool down time delay expires.
8. The engine start contacts open, signaling the generator to stop.

2.5.3 Test Sequence, Service Entrance Models

Unloaded Test Sequence

The unloaded test sequence is the same as for standard transition. See Test Sequence, Standard Transition Section.

Loaded Test Sequence is Initiated (Loaded)

1. The engine start contacts close, signaling the generator set to start.
2. The generator starts and the standby source becomes available.
3. Pre-transfer load control time delays expire and load control contacts open.
4. Preferred-to-standby time delay expires.
5. Source 1 circuit breaker opens.
6. Off-to-standby time delay expires.
7. Source 2 circuit breaker closes.
8. Post-transfer load control time delays expire and load control contacts close.

Emergency Source Fails (Normal Source is available)

1. Test function is deactivated.
2. Immediate failure to acquire standby alarm.
3. Load control contacts open.
4. Source 2 circuit breaker opens.
5. Off-to-preferred time delay expires.
6. Source 1 circuit breaker closes.
7. Post-transfer load control sequences and engine cool down time delay expire.
8. Load control contacts close.
9. Engine start contacts open.

Loaded Test Sequence is Ended

1. Standby-to-preferred time delay and pre-transfer load control sequences run.
2. Load control contacts open.
3. Source 2 circuit breaker opens.
4. Off-to-preferred time delay expires.
5. Source 1 circuit breaker closes.
6. Post-transfer load control sequences and engine cool down time delay expire.
7. Load control contacts close.
8. The engine start contacts open, signaling the generator to stop.

2.6 Sequence of Operation, KUS/KUP Service Entrance Models

Service entrance models KUS and KUP have a service entrance breaker in a separate section of the enclosure. The circuit breaker can be opened in several ways:

- Manually open using the circuit breaker handle on the outside of the enclosure;
- Open automatically in the case of an overcurrent condition, or;
- Open by the shunt trip mechanism.

The KUS and KUP sequence of operation and exercise operation is the same as for the KCS standard and KCP programmed transition models. See Sequence of Operation, Standard Transition, and Sequence of Operation, Programmed Transition, in this document.

3.1 Introduction

This section illustrates the view screens. Use the view screens to check system settings, event history, and maintenance records. No password is required to navigate through the view screens.

For detailed instructions for using the password-protected setup and test screens, see Section 4.

Some parameters will appear only under certain conditions. For example:

- The Daylight Saving Time settings are displayed only if DST is enabled.
- Phase rotation and in-phase monitoring are displayed only for three-phase systems.
- Some parameters and time delays appear only for programmed-transition models.

3.2 Main Screen

The main screen appears at system startup. See Figure 28.

Press the View button to navigate to the View screens shown in the following sections.

The display returns to the main screen after 10 minutes of no activity (no buttons pressed). See Normal Operation Menus Section for instructions to view system status from the main screen.

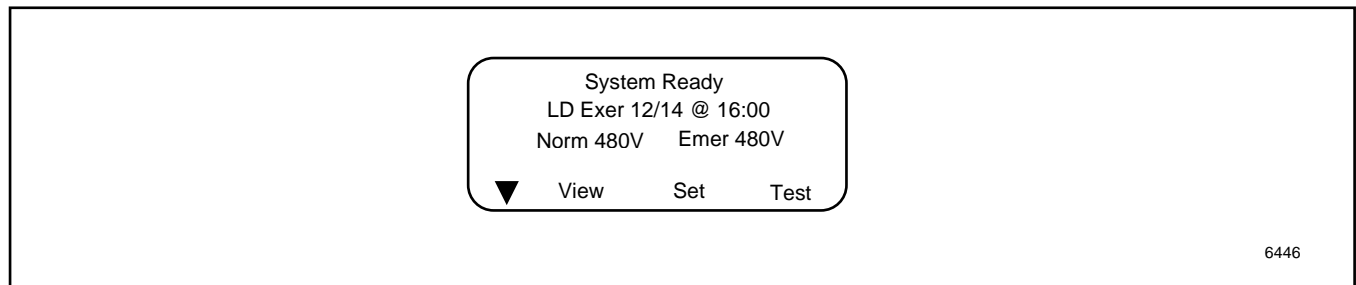


Figure 28 Main Screen

3.3 View Screens

From the main screen, press the View button to step to the first view screen, View Event History.

In the View screens, press the down arrow (▼) button to step to the next view screen. Press the right arrow (▶) button to view details.

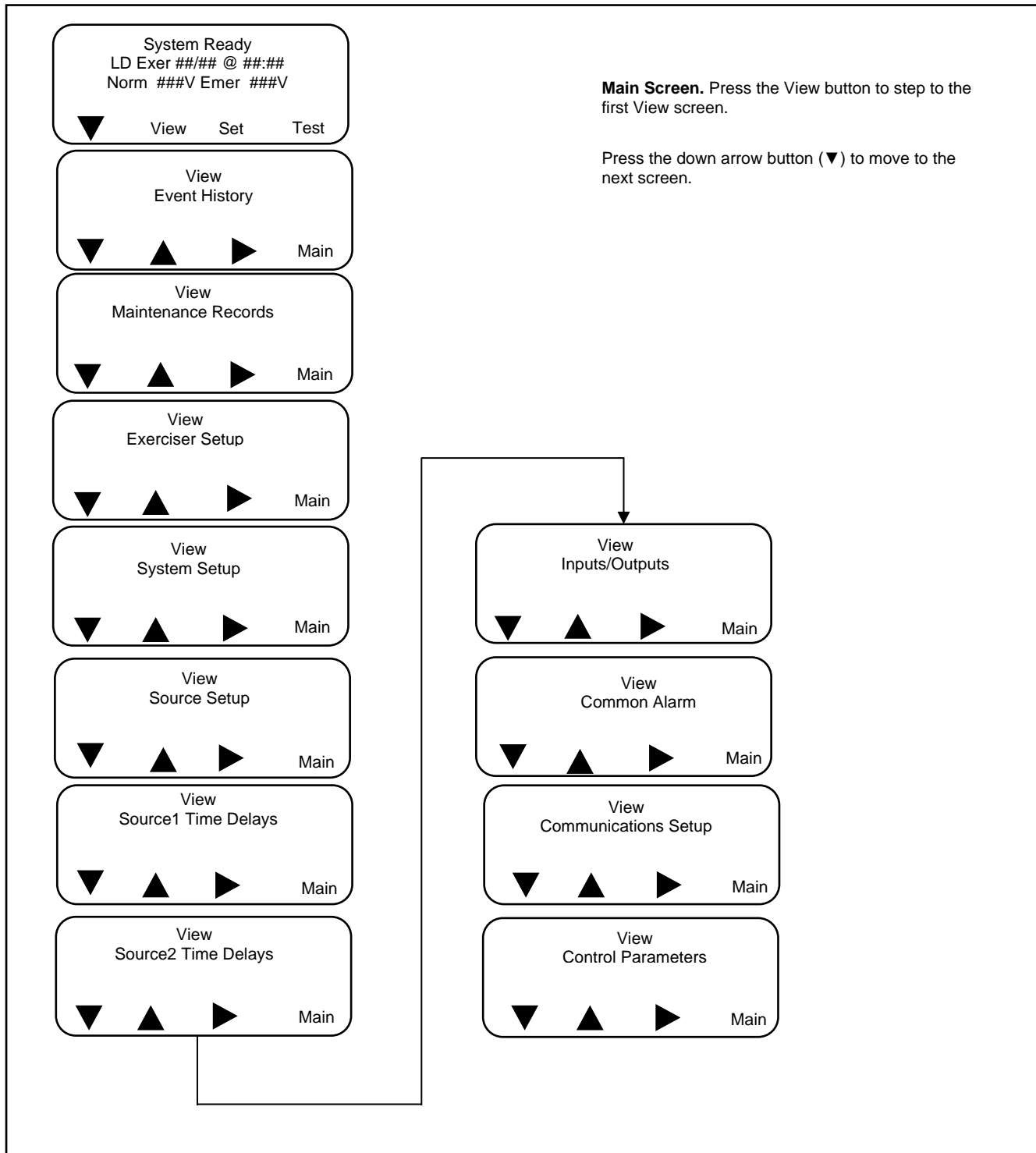


Figure 29 View Screens

3.4 View Event History

The Event History screens show recent transfer switch events. Examples of events recorded in the event history are shown in Figure 30. Events are time- and date-stamped. Check the event history for recent transfer switch operation, faults, or changes to settings. The event history is especially useful for transfer switch troubleshooting.

View
Event History

▼
▲
▶

Main

Event Description
ON/OFF MM/DD/YY HH:MM
Additional Info

▼
Back

Press the right arrow (▶) button to view events in the event history log.

Press the down arrow (▼) button to step to the next event in the log.

Event Descriptions	
End Time Delay Btn	Low Battery Voltage
Test Btn	Remote Common Alarm
Exercise Btn	Over Frequency
Lamp Test	Under Frequency
Service Req'd Reset	Phase Loss
Maint DIP Switch	Phase Rotation Error
Pwd DIP Switch	Over Voltage L1-L2
Manual Option Switch	Over Voltage L2-L3
New Module	Over Voltage L3-L1
Contactor in Off	Under Voltage L1-L2
Contactor in Src N	Under Voltage L2-L3
Contactor in Src E	Under Voltage L3-L1
Low Battery	Voltage Imbalance
Exerciser Active	Save History To File
Fail to Acquire Pref	Auto Loaded Test End
Fail to Acquire Stby	Test Loaded Changed
Fail to Sync	Pref Source Changed
Fail to Transfer	Reload Dflt Params
I/O Module Lost Comm	MODBUS Peak Shave
Aux Switch Fault	MODBUS Forced to OFF
Aux Switch Open	MODBUS System Test
Rem End Time Delay	Battery Control Out
Forced Trans to Off	Minimum Values
Peak Shave Mode	Maximum Values
Inhibit Transfer	Breaker Trip
Remote Test	

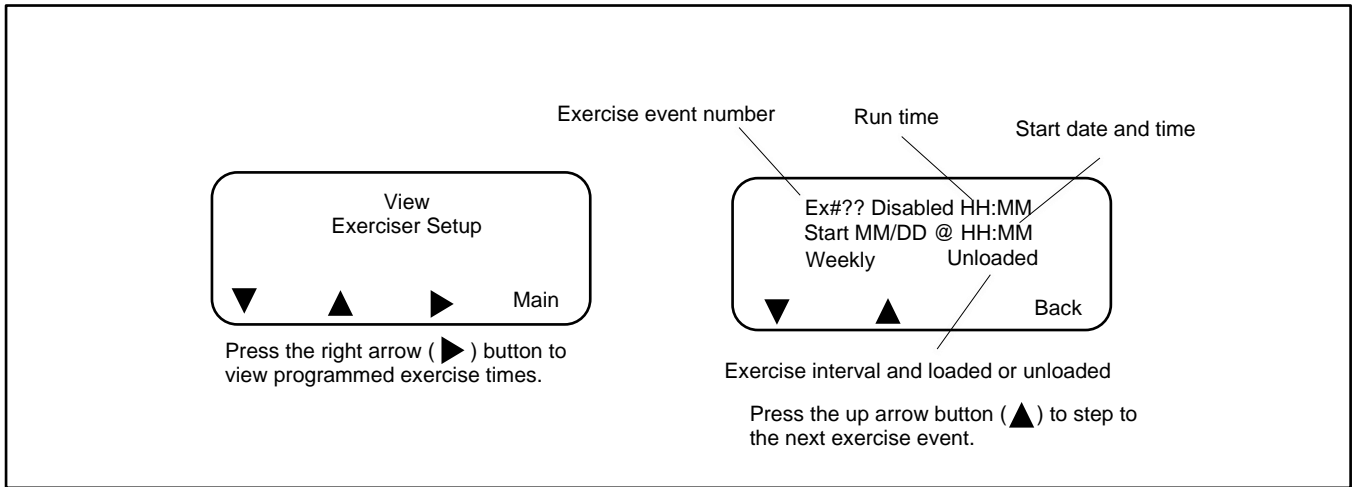
Figure 30 Examples of Event Descriptions

3.5 View Maintenance Records

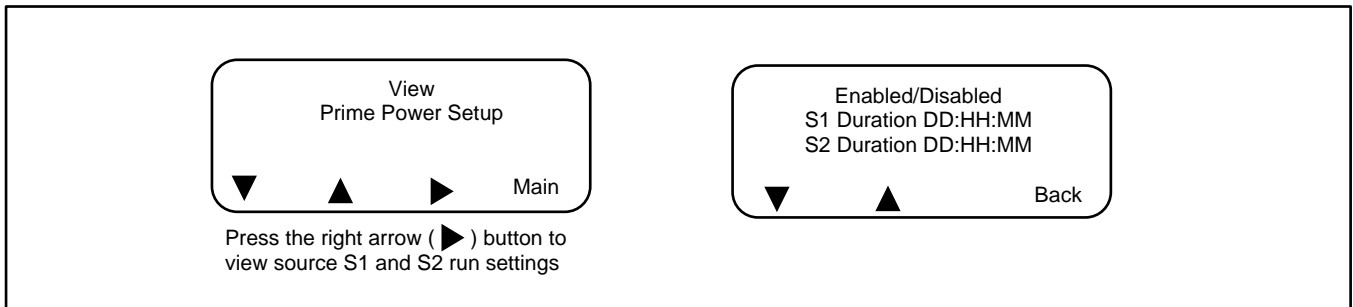
<div style="border: 1px solid black; border-radius: 15px; padding: 10px; margin-bottom: 5px;"> <p>View Maintenance Records</p> <p style="text-align: right;">Main</p> </div> <p>Press the right arrow (▶) button to view maintenance items.</p>	<div style="border: 1px solid black; border-radius: 15px; padding: 10px; margin-bottom: 5px;"> <p>View Maintenance Maintenance Item #####</p> <p style="text-align: right;">Back</p> </div> <p>Press the down arrow (▲) button to step to the next maintenance item.</p>
---	--

Maintenance Items	
Total Min not in Pref	Transfer Time N>E
Reset Min Not Pref	Transfer Time E>N
Total Min in Standby	Dual Src Conn Time
Reset Min in Standby	S1 to Open Time
Total Min Operation	S1 to Close Time
Reset Min Operation	S2 to Open Time
Total Transfers	S2 to Close Time
Reset Transfers	System Start Date
Total Fail Transfer	Last Maint Date
Reset Fail Transfer	Last Loss Date/Time
Total Loss Pref Tran	Last Loss Duration
Reset Loss Pref Tran	

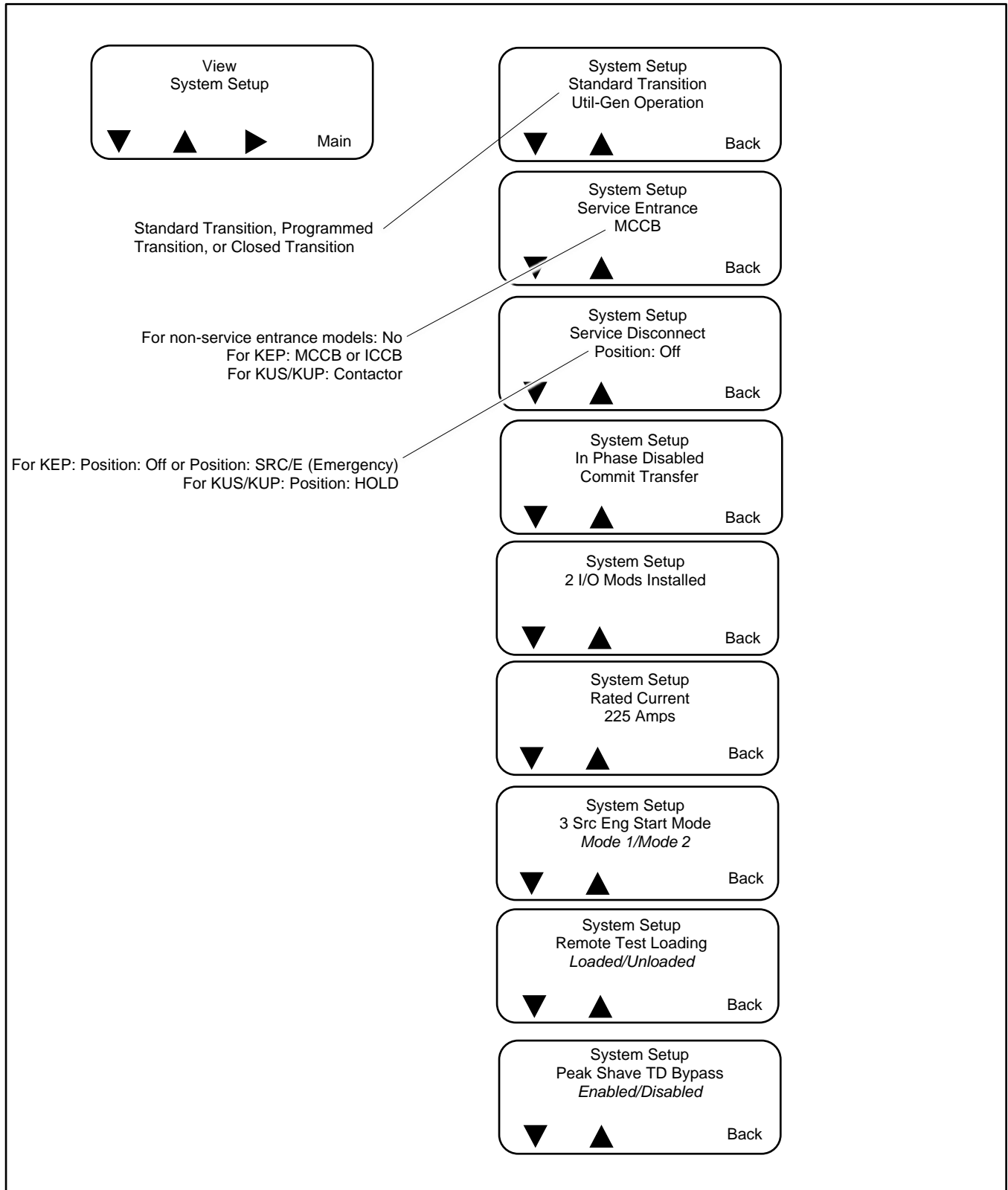
3.6 View Exerciser Setup



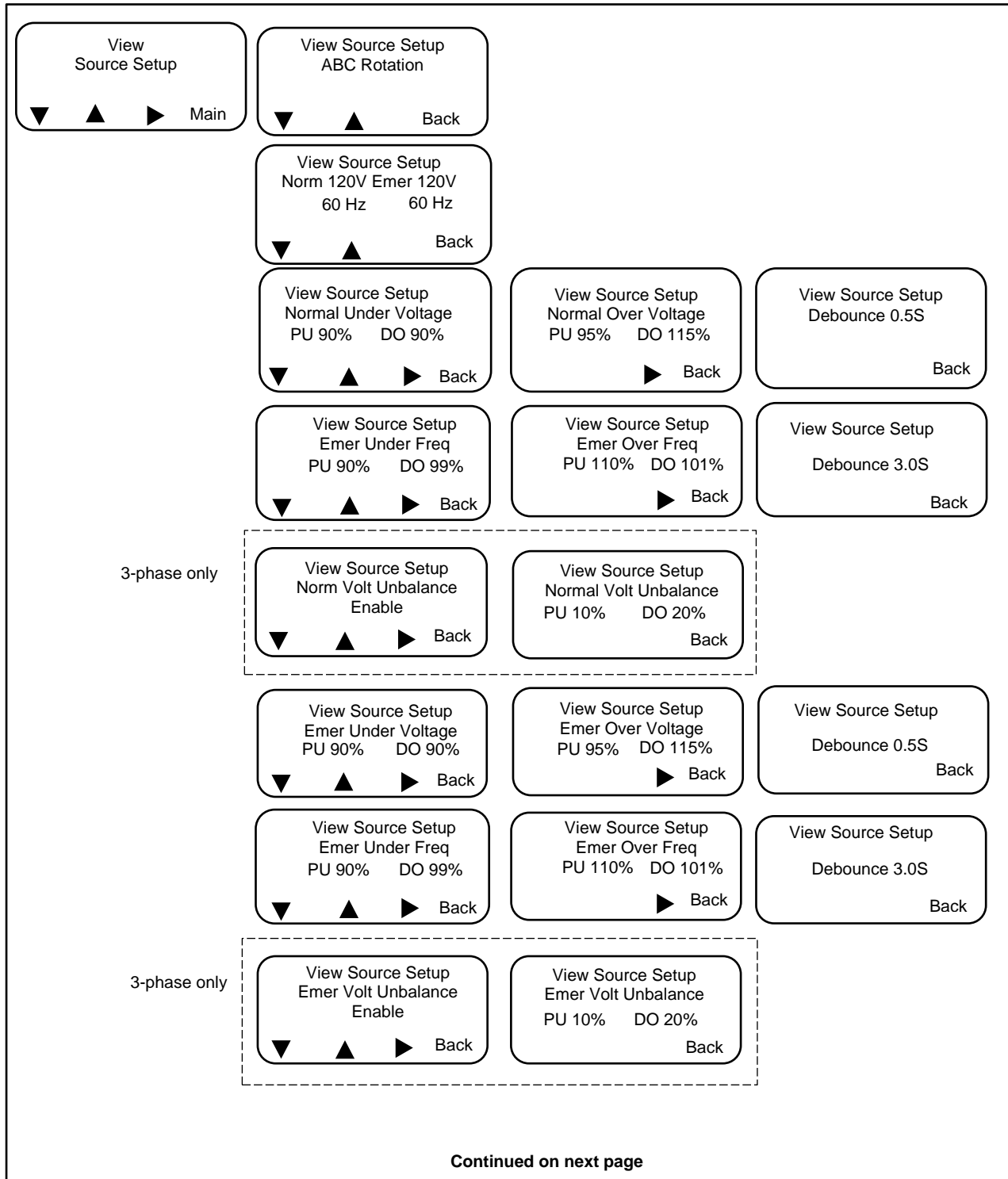
3.7 View Prime Power Setup



3.8 View System Setup



3.9 View Source Setup



Continued from previous page

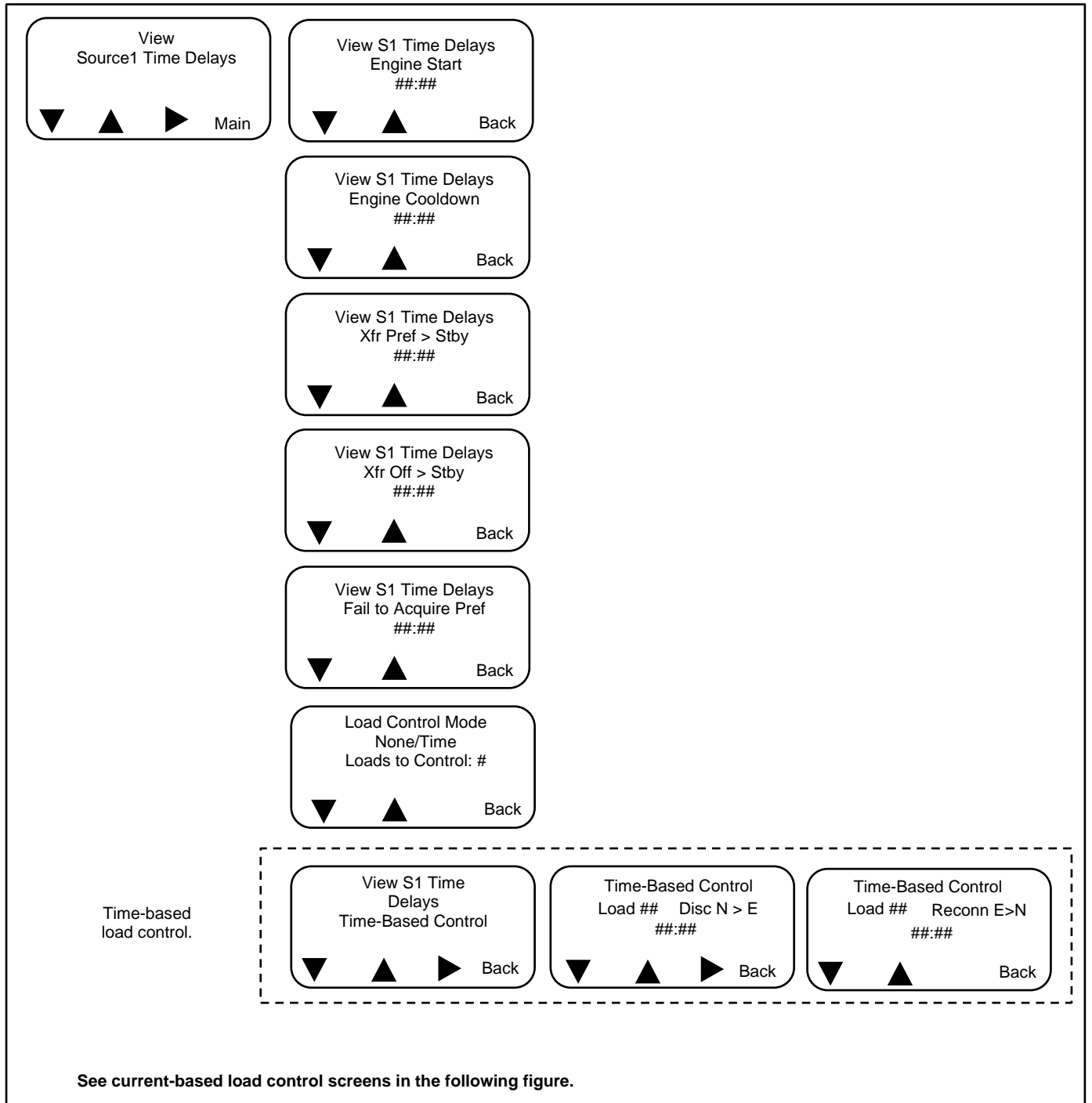
Standard Transition Only

View Source Setup In Phase Monitor ▼ ▲ ► Back	View Source Setup In Phase Monitor <i>Enabled/Disabled</i> ► Back	View Source Setup In Phase Monitor Angle XX Degrees Back
View Source Setup In Phase Xfer Fail ▼ ▲ ► Back	View Source Setup In Phase Xfer Fail <i>Enabled/Disabled</i> ► Back	View Source Setup in Phase Xfer Fail ##.## Back

Closed Transition Only

View Source Setup Synchronization Voltage Differential ▼ ▲ ► Back	View Source Setup Voltage Differential ## Percent Back	
View Source Setup Synchronization Freq Differential ▼ ▲ ► Back	View Source Setup Freq Differential 0.# Hz Back	
View Source Setup Synchronization Angle Differential ▼ ▲ ► Back	View Source Setup Angle Differential XX Degrees Back	
View Source Setup Fail to Sync ▼ ▲ ► Back	View Source Setup Fail to Sync <i>Enabled/Disabled</i> ► Back	View Source Setup Fail to Sync ##.## Back

3.10 View Time Delays, Source 1



View Time Delays, Source 1, Continued

Current-based load control screens, continued from Source 1 time delay screens.

View S1 Time Delays
Current-Based Contrl
Load Disc N>E

▼ ▲ ▶ Main

Current-Based Contrl
Load ## Disc N>E
##:##

▼ ▲ Back

View S1 Time Delays
Current-Based Contrl
Load Control Source1

▼ ▲ ▶ Main

Current-Based Contrl
Load Ctrl # Source1
Enabled/Disabled

▼ ▲ ▶ Main

Current-Based Contrl
Load # Add Source1
##:##

▼ ▲ ▶ Main

Current-Based Contrl
Amps Lvl Remove Srce1
Amps: ####

▼ ▲ ▶ Main

Current-Based Contrl
Load # Add Source1
Priority: #

▼ ▲ ▶ Main

Current-Based Contrl
Amps Lvl Add Source1
Amps: ####

▼ ▲ ▶ Main

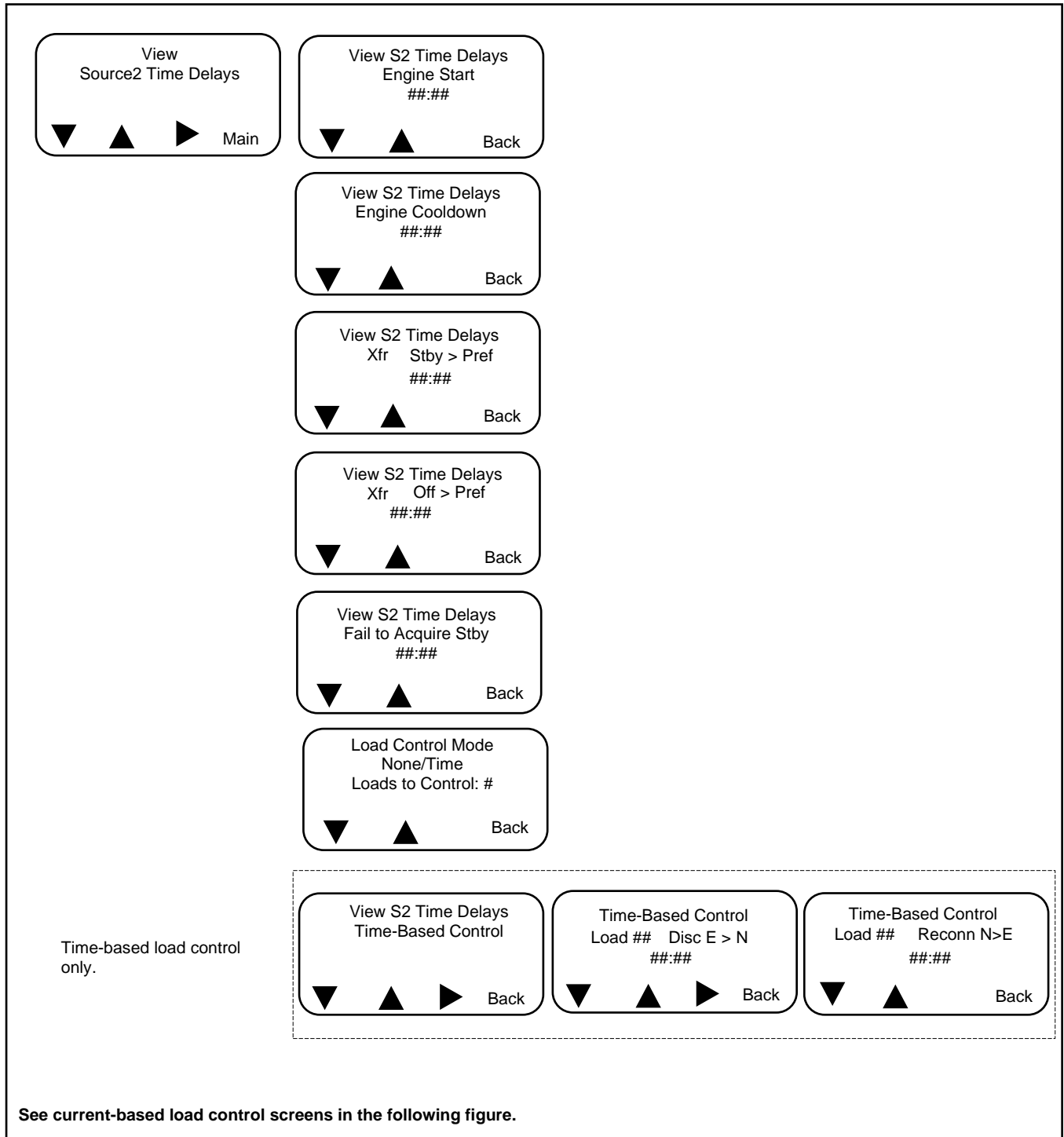
Current-Based Contrl
Load # Remove Source1
####

▼ ▲ ▶ Main

Current-Based Contrl
Load # Remove Source1
Priority: #

▼ ▲ Back

3.11 View Time Delays, Source 2



View Time Delays, Source 2, Continued

Current-based load control screens, continued from Source 2 time delay screens.

View S2 Time Delays
Current-Based Contrl
Load Disc N>E

▼ ▲ ▶ Main

Current-Based Contrl
Load ## Disc N>E
##:##

▼ ▲ Back

View S1 Time Delays
Current-Based Contrl
Load Control Source2

▼ ▲ ▶ Main

Current-Based Contrl
Load Ctrl # Source2
Enabled/Disabled

▼ ▲ ▶ Main

Current-Based Contrl
Load # Add Source2
##:##

▼ ▲ ▶ Main

Current-Based Contrl
Amps Lvl Remove Source2
Amps: #####

▼ ▲ ▶ Main

Current-Based Contrl
Load # Add Source2
Priority: #

▼ ▲ ▶ Main

Current-Based Contrl
Amps Lvl Add Source2
Amps: #####

▼ ▲ ▶ Main

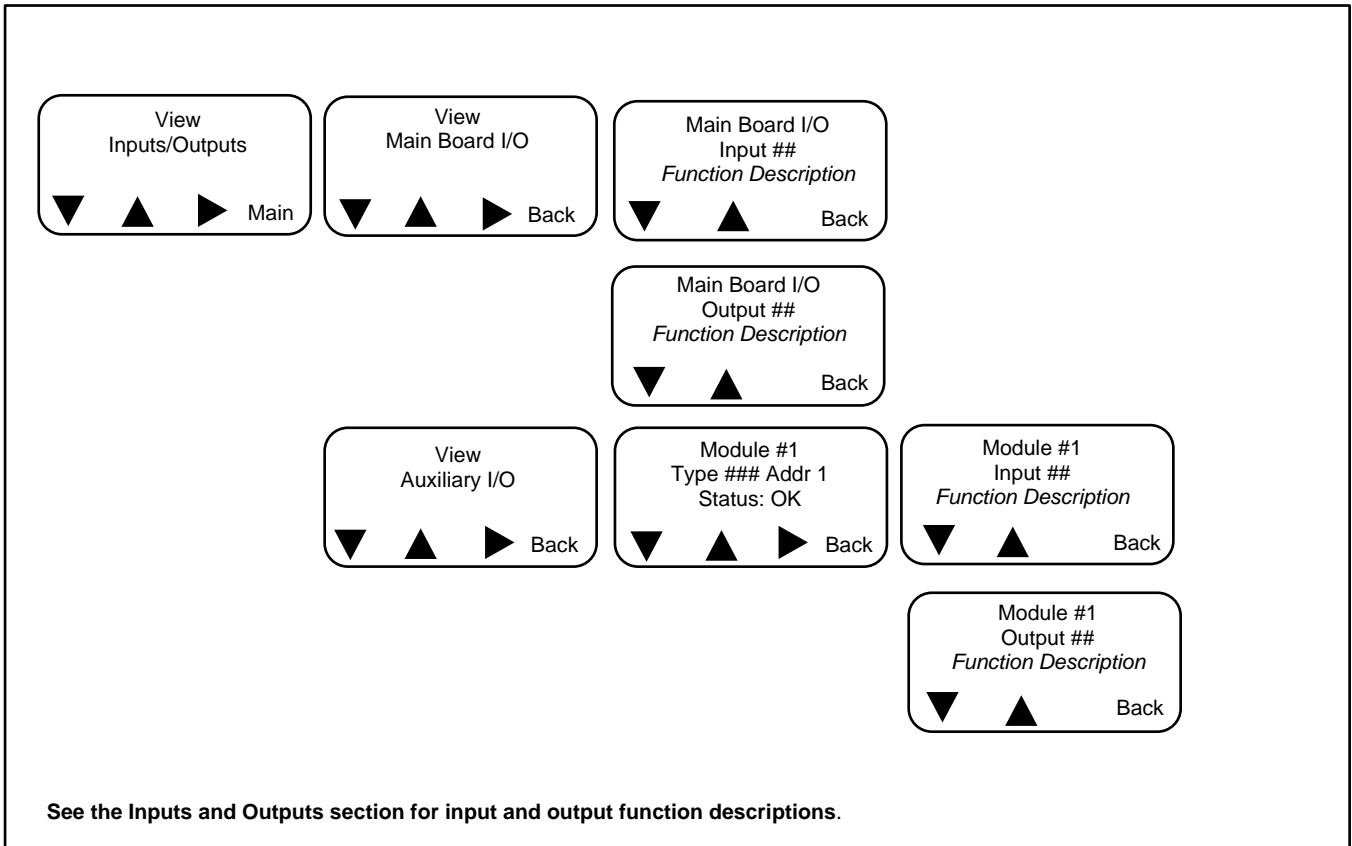
Current-Based Contrl
Load # Remove Source2
####

▼ ▲ ▶ Main

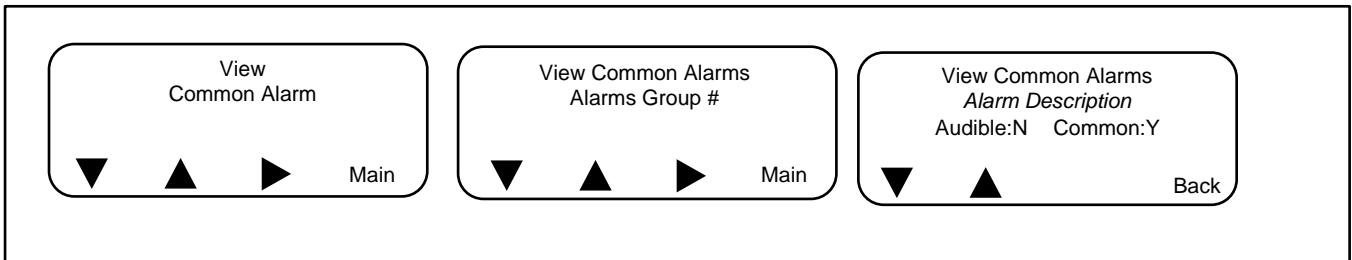
Current-Based Contrl
Load # Remove Source2
Priority: #

▼ ▲ Back

3.12 View Inputs/Outputs

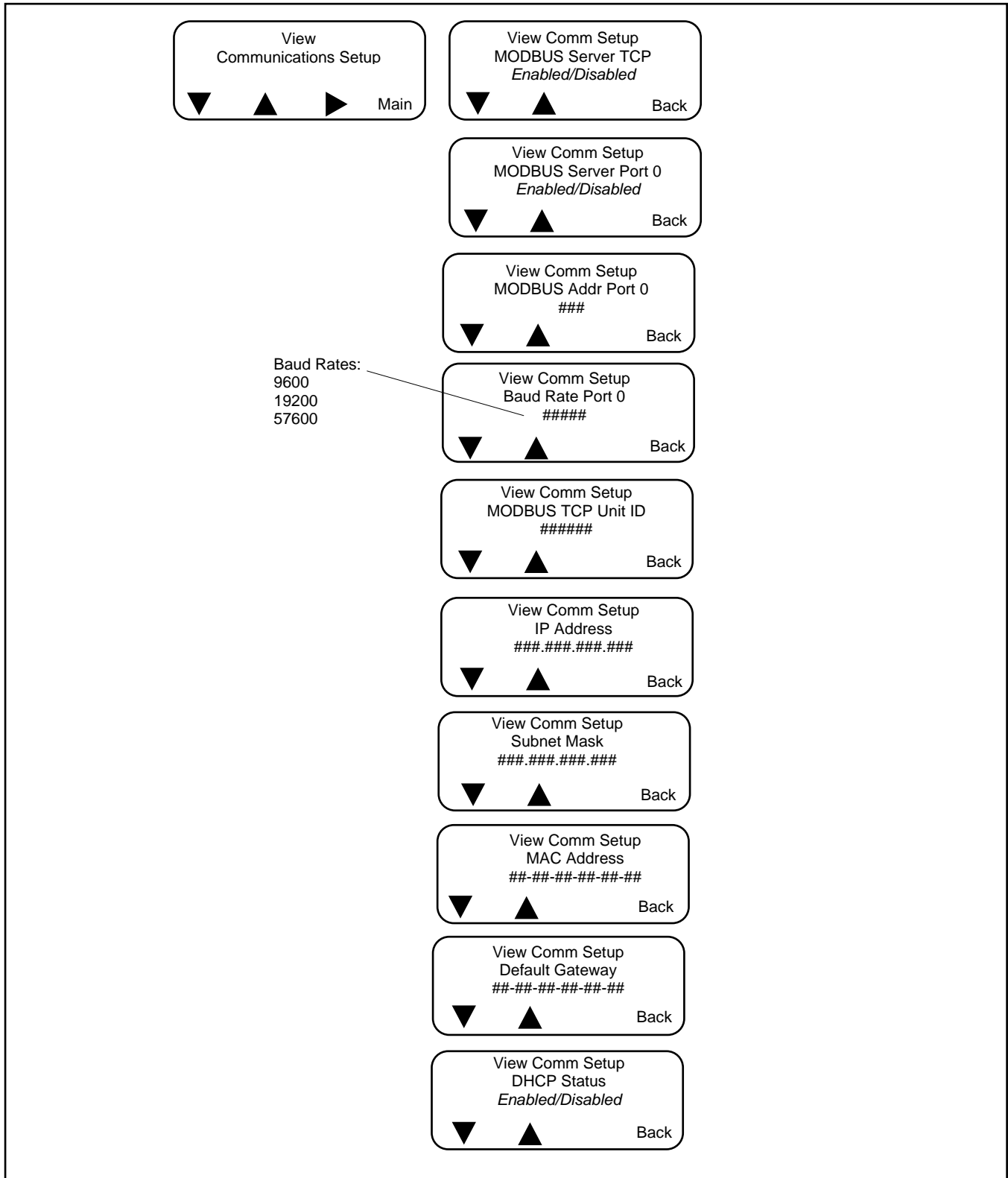


3.13 View Common Alarms



3.14 View Communications Setup

Ethernet communication requires the Ethernet communication accessory board.



3.15 View Control Parameters

The site designation, load description, branch description, and location are designed to identify the transfer switch. Use a personal computer and Kohler® SiteTech™ software to enter descriptions that uniquely identify the transfer switch. In SiteTech, these items appear under ATS Information.

Kohler SiteTech software is available to Kohler authorized distributors and dealers.

View Control Parameters ▼ ▲ ▶ Main	Control Parameters Application Ver: ▼ ▲ Back
	Control Parameters ATS Serial Number: ##### ▼ ▲ Back
	Control Parameters Controller Ser. #: ##### ▼ ▲ Back
	Control Parameters Contactor Serial #: ##### ▼ ▲ Back
	Control Parameters Site Designation: NOT SET ▼ ▲ Back
	Control Parameters Load Description: NOT SET ▼ ▲ Back
	Control Parameters Branch Description: NOT SET ▼ ▲ Back
	Control Parameters Location: NOT SET ▼ ▲ Back

Note:
Serial numbers are factory-set. Use SiteTech™ software to set the other parameters to identify the transfer switch.

4.1 Introduction

The Decison-Maker® MPAC 1500 controller is factory-set for your transfer switch model. Some settings may need to be changed at installation or during service. This section lists factory default settings and includes instructions to change parameter settings using the setup menus.

Use the Setup menus to change the controller time delays, pickup and dropout settings, inputs, outputs, and options, if necessary.

Settings can also be assigned using a personal computer with Kohler® SiteTech™ software or over Modbus. SiteTech™ software is available to authorized Kohler distributors. See TP-6701, SiteTech Software Operation Manual, for instructions to change settings using SiteTech software. See TP-6113, Modbus Protocol Manual, for Modbus register maps.

4.2 Setup Menus

From the main operation window, press the Set button to enter the setup menus.

The setup password is required. The default password is 0000. Changing the password is recommended. See Set Passwords Section for instructions to change the password.

After entering the password, use the black arrow keys to step through the setup menus as shown in Figure 31.

Timeout. After 10 minutes of no activity (no buttons pressed) the controller exits the setup mode and returns to the main menu.

The following sections discuss the setup menus in the order of appearance on the controller.

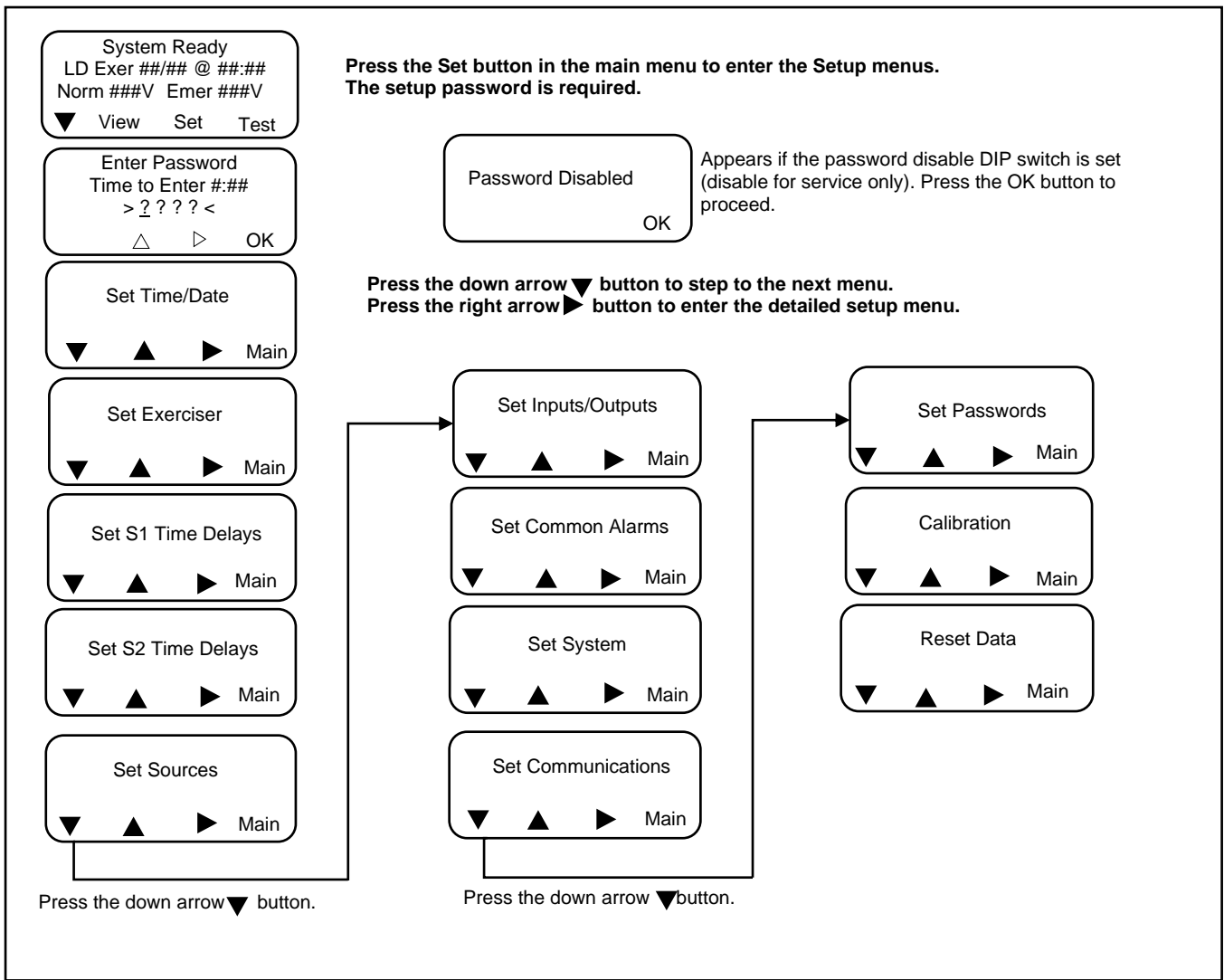


Figure 31 Main Setup Menus

4.3 Time/Date

Note:

Set the current time and date after transfer switch installation or after an extended period of no power.

Set the current time and date. The time and date are used by the exercise function and event history functions.

The Time/Date setup menu includes the option to enable automatic Daylight Saving Time and set the start and stop date. See Figure 32.

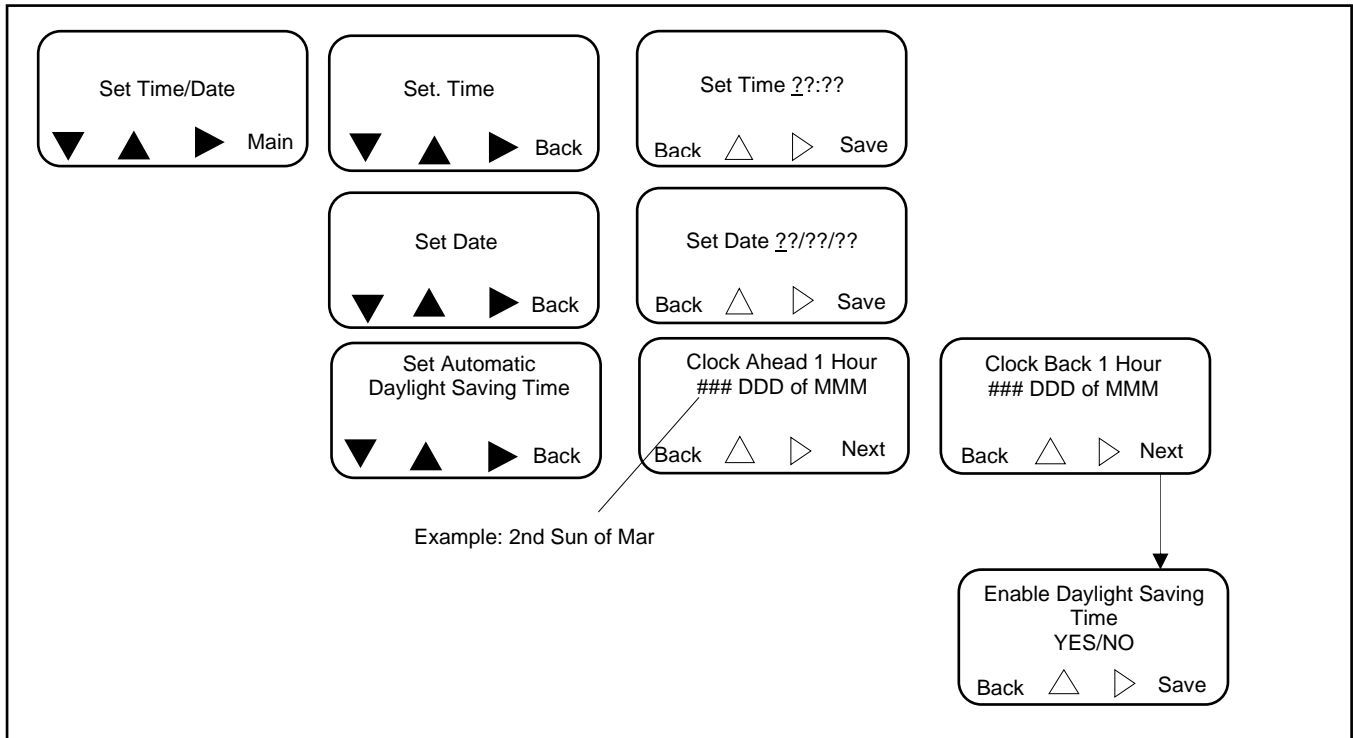


Figure 32 Setting the Time and Date

4.4 Exerciser

The exerciser uses a calendar-based scheduling system. Up to 21 different exercise events can be scheduled, each with different settings. Exerciser settings include the start date, start time, run duration, type (loaded or unloaded), interval, and repeat rate.

An exercise event can be temporarily disabled to prevent its execution and then re-enabled later using the enable/disable setting.

The next scheduled exercise time and date are indicated on the main menu. (See Figure Main Menu in Main Menu Section)

4.4.1 Setting the Exerciser

See Figure 33 and Figure 34.

Exerciser Parameter	Description
Event Number	Each scheduled exercise is called an event. Up to 21 different exercise events can be set, each with different settings for the parameters shown in this table.
Enable/Disable	Enable the event to allow it to run as scheduled. Disable an event to prevent it from running. The event remains on the calendar so that it can be enabled again at a later time. This allows you to temporarily prevent a scheduled exercise event from running, and then enable it again later without having to re-enter all the settings.
Loaded/Unloaded	A loaded exercise starts the generator set and transfers the electrical load from the normal source to the standby generator set. An unloaded exercise will start and run the generator set without transferring the load.
Interval	Daily, weekly, monthly, or day/month. This setting works with the repeat rate to set the time interval between exercise runs. The day/month selection allows you to set the exerciser to run on the same day every month. For example, the exerciser can be set to run the first Sunday of every month. Use caution with the day/month selection. For example, selecting day/month on the 5th Friday of the month will cause the exerciser to run only during months that have five Fridays.
Repeat Rate	The repeat rate works with the interval to set the time interval between exercise runs. For example, if <i>Day</i> is selected as the interval, and 5 is selected as the repeat rate, then the exercise will repeat every 5 days. Select a number between 1 and 12.
Duration	Enter the exercise run duration in hours:minutes. For example, a run time of 00:30 will run the generator set for 30 minutes. The maximum run time is 24 hours.
Start Date	Enter the date, month/date/year, of the first exercise event. Subsequent events will be scheduled based on the interval and repeat rate.
Start Time	Enter the desired start time of the exercise run in hours:minutes. The time settings range from 00:00 to 23:59, with 00:00=midnight.

Figure 33 Exerciser Settings

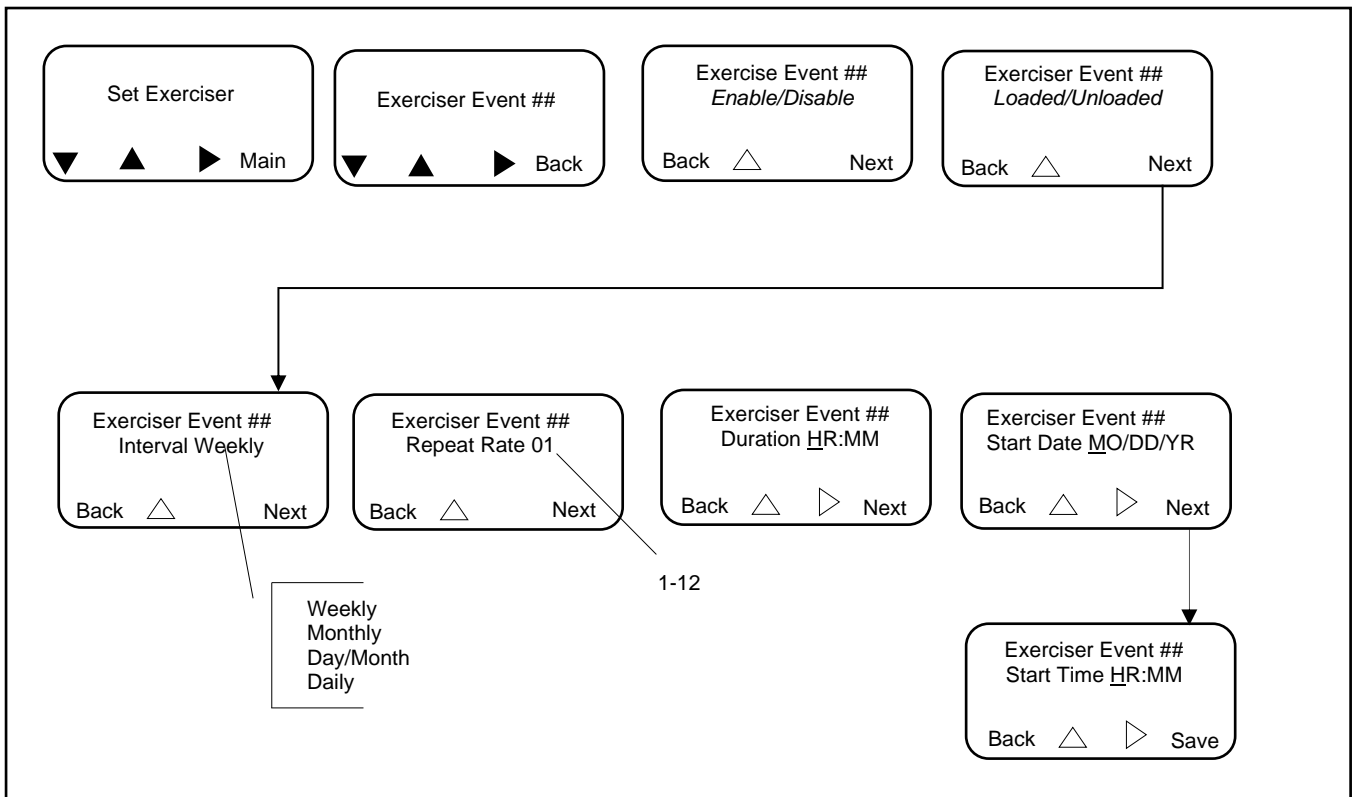


Figure 34 Setting the Exerciser

4.4.2 Source/Source Mode

In the Util-Gen mode, the exercise function occurs on the standby source. In Gen-Gen mode, the standby source generator set is exercised.

In a three-source system, there are two generators on the standby transfer switch. The exercise function is programmed and controlled by the standby transfer switch. For a loaded exercise, the standby transfer switch schedule is synchronized with the preferred transfer switch and the standby exercise occurs within the preferred transfer switch exercise period. This allows either generator set to run under the load designated by the utility exercise periods.

4.5 Prime Power Run

The transfer switch can be used between two prime power sources (two generator sets). The prime power run feature allows the controller to sequence the usage of each generator set to equalize the run times. Prime power mode is not available for service entrance models.

Note:

Follow the generator set requirements for prime power operation and maintenance. Not all generator sets are approved for prime power applications; check the generator set documentation.

An external battery module is recommended for this type of application. See External Battery Supply Module (EBSM/BOB) Section.

4.5.1 Prime Power Mode Setup

- In the Set System menu, set the source type to Gen-Gen. See Set System Section.
- Connect the engine start leads of the source 2 generator set to the ATS engine start leads. See the ATS Operation/Installation Manual for the engine start connection terminals.
- Connect the engine start leads of the source 1 generator set to output 1. Connect to a different output on the main logic board or accessory I/O module if output 1 is not available. Assign the Source N Start Signal function to the output connected to the source 1 generator set engine start leads. See Programmable Inputs and Outputs Section.
- Check the over frequency and under frequency pick up and drop out settings for both sources, and adjust if necessary.
- Set the normal source engine start and engine cool down time delay settings.
- Navigate to the Set Prime Power Run menu. Enable the prime power event and program the S1 and S2 generator set run duration times in days:hours:minutes (i.e. how long each generator set runs before transfer to the other generator set). See Figure 35.
- In the Prime Power Event menu, use the up arrow button to switch between Start and Stop. Select Start and then press Save to save the duration settings and start the prime power sequence.

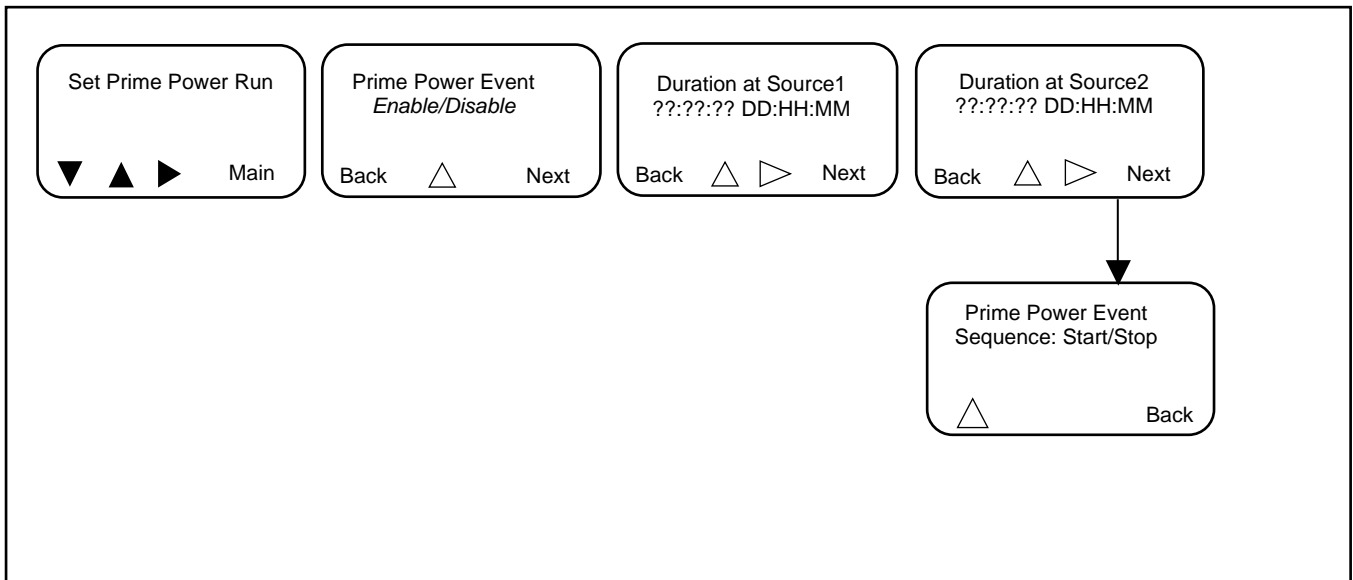


Figure 35 Set Prime Power Run Menu

4.5.2 Prime Power Mode Operation

During a prime power run sequence, the main menu displays a countdown of the run time remaining for the generator set that is currently running.

The transition type selected in the Set System menu determines the type of transfer between the two prime power sources. For example, on closed-transition model transfer switches, the transfer between sources will be closed, resulting in no power interruption to the load during transfer. Other transition types use a break-before-make transfer that can cause a brief interruption of power to the load.

Note:

Only Model KCC and KBC transfer switches can operate in closed-transition mode.

During a prime power sequence, the preferred source selection alternates so that the generator set operating at the time is designated as the preferred source.

Press the end button to start the other generator set and transfer the load. The generator set run time may be ended by pushing the end time delay button. This will start the alternate source, transfer the source, and run on the alternate source for the programmed period of time. The first generator set will run for the programmed engine cool down time and then be signaled to stop.

To stop the prime power run sequence, enter the Set menus (password required), navigate to the Set Prime Power Run menu, Prime Power Event Sequence Start/Stop. Use the up arrow button if necessary to switch to Stop, and press Save.

4.6 Time Delays

4.6.1 Time Delays

The factory settings and adjustment ranges for the time delays are shown in Figure 36.

The engine start time delay and transfer time delays can prevent nuisance transfers caused by brief voltage dips or surges. The engine cool-down time delay holds the engine start contacts closed for a designated time after transfer to allow the generator set to run without load before shutting down.

Time Delay Description	Description/Note	Default Time	Adjustment Range
Engine Start, Source S2	Source S2 - Util/Gen and Gen/Gen modes	3 sec	0- 6 sec*
Engine Start, Source S1	Source S1 - Use for Gen/Gen mode	3 sec	
Engine Cool down, Source S2	Source S2 - Util/Gen and Gen/Gen modes	5 sec	0- 60 min
Engine Cool down, Source S1	Source S1 - Gen/Gen mode	2 sec	
Xfr Pref>Stby	Transfer delay, preferred to standby	3 sec	
Xfr Stby>Pref	Transfer delay, standby to preferred	15 min	
Xfr Off>Stby	Time in the OFF position (Preferred to Standby for programmed transition models only)	1 sec	1 sec. - 60 min
Xfr OFF>Pref	Time in the OFF position (Standby to Preferred for programmed transition models only)	1 sec	1 sec. - 60 min
Fail to Acquire Pref	If the preferred source does not reach acceptable voltage and stabilize within the allowed time, the Fail to Acquire Preferred Source fault is activated.	1 min	0- 60 min
Fail to Acquire Stby	If the standby source does not reach acceptable voltage and stabilize within the allowed time, the Fail to Acquire Standby Source fault is activated.	1 min	
Fail to Synch (found in the Set Sources menu)	For closed-transition models only. Operates when two sources are available. If the sources do not synchronize before the Fail to Sync time delay expires, the programmed- transition override function operates. See Set System Section.	1 min	10 seconds - 15 min
In-Phase Xfr Fail (found in the Set Sources menu)	For in-phase monitoring: the time allowed for the two sources to come into synchronization within specified phase angle before a Fail to Sync fault is activated. See Set Sources Section.	30 sec	0- 60 min
Load # Disc N>E	Disconnect load before-transfer to standby source. Used for time-based and current-based load control. See Load Control Section.	0 sec	
Load # Rec N>E	Reconnect load after-transfer to standby source. Used for time-based load control. See Load Control Section.	0 sec	
Load # Disc E>N	Disconnect load before-transfer to preferred source. Used for time-based and current-based load control. See Load Control Section.	0 sec	
Load # Rec E>N	Reconnect load after-transfer to preferred source. Used for time-based load control. See Load Control Section.	0 sec	0- 60 min
Load # Add Source1/Source2	For current-based load control. See Current-Based Load Control Section.	0 sec	
Load # Remove Srce1/Srce2	For current-based load control. See Current-Based Load Control Section.		

* The optional external battery module allows extended engine start time delays from 0- 60 min.

Figure 36 Time Delay Settings

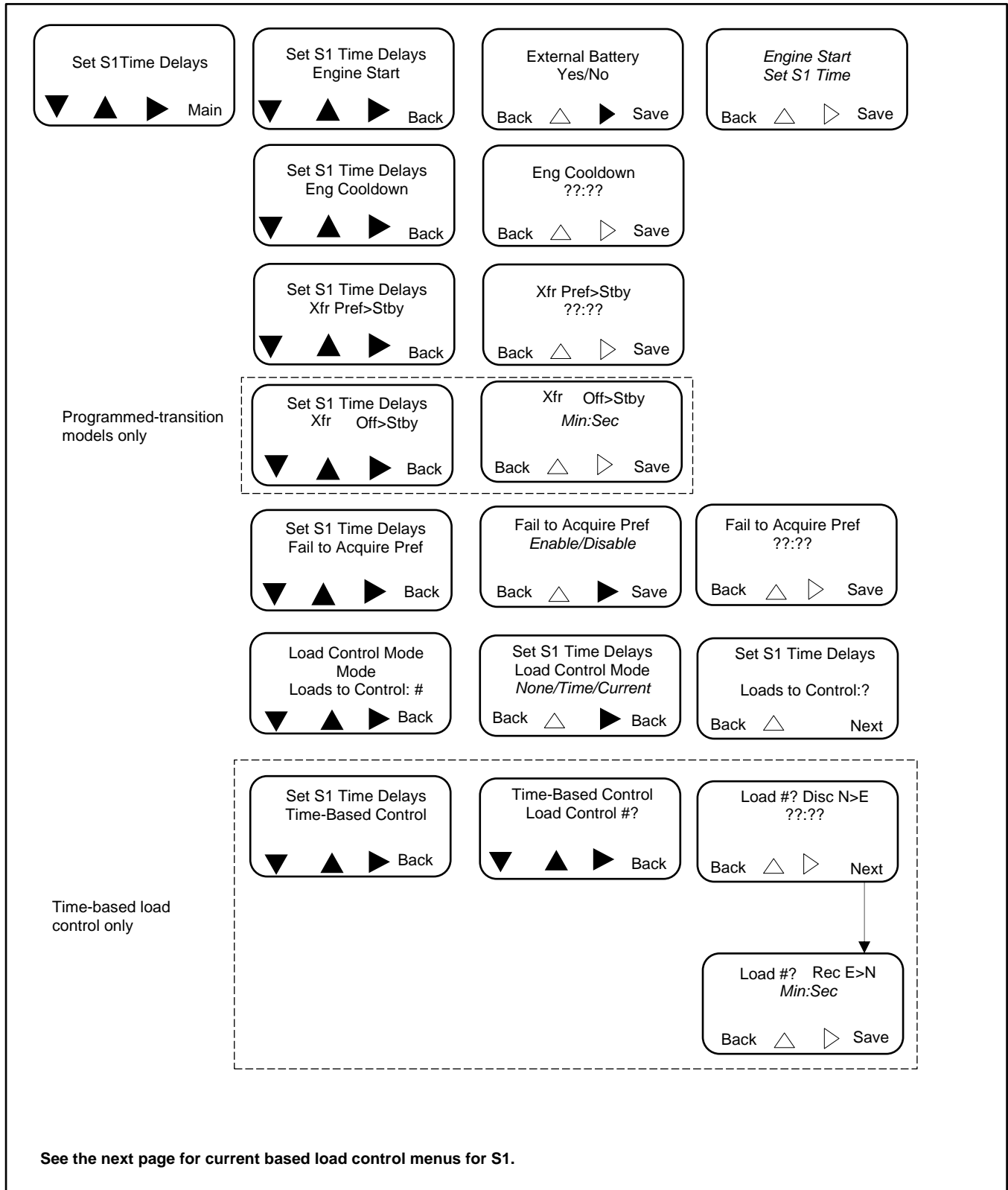
4.6.2 Load Control Time Delays

The pre/post-transfer load control time delays allow loads to be sequenced on and off prior to and following transfers. The pre-transfer signals are active only when both sources are available. The pre-transfer signals overlap the transfer time delays (Xfr N>E and E>N). The longer delay determines the time delay before transfer. Up to nine loads can be controlled with independent timing sequences for pre- and post-transfer delays in either direction of transfer.

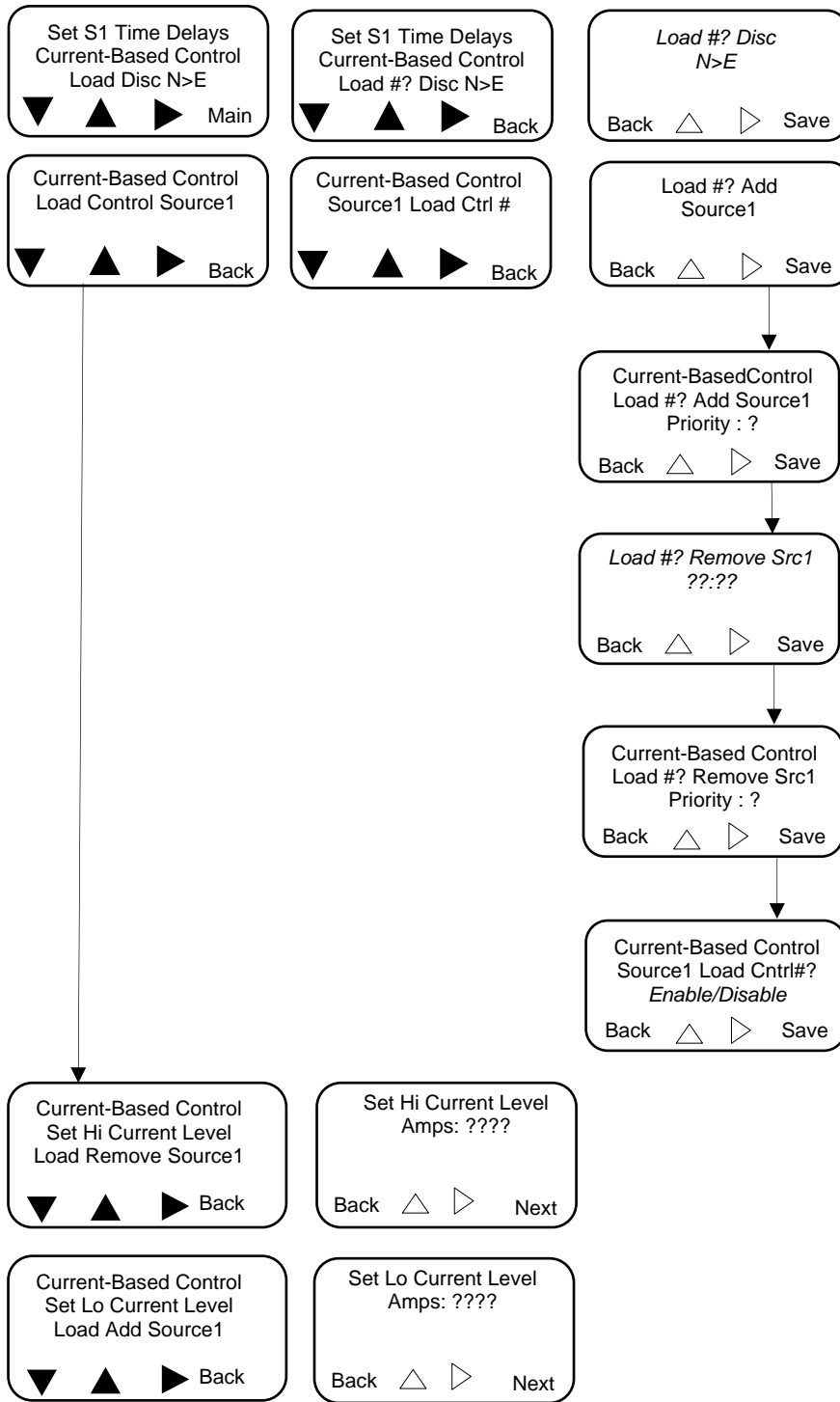
Current-based load control is also available. Current-based load control uses the Load Disconnect, Load Add Source1/Source2, and Load Remove Source1/Source2 time delays. Time-Based Load Control Section for more information about the time delays used for current-based load control.

Proceed to Load Control Section, for more information.

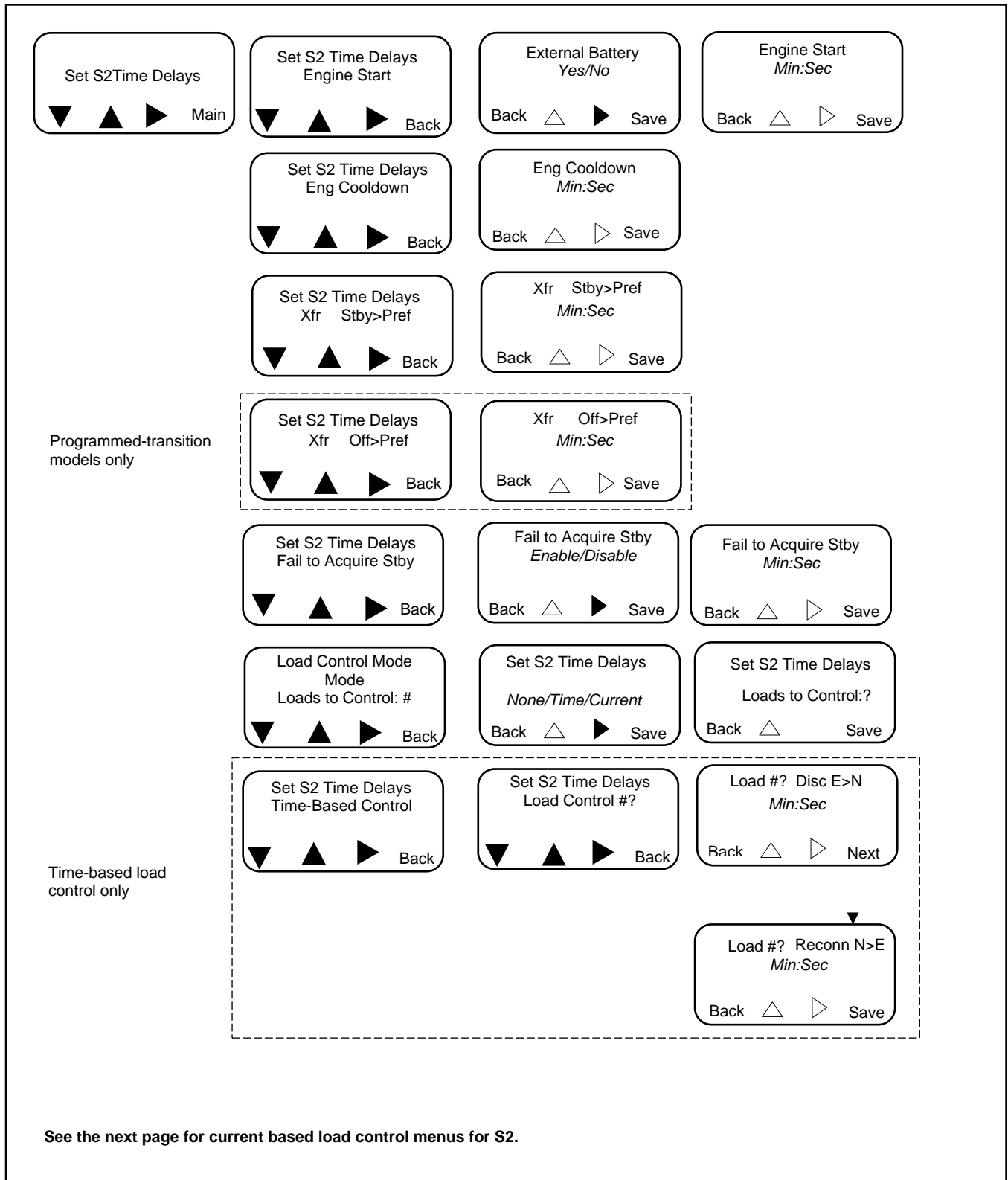
4.6.3 Set S1 Time Delays



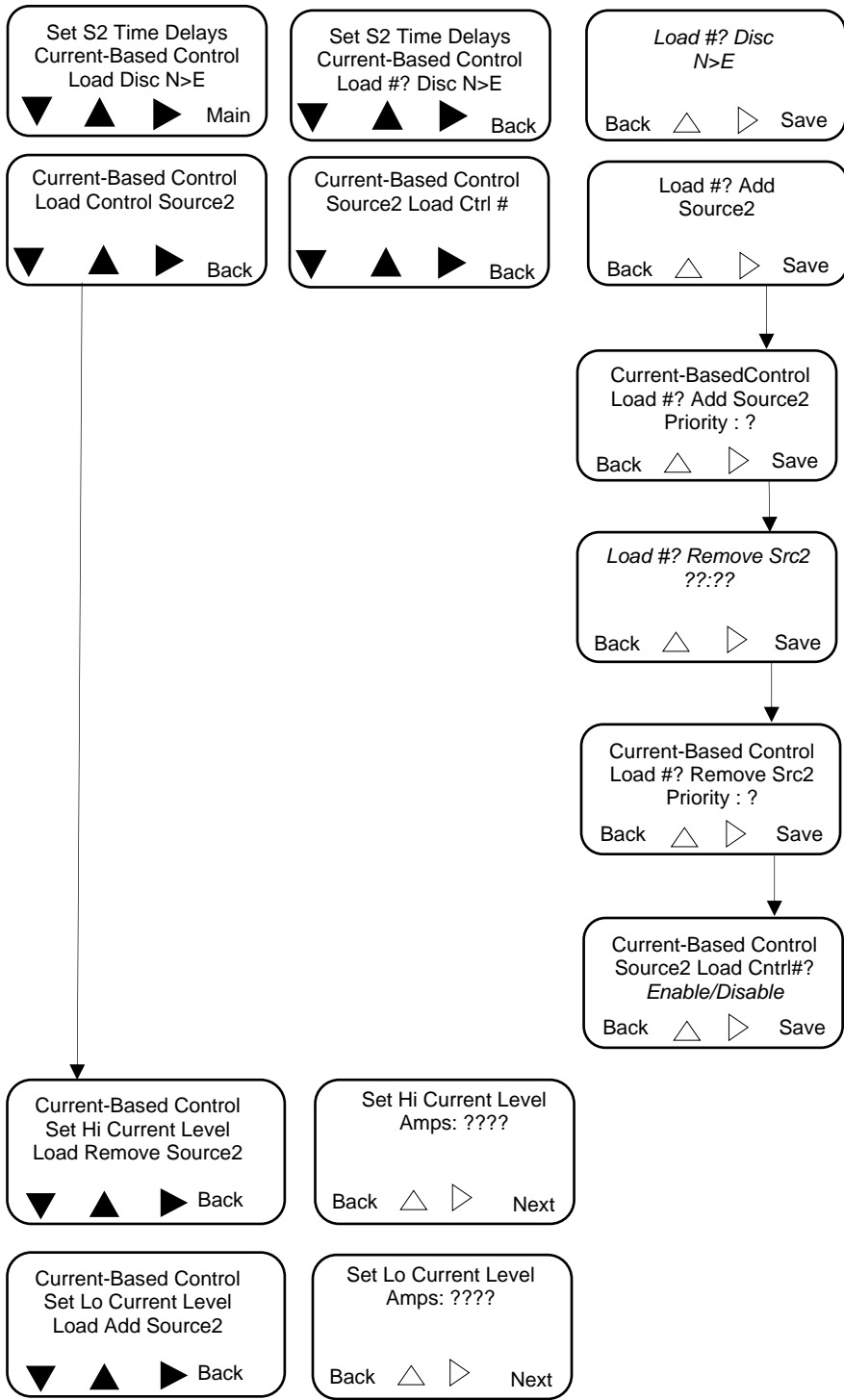
Current-Based Load Control Menus Continued from Previous Page:



4.6.4 Set S2 Time Delays



Current-Based Load Control Menus Continued from Previous Page:



4.7 Load Control

The controller allows control of up to 9 separate loads. Two load control modes allow selected loads to be disconnected and reconnected to the source:

- Time-based load control adds and removes loads according to a timed sequence before and after transfer.
- Current-based load control adds or removes loads according to the current measured through the transfer switch. This mode allows load control based on power usage.

The load control function is not activated if the controller detects no available source. The pre-transfer signals are active only when both sources are available; for example, during loaded test, loaded exercise, or programmed transfers for peak shave operation when the transfer is controlled.

Note that the load control can be set up to operate during transfer to Source1 and/or Source2. Your application may require load control during transfer to one source (e.g. a generator set) but not the other source (e.g. the utility).

Two types of load control are available: time-based load control and current-based load control.

Note:

The load control setup parameters are found in the Set S1 Time Delays and Set S2 Time Delays menus. See Set S1 Time Delays Section and Set S2 Time Delays Section for the time delay menus.

4.7.1 Time-Based Load Control

The time-based load control function allows selected loads to be disconnected from the source before transfer and reconnected to the source after transfer at different time intervals. The loads can be connected and disconnected at different times for each source. The pre-transfer signals are active only when both sources are available.

When the load control function is activated, the contacts open a programmed length of time before transfer to allow controlled disconnection of selected loads. After transfer, the contacts remain open for a programmed length of time and then close to allow controlled application of selected loads. For example, large motor loads such as an air conditioner can be delayed to start after other essential loads have been transferred.

The pre-transfer signals overlap the preferred-to standby and the standby-to-preferred time delays. See Figure 37. If any of the pre-transfer load disconnect time delays are longer than the transfer time delay, the longest delay will control the time delay before transfer.

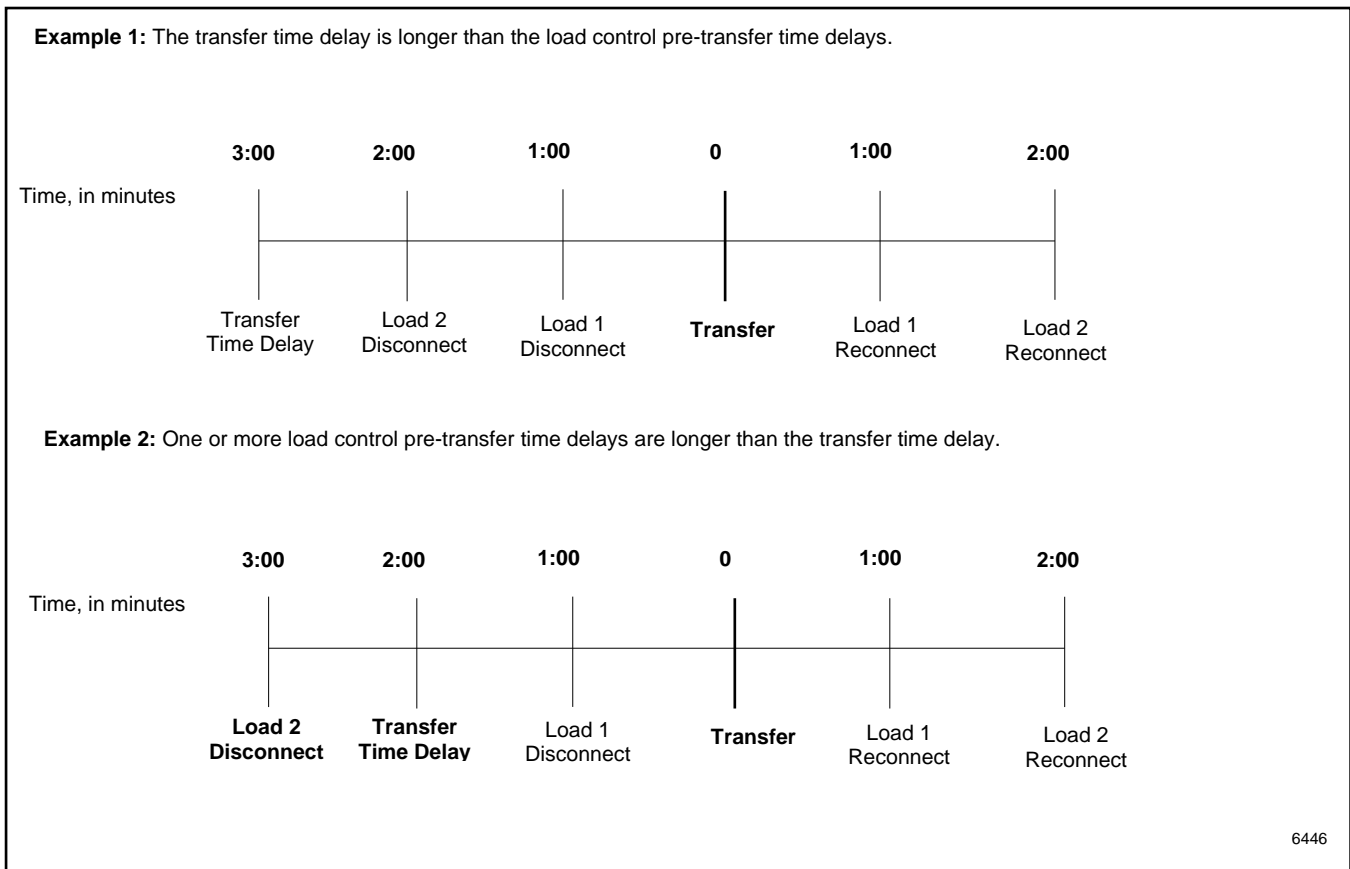


Figure 37 Time-Based Load Control and Transfer Time Delays

Time-Based Load Control Setup

The Load # Disc N>E pre-transfer time delay disconnects loads a programmed time before transfer from Normal to Emergency. The pre-transfer delays operate during loaded test, loaded exercise, or programmed transfers for peak shave operation when the transfer is controlled.

The Load # Reconn E>N post-transfer time delay reconnects loads a programmed time after transfer to Normal. The post-transfer time delay allows delayed or staggered addition of selected loads to avoid starting numerous large motors or other large loads at the same time. Staggering the loads can minimize voltage dips as large loads come online.

The Loads to Add setting is the number of loads that have been connected to load control outputs for pre-transfer disconnect and delayed reconnect. Up to 9 separate loads can be connected.

Setting up the load control function requires the following steps:

1. Connect each selected load to an output terminal on the main logic board or one of the input/output modules. The high power module accessory is available for high voltage or high current loads.
2. Use the Set Inputs/Outputs menu to assign the connected output to one of the load control outputs 1-9. See Inputs and Outputs Section.
3. Navigate to the Set S1 Time Delays or Set S2 Time Delays menu. See Set S1 Time Delays Section and Set S2 Time Delays Section for the time delay menus.

Note:

Save the setting after each step and then use the Back and arrow buttons to navigate to the next setting as needed.

4. In the Set S1 Time Delays menu, select Time as the load control mode.
5. Enter the number of loads to control, which is equal to the number of loads connected to outputs in step 1.

6. Use the Set S1 Time Delays menu to set the following associated time delays.
 - a. Load # Disc N>E: Enter the pre-transfer time delay in Minutes: seconds, up to 60 minutes.
 - b. Load # Reconn E>N: Enter the post-transfer time delay in Minutes: seconds, up to 60 minutes.
 - c. Loads to Add: Enter the number of loads that have been connected to load control outputs, from 1 to 9.
7. If time-based load control is required for source 2, go to the Set S2 Time Delays menu and repeat steps 3 through 6 for source 2.

4.7.2 Current-Based Load Control

Current-based load control allows the addition and removal of loads based on the measured current through the transfer switch. This feature requires an optional current sensing kit, which includes appropriately rated current transformers (CTs) and wiring designed for your transfer switch. See Current Sensing Section.

Current-based load control can be enabled for one or both sources. The feature incorporates high and low current setpoints for either source in amps. The user can designate up to 9 outputs for current-based or time-based load control.

Non-critical loads can be removed during periods of high power usage. When the current exceeds a high current limit, loads are removed in sequence according to their priority settings until the current falls below the high current limit. If the current level drops below the low current limit, loads are added in order of their priority.

The add priority and remove priority settings are set separately and can be different for the same load. Add Priority #1 loads are added first. Remove Priority #1 loads are removed first.

Example:

If you have four loads, with one load that should be added first and removed last, set Add Priority = 1 and Remove Priority = 4 for that load. Prioritize the other loads according to the order in which they should be added and removed.

Adjustable time delays prevent load addition and removal caused by momentary current variations. There are three time delays associated with each load. See Figure 38 for time delays and other load control parameters.

Current-Based Load Control Setup Procedure:

1. Connect each selected load to an output terminal on the main logic board or one of the input/output modules. The high power module accessory is available for high voltage or high current loads.
2. Use the Set Inputs/Outputs menu to assign the connected output to one of the load control outputs 1-9. See Inputs and Outputs Section.
3. In the Set S1 or Set S2 Time Delays menu, select Current as the load control mode.
4. Enter the number of loads to control, which is equal to the number of loads connected to outputs in step 1.
5. Navigate to the Current-Based Control menu under Set S1 Time Delays or SetS2 Time Delays to set the following parameters for each connected load.
 - a. Load Disc N>E (or E>N): Set the load disconnect time delay before transfer to source E (or Source N). See Figure 38. Save the setting.
 - b. Load Ctrl # Source 1: Step through each load connected to a load control output and set the following parameters.
 - c. Load # Add Source1: Enter the time to wait before the load is added. This prevents nuisance changes caused by brief current dips. See Figure 38.
 - d. Load # Add Source1 (Source2) Priority: Assign a priority to each load. This number will be used to determine the order in which loads are added if the current drops below the low limit.
 - e. Load # Remove Src1 (Src2): Enter the time to wait before the load is removed. This prevents nuisance changes caused by brief current spikes. See Figure 38.
 - f. Load # Remove Src1 (Src2) Priority: Assign a priority to each load. This number will be used to determine which loads are removed first if the current rises above the high limit. (The priority 1 load is removed first.)
 - g. Source1 Load Ctrl # Enable/Disable: Toggle to Enable and press Save to enable load control for the selected load.
6. Set Hi Current Level, Load Remove Source1/Source2: Set the high current level. If the current rises above this limit, loads will be removed in order of their remove priority settings until the current falls back to an acceptable level.
7. Set Lo Current Level, Load Add Source1/Source2: Set the low current level. If the current drops below this level and some loads are not connected, loads will be added in the order of them add priority settings. (The add priority and remove priority settings for a load may be different.)

Parameter	Description	Adjustment Range
Outputs	Assign Load Control Out # to each connected load output. Use the Set Inputs/Outputs menu. See Section 4.9, Programmable Inputs and Outputs.	Load Control Out 1-9
Load Control Mode	Select Current for current-based load control. See Section 4.7.2 for more information.	None/Time/Current
Loads to Control	Enter the number of loads to be controlled. Each load must be connected to a separate output on the main logic board or accessory I/O module.	1-9
High Current Level	If the current rises above this limit, loads will be removed in order of their remove priority settings until the current falls back to an acceptable level.	0-4000 Amps
Low Current Level	If the current drops below this level and some loads are not connected, loads will be added in the order of their add priority setting.	0-4000 Amps
Load Control # Enable/Disable	Enable or disable current-based load control for each load on each source.	Enable or Disable
Add Priority	Assign a priority for the addition of each load when the current level falls below the low current level. Add Priority #1 loads are added first. The add priority and remove priority for a given load can be different.	1-9
Remove Priority	Assign a priority for the removal of loads when the current level rises above the high current level. Remove priority #1 loads are removed first. The add priority and remove priority for a given load can be different.	1-9
Disconnect (Disc) Time Delay	Time delay after a transfer signal to allow disconnection of selected loads before transfer to the other source. (Operates when both sources are present.)	00:00 to 59:59 min:sec
Load Add Source1 or Source2	Time delay after the current falls below the low limit until the load is added. Prevents load add caused by a momentary drop in the current.	00:00 to 59:59 min:sec
Load Remove Src1 or Src2	Time delay after the current rises above the high limit until the load is removed. Prevents load removal caused by a momentary rise in the current.	00:00 to 59:59 min:sec

Figure 38 Current-Based Load Control Parameters

4.8 Set Sources

4.8.1 Phase Rotation

The Phase Rotation menu appears only if a three-phase source is selected. (See Set Number of Phases later in the Set Sources menus for the Normal and Emergency sources.)

Select ABC, BAC, or disabled. Phase rotation can be disabled for programmed-transition models or standard-transition models in applications that do not have phase-sensitive loads. Phase rotation cannot be disabled on closed-transition models.

4.8.2 In-Phase Monitor

Standard-Transition Models

The in-phase monitor can be enabled or disabled for standard-transition models. The in-phase monitor operates prior to transfer when both sources are available. Transfer is inhibited while both sources are greater than 2 cycles apart. If the connected source falls below 70% of its nominal voltage rating, the in-phase monitor terminates and allows transfer.

The synchronism window has a default value of 5° and is adjustable from 15° to 5° before synchronism only. The in-phase monitor feature can be enabled for Util-Gen and Gen-Gen modes of operation. In Util-Util mode, it is assumed that both sources are always in phase with each other, and immediate transfer occurs when in-phase monitoring is enabled.

Programmed-Transition Models

The in-phase monitor is disabled for programmed transition models.

Closed-Transition Models

The in-phase monitor is always enabled for closed transition models. Synchronization settings for closed transition models include voltage differential, frequency differential, angle differential, and the Fail to Sync time delay. Transfer is inhibited when any of the differential readings between the two sources are outside the set limits. See Figure 39.

Parameter	Adjustment Range	Default Setting
Voltage Differential	0- 5%	5%
Frequency Differential	0- 0.3 Hz	0.1 Hz
Angle Differential	0- 10 degrees	10 degrees
Fail to Sync time delay	10 sec- 15 min.	1 min.

Figure 39 Synchronization Settings for Closed-Transition Switches

4.8.3 Preferred Source Selection

The preferred source selection function allows selection of either Source N or Source E as the preferred source.

Note:

The alarm module accessory must be installed for this function to operate. See Alarm Module Section.

The transfer switch seeks and transfers to the preferred source whenever it is available. Source N is always the source connected to the Normal side of the transfer switch, and Source E is always connected to the Emergency side. Generator engine start relays are assigned to the source (Source N or Source E). The engine start relays do not change when the preferred source selection changes. This prevents the need to change the wiring of the engine start relay(s) when the preferred source changes.

Time Delays and Source Parameters. Engine start relays and time delays, source voltage and frequency trip points, and load shed time delays are assigned to the source (N or E). They do not change assignment when the preferred source selection is changed.

Note:

Source N is always connected to the Normal side of the transfer switch, and Source E is always connected to the Emergency side.

Other time delays are assigned to the source function (preferred or standby). System parameters that are assigned to the function automatically change source when the preferred source selection changes. Figure 40 shows which parameters are assigned to the source and which are assigned to the function. The last two columns of the table show the effect of the preferred source selection on each parameter or time delay.

Item	Assignment	Preferred Source Selection	
		Normal	Emergency
Source N generator engine start relay	Source	N	N
Source E generator engine start relay	Source	E	E
Source N engine start time delay	Source	N	N
Source E engine start time delay	Source	E	E
Source N engine cool down time delay	Source	N	N
Source E engine cool down time delay	Source	E	E
Source N voltage and frequency trip points	Source	N	N
Source E voltage and frequency trip points	Source	E	E
In-phase monitor sync	Source	E	E
Pre-transfer to source N	Source	N	N
Pre-transfer to source E	Source	E	E
Post-transfer to source N	Source	N	N
Post-transfer to source E	Source	E	E
Preferred-to-standby time delay	Function	N to E	E to N
Standby-to-preferred time delay	Function	E to N	N to E
Failure to acquire standby source	Function	E	N
Off-to-standby time delay (programmed-transition only)	Function	Off to E	Off to N
Off-to-preferred time delay (programmed-transition only)	Function	Off to N	Off to E
Note: Source N is connected to the Normal side of the transfer switch, and Source E is connected to the Emergency side.			

Figure 40 Preferred Source Selection Effect on System Parameters and Time Delays

4.8.4 System Voltage and Frequency

For each source, set the number of phases, nominal voltage, and nominal frequency (50 or 60 Hz). Then proceed to set the pickup and dropout settings.

4.8.5 Voltage and Frequency Pickup and Dropout Settings

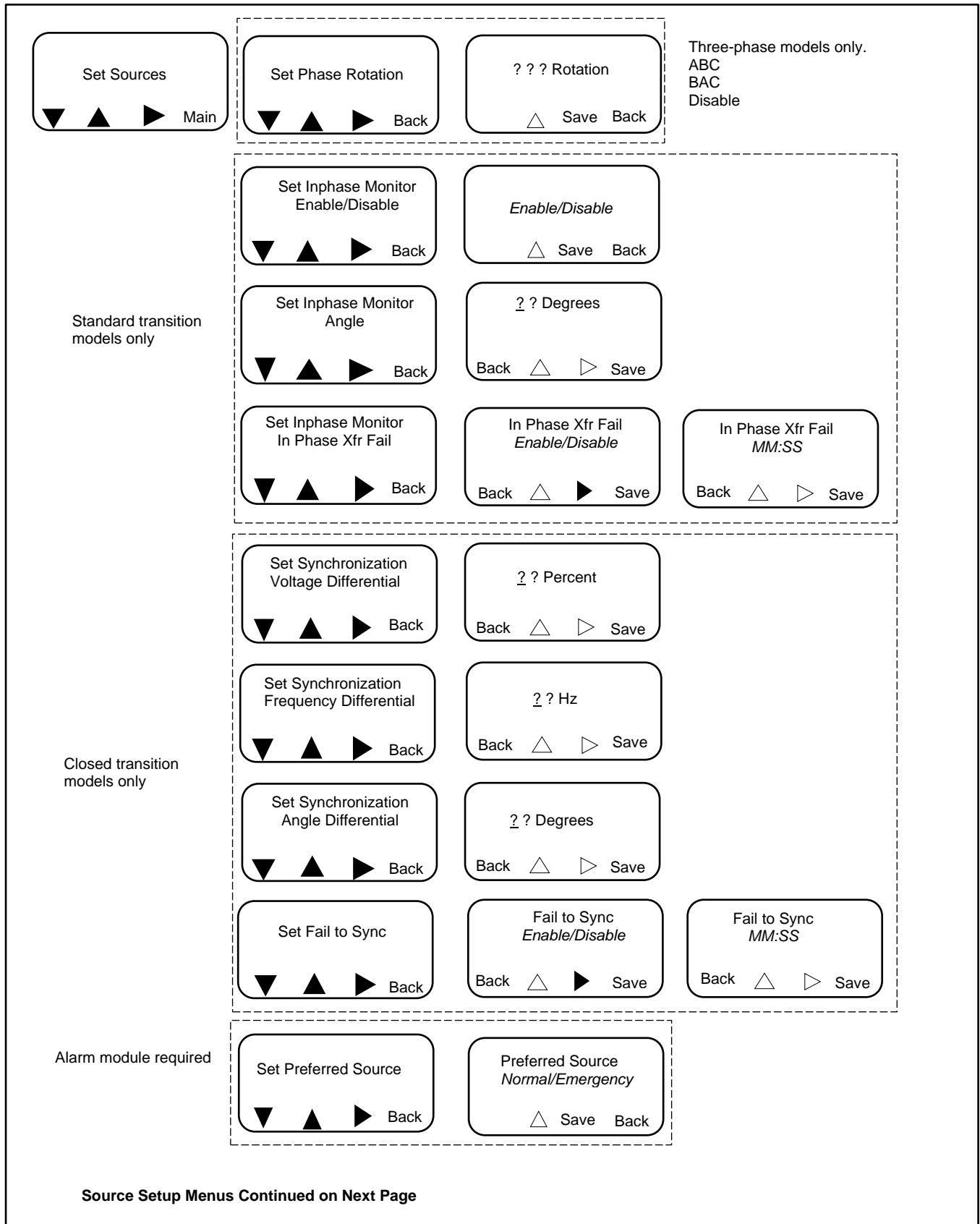
The controller senses the voltage on both sources with an accuracy of $\pm 0.5\%$. A source is considered available when its voltage and frequency are within the range of dropout settings. The debounce time prevents nuisance transfers caused by brief voltage spikes and dips. If the voltage or frequency of the active source is outside the acceptable range for a length of time longer than the debounce time, the system attempts to transfer the load to the alternate source.

See Figure 41 for default settings and adjustment ranges.

Description	Settings	Default Setting	Adjustment Range
Normal source voltage	Under voltage dropout	90%	75% to 98% of Pickup
	Under voltage pickup	90%	85% to 100% of Nominal
	Over voltage dropout	115% (110% for 600 V systems)	106% to 135% of Nominal (maximum 690 Volts)
	Over voltage pickup	95%	95 to 100% of Dropout
	Unbalance enable	Enable	Enable or disabled
	Unbalance drop out	20%	5% to 20%
	Unbalance pick up	10%	3% to 18%
	Debounce time	0.5 seconds	0.1 to 9.9 seconds
Emergency source voltage	Under voltage dropout	90%	75% to 98% of Pickup
	Under voltage pickup	90%	85% to 100% of Nominal
	Over voltage dropout	115% (110% for 600 V systems)	106% to 135% of Nominal (Except 600 V Apps)
	Over voltage pickup	95%	95 to 100% of Dropout
	Unbalance enable	Enable	Enable or disabled
	Unbalance drop out	20%	5 to 20%
	Unbalance pick up	10%	3 to 18%
	Debounce time	0.5 seconds	0.1 to 9.9 seconds
Normal source frequency (Gen-Gen mode of operation only)	Under frequency dropout	99%	95% to 99% of Pickup
	Under frequency pickup	90%	80% to 95% of Nominal
	Over frequency dropout	101%	101% to 115% of Pickup
	Over frequency pickup	110%	105% to 120% of Nominal
	Debounce time	3 seconds	0.1 to 15 seconds
Emergency source frequency	Under frequency dropout	99%	95% to 99% of Pickup
	Under frequency pickup	90%	80% to 95% of Nominal
	Over frequency dropout	101%	101% to 115% of Pickup
	Over frequency pickup	110%	105% to 120% of Nominal
	Debounce time	3 seconds	0.1 to 15 seconds

Figure 41 Pickup and Dropout Settings

4.8.6 Set Sources



Source Setup Menus Continued from Previous Page:

Note:

The same menus are available for the Emergency source.

Set Normal Source
Emergency

▼ ▲ ▶ Back

Normal Source
Set Number of Phases

▼ ▲ ▶ Back

Single/Three Phase

△ Save Back

Normal Source
Set Voltage

▼ ▲ ▶ Back

Set Voltage
?? VAC

Back △ ▶ Save

Normal Source
Set Frequency

▼ ▲ ▶ Back

Set Frequency
?? Hz

Back △ ▶ Save

Normal Source
Set Under Voltage
Pickup

▼ ▲ ▶ Back

Pickup
??? % of Nominal
85-100%

▽ ▲ Save Back

Normal Source
Set Under Voltage
Dropout

▼ ▲ ▶ Back

Dropout
??? % of Pickup
75-98%

▽ ▲ Save Back

Normal Source
Set Over Voltage
Pickup

▼ ▲ ▶ Back

Pickup
??? % of Dropout
95-100%

▽ ▲ Save Back

Normal Source
Set Over Voltage
Dropout

▼ ▲ ▶ Back

Dropout
??? % of Nominal
106-135%

▽ ▲ Save Back

Normal Source
Set Voltage Debounce

▼ ▲ ▶ Back

Debounce Time
?.? Seconds
0.1-9.9 Seconds

▽ ▲ Save Back

Normal Source
Voltage Unbalance
Enable/Disable

▼ ▲ ▶ Back

Normal Source
Voltage Unbalance
Pickup

▼ ▲ ▶ Back

Normal Source
Voltage Unbalance
Dropout

▼ ▲ ▶ Back

Voltage Unbalance
Enable/Disable

△ Save Back

Pickup
??%
3-18%

▽ ▲ Save Back

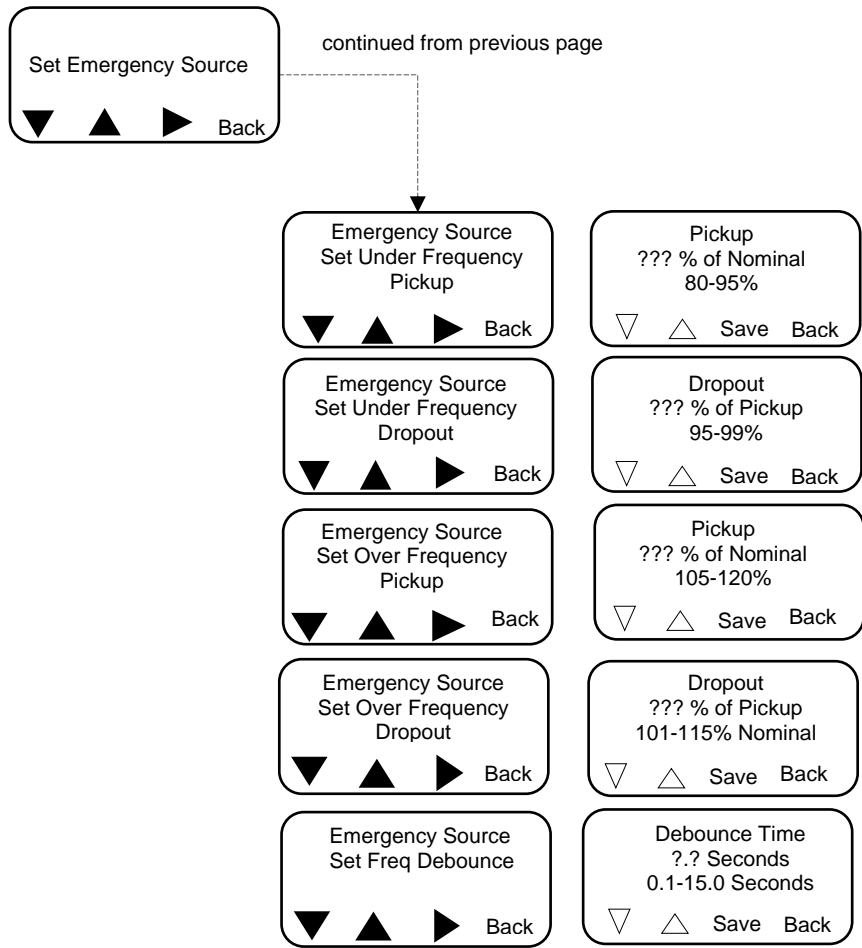
Dropout
??%
5-20%

▽ ▲ Save Back

Three-phase only

Continue to next page for additional menus for Emergency source only

Additional Source Setup Menus for the Emergency Source Only:



4.9 Inputs and Outputs

Inputs and outputs are unassigned (except as noted in Figure Factory Set Inputs in Input Functions Section) until the installer or operator assigns a function to the I/O.

The programmable inputs and outputs can be assigned to the functions shown in Figure Available Programmable Inputs in Input Functions Section and Figure Available Programmable Outputs in Output Functions Section. Programmable inputs and outputs on the controller and input/output (I/O) modules can be assigned in several ways:

- Using the controller's keypad and display; see Figure 42.
- Using a PC with Kohler® SiteTech™ software; see TP-6701, SiteTech Software Operation Manual, for instructions.
- Over Modbus; see TP-6113, Modbus Protocol Manual, for Modbus registers.

Each programmable input and output requires a connection to the transfer switch. Do not change the programmable input/output assignments without verifying the transfer switch input and output connections.

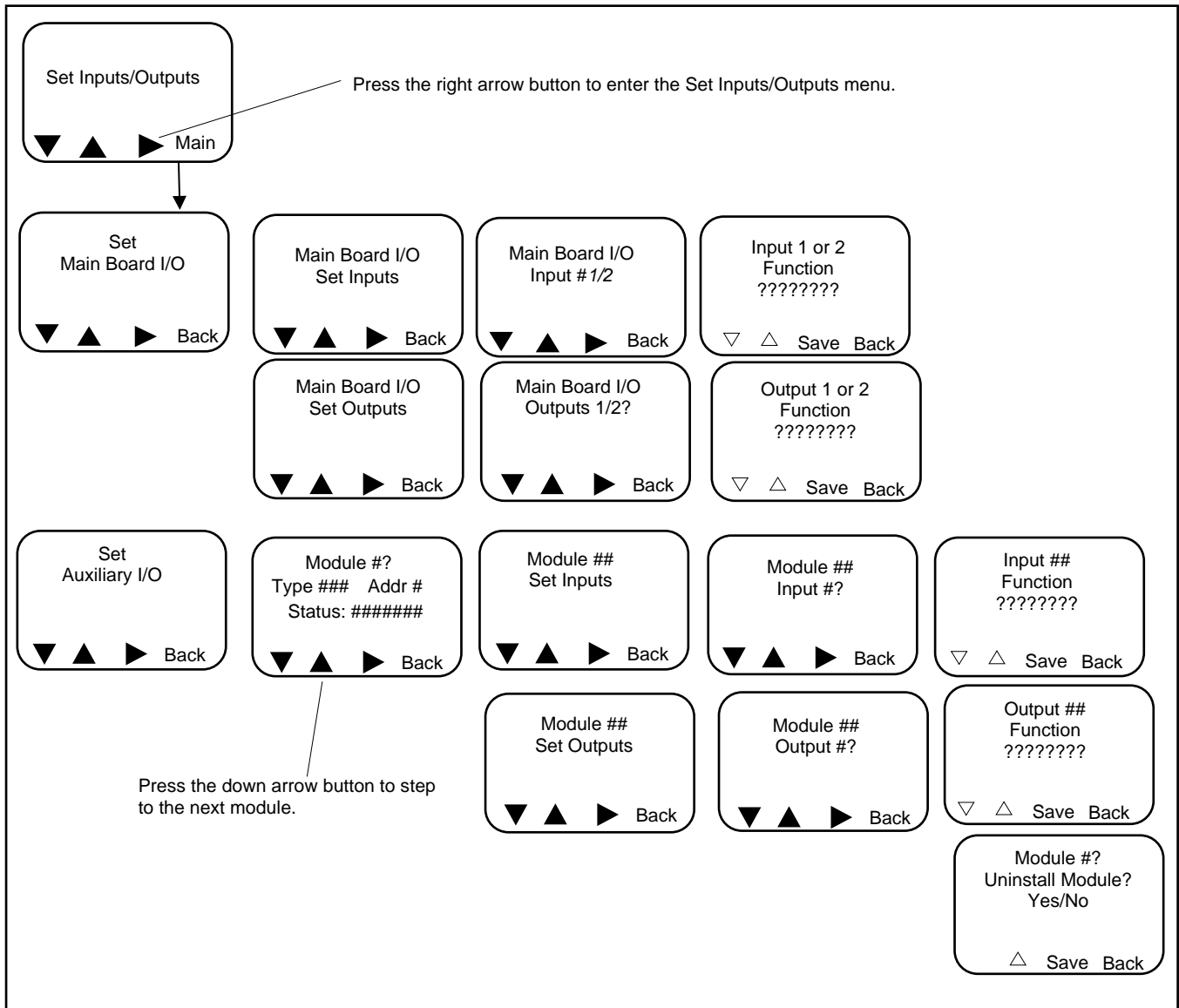


Figure 42 Assigning Inputs and Outputs

4.9.1 Controller Inputs and Outputs

There are two programmable inputs and two programmable outputs on the controller. Additional inputs and outputs are available through the installation of optional input/output modules.

See the Installation Section for connection information for main logic board inputs and outputs.

4.9.2 Input/Output Modules



Input/output (I/O) modules are optional accessories. The standard I/O Module has two inputs and six outputs. The high-power I/O module has two inputs and three outputs. The I/O modules specifications are shown in Input/Output (I/O) Modules Section.

See Input/Output (I/O) Modules Section for I/O module connection information.

4.9.3 Input Functions

Available input functions are shown in Figure 43. Some inputs will trigger an indicator LED on the user interface and/or display a message on the LCD menu when they are activated.

All of the inputs may be assigned to either one or both of the common alarms.

Programmable Inputs *	 LED	 LED	Display Message
Bypass Contactor Disable*	None	Flashing	Bypass Contactor Disable *
Forced Transfer to OFF* (programmed-transition or closed-transition models; requires load shed accessory)[None	Flashing	Forced Off
Inhibit Transfer* (maintenance mode)	None	Flashing	Inhibit Transfer
Low Battery Voltage	Steady	None	Low Battery Voltage
Peak Shave Mode	None	None	Peak Shave
Remote End Time Delay	None	None	None
Remote Common Alarm	Steady	None	Remote Common Alarm
Remote Test	None	None	Normal test sequence menus. See Section 1.7.
Remote Monitor In #1- 4	None	None	None
Service Disconnect*	None	Flashing	Service Disconnected
Three-Source System Disable	None	None	None

* See Figure 44 for factory-set input functions for selected models. Do not change the factory settings.
† The load shed accessory is not required on model KEP Service Disconnect to OFF models.

Figure 43 Available Programmable Inputs

Note:

Some models have factory-set input functions as shown in Figure 44. Do not change these settings.

Model or Factory-Installed Accessory	Main Board Input Factory Setting
Bypass/isolation Models	Bypass Contactor Disable
Service Entrance Models	Service Disconnect
Load Shed Kit	Forced Transfer to OFF

Figure 44 Factory Set Inputs

Service Disconnect Input. Service Entrance models have one input factory-set to Service Disconnect. Do not attempt to change this setting.

Forced Transfer to OFF Input. This function requires the load shed accessory installed on a programmed transition or closed-transition model transfer switch. (Exception: The load shed accessory is NOT required for model KEP Service Disconnect to OFF models.) Activation of this input signals the transfer switch to transfer immediately from Source E to the OFF position.

The transfer switch then transfers to Source N if it is available, executing the applicable time delays.

Remote Monitored Inputs. There are four remotely monitored input functions. These functions can be assigned to any of the inputs on either the main logic board or standard/high voltage/high current I/O boards. The state of any or all of these inputs can be monitored using SiteTech™ software or over Modbus.

Peak Shave/Area Protection Input. Starts the generator set and transfers to the standby source, ignoring the engine start time delay. The pre/post transfer, delayed-transition time delays, and in-phase monitor will be active if enabled.

When the peak shave signal is removed, the load transfers back to the preferred source. The pre/post transfer, delayed-transition, and engine cool down time delays, along with the in-phase monitor if enabled, will be executed.

If the standby source is lost during peak shave, the unit will transfer back to the preferred source.

See Peak Shave TD Bypass Section for information about the Peak Shave TD Bypass.

Remote End Time Delay Input. Allows a remote signal to end an active time delay. The signal ends only the time delay that is active at the time the signal is applied. Repeated signals are required to end additional time delays. Does not end the programmed-transition time delays or an exerciser run.

Remote Test Input. Activating the input starts a test, and deactivating the input stops the test. Tests follow the sequence described in System Test Section. A remote test can be stopped locally, if necessary, by pressing the END TEST button on the controller.

MPAC firmware versions before 1.10: If a local test is already running, activating the remote test input will stop the local test.

MPAC firmware versions 1.10 or higher: If a local test is already running, activating the remote test input will NOT stop the local test.

The default type for a remote test is unloaded. There are several ways to change the remote test type:

- Use the Set System, Remote Test Loading menu.
- Use a computer and Kohler SiteTech Software to set the Remote Test Loaded parameter.
- Set the remote test type over Modbus.

4.9.4 Output Functions

Output functions are shown in Figure 45. Information about selected output functions is shown below. Refer to the section number shown in Figure 45 for more information about the output function.

Note:

On Service Entrance (KEP) models, one output is factory set and not available for customer use.

Service Disconnect Gen Cntrl. Service Disconnect (KEP) models that use the Service Disconnect to OFF mode of operation have one output set to Service Disconnect Gen Cntrl. This output is factory-set and should not be changed. See Service Entrance Section for more information about service disconnect modes of operation.

In-Phase Monitor Sync Output. Is activated when the in-phase transfer fail or fail to sync time delays expire, indicating that the sources did not synchronize in the allotted time. See In-Phase Monitor Section for more information about the in-phase monitor. For closed-transition models, customer-supplied equipment used to boost the generator set can be connected to this output. See the transfer switch installation manual for output connection information.

Note:

The In-phase Transfer Fail and/or Fail to Sync time delays are set in the Set Sources menu. See Set Sources Section.

Programmable Output	Type	See Section
Alarm Silenced	Monitor	7.2.3
Audible Alarm	Control	7.2.3
Aux Switch Fault	Fault	1.10
Aux Switch Open	Fault	1.10
Common Alarm Active (1 and 2)	Fault	4.10
Contactor in OFF position	Monitor	—
Contactor in Preferred Position	Monitor	—
Contactor in Source E Position	Monitor	—
Contactor in Source N Position	Monitor	—
Contactor in Standby Position	Monitor	—
Exerciser Active	Monitor	4.4, 2.2.2
Expansion Module Lost Comm	Fault	1.10
Fail to Acquire Preferred	Fault	1.10
Fail to Acquire Standby	Fault	1.10
Fail to Transfer	Fault	1.10
Fail to Open Source1	Fault	—
Fail to Close Source1	Fault	—
Fail to Open Source2	Fault	—
Fail to Close Source2	Fault	—
In-Phase Monitor Sync	Control	4.9.4, 4.8.2
In Service Disconnect (Service disconnect switch is activated)	Monitor	—
Load Bank Control Active	Control	4.9.4
Load Control Active	Monitor	4.7.1
Load Control Out 1-9	Control	4.7.1
Low Battery (external battery)	Monitor	7.2.2
Maintenance Mode	Monitor	—
Non-Emergency Transfer	Monitor	—
Not in Auto	Monitor	1.3.4
Peak Shave Active	Monitor	4.11.9
Preferred Source Available	Monitor	4.8.5
MBUS Control RDO #1-4	Control	4.9.4
Service Disconnect Gen Cntrl *	Control	4.9.4
Service Disconnect Trip Breaker (KUS/KUP only)		—
Source 1 (2) Breaker Trip (KEP only)		—
Source E (Phase) Rotation Error	Fault	—
Source E Loss of Phase	Fault	—
Source E Over Frequency	Fault	4.8.5
Source E Over Voltage	Fault	4.8.5
Source E Start Signal	Control	4.9.4
Source E Under Frequency	Fault	4.8.5
Source E Under Voltage	Fault	4.8.5
Source E Voltage Unbalance	Fault	4.8.5
Source N (Phase) Rotation Error	Fault	—
Source N Loss of Phase	Fault	—
Source N Over Frequency	Fault	4.8.5
Source N Over Voltage	Fault	4.8.5
Source N Start Signal	Control	4.9.4, 4.12
Source N Under Frequency	Fault	4.8.5
Source N Under Voltage	Fault	4.8.5
Source N Voltage Unbalance	Fault	4.8.5
Standby Source Available	Monitor	4.8.5
Test Mode Active	Monitor	1.7
Three (3) Src Sys Disabled	Control	4.12
* Factory set; do not change.		

Figure 45 Available Programmable Outputs

Load Control Output, 1- 9. Connect up to nine loads that can be connected or disconnected using either time-based or current-based load control. Assign load control outputs 1 through 9 to the corresponding outputs on the main board or I/O modules, and then go to the Time Delay setup menu to set up the load control sequences. See Time Delays Section for the Time Delay setup menus, and Load Control Section for more information about load control.

MBUS-Controlled Outputs. There are four Modbus-Controlled Output functions. These four functions can be assigned to any of the outputs on either the main logic board or the optional I/O boards. The state of any or all of these four functions can be controlled and monitored via Modbus messages only.

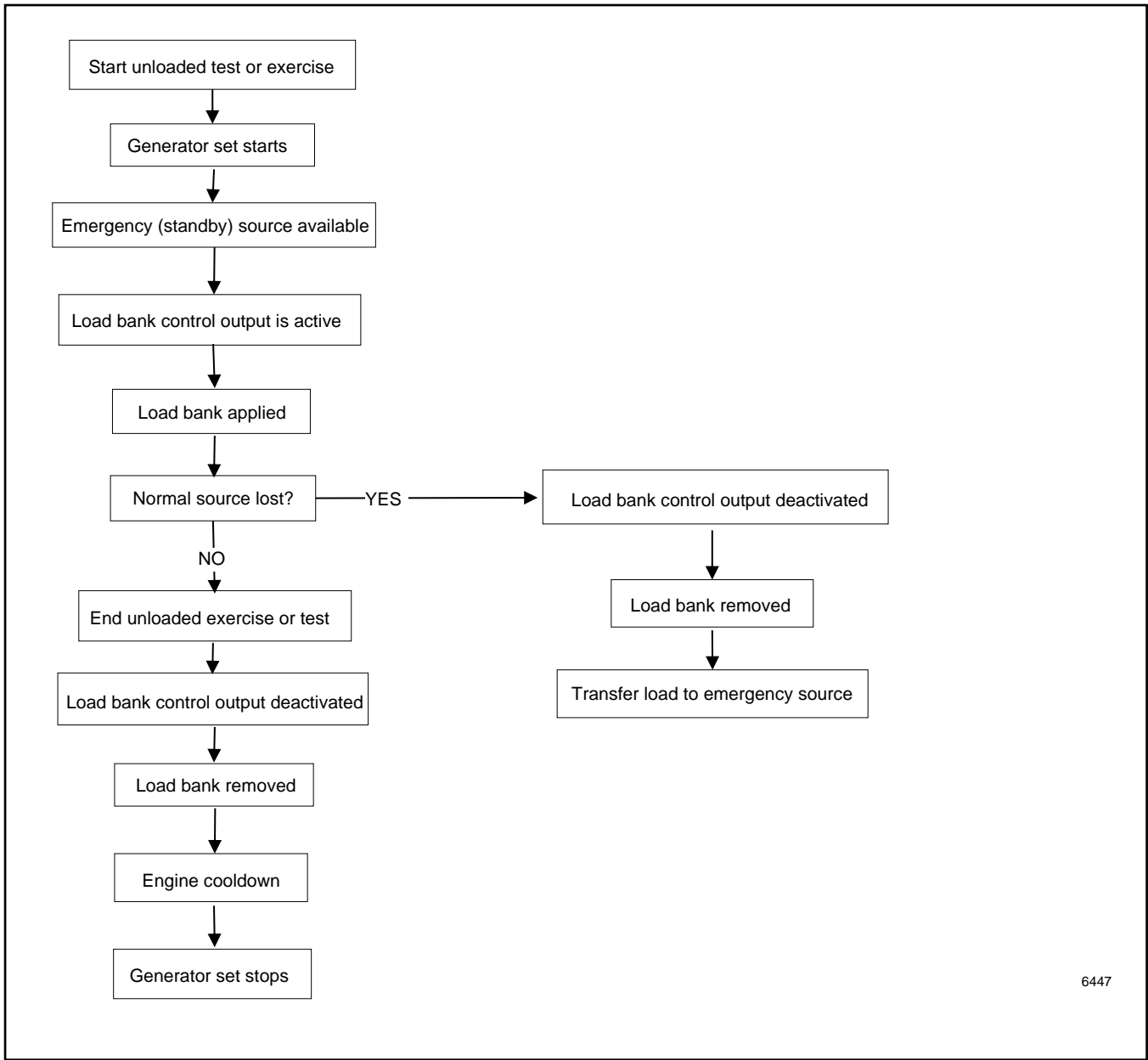
Source N Engine Start Signal. Use if Source N is a generator set, especially for three-source systems or prime power mode. See Three-Source Systems Section for more on three-source systems. See Prime Power Run Section for more about prime power mode.

Source E Engine Start Signal. An alternative to the engine start contacts on the transfer switch.

Load Bank Control Active. The load bank control output is a C form contact that can be used to apply a load to the generator set during an unloaded exercise or test. The load bank control output is active during each unloaded test and unloaded exercise. See Figure 46.

The load bank control output closes or opens a contact that can be used to signal the load bank controller to operate. Connect the normally open or normally closed output contact to the load bank controller as required for proper operation. Refer to the connection instructions provided by the load bank manufacturer.

If the Normal source is lost during an exercise period, the load bank control output is deactivated to remove the load bank and allow the transfer of the building load to the emergency source.



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Figure 46 Load Bank Control Sequence

4.9.5 User-Defined I/O Descriptions

The controller can store a 19-character string description for each of the 9 user controllable/monitored I/Os. Use a personal computer with Kohler® SiteTech™ software to enter descriptions. Descriptions are only available for reading and writing through SiteTech and over Modbus. Descriptions are not used by the controller.

4.10 Common Alarms

Use the Common Alarms setup menu to assign events to the controller’s common alarm groups. See Figure 47 for a list of functions that can be assigned to the common alarm and the audible alarm. See Figure 48 for the common alarms setup menus.

Alarm Descriptions	
Aux Switch Fault*	Src E Over Voltage
Aux Switch Open*	Src E Rotation Err *
Contactors in Off	Src E Under Freq
Contactors in Pref	Src E Under Voltage
Contactors in Src E	Src E Voltage Unbal
Contactors in Src N	Src N Loss of Phase
Contactors in Stby	Src N Over Freq
Exerciser Active	Src N Over Voltage
Fail to Acquire Pref *	Src N Rotation Err *
Fail to Acquire Stby *	Src N Under Freq
Fail to Transfer *	Src N Under Voltage
IPM Synching	Src N Voltage Unbal
Load Bank Ctl Active	Stby Src Available
Load Control Active	System Ready
External Battery Low *†	Test Mode Active
Non-Emergency Trans	Critical Service Required
Not in Auto	Man Transfer Waiting
Peak Shave Active †	Module Lost Comm *
Pref Src Available	Non-Critical Service Req
Remote Common Alarm *	Source E Available
Remote Monitor In #1-4	Source N Available
Src E Loss of Phase	MBUS-Control RDO #1-4
Src E Over Freq	

* Assigned to Critical Service Required alarm
† Assigned to Non-Critical Service Required alarm

Figure 47 Alarm Descriptions

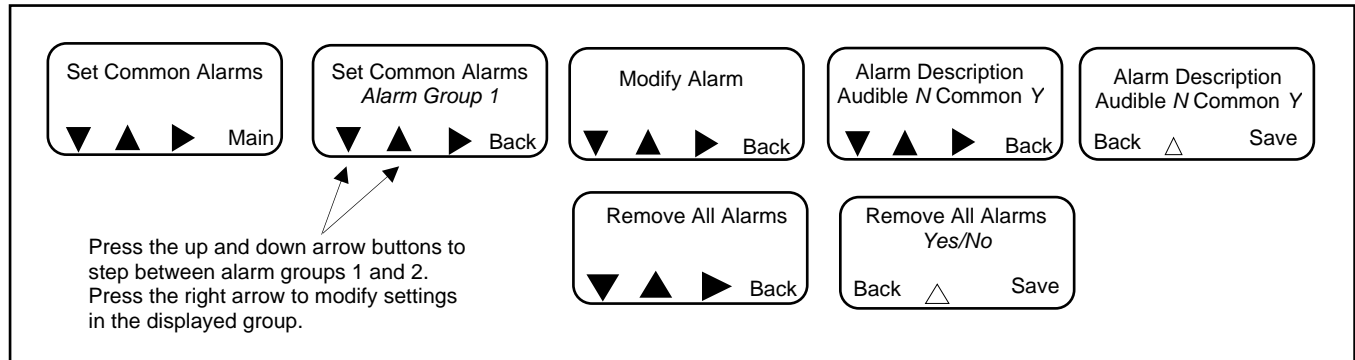


Figure 48 Setting Common Alarms

4.10.1 Common Alarm Output

Functions can be assigned to two alarm groups. The groups can then be assigned to programmable outputs, if desired. Any function assigned to the Common Alarm triggers the Common Alarm programmable output. See Inputs and Outputs Section, Programmable Inputs and Outputs, for more information about programmable outputs.

4.10.2 Audible Alarm

The audible alarm setting requires the Alarm Module accessory for operation. See Alarm Module Section for more information about the alarm module.

Enable the audible alarm for any alarm function by navigating to the Alarm Description, Common, Audible menu. press the open up arrow button until the display shows Audible Y and Y or N for Common as desired. press Save.

4.10.3 Chicago Alarm

The Chicago Alarm function requires the alarm module accessory.

The Chicago alarm function is a programmable feature of the MPAC 1500 controller. The alarm is active when the transfer switch is in the Emergency position. The alarm can be silenced via the user interface, which will also activate a light indicating the alarm-silenced condition. The alarm silenced light is de-energized when the transfer switch returns to the Normal position.

For Chicago Alarm Mode, use the Common Alarm Setup menu to assign the necessary faults and conditions to the audible alarm. Be sure to assign the Contactor in Standby function to trigger the audible alarm.

4.11 Set System

See Figure Set System Menus in Section: Transition Type for the Set System menus.

4.11.1 Default Settings

The system parameter factory settings are shown in Figure 49.

System Parameter	Factory Setting
Standard or programmed transition	Set to order †
Single/three phase	Set to order †
Operating voltage	Set to order †
Operating frequency (50 or 60 Hz)	Set to order †
Phase rotation	ABC
Commit to transfer (yes or no)	No
Rated current	Set to order †
Operating mode: Generator-to-Generator, Utility-to-Generator, or Utility-to-Utility	Utility-to-Generator
In-phase monitor	Disabled
In-phase monitor transfer angle	5°
Transfer mode (automatic or non-automatic)*	Set to order
* The transfer mode (automatic or non-automatic) cannot be changed in the field.	
† See the ATS nameplate.	

Figure 49 System Parameters

4.11.2 Source Type/Source Type

Set the source type selection for the types of sources used:

- One utility source and one generator set
- Two generator sets (gen-gen) (Use for prime power run mode. See Prime Power Run Section)
- Two separate utility sources
- One utility source and two generator sets for a three-source system (see Three-Source System Section)

The transfer switch is factory-set for the utility-generator set source type. This type uses one generator set, which is connected to the Emergency side of the contactor (Source E), and one engine start relay. The engine start contact is assigned to the generator set that is connected to the Emergency side of the transfer switch.

The gen-gen type source type uses two generator sets and requires the assignment of a second engine start output. Use the Input/Output Setup menu to assign a controller terminal strip output or an I/O module output to Start Source N Generator, and connect the engine start leads for the Source N generator set to the corresponding terminals on the controller terminal strip or the I/O module. See Inputs and Outputs Section. The programmable engine start output remains tied to the Source N generator set regardless of the preferred source selection.

The utility-utility source type is designed to use utility power for both sources.

4.11.3 Transition Type

The transition type is factory set for each model and should not require change except in the case of controller replacement. Select standard, programmed, or closed transition, if necessary.

Note:

The transition type is indicated by the third letter of the ATS model designation as indicated Figure 50. Do not attempt to change the transition type to one that is not listed for your model.

Model	Transition Type
KBS	Standard (S)
KCS	
KAS	
KGS	
KUS	
KBP	Programmed (P)
KCP	
KEP	
KAP	
KGP	
KUP	
KBC	Closed (C)
KCC	

Figure 50 Transition Types by Model

Standard-transition (S) (also referred to as open transition) models use a break-before-make transfer that does not require source synchronization for transfer between available sources.

Programmed-transition (P) models stop momentarily in the OFF position during transfer between two available sources. The time in the OFF position can be adjusted using the transfer time delays. See Section: Time Delays.

Closed-transition (C) models provide make-before-break transfer for uninterrupted power to the load when both sources are available. The sources are monitored for synchronization and are paralleled for approximately 100 milliseconds during the transfer.

Programmed-transition override (for closed-transition models only). When closed transition is selected, the programmed-transition override menu appears. The override function operates if the sources do not synchronize before the Inphase Transfer Fail time delay expires. In this case, the transfer switch can be set to transfer to the other source using programmed-transition mode, with a short interruption in power to the load during transfer.

- Select Automatic to set the unit to initiate a programmed-transition transfer automatically after the Inphase Transfer Fail time delay expires.
- Select Manual to require an operator to initiate a programmed-transition transfer by pressing a button after the Inphase Transfer Fail time delay expires.

If a manual transfer is not initiated, the controller continues to monitor the sources and transfers if synchronization occurs.

- Set the Xfr Off>Stby (transfer off-to-standby) time delay for the desired “off” time during the transfer. See Section: Time Delays for the default time delays.

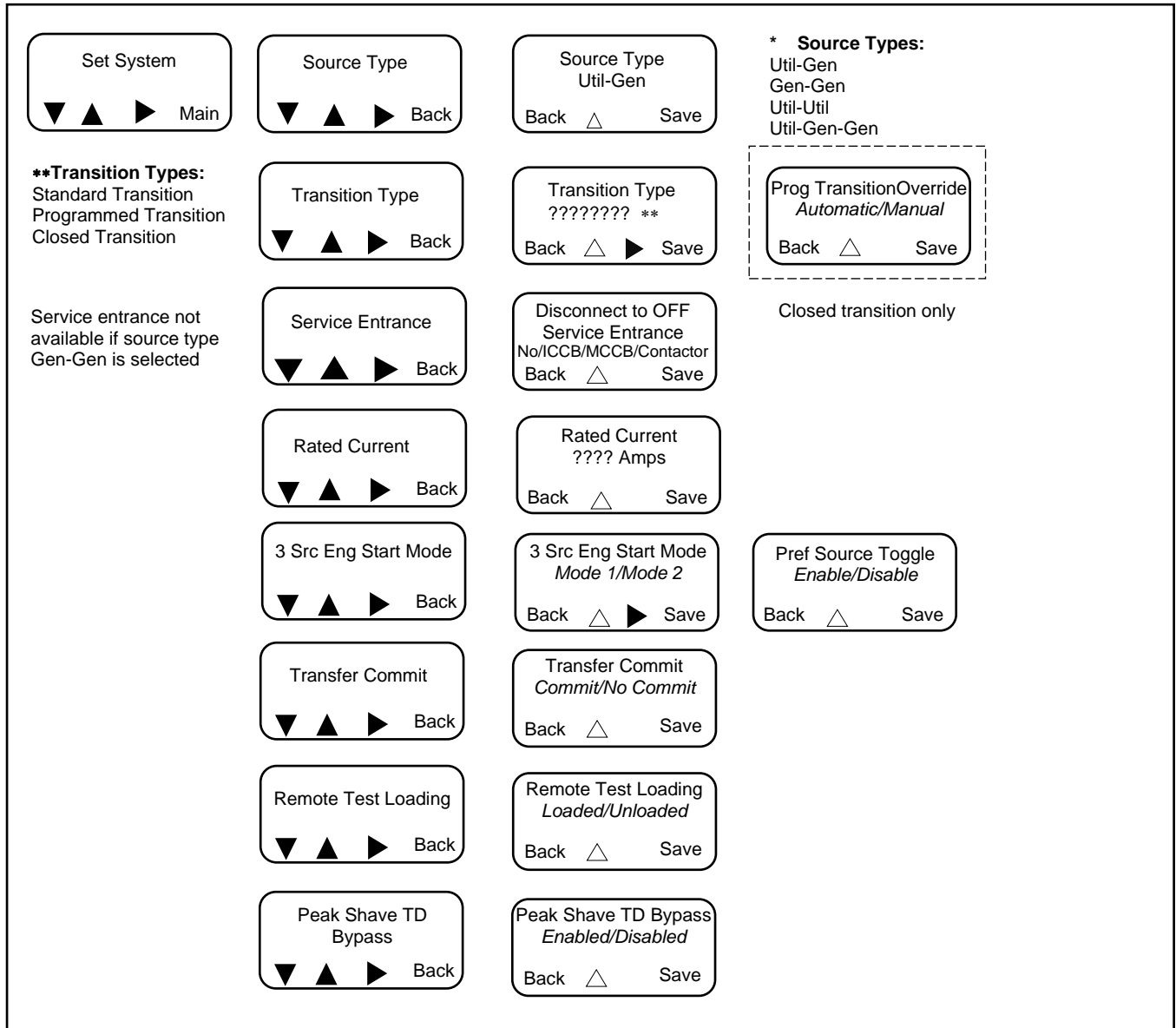


Figure 51 Set System Menus

4.11.4 Service Entrance Model KEP

The model KEP is a service entrance rated programmed-transition transfer switch. ICCB denotes insulated case circuit breakers or switches. MCCB denotes molded-case circuit breakers or switches. Check the model designation on the ATS nameplate and see the model designation key in the specification sheet or the Installation Manual to identify ICCB and MCCB models.

Two service disconnect positions are possible for the Model KEP Service Entrance rated transfer switches. The service disconnect position is factory-set and cannot be changed at the controller.

- **Service Disconnect to Emergency (SRC/E).** When the service disconnect switch is moved to the SERVICE DISCONNECT position, the transfer switch signals the generator set to start and transfers to the Emergency source.
- **Service Disconnect to OFF.** When the service disconnect switch is moved to the SERVICE DISCONNECT position, the utility breaker opens. Utility power is disconnected and the ATS is in the OFF position.

The service disconnect position is shown in the System Setup screen as Service Disconnect to SRC/E or Service Disconnect to OFF. Transfer switches with no service disconnect position indication in the system setup screen use the Service Disconnect to Emergency position. See the Model KEP ATS Operation and Installation Manual for more information about the service disconnect position.

4.11.5 Service Entrance Models KUS/KUP

The models KUS and KUP are service entrance rated contactor-based standard-transition (KUS) and programmed-transition (KUP) transfer switches. These transfer switches are equipped with an integral service entrance rated circuit breaker on the utility source side. The circuit breaker is mounted in a separate compartment, which provides electrical isolation from the rest of the circuits.

In the Set System>Service Entrance menu for the KUS/KUP models, select Contactor. .

4.11.6 Rated Current

This value is factory-set for each unit and should not require adjustment. If necessary, enter the rated current from the transfer switch nameplate.

4.11.7 Three Source Engine Start Mode

See Section: Three-Source Systems.

4.11.8 Transfer Commit

The transfer commit setting controls operation if the preferred source returns after a transfer to standby sequence has been initiated but not completed (i.e., preferred returns during the transfer time delay).

- The Commit setting allows the complete transfer sequence to execute even if the preferred source returns before the load has been transferred to standby.
- The No Commit setting causes the transfer sequence to be cancelled without transfer if the preferred source returns before the load has been transferred to standby.

4.11.9 Remote Test Loading

Select loaded or unloaded for a remote test sequence initiated by a remote test input.

4.11.10 Peak Shave TD Bypass

Peak Shave Operation. When the peak shave input is activated, the generator set starts immediately, bypassing the engine start time delay. The pre/post transfer time delays, programmed-transition time delays, and in-phase monitor are active if enabled. The ATS transfers the load to the standby source.

Peak Shave TD Bypass. In normal operation, retransfer from standby to preferred is delayed (15 minutes default setting) to ensure that the preferred source is stable before transfer. The Peak Shave TD Bypass allows you to skip the retransfer time delay after peak shave operation.

When the peak shave input is removed, the ATS transfers back to the preferred source according to the Peak Shave TD Bypass setting:

- If the Peak Shave TD Bypass is enabled, the retransfer (standby to preferred) time delay is bypassed when the peak shave signal is removed. Notice that by enabling the TD bypass, you are ordering the system to skip the retransfer time delay.
- If the Peak Shave TD Bypass is disabled, the retransfer (standby to preferred) time delay executes before the ATS transfers back to the preferred source. Transfer is delayed by the retransfer time delay. The retransfer time delay is adjustable, with a 15-minute factory setting.

If the standby source is lost during peak shave operation, the unit transfers back to the preferred source.

4.12 Three-Source Systems

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

Note:

The second transfer switch (ATS2) requires an external battery supply module (EBSM; also called battery option board or BOB) to provide power to the controller.

During normal operation, the utility source supplies the load with power. In the event of a utility failure, generator set G1 or G2 will supply the load as described in Sections: Three Source Engine Start Mode and Preferred Source Toggle.

4.12.1 Three Source Engine Start Mode

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

Mode 1

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

Mode 2

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

4.12.2 Preferred Source Toggle

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

4.12.3 Three Source System Test and Exercise

Unloaded Test

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

Loaded Test

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

Unloaded Exercise

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

Loaded Exercise

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

4.12.4 Three-Source System Setup

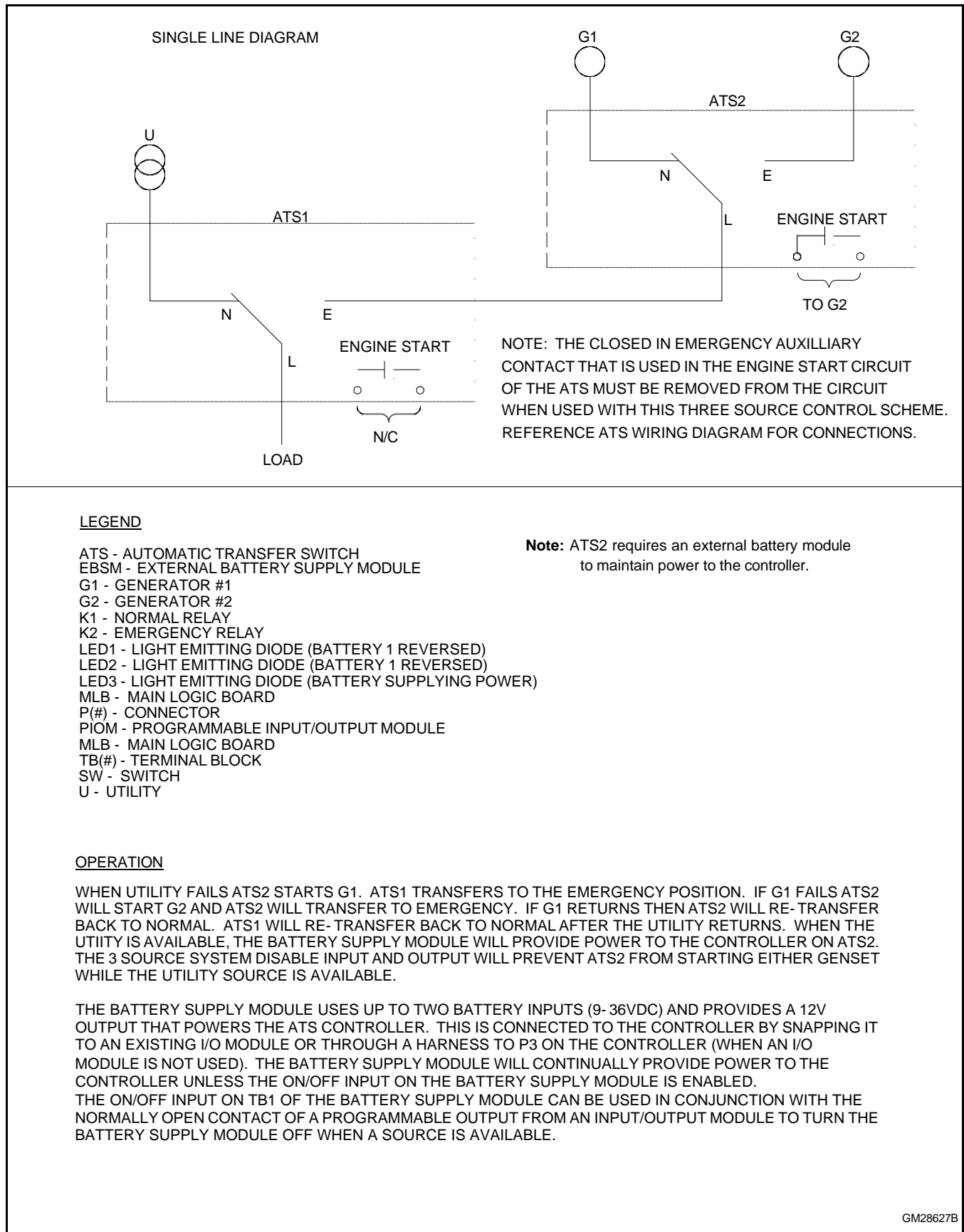


Figure 52 Three-Source System Transfer Switch and Source Connections

Refer to the Transfer Switch and Source Connections diagram and Input and Output Connections diagram during the following steps.

1. Connect the power sources to the transfer switches as described below. Refer to the transfer switch operation/installation manual or specification sheet for cable sizes. See Figure Three-Source System Transfer Switch and Source Connections in Section: Three Source System Test and Exercise for connections.
 - a. Connect the utility power source to the normal side of ATS1.
 - b. Connect the load to the load side of ATS1.
 - c. Connect the emergency side of ATS1 to the load side of ATS2.
 - d. Connect generator set 1 to the normal side of ATS2.
 - e. Connect generator set 2 to the emergency side of ATS2.
2. Three-source systems require the following input/output connections to control the engine start commands for generator sets 1 and 2. Observe the polarity of all connections shown in Figure Input and Output Connections for Three-Source Systems in Section: ATS1 and ATS2 System Setup. Use wire sizes from #14 AWG to #20 AWG for EBSM (a.k.a. BOB) and I/O module connections.
 - a. Connect the ATS2 engine start contacts to the engine start circuit on generator set 2 (G2).

Note:

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

- b. Connect one ATS1 programmable output from the controller to one ATS2 main logic board programmable input as shown in Figure Input and Output Connections for Three-Source Systems in Section: ATS1 and ATS2 System Setup. This I/O connection will be set to Three-Source System Disable.
 - c. Connect one ATS2 programmable output from the controller to the engine start connection on generator set 1 (G1). The ATS1 programmable output will be set to Source N Start Signal.
3. Connect battery power. Use #14-28 AWG wire to connect the generator set engine starting battery (or batteries) to the BATT1 terminals on terminal block TB13 on the external battery supply module (EBSM or BOB). (Another battery(ies) can be connected to terminals BATT2 but is not required.) Follow the marking on the board for the positive (+) and negative (-) connections. See Figure Address DIP Switch Settings in Section: Input/Output (I/O) Modules and Figure External Battery Supply Module in Section: External Battery Supply Module (EBSM/BOB).

Note:

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

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

Note:

See Section External Battery Supply Module (EBSM/BOB) for more information on the EBSM (or BOB).

5. Assign the ATS1 programmable output connected in step 2b. to Three-Source System Disable.
6. Assign the following inputs and outputs for the second transfer switch.
 - a. Assign ATS2 controller programmable input 1 to Three-Source System Disable.
 - b. Assign the ATS2 controller programmable output connected in step 2c. to Source N Start Signal.

4.12.5 ATS1 and ATS2 System Setup

Set the following parameters on the transfer switches:

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

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

The transfer switch settings are summarized in Figure 53.

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

Figure 53 Transfer Switch Settings for Three-Source Systems

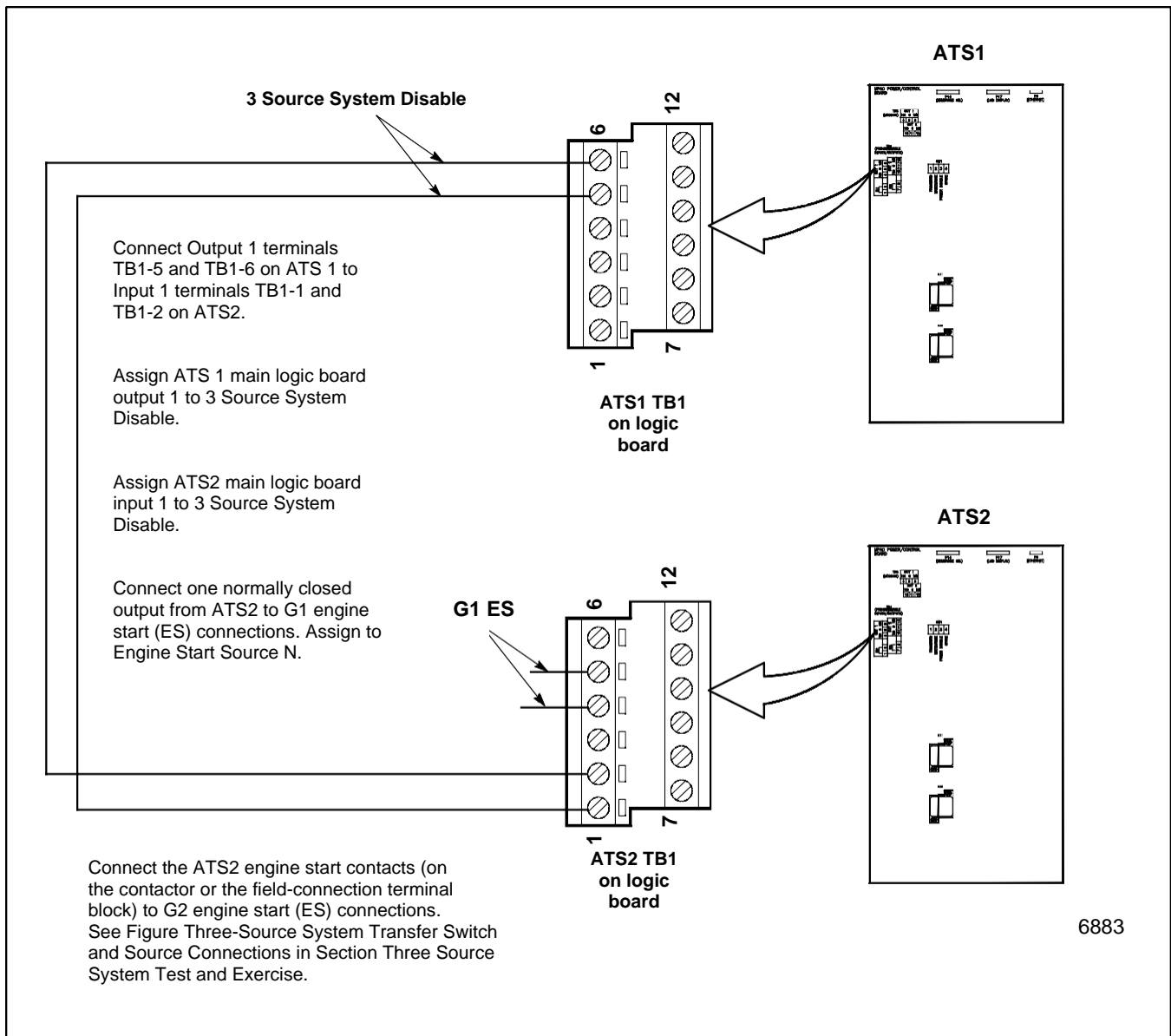


Figure 54 Input and Output Connections for Three-Source Systems

4.13 Communications

Use the Set Communications menu to set the communication parameters for serial or Ethernet connections. See Section 5, Communications, for instructions.

4.14 Set Passwords

Two passwords control access to the Test and Setup menus. Passwords are 4-digit numerical values ranging from 0000 to 9999. The default passwords are set to 0000. Change the passwords to prevent unauthorized access to the Test initiation menus and system settings.

Note:

A DIP switch on the controller's main logic board allows the setup password to be disabled. The DIP switch does not disable the test password.

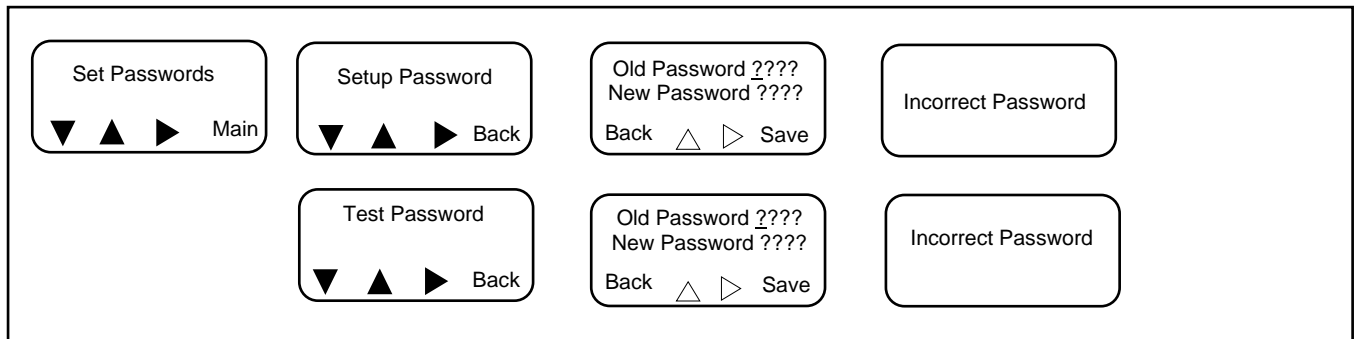




Figure 55 Setting/Changing Passwords

4.15 Calibration

 DANGER	<p>Hazardous voltage. Will cause severe injury or death. Only authorized personnel should open the enclosure.</p>
	

Testing live electrical circuits. Hazardous voltage or current will 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)

The transfer switch voltage and current sensing (if equipped) are calibrated at the factory. If voltage recalibration is necessary, refer to the transfer switch installation manual or service manual for instructions to check the voltages, and then use the Calibration menu to enter the measured values. See Figure 56.

The current sensing accessory is required in order for the transfer switch to measure and display the current values. See Section: Current Sensing. Use a clamp-on current sensing meter to measure the current and enter the measured values through the Setup Menu- Calibration shown below.

For three-phase models, the voltage and current for all phases will appear and can be calibrated.

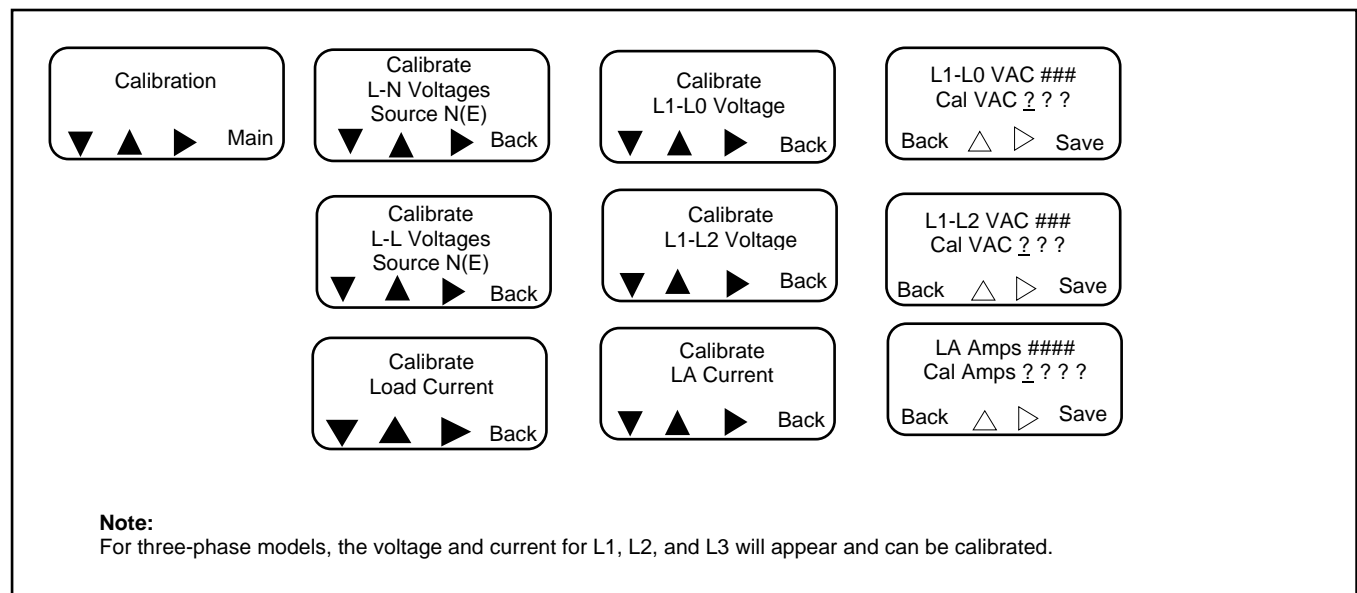


Figure 56 Calibration

4.16 Setting the Current to Zero

The metered current can be set to zero. This can be done with any screen showing, but zeroing the current while viewing the current metering screen is recommended. See the Operation Menus shown in the Normal Operation Menu section.

Procedure to Set the Current to Zero

1. Remove all loads from the transfer switch.
2. Press buttons 1 and 4 on the controller. See Figure 57.

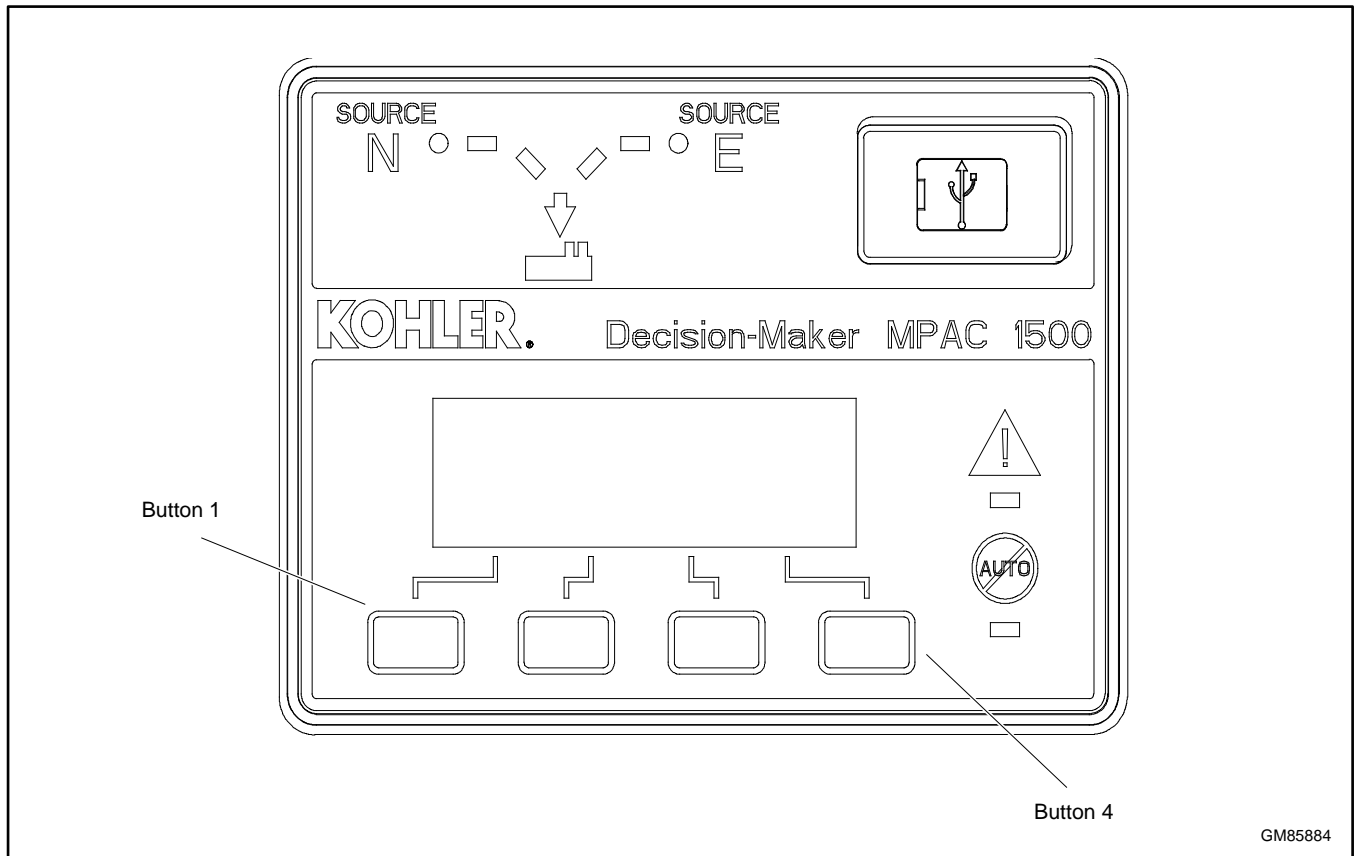


Figure 57 User Interface Panel

4.17 Reset Data

The Reset Data menu allows the service technician to reset the maintenance records, event history, and other items. See Section: Reset Data.

Section 5. Communications

5.1 Introduction

The Decision-Maker® MPAC 1500 controller has three types of communications connections: an RS-485 serial port, an ethernet port, and a USB port.

Kohler authorized distributors and dealers can use a personal (laptop) computer with Kohler® SiteTech™ software to view and adjust controller parameters, view event history, import and export parameter files, and update controller firmware. See TP-6701, SiteTech Software Operation manual, for instructions.

The controller uses Modbus® TCP/IP communication protocol over the Ethernet port and Modbus® RTU communication protocol over the serial port. The Modbus registers are available in the Modbus Protocol manual. See the List of Related Materials.

The controller can send encapsulated Modbus messages over the network connection. Only one Modbus address can be assigned to the controller, regardless of the communication port or protocol being used.

Note:

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

5.2 Connections

5.2.1 USB Port SiteTech Connection

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

See Figure 58 for the USB port location on the front of the controller assembly. Remove the small port cover and use a USB cable with a mini-B connector to connect the controller's USB port to the computer.

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

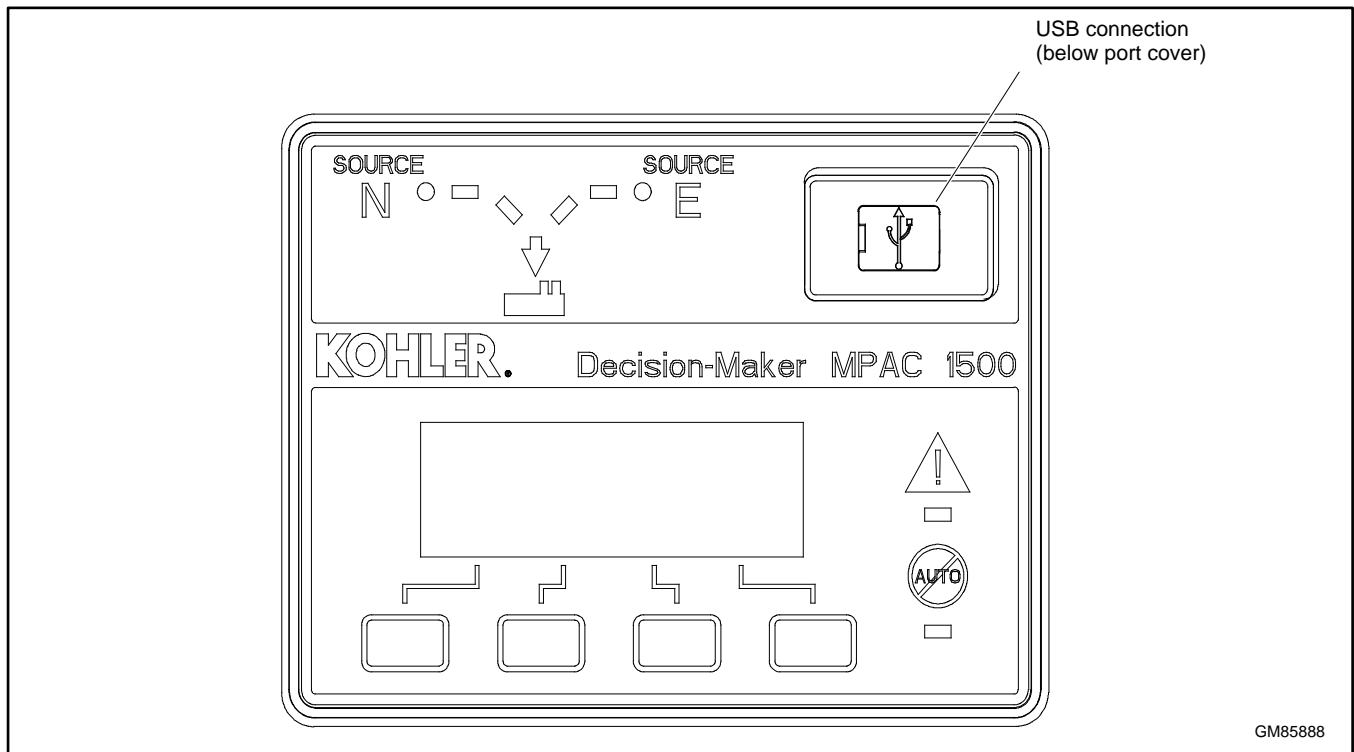


Figure 58 USB Connection (for SiteTech)

5.2.2 Modbus Connection

The controller is equipped with a Modbus port with an RS-485 connector. See Figure 59 for the RS-485 Modbus connector location.

Use serial connections to TB2 on the main logic board to connect the transfer switch to a personal computer for system monitoring, an optional remote annunciator, or a Modbus network. See the transfer switch Installation Manual for connection instructions.

The serial port is an isolated RS-485 port with connection speeds of 9.6, 19.2, and 57.6 kbps.

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

Note:

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

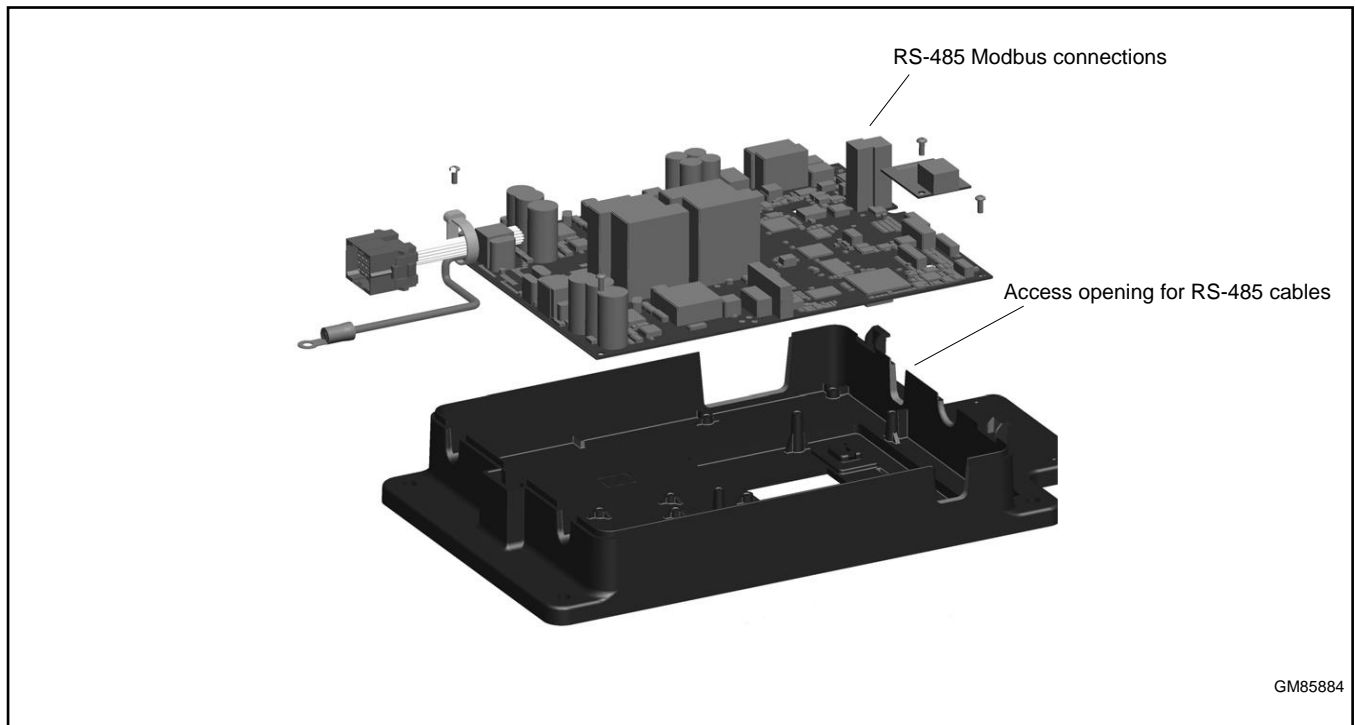


Figure 59 Modbus Connections (controller cover removed for illustration only)

5.2.3 Ethernet connection

The Ethernet communication accessory board is required for connection to the Ethernet. The Ethernet communication board is an optional accessory for the MPAC 1200 controller. The communication board connects to the controller board as shown in Figure 59.

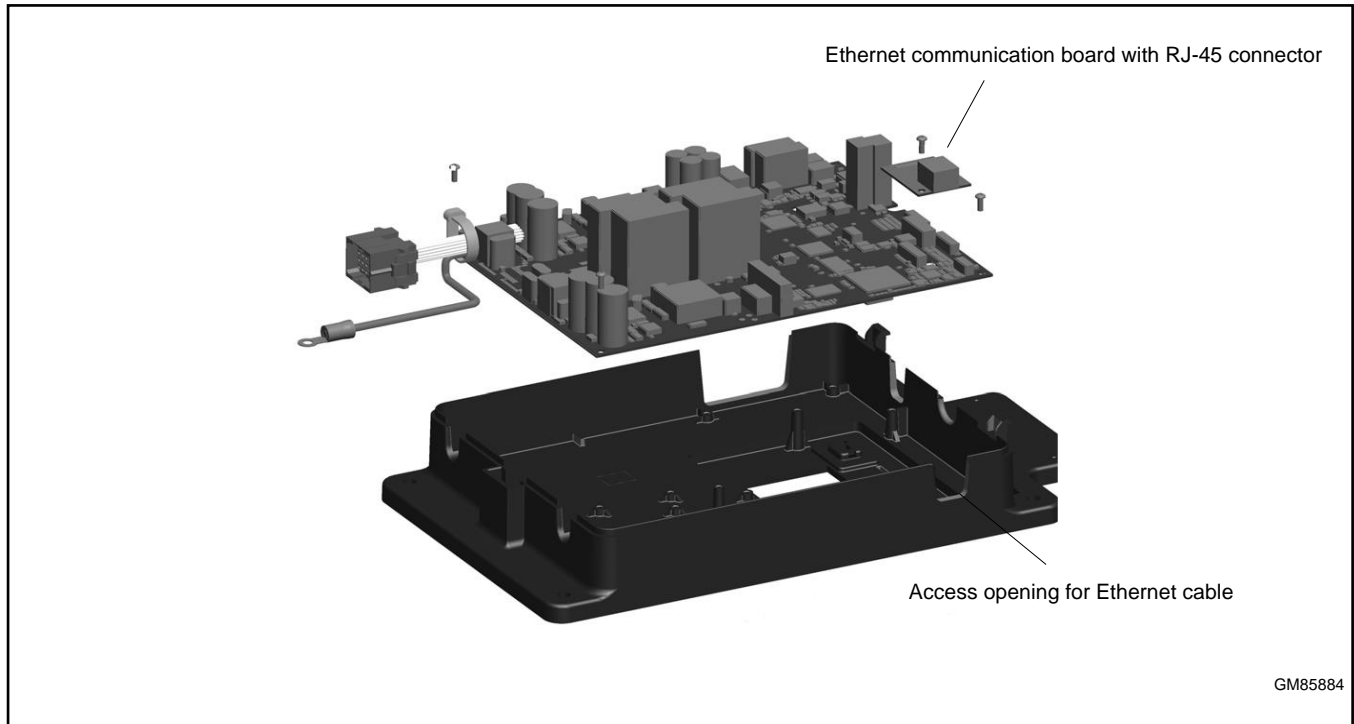


Figure 60 Ethernet Board (controller cover removed for illustration only)

The Ethernet communication accessory board allows the transfer switch to be connected to a building's Ethernet network to communicate with personal computers connected to the same subnet. See the transfer switch Installation manual for connection instructions.

Note:

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

Use the Setup menus or a personal computer connected to the controller's USB port and Kohler SiteTech software to set the communication parameters. Assign a port number, IP address, and subnet mask number from the controller's front panel. The Ethernet communication board may have a default IP address assigned at the factory for test purposes. **Change the IP address to an address owned by the user.** See the Communications section for instructions to set the communication parameters.

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

5.3 Communications Setup

Use the controller display and keypad or a personal computer with Kohler® SiteTech™ software connected to the USB port to set the communication parameters for serial or ethernet connections. The controller uses Modbus® communication protocol.

5.3.1 Modbus Serial Communication Setup

Set the following communication parameters for serial communication. Also see Figure Communication Parameters in Section: Setup Using SiteTech for a summary of these settings.

Note:

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

Modbus Enabled. Set to True to allow Modbus communication.

Modbus Baud Rate. Required for serial connections. The baud rate must match the baud rate of the connected PC.

Modbus Slave Addr. Assign a unique address between 001 and 247 to the serial port.

5.3.2 Network Communication Setup

Work with your local network administrator to set the following communication parameters for Ethernet communication.

See Figure Communication Parameters in Section: Setup Using SiteTech for a summary of the following settings.

DHCP Enabled. Factory set to False. Setting this parameter to True enables dynamic host configuration protocol (DHCP), which allows a DHCP server to automatically assign a dynamic IP address, subnet mask, and default gateway to the MPAC controller. Work with your local network administrator to determine whether DHCP is required.

Static IP Address. The transfer switch may have a default IP address assigned at the factory. **Change the IP address to a static IP address owned by the user.** Obtain an IP address, subnet mask, and default gateway information from the local network administrator.

Static Subnet Mask. Obtain subnet mask information from the local network administrator. All devices that communicate with each other on the same local network must use the same subnet mask.

Static Default Gateway. Obtain gateway information from the local network administrator.

DHCP Server. Displayed for information only. Provide this value to the network administrator if there are problems with DHCP.

Modbus TCP Unit ID. The unit ID is required for Modbus over TCP communication. The unit ID for TCP communication is analogous to the Modbus address for serial communication through the RS-485 ports. The factory default setting is 2.

Modbus TCP Server Enabled. Enable (set to True) to enable TCP if the transfer switch is connected to a network for TCP/IP communication (for example, ethernet communication).

MAC address. The MAC hardware address is factory-set. It can be seen in the View>Communications Setup menu but not viewed or changed in the setup menu.

5.3.3 Setup Using the Controller Keypad

Use the Set Communications menu to set the communication parameters for serial or Ethernet connections. See Figure Communications Setup from the Controller Display and Keypad in Section: Setup Using SiteTech.

The Modbus port on the controller circuit board is Port 0.

5.3.4 Setup Using SiteTech

Use a USB cable, male USB A to male USB mini-B, to connect the MPAC controller to a personal computer. Then use Kohler SiteTech software to set the communication parameters for serial or Ethernet connections. See Figure 62 and TP-6701, SiteTech Software Operation Manual.

SiteTech software is available only to Kohler authorized distributor and dealers.

Some parameter names in SiteTech are slightly different than what is shown the controller display. Figure 61 shows both names.

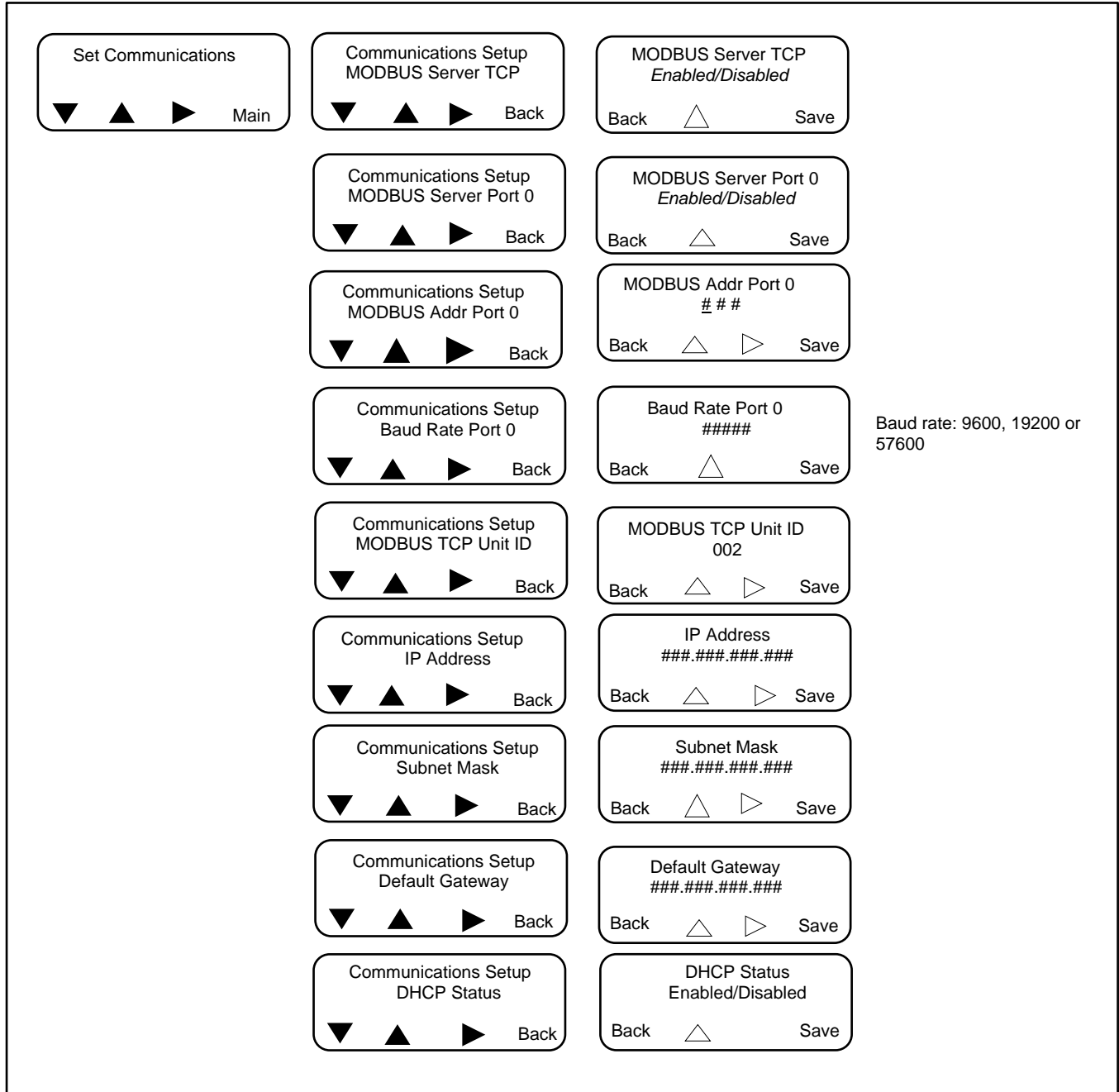


Figure 61 Communications Setup from the Controller Display and Keypad



* Obtain from the local network administrator

Figure 62 Communications Setup using Kohler® SiteTech™ Software (typical screen shown)

Setting as shown in SiteTech and on the controller display	Range	Default	Notes
SiteTech: Modbus Enabled Controller: Modbus Server Port 0	True or False Enabled or Disabled	True Enabled	Enable for network communication through the ethernet port.
SiteTech: Modbus Baud Rate Controller: Baud Rate	9600, 19200, 57600	19200	Baud rate in bits per second for serial communication between the controller and a personal computer's COM port.
SiteTech: Modbus Slave Address Controller: Modbus Address	001-247	0	Address for the RS-485 serial port (on the logic board).
SiteTech: Modbus Parity Controller: (not shown on controller)	Read only	None	Not adjustable.
SiteTech: Modbus Stop Bits Controller: (not shown on controller)	Read only	1	Not adjustable.
SiteTech: DHCP Enabled Controller: DHCP Status	True or False Enabled or Disabled	False Disabled	Dynamic host communication protocol. Enable if required; check with your local network administrator.
SiteTech: Static IP Address Controller: IP Address	See notes.	*	Obtain from your local network administrator. Every device on the network must have a unique IP address.
SiteTech: Static Subnet Mask Controller: Subnet Mask	See notes.	*	Obtain from your local network administrator. All devices that communicate with each other on the same local network must use the same subnet mask.
SiteTech: Static Default Gateway Controller: Default Gateway	See notes.	*	Obtain from your local network administrator.
SiteTech: DHCP Server Controller: (not shown on controller)	Read only	—	Displayed in SiteTech for information only.
SiteTech: Modbus TCP Unit ID Controller: Modbus TCP Unit ID	001-247	002	The unit ID is required for Modbus over TCP communication.
SiteTech: Modbus TCP Server Enabled Controller: Modbus Server TCP	True or False Enabled or Disabled	True Enabled	Enable (set to True) to enable TCP/IP communication (for example, Ethernet communication).
SiteTech: MAC Address Controller: MAC Address (view menu only)	Not Adjustable	Factory-set	Hardware address, entered at the factory. Not adjustable.
* Do not use the factory settings for IP address, subnet mask, or default gateway. Obtain these settings from your local network administrator.			

Figure 63 Communication Parameters

5.4 Parameter Files

The parameter setting files can be exported to a personal computer (PC) using Kohler® SiteTech™ software. Use a USB cable to connect the PC to the controller. The resulting file can be opened using a spreadsheet program on your computer. Modification of the settings in the file is not recommended.

Parameter settings can be loaded onto the MPAC controller from a saved file. This can be useful for service or controller replacement. See the SiteTech Operation Manual for instructions to export and import files.

5.5 Controller Firmware Updates

Kohler may release updated versions of the controller firmware. A personal (laptop) computer connected to the USB port and Kohler® SiteTech™ software are required for updating the firmware on the controller. Have an authorized distributor/dealer load an updated version of the controller firmware, if necessary. See TP-6701 for instructions to update the firmware.

Section 6. Scheduled Maintenance



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

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

 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. Moving parts. Will cause severe injury or death.
	Operate the generator set only when all guards and electrical enclosures are in place.

Grounding electrical equipment. Hazardous voltage will 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.

Servicing the transfer switch. Hazardous voltage will 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 will 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

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.

6.2 Testing

6.2.1 Generator Set Exercise

To maximize the reliability of the emergency power system, use the exerciser to start and run the generator set at the intervals and load conditions recommended by the generator set manufacturer. See the Exerciser section for instructions to program the exerciser.

6.2.2 Monthly Automatic Control System Test

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

- Verify that the expected sequence of operations occurs as the switch transfers the load to the emergency 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.
- On programmed-transition units, verify that the time delay in the OFF position functions during transfer to the standby source and transfer back to the preferred source.

6.3 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.

6.3.1 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.

6.3.2 Internal Inspection

 DANGER	Hazardous voltage. Will cause severe injury or death. Disconnect all power sources before opening the enclosure.
	



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

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

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

If the application does not allow a power interruption for the time required for the internal inspection, have an authorized distributor/dealer perform the internal inspection.

6.3.3 SPD Inspection

 DANGER	Hazardous voltage. Will cause severe injury or death. Only authorized personnel should open the enclosure.
	

On transfer switches equipped with optional surge protective devices (SPDs), check the following items every two months:

- SPD status indicators
- Condition of SPD connecting leads

6.3.4 Other Inspections and Service

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

6.3.5 Model KGS/KGP Bypass/Isolation Switches

For Model KGS/KGP bypass/isolation switches, have a Kohler authorized distributor/dealer perform the following additional maintenance checks every year. Refer to the transfer switch Service Manual for instructions when necessary.

- Apply dielectric grease to movable finger assemblies, if possible.
- Take thermal readings of each socket after the socket has been energized for at least 3 hours. Any readings on the socket surface that exceed 65°C (149°F) indicate a need to replace the socket. Record the amperage levels when taking the thermal readings.
- With the transfer switch removed, locate the bolt that retains the pin for each power connector and ensure that it is properly torqued.
- With the bypass de-energized, locate the bolt that retains the socket for each power connector (where accessible) and verify that it is properly torqued.

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

6.4 Service Schedule

Follow the service schedule below for the recommended service intervals. Have all service performed by an authorized distributor/dealer except for activities designated by an X, which may be performed by the switch operator.

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	6.3.1	X	X				Y
Check the contactor's external operating mechanism for cleanliness; clean and relubricate if dirty *	6.3.1	X			D (clean and lube)		Y
Inspect wiring insulation for deterioration, cuts, or abrasion. Repair or replace deteriorated or damaged wiring	6.3.1	X	D	D			Y
Tighten control and power wiring connections to specifications	2		D			D	Y
Check the transfer switch's main power switching contacts' condition; clean or replace the main contacts or replace the contactor assembly as necessary	S/M	D		D	D		Y
For Model KUS/KUP service entrance models, check the circuit breaker	-	X	X	D	D	X	Y
For Model KGS/KGP bypass/isolation switches, perform the additional checks in Section 6.3.5.	6.3.5, S/M		D	D		D	Y
Control System							
Exercise the generator set under load	Generator set documentation					X	See the generator set documentation
Test the transfer switch's automatic control system	6.2.2 1.8	X				X	M
Test all indicators (LEDs) and all remote control systems for operation	I/M	X	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 *	6.3.1	X			X		M
Check that all external hardware is in place, tightened, and not badly worn	6.3.1	X	X	X			M
Inspect the inside of transfer switch for any signs of excessive vibration, leakage, high temperature, contamination, or deterioration *	6.3.4	D	D		D		Y
Check that all internal hardware is in place, tightened, and not badly worn	6.3.4	X	D	D			Y
SPD Modules (if equipped)							
Check status indicators	7.10	X		D			Every 2 months
Check condition of connecting leads	7.10	X		D			
* Service more frequently if the transfer switch is operated in dusty or dirty areas.							
<p>See Section: Read these sections carefully for additional information before attempting maintenance or service.</p> <p>Visually Inspect: Examine these items visually.</p> <p>Check: Requires physical contact with or movement of system components, or the use of nonvisual indications.</p> <p>Adjust, Repair, Replace: Includes tightening hardware and lubricating the mechanism. May require replacement of components depending upon the severity of the problem.</p> <p>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></p> <p>Test: May require tools, equipment, or training available only through an authorized distributor/dealer.</p>							
<p>Symbols used in the chart:</p> <p>X= The transfer switch operator can perform these tasks. W=Weekly D=An authorized distributor/dealer must perform these tasks. M=Monthly I/M = Transfer Switch Installation Manual Q=Quarterly S/M = Service Manual. An authorized distributor/dealer must perform S=Semiannually (every six months) these tasks. Y=Yearly (annually)</p>							

7.1 Introduction

This section describes the hardware options that are available with the Decision-Maker® MPAC 1500 controls. The following accessories are available:

- Accessory modules
- Controller disconnect switch
- Current monitoring
- Digital meter: displays voltage, frequency, current, power, and more (factory-installed)
- Energy Reduction Maintenance Setting (ERMS) System (factory-installed, available for KUS/KUP 1200-4000 Amps only)
- Engine start circuit monitoring system
- Load shed module (available on programmed transition and closed-transition models only)
- Line-to-neutral voltage monitoring
- Supervised transfer control switch
- Surge protection device (SPD)
- User interface cover

7.2 Accessory Modules

The following types of accessory modules (also referred to as accessory boards) are available:

- Standard input/output module
- High power input/output module
- Alarm module with Chicago alarm function
- External battery module

See the transfer switch Installation Manual for field connection instructions. If the modules are not factory-installed, refer to the installation instructions provided with the accessory kits.

The mounting kit holds up to five optional modules. The maximum total current draw is 300 mA. See Figure 64. If an External Battery Module is installed, there is no current restriction.

The accessory modules with mounting kit are shown in Figure 65.

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

Figure 64 Option Board Types

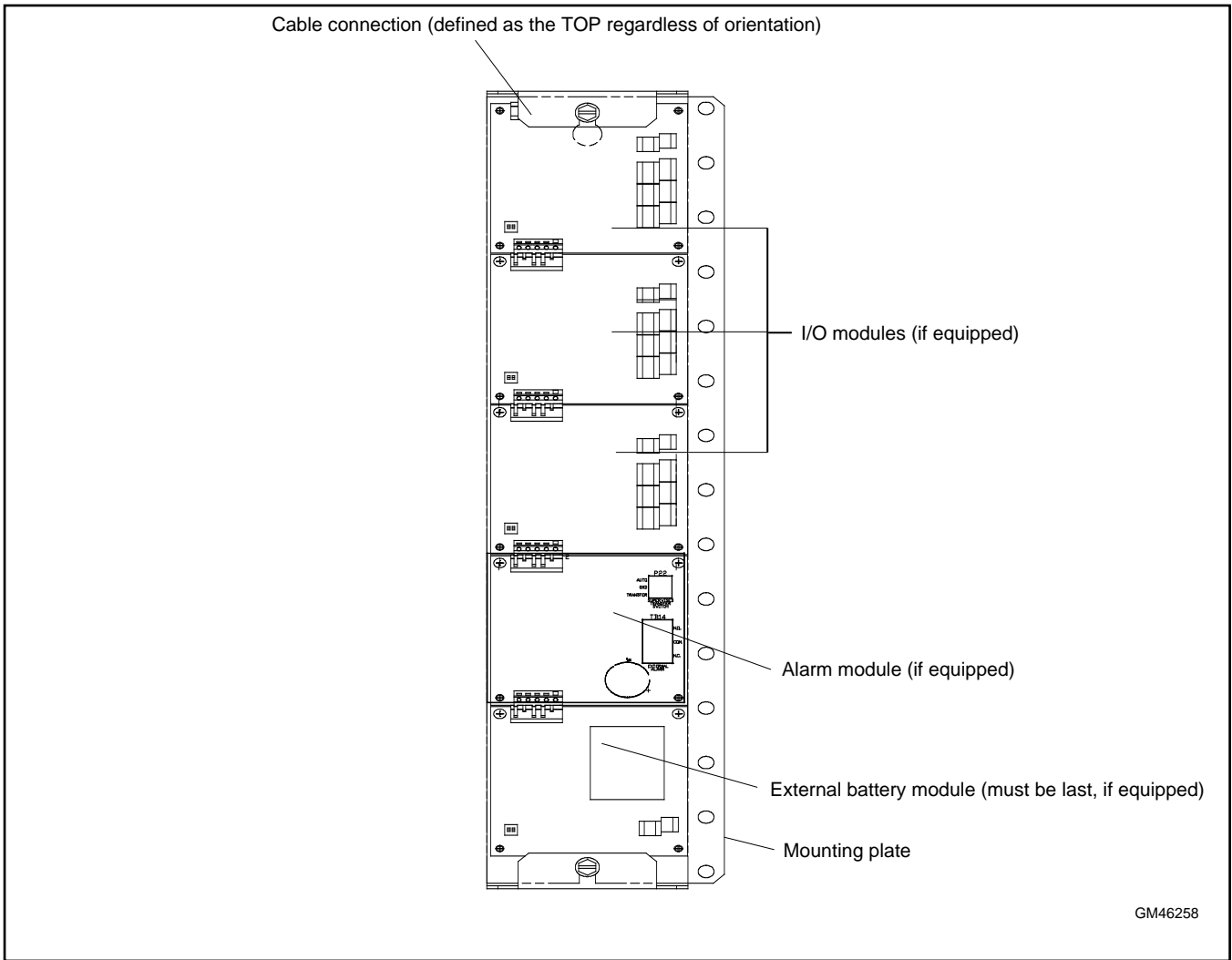


Figure 65 Accessory Module Mounting

7.2.1 Input/Output (I/O) Modules

Two types of input/output modules are available. The standard I/O Module has two inputs and six outputs. The high-power I/O module has two inputs and three outputs. See Figure 67 through Figure 69 for I/O module illustrations and specifications.

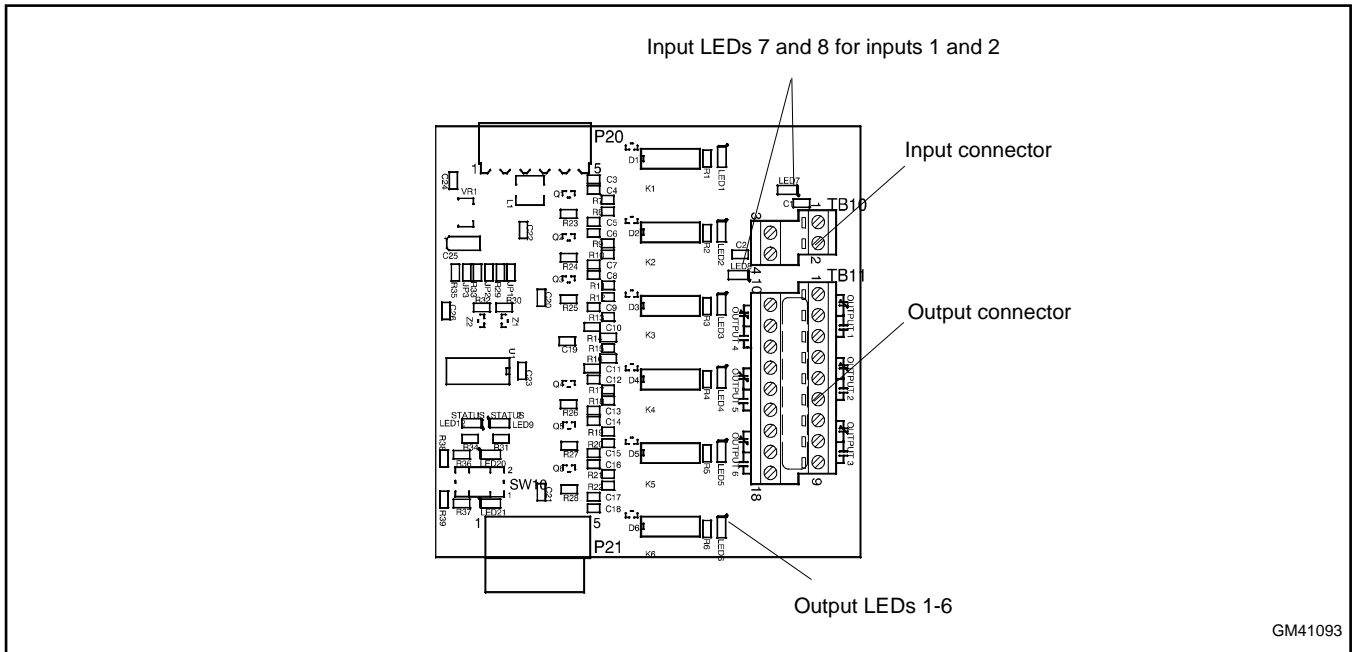
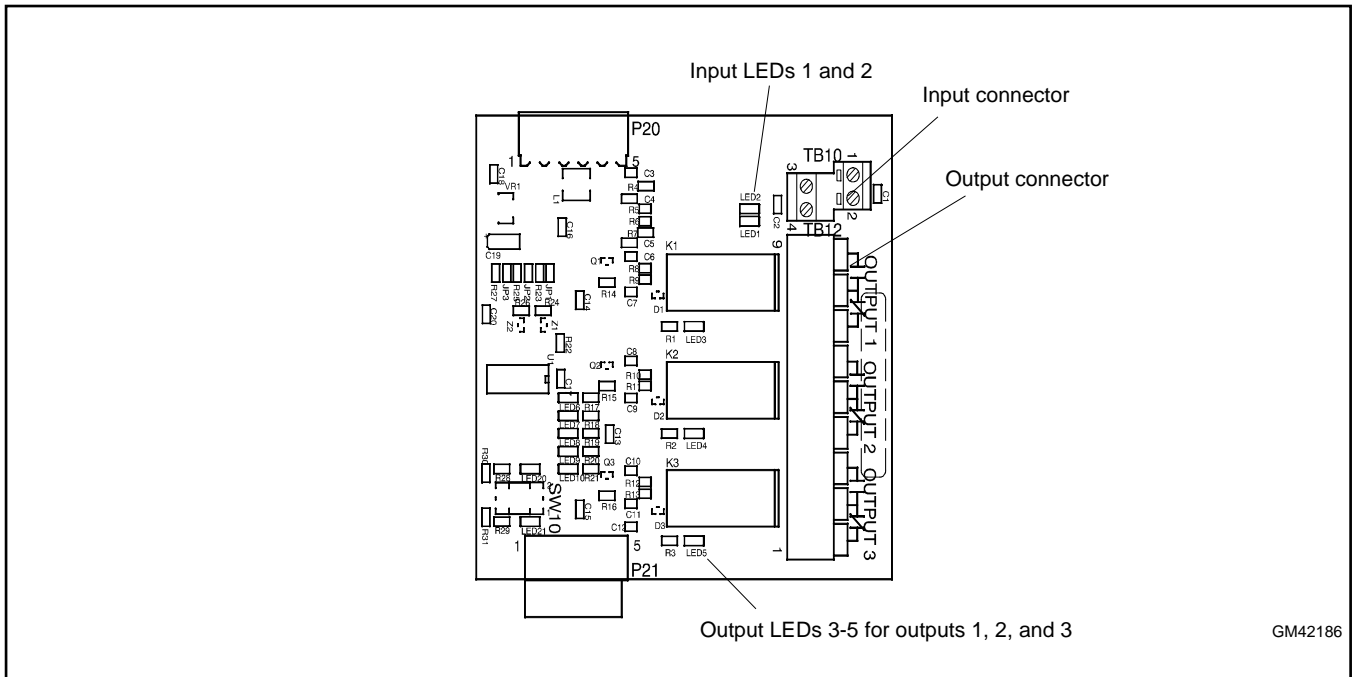


Figure 66 Standard I/O Module

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

Figure 67 Standard Input/Output Module



GM42186

Figure 68 High-Power I/O Module

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

Figure 69 High-Power Input/Output Module

Note:

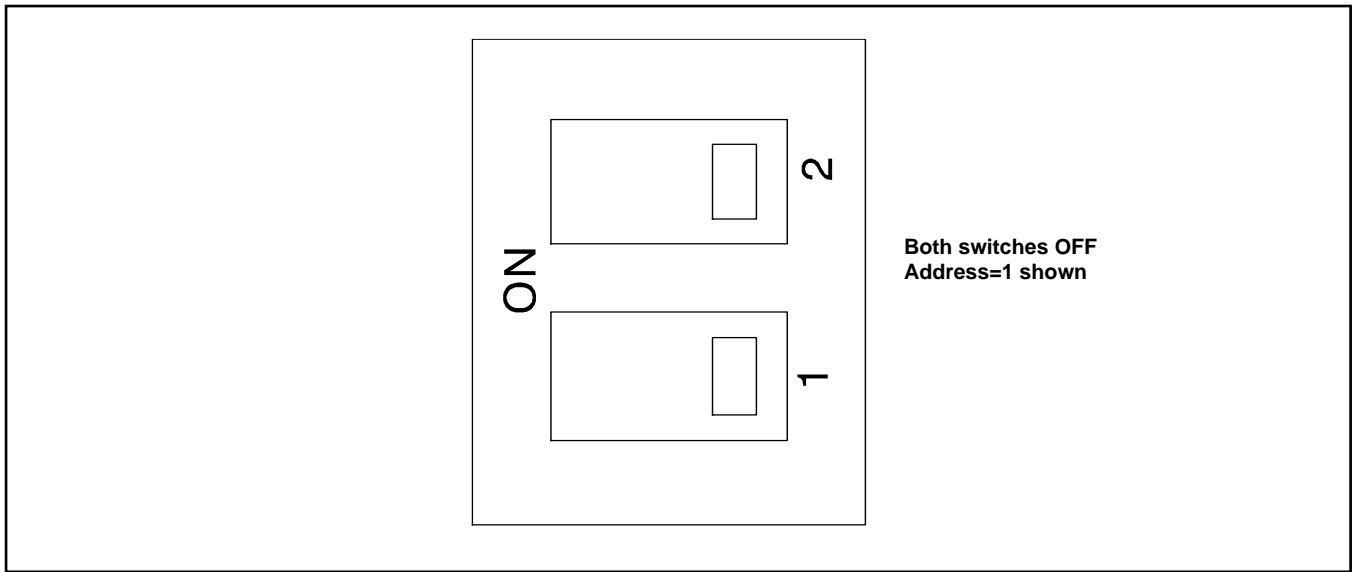
Each I/O module must have unique address.

Use the address DIP switches on the I/O module to assign a unique (different) address to each module as shown in Figure 70. Assign addresses in order from 1 to 4. An LED for each DIP switch lights to indicate that the switch is closed.

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

Use the Set Inputs/Outputs menu to assign input and output functions. See Section Inputs and Outputs for instructions.

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



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

Figure 70 Address DIP Switch Settings

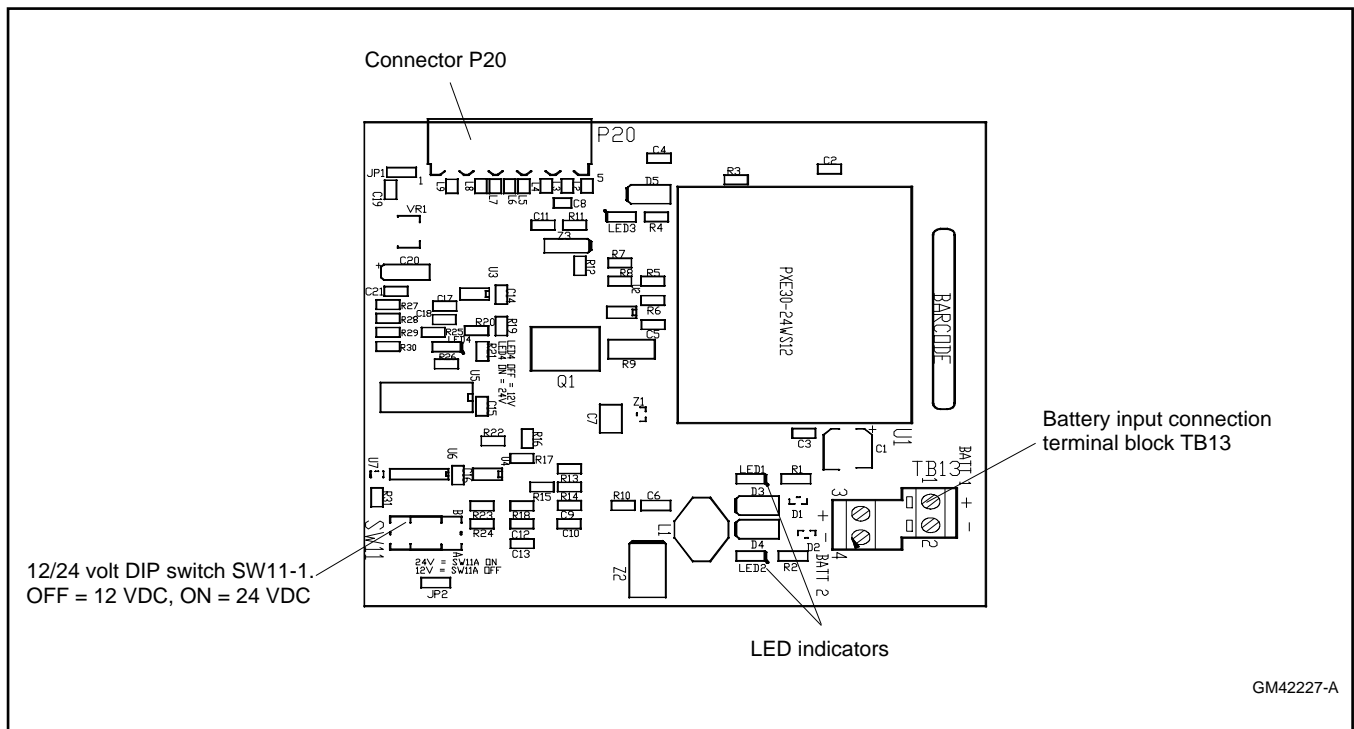
7.2.2 External Battery Supply Module (EBSM/BOB)

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

The EBSM kit is required for the following applications:

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

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



7.2.3 Alarm Module

See Figure 73 for the alarm module.

The functions provided by this board are:

- 90 dB Audible alarm (any alarm function can be programmed to trigger the audible alarm)
- Chicago alarm operation
- Preferred source selection
- Supervised transfer control (supervised transfer control switch required)
- Connection for external alarm The alarm board has a fixed address = 5.

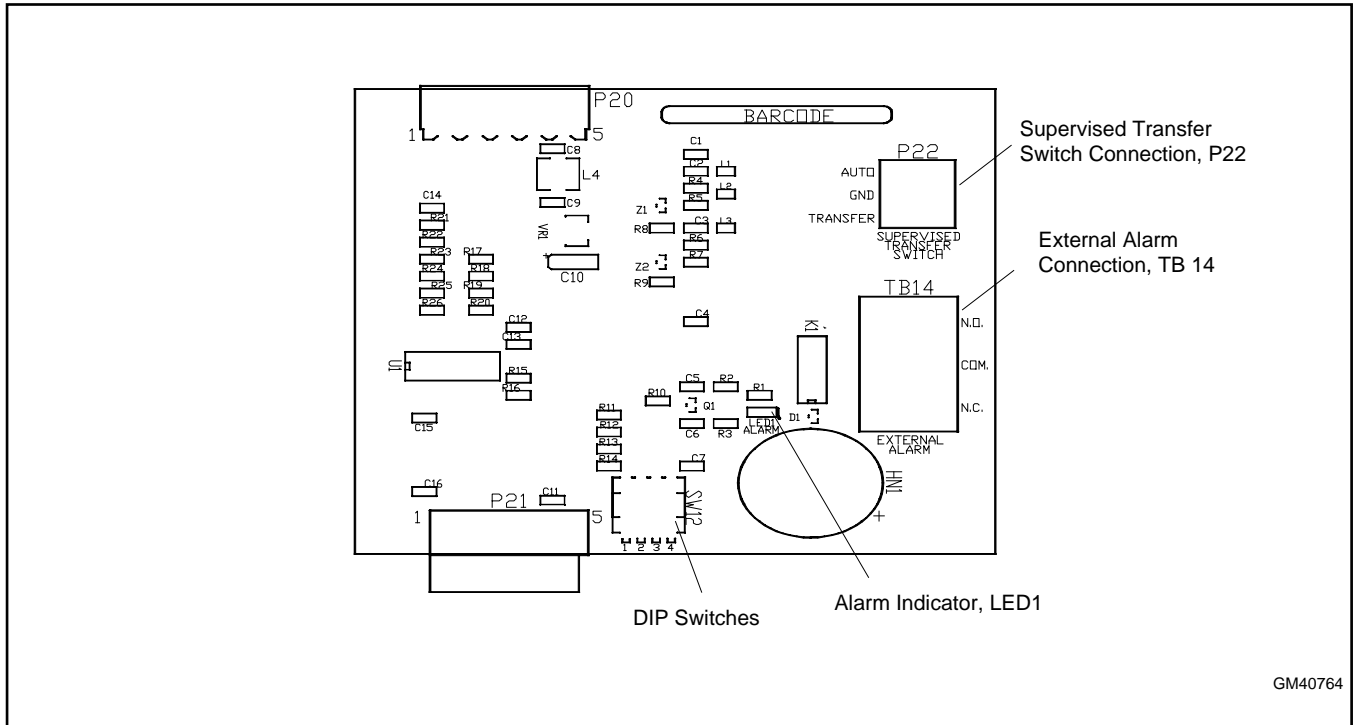


Figure 73 Alarm Module

Alarm Board DIP Switches

There are four DIP switches on the alarm module board. Some of the switches are not used. See Figure 74. To enable the preferred source selection, set DIP switch 1 to ON. If the supervised transfer switch is installed on the ATS, set DIP switch 2 to ON.

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

Figure 74 Alarm Board DIP Switches

Preferred Source Selection

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

External Alarm

A customer-supplied external alarm horn can be connected to the alarm module at terminal block TB14. Connect to the normally open or normally closed contact as recommended by the alarm manufacturer's instructions. See Figure 75.

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

Figure 75 External Alarm Connection Specifications

Audible Alarm Setup

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

Alarm Operation, Normal Mode

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

Alarm Operation, Chicago Alarm Mode

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

For Chicago Alarm Mode, use the Common Alarm Setup menu to assign the necessary faults and conditions to the audible alarm. See Section Common Alarms. Be sure to assign the Contactor in Standby condition to trigger the audible alarm.

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

Alarm Silence Mode

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

The Alarm Silenced condition can be assigned to a programmable output. See Section Inputs and Outputs for instructions to assign outputs.

Instructions to Silence the Alarm in Normal and Chicago Alarm Modes

When the alarm is activated, the word Alarm appears on the main display menu above the first button. See Figure 76. Press the Alarm button to open the Reset menu. Then press the button labeled Reset to silence the alarm.

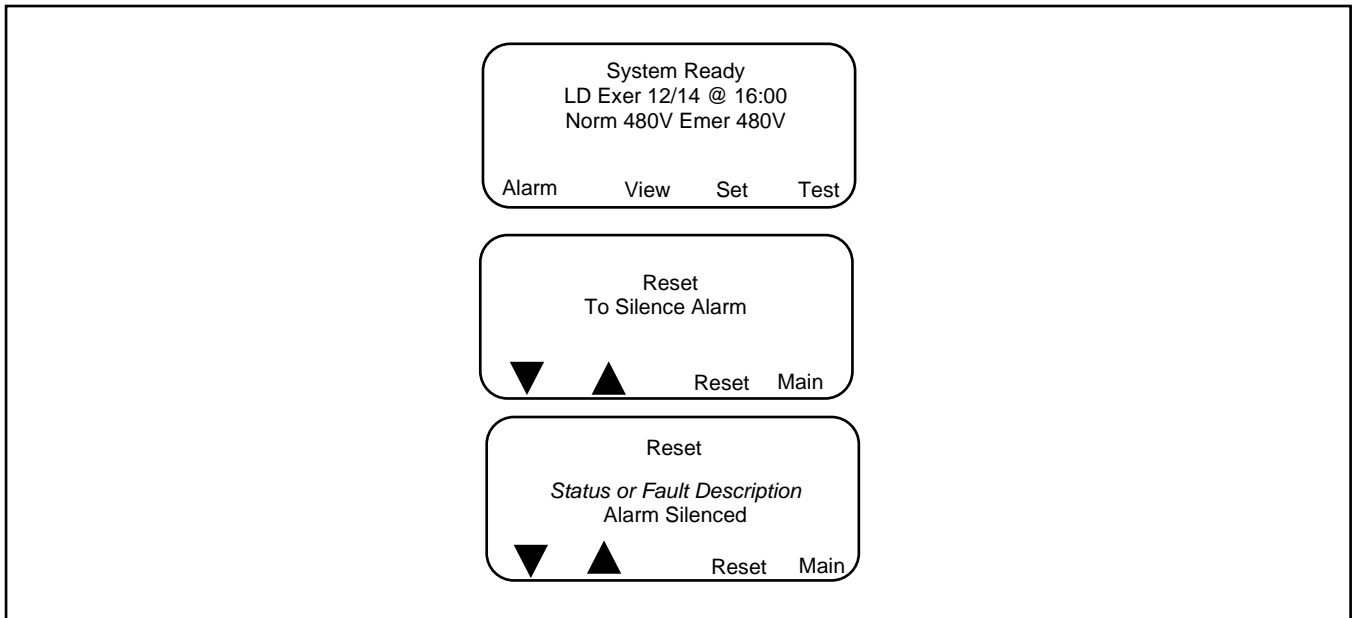






Figure 76 Alarm Silence

7.3 Controller Disconnect Switch

 WARNING	<p>Accidental starting. Can cause severe injury or death.</p> <p>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.</p>
	

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

 DANGER	<p>Hazardous voltage. Will cause severe injury or death.</p> <p>Only authorized personnel should open the enclosure.</p>
	

The controller disconnect switch allows disconnection of the power to the controller during maintenance and service. See Figure 77.

Note:

Disable the generator set before using the controller disconnect switch to disconnect power to the ATS controls.

Disconnecting power to the controls will cause the ATS to send an engine start signal to the generator set. Prevent the generator set from starting by pressing the OFF button on the generator set controller and disconnecting the battery charger and battery. Refer to the generator set operation manual for specific instructions.

The switch has two positions, auto (I) and disconnect (0). Move the controller disconnect switch to the 0 position to disconnect power to the ATS controller. After maintenance or service, move the switch to the I position to reconnect power. Follow the instructions in the generator set documentation to reenale the generator set.

The controller disconnect switch is not available for model KEP service entrance transfer switches, which are equipped with a control circuit isolation switch as standard equipment.

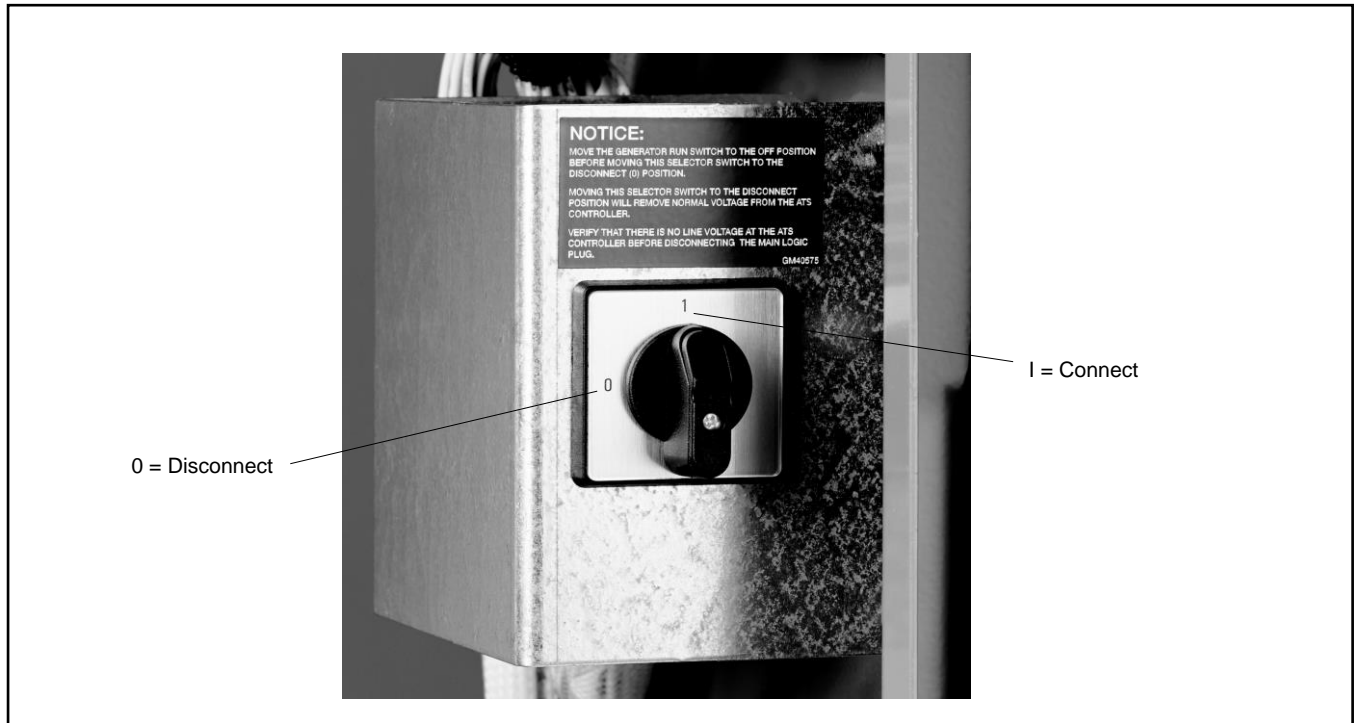


Figure 77 Controller Disconnect Switch

7.4 Current Sensing

The current sensing kit is shown in Figure 78. See Figure 79 for the current sensing kit connections.

The current sensing kit uses current transformers to measure the load bus current on all phases. Load current can then be displayed on the controller menu. See Section Normal Operation Menus, Normal Operation Menus.

Current transformer kits are designed for your transfer switch based on the current rating, number of phases, and transfer switch model.

Use a clamp-on current sensing meter to calibrate the current. Store the measured current values using the Calibration menu. See Section Calibration.

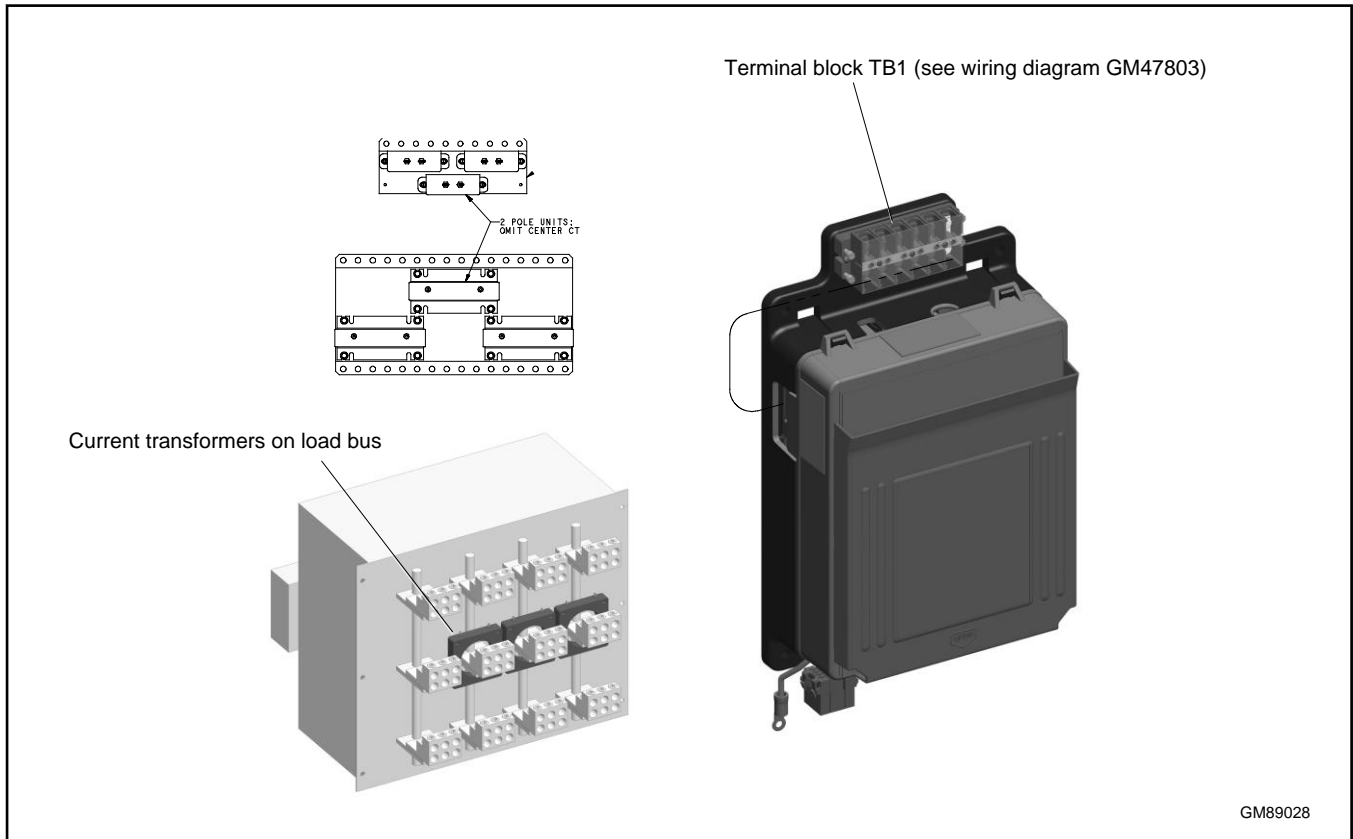


Figure 78 Current Sensing Kit

7.5 Digital Meter

The digital power meter displays voltage, current, frequency, and power. See Figure 80 for a typical meter display. Other features include:

- 35 programmable alarms
- LCD display, 67 x 62.5 mm (2.65 x 2.5 in.)
- Pushbutton operation
- Password-protected programming menus
- Two digital inputs
- Two digital outputs
- Two Form A relay outputs
- Serial port for optional network connections
- Data logging

Digital meters must be factory-installed.

See TP- 7168, PM5330 User Manual, for operation instructions.



Figure 80 Digital Meter

7.6 Engine Start Circuit Monitoring System

The Engine Start Circuit Monitoring System forwards engine start signals while continuously monitoring for wiring faults (open or short circuits) as required by the electrical code NEC 700.10. If the generator module receives an engine start signal or detects any faults, it will send the start signal to the generator and provide an alarm.

The system uses one generator (GEN) module and up to eight Automatic Transfer Switch (ATS) modules. The GEN modules and ATS modules are sold separately. Use one GEN module for the generator and one ATS module for *each* transfer switch in the system (maximum 8 ATSs per GEN module). See Figure 81 and Figure 82.

See the Installation Instructions provided with the kit for more information.

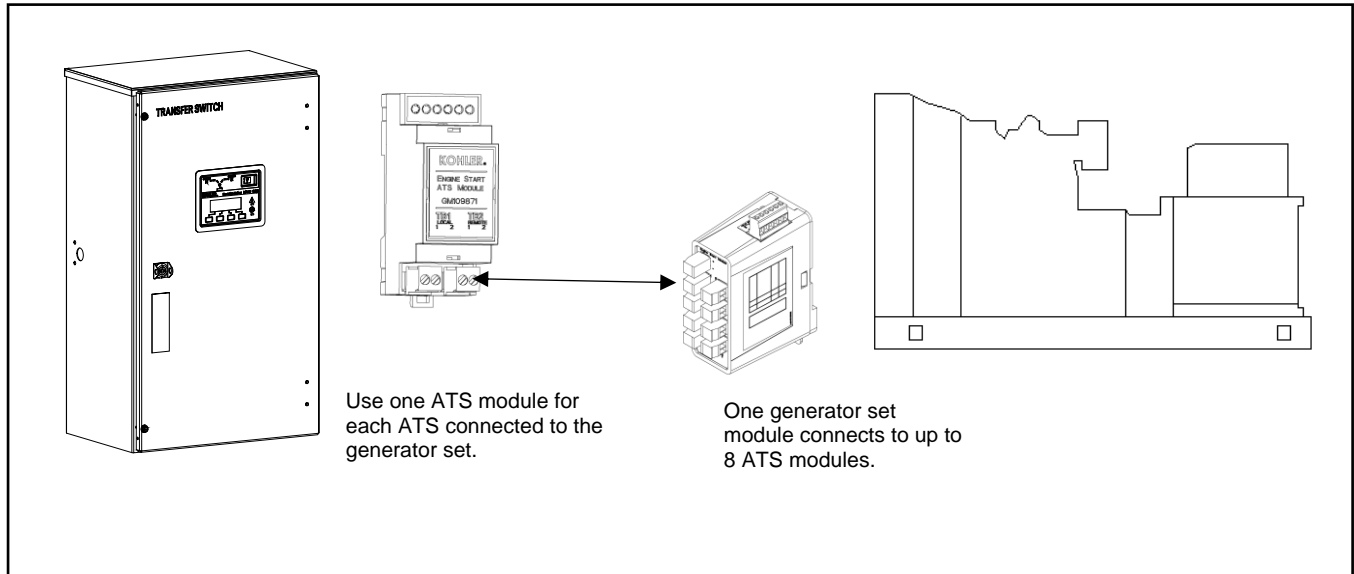


Figure 81 System Modules

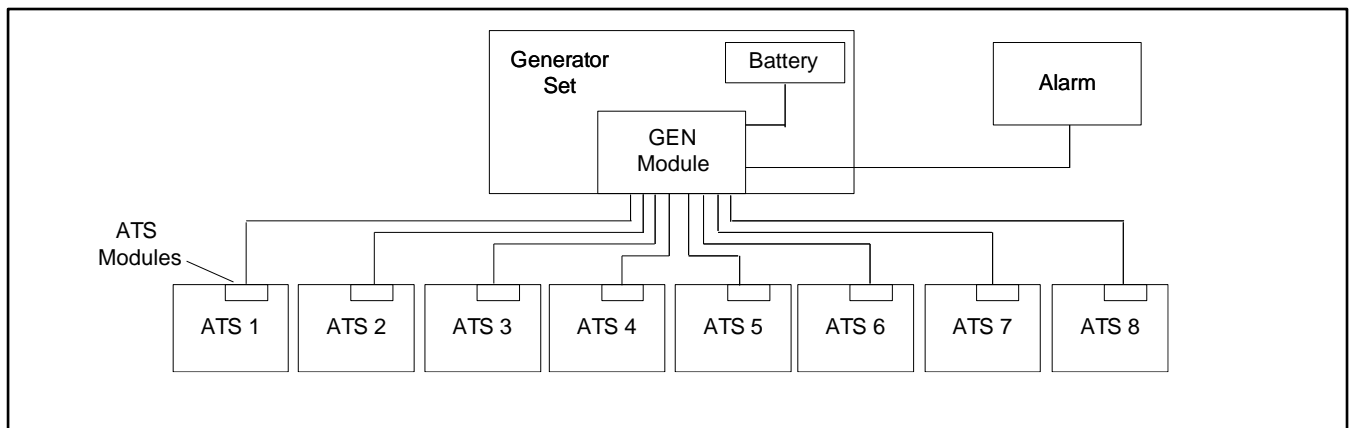


Figure 82 System Architecture

7.7 Energy Reduction Maintenance Setting (ERMS) System

The Energy Reduction Maintenance Setting (ERMS) system is available as optional, factory-installed equipment on 1200 Amp and larger model KUS and KUP service entrance rated automatic transfer switches (ATS). The ERMS system is used to reduce the arc flash incident energy (AFIE) during energized service.

The system can help provide compliance with NEC requirements for arc flash reduction. Refer to the NEC and follow all applicable codes and regulations during the ATS installation.

The ERMS system is available on MicroLogic P or H trip units with the blue ERMS label shown in Figure 83. See the KUS/KUP Specification Sheet for circuit breaker information.

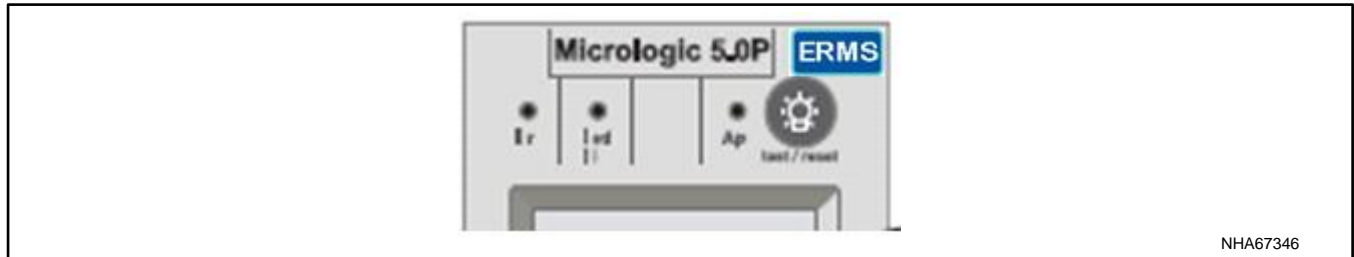


Figure 83 ERMS Label on Circuit Breaker Trip Unit

The ERMS module is manufactured by the circuit breaker manufacturer and is used to reduce the tripping threshold and clearing time. The ERMS is installed and wired at the factory according to the circuit breaker manufacturer's instructions. Factory connections are shown in Figure 85 for reference only. No customer connections to the system are required.

The following components are mounted on the ATS enclosure door as shown in Figure 84.

- ERMS Maintenance Mode ON/OFF selector switch.
- Maintenance mode indicator light. The light is ON when the circuit breaker is in ERMS mode.

The I/O Module factory setting = 3; do not change this setting.

ERMS System Operation Description

When the ERMS switch is "ON" (circuit breaker is in maintenance mode), the circuit breaker's ERMS instantaneous pickup is set to the pre-programmed level which is less than the normal instantaneous pickup setting as set by the rotary switch setting (Ii). As a result, the potential for nuisance tripping increases. Nuisance tripping can be caused by a motor starting, transformer inrush, or some other momentary power disturbance.

For more information, refer to the ERMS system manufacturer's literature included with the transfer switch.

ERMS Operation Instructions

1. Turn the ERMS maintenance mode switch to ON before performing service or maintenance on the transfer switch or downstream equipment.

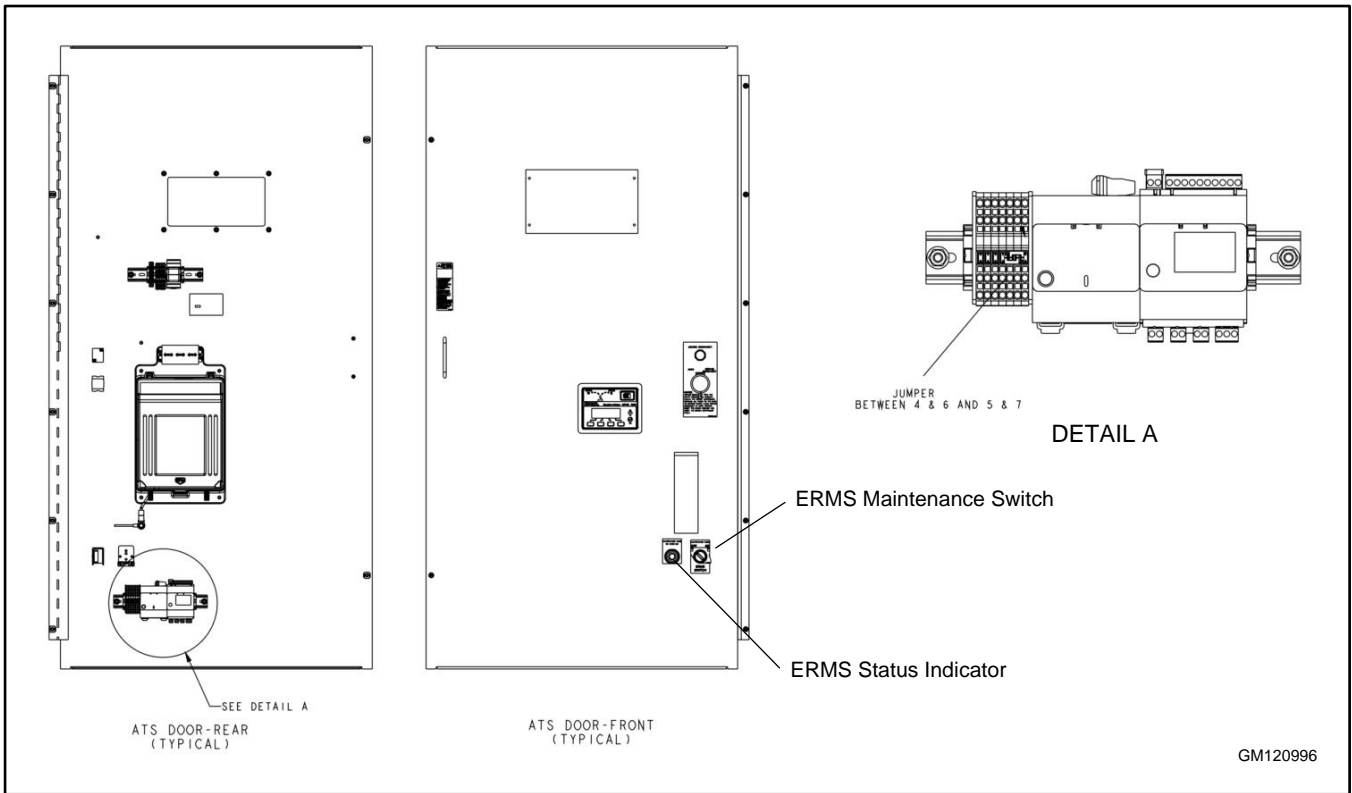
Note:

Utility source voltage is still present! The ERMS system does not disconnect power or trip/open the utility circuit breaker.

2. After the service procedures are complete, turn the switch OFF for normal system operation.

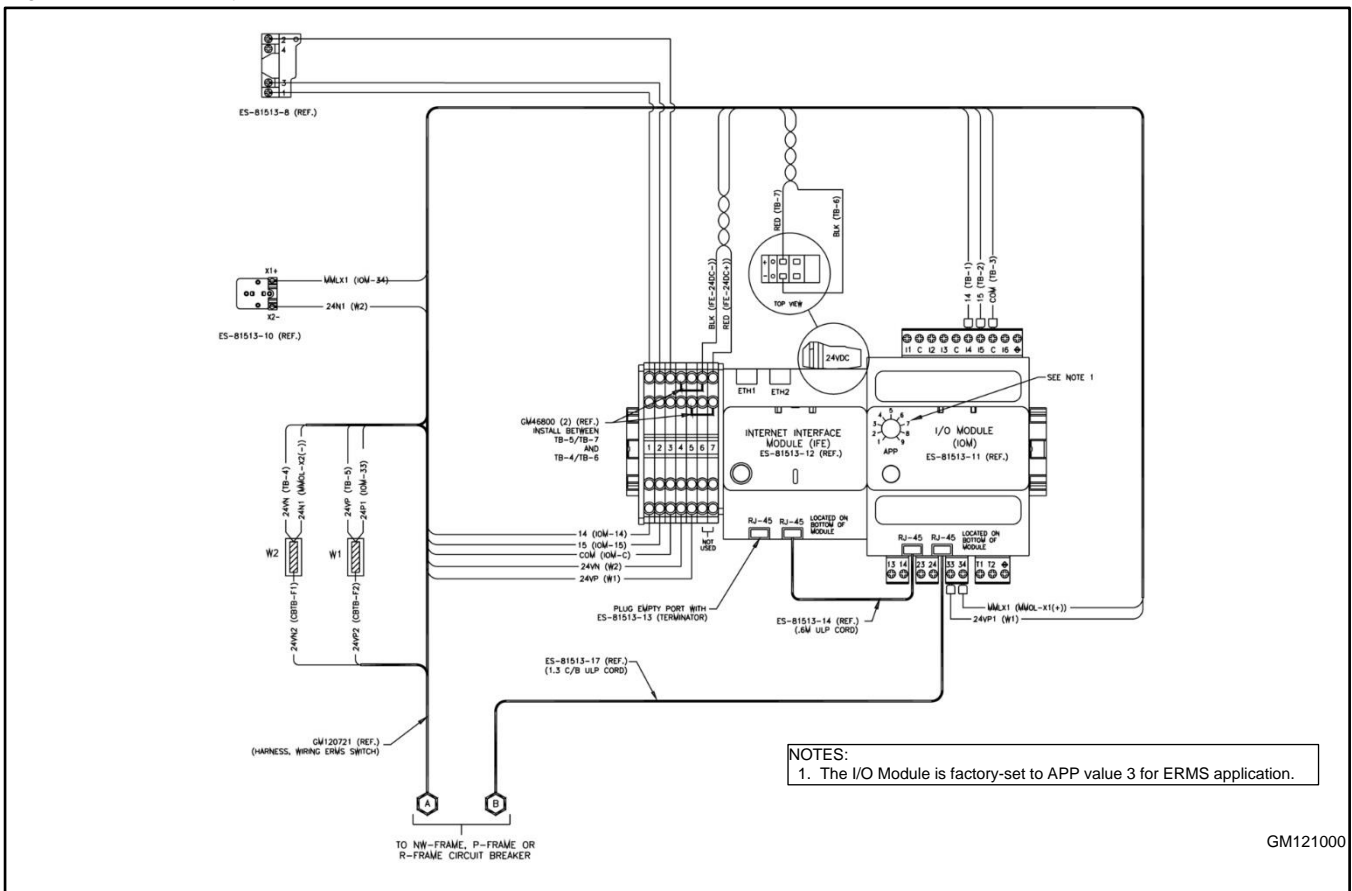
Note:

Be sure to follow all safety precautions and instructions, including instructions to disconnect power and/or disable the generator set, when performing maintenance and service procedures on the power system or connected equipment.



GM120996

Figure 84 ERMS System Components



GM121000

Figure 85 ERMS wiring (factory-installed)

7.8 Heater

An anti-condensation heater kit is available. The strip heater is controlled by a hygrostat to raise the temperature inside the enclosure above the dew point to prevent condensation. Figure 86 shows a typical location of the heater kit components inside the enclosure.

The installer must connect 120 VAC power to the terminal block near the hygrostat. See Figure 87 and Figure 88. The heater and hygrostat are connected to power through a 15-amp circuit breaker.

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

Because of space limitations in the smaller enclosures, the following models can include either an enclosure heater or a surge protection device (SPD), but not both:

Model KCS 30- 200 Amps

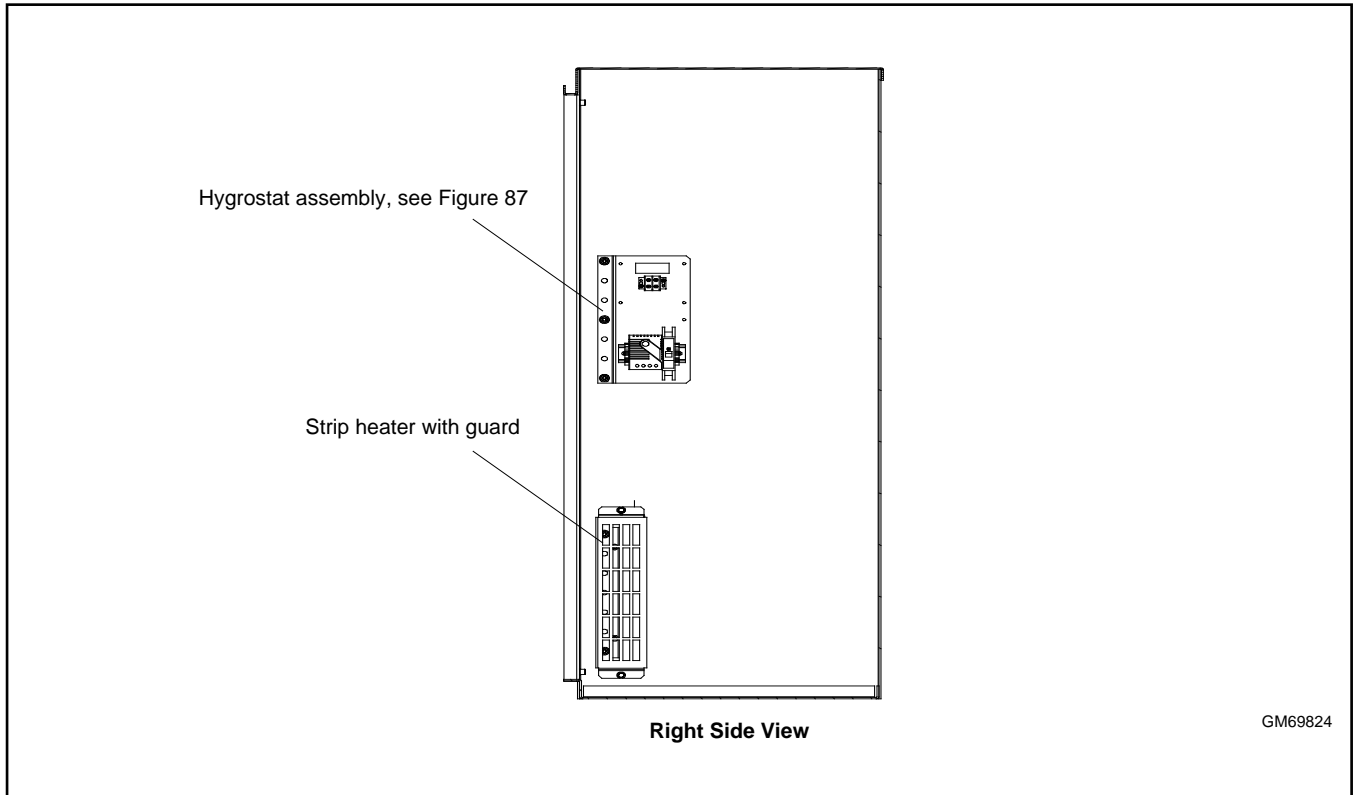


Figure 86 Heater Location, Typical

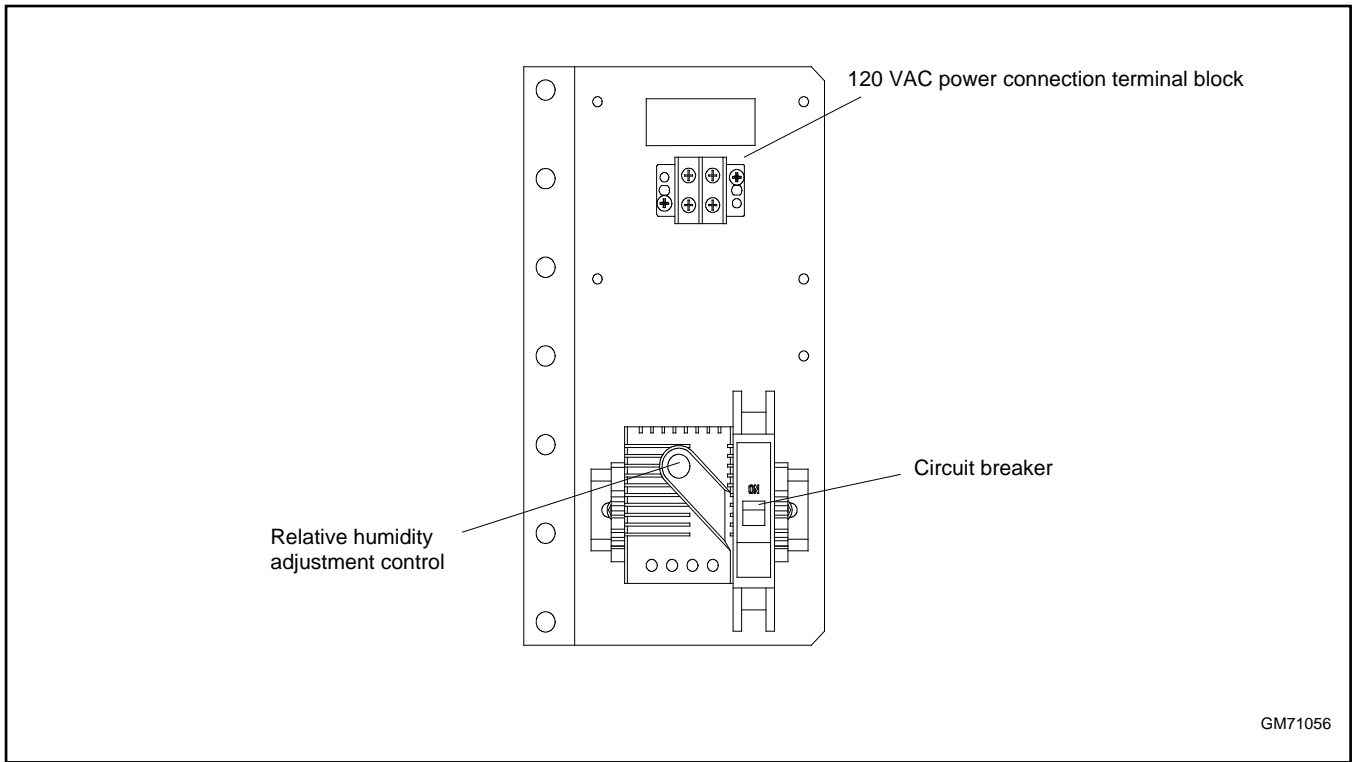


Figure 87 Hygrostat Assembly, Typical

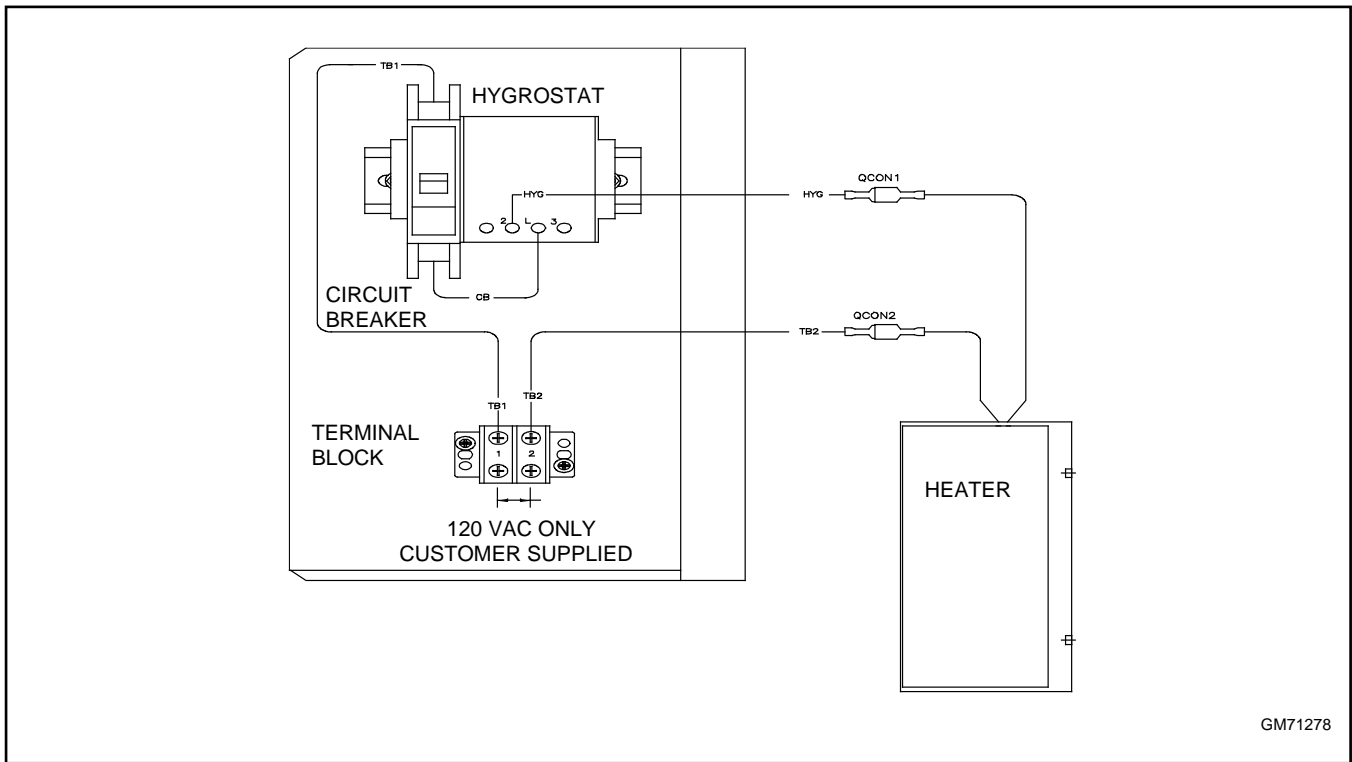


Figure 88 Heater Connections

7.9 Line-to-Neutral Voltage Monitoring

Line-to-neutral voltage monitoring allows the display of the AN, BN, and CN RMS voltages in the normal operation menus. See Section Normal Operation Menus. It is standard on 4-pole models and optional on 2-pole and 3-pole models.

The line-to-neutral monitoring kit is available factory-installed or as a loose kit. Refer to the instructions provided with the kit for field installation.

7.10 Load Shed (Forced Transfer to OFF)

The load shed (forced transfer to OFF) accessory is available for programmed-transition and closed transition transfer switches.

- The load shed accessory for models KCP and KCC is available factory-installed or as a loose kit.
- The load shed accessory for bypass/isolation models KBP and KBC must be factory-installed.
- The load shed accessory is not required for load shed (forced transfer to OFF) functionality on model KEP Service Disconnect to OFF models.

See Figure 89 for an illustration of the load shed accessory.

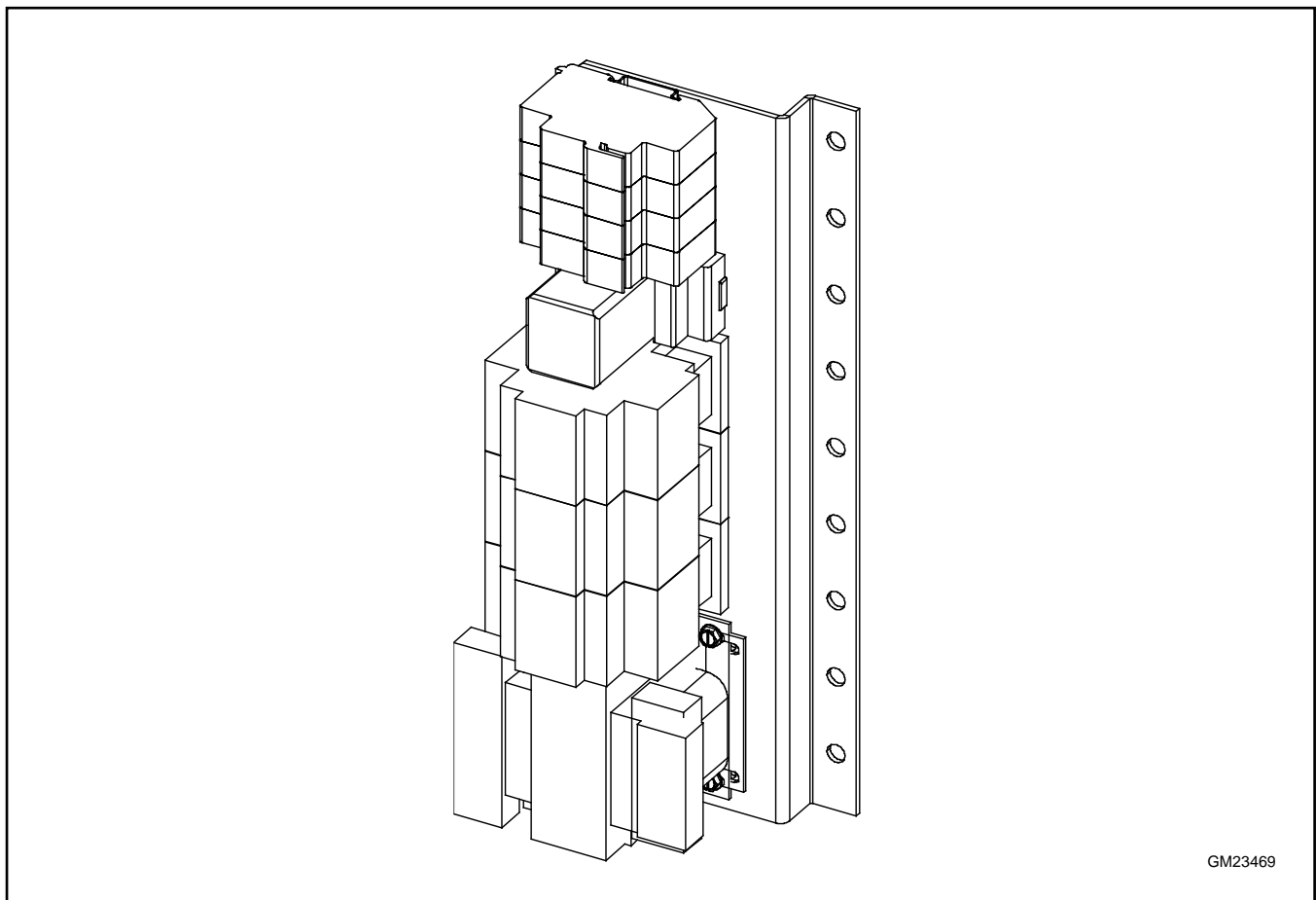


Figure 89 Load Shed Accessory (for identification)

7.10.1 Description

The load shed (forced transfer to off) accessory allows the removal of non-critical loads from the Source E generator set. The accessory requires an external signal (contact closure) to initiate transfer to the OFF position.

When the Forced Transfer to Off input is activated (contact closed), the contactor moves from Source E to the OFF position immediately, ignoring all time delays. If the normal source is available when the input is activated, the ATS transfers to the OFF position and then to Source N. If Source N is not available, the ATS remains in the OFF position until the input is deactivated.

Activating the Forced Transfer to Off input while the contactor is in the Source N position does not cause a transfer to the OFF position. However, if source N is lost while the input is activated, the contactor will move to the OFF position. The contactor will not transfer to Source E, even if Source E is available. When Source N returns, the contactor will transfer back to Source N.

When the input is deactivated, the ATS transfers back to Source N, if available, executing all programmed time delays. If Source N is not available, the ATS transfers to Source E.

The load shed (forced transfer to off) function only sheds loads connected to Source E. The preferred source selector switch position (if equipped) does not affect this function.

7.10.2 Customer Connection

The load shed function requires an external signal (contact closure) to initiate transfer to the OFF position. Connect the external contact to input #1 (if available) or input #2 on connector TB1 on the controller. See Figure 90. Use #12- 24 AWG wire and tighten to 0.5 Nm (4.4 in. lb.).

Use the Set Inputs/Outputs menu or Kohler® SiteTech™ software to assign the connected input (Main Board Input #1 or #2, or Digital Input A1 or A2 in SiteTech) to the Forced Transfer to Off function. If the external contact is connected to a different input connection on an optional I/O module, assign the Forced Transfer to Off function to that input.

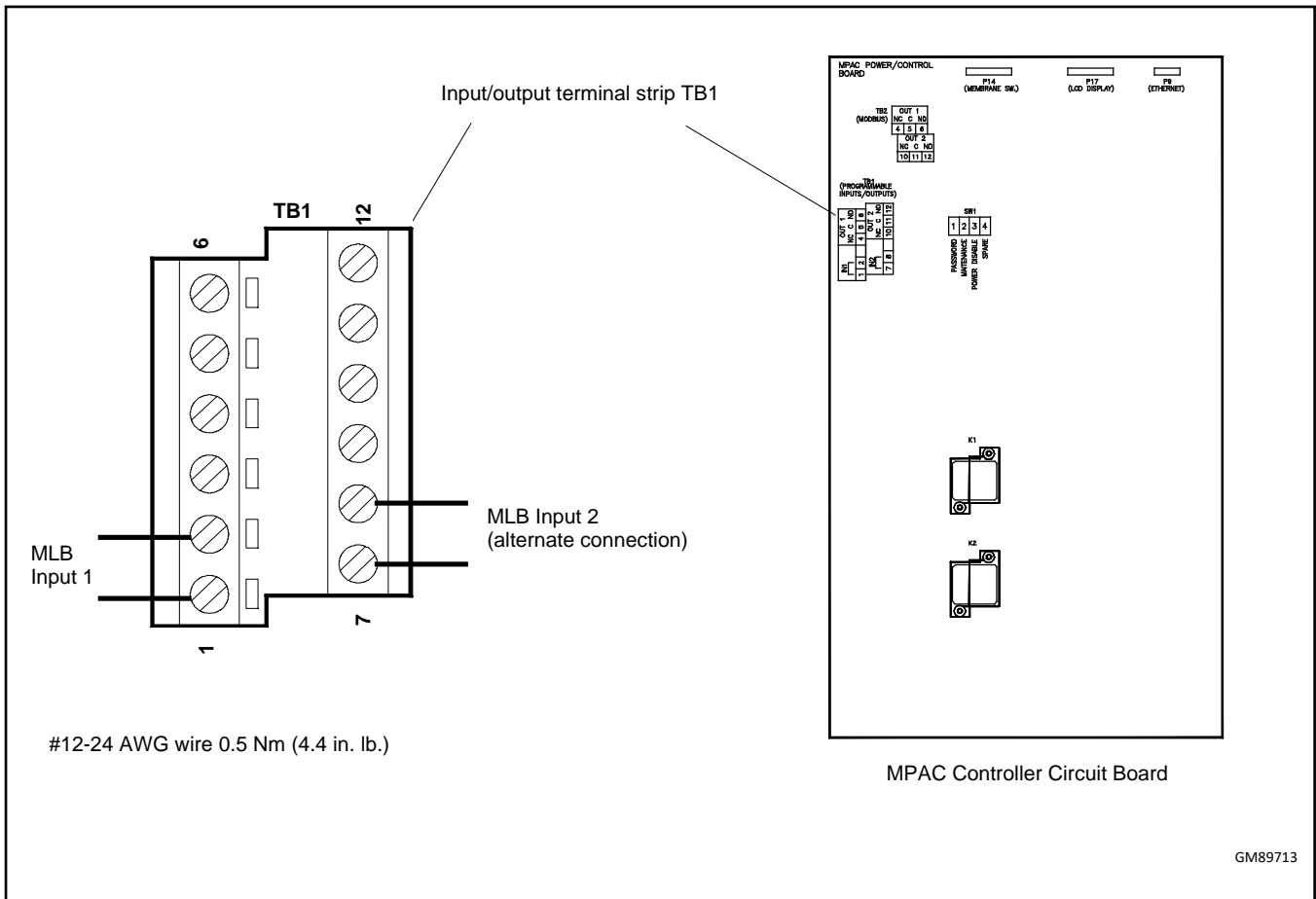


Figure 90 Forced Transfer to Off Input Connection (for load shed kits)

7.11 Supervised Transfer Control Switch

The supervised transfer control switch (AUTO/MANUAL/TRANSFER switch) is a three-position, key operated switch that allows manual control of load transfers. The alarm module is required for installation and operation of the supervised transfer control switch. The switch connects to P22 on the alarm module. See Figure Alarm Module in Section: Alarm Module.

The switch has maintained AUTO and MANUAL positions and a momentary TRANSFER position. The key can be removed in either the AUTO or MANUAL position. The key cannot be removed when the switch is in the TRANSFER position. Figure 91 shows the switch.

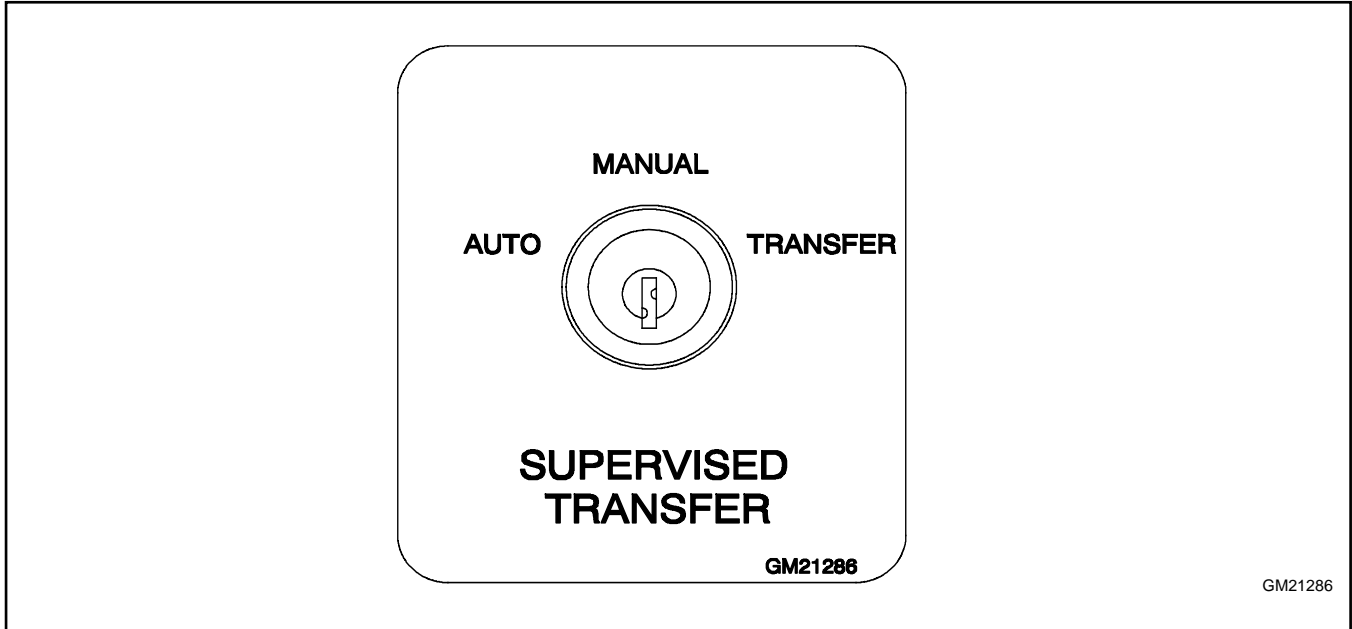


Figure 91 Supervised Transfer Control Switch

7.11.1 Manual Transfer

Moving the switch to the TRANSFER position will not cause the ATS to transfer unless an event such as a loss of utility, a loaded test, or a loaded exercise has initiated a transfer sequence. The transfer sequence executes all programmed time delays and signals the generator set engine to start. Wait for the time delays to expire, or press the End Time Delay button.

MANUAL TRANSFER is displayed on the controller display and the Not-in-Auto LED flashes when the ATS is ready to transfer. Turn the switch to TRANSFER and release it to allow a transfer. It is not necessary to hold the switch in the TRANSFER position.

The MANUAL mode allows the system to run on the standby source indefinitely, even if the preferred source is available.

Manual Transfer Procedure

1. An event occurs such as the loss of the connected source or the start of a loaded exercise, or an operator starts a loaded test.
2. The ATS executes times delays and signals the generator set engine to start.

Note:

Press the END TIME DELAY button to shorten the time delays, if desired.

3. MANUAL TRANSFER is displayed on the controller and the Not-in-Auto LED flashes.
4. Turn the key switch to the TRANSFER position and release.
5. The load is transferred to the standby source, if available.
6. When the preferred source returns or the exercise or test ends, manual transfer is required to transfer back to the preferred source. Turn the key switch to TRANSFER and release. Load control time delays will operate if both sources are available.

Note:

Automatic and non-automatic transfer switches operate differently when the supervised transfer control switch is in the MANUAL position. The operation is described in the following sections and shown in Figure 92.

Switch Position	Automatic Switches	Non-Automatic Switches
AUTO	<ul style="list-style-type: none"> • Automatically transfers to the standby source, when available, if the preferred source is lost. • Transfers back to the preferred source when it becomes available. 	
MANUAL	<ul style="list-style-type: none"> • Automatically transfers to an available source if the connected source is lost. • Test, peak shave, and loaded exercise commands will transfer to the standby source. • Does not automatically transfer back to preferred when both sources are available. 	<ul style="list-style-type: none"> • Does not automatically transfer to an available source when the connected source is lost. • Test, peak shave, and loaded exercise commands are ignored. • Does not automatically transfer back to preferred when both sources are available. • Transfers only when the switch is manually moved to the TRANSFER position as described below.
TRANSFER (momentary switch position)	<ul style="list-style-type: none"> • Does not initiate an engine start sequence. Generator set engine must be signaled to start by an event such as a loss of utility, loaded test, loaded exercise, etc. • Allows transfer to the other source, if available. An event such as a loss of utility, loaded exercise, or loaded test must first initiate the transfer sequence. • Time delays will operate. Wait for time delays to expire, or press the End Time Delay button. • Operates pre- and post-transfer load control time delays if both sources are available. • MANUAL TRANSFER is displayed when the ATS is ready to transfer. 	

Figure 92 Supervised Transfer Control Switch Operation for Automatic and Non-Automatic Transfer Switches

7.11.2 Automatic Transfer Switches

AUTO position

On an automatic transfer switch, when the Supervised Transfer Control switch is in the AUTO position, the controller responds normally to transfer requests, and will automatically transfer to a source if that source is available.

MANUAL Position

On an automatic transfer switch with the Supervised Transfer Control Switch in the MANUAL Position, the contactor will automatically transfer to the available source if the connected source is not available. In this case, no user action is required to initiate the transfer.

Operation with Test and Peak Shave

On an automatic transfer switch, a test, peak shave, or loaded exercise command will be recognized and a transfer sequence to the standby source will operate normally when the Supervised Transfer Control Switch is in the MANUAL position. However, ending the test or removing the peak shave signal will not cause a transfer back to the preferred source. Move the supervised transfer control switch to the TRANSFER position to initiate transfer back to the preferred source.

7.11.3 Non-Automatic Transfer Switches

Non-automatic transfer switches are factory-equipped with the supervised transfer control switch.

Note:

Transfer switches are built and UL-labeled as automatic or non-automatic by the factory and cannot be converted in the field. The supervised transfer control switch must not be removed from non-automatic switches in the field.

AUTO position

On a non-automatic transfer switch, when the Supervised Transfer Control switch is in the AUTO position, the controller responds normally to transfer requests, and will automatically transfer to a source if that source is available.

MANUAL Position

When the supervised transfer control switch is in the MANUAL position, a non-automatic transfer switch does not transfer automatically, even if the connected source is lost. To initiate a transfer sequence after the source has been lost, move the switch to TRANSFER and then release the switch as described in Section Manual Transfer.

Operation with Test and Peak Shave

On a non-automatic transfer switch, the test, peak shave and loaded exercise signals are ignored when the Supervised Transfer Control Switch is in the MANUAL position.

7.12 Surge Protection (SPD)

A surge protection device (SPD) is available for the transfer switch. Installed on the Normal source side, the SPD protects the system from voltage surges, preventing damage to household loads. The SPD resets automatically. See Figure 93 for the typical SPD assembly location inside the ATS enclosure. See Figure 94 for SPD specifications and Figure 95 for SPD connections.

Because of space limitations in the smaller enclosures, the following models can include either an enclosure heater or a surge protection device (SPD), but not both: Model KCS 30- 200 Amps

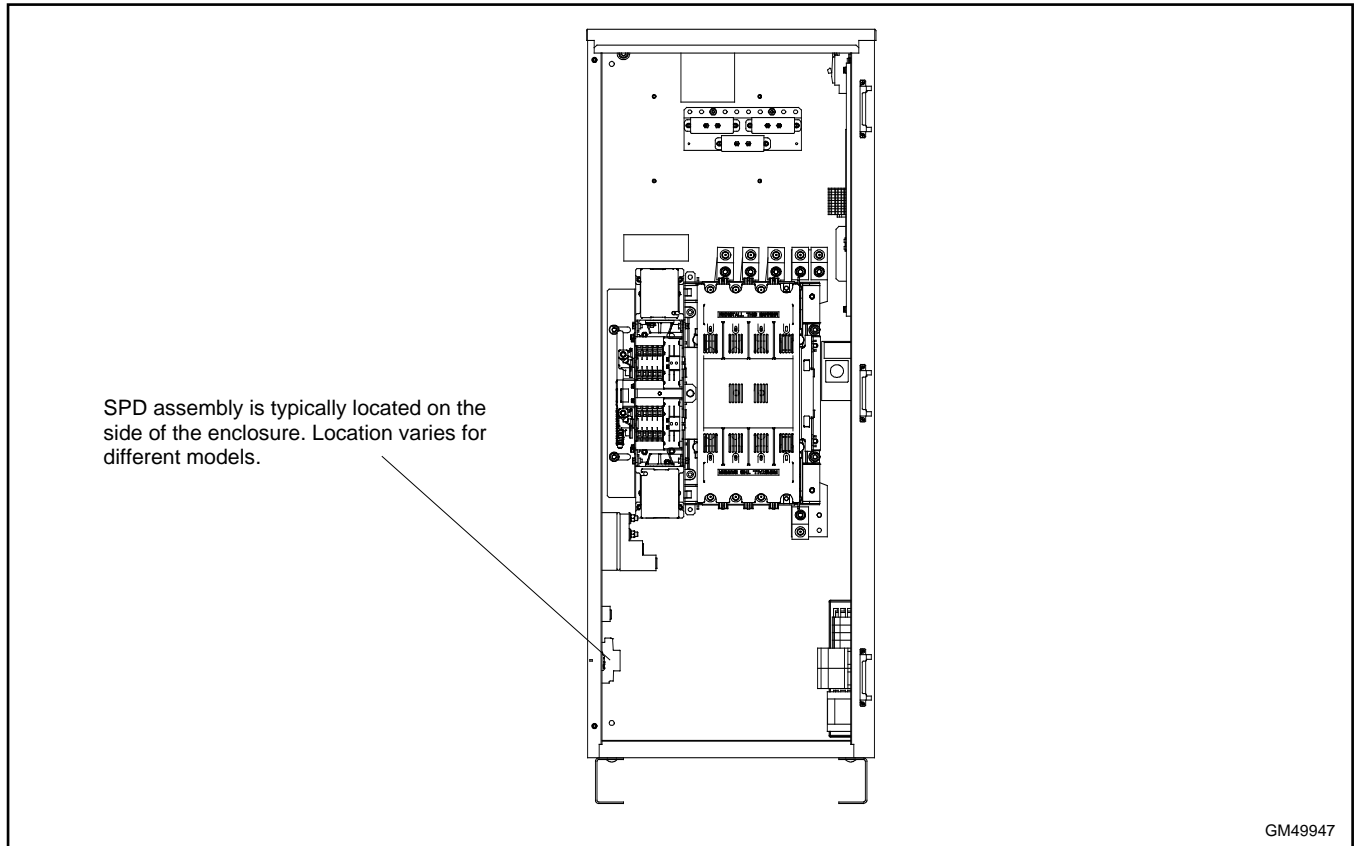


Figure 93 SPD Location, Typical

SPD Specifications								
Nominal Voltage (V ±15%)	Max. Discharge Current (kA)	Phase	Poles	UL VPR 3rd Ed (L-N/N-G/L-G) (kV)	Limiting Voltage, (L-N/N-G/L-G) (kV)		Short Circuit Withstand Current (kA)	Maximum Continuous Operating Voltage (VAC)
					at 3kAmps	at 10kAmp		
120/240	40	Split	3	0.6 / 1.2 / 0.7	0.6 / 0.4 / 0.6	0.8 / 0.7 / 0.8	200	175 / 350
120/208	40	Wye	4	0.6 / 1.2 / 0.7	0.6 / 0.4 / 0.6	0.8 / 0.7 / 0.8	200	175 / 350
277/480	40	Wye	4	1.0 / 1.2 / 1.1	1.0 / 0.4 / 1.0	1.2 / 0.7 / 1.2	200	320 / 640
120/240	40	HLD	4	1.0 / 1.2 / 1.1	1.0 / 0.4 / 1.0	1.2 / 0.7 / 1.2	200	320 / 640
347/600	40	Wye	4	1.3 / 1.2 / 1.4	1.3 / 0.4 / 1.3	1.5 / 0.7 / 1.5	200	440 / 880

Figure 94 SPD Specifications

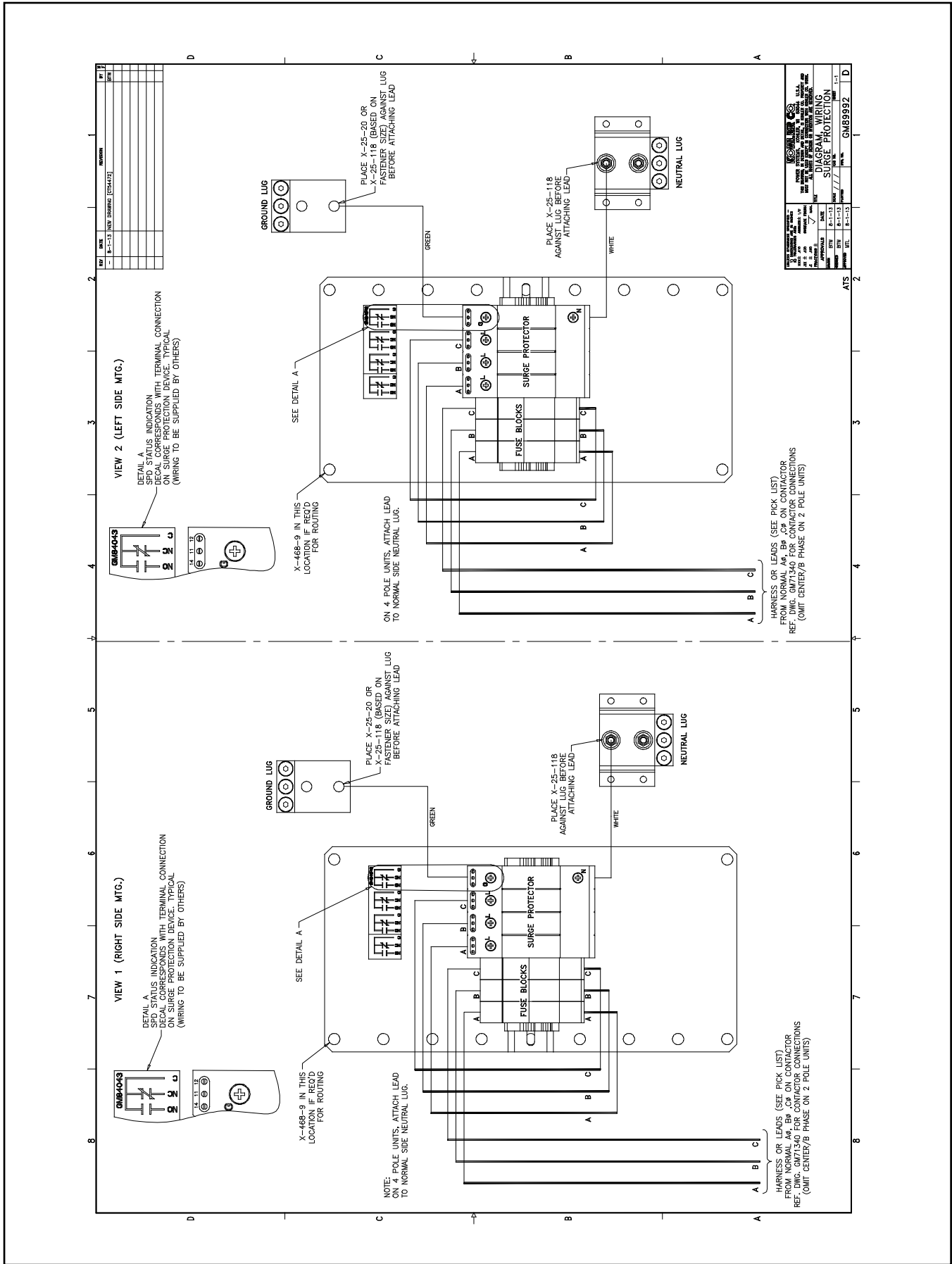


Figure 95 SPD Wiring Diagram, GM89992

7.12.1 SPD Status Indicators

A status indicator on each Surge Protection Device (SPD) module indicates the SPD condition. See Figure 96. A green indicator shows that the SPD is providing protection. When the status indicator is red, the SPD no longer provides protection. Replace the SPD cartridge. See the SPD Replacement section for replacement instructions.

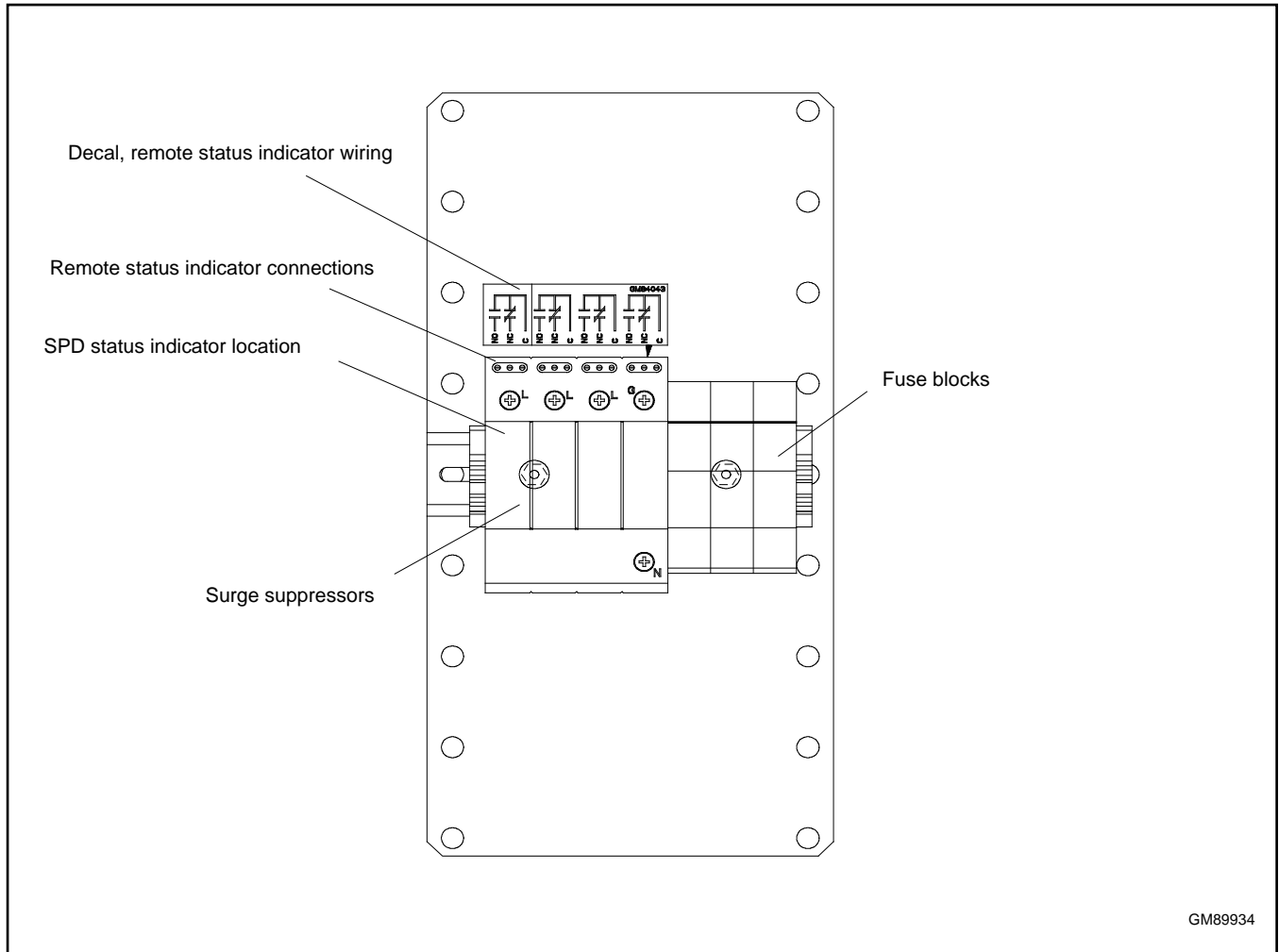


Figure 96 SPD Assembly, Typical

7.12.2 SPD Remote Status Indicator

A customer-supplied indicator for the SPD can be connected to provide remote indication when the SPD needs to be replaced. The contact changes state when the SPD module needs replacement.



Connect customer-provided indicators or alarms to the normally open (NO) or normally closed (NC) auxiliary contact terminals on the remote status indicator connection terminal block. See Figure 97 for the contact rating and Figure SPD Assembly, Typical in Section: SPD Status Indicators for the terminal block location. See the decal on the SPD assembly or the transfer switch wiring diagram for connections.

SPD Remote Status Indication	Specification
Contact rating	1 A @ 250 VAC
Wire Size	16 AWG

Figure 97 Remote Status Indicator Contact Specifications

7.12.3 SPD Replacement

Replace the module when the SPD indicator turns red. Follow the replacement procedure in this section.

 DANGER	Hazardous voltage. Will cause severe injury or death. This equipment must be installed and serviced by qualified electrical personnel.
	

Servicing the transfer switch. Hazardous voltage will 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.

SPD Replacement Procedure

Note:

The cartridges are keyed for the phases or the neutral. Be sure to obtain the correct service part for each cartridge. See KohlerPowerParts.com for service part numbers.

1. Disable the generator set to prevent starting as follows:
 - a. Move the generator set master switch to the OFF position.
 - b. Disconnect power to the battery charger.
 - c. Disconnect the generator set engine starting battery, negative (-) lead first.
 - d. Open the line circuit breaker at the generator set.
2. Disconnect power to the transfer switch.
 - a. KEP Service entrance models: Open the ATS enclosure's hinged door and move the Normal and Emergency service disconnect circuit breakers to the OFF position.

Note:
Utility power is still present at the inlet side of the normal source circuit breaker.
 - b. KUS/KUP Service entrance models: Turn OFF the service entrance circuit breaker to remove power to the transfer switch.

Note:
The line side of the circuit breaker in the service entrance compartment is still energized.
 - c. All other models: Open the normal and emergency source circuit breakers upstream of the transfer switch.
3. Remove the enclosure's inner panel , if equipped.
4. Open the fuse holder.
5. Remove the cartridge by pulling straight out.
6. Replace the SPD cartridge with the appropriate service part.
7. Close the fuse holder.
8. Replace the enclosure's inner panel, if equipped.
9. Reconnect power to the transfer switch by closing the normal and emergency source circuit breakers.
10. Check the SPD status indicators.

11. Reconnect the generator set engine starting battery, negative (-) lead last.
12. Reconnect power to the battery charger.
13. Close and lock the ATS enclosure door.
14. Move the generator set master switch to the AUTO position.

7.13 User Interface Cover

The gasket-sealed, hinged user interface cover prevents unauthorized access to the transfer switch controls and protects the user interface from harsh environmental conditions. Use a customer-supplied padlock to lock the cover.

The cover is available as an optional accessory for NEMA 1 enclosures. NEMA 3R enclosures include the cover as standard equipment.

Appendix A. Abbreviations

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

A, amp	ampere	CID	cubic inch displacement	FHM	flat head machine (screw)
ABDC	after bottom dead center	CL	centerline	fl. oz.	fluid ounce
AC	alternating current	cm	centimeter	flex.	flexible
A/D	analog to digital	CMOS	complementary metal oxide substrate (semiconductor)	freq.	frequency
ADC	advanced digital control; analog to digital converter	com	communications (port)	FS	full scale
adj.	adjust, adjustment	coml	commercial	ft.	foot, feet
ADV	advertising dimensional	Coml/Re	Commercial/Recreational	ft. lb.	foot pounds (torque)
Ah	amp-hour	conn.	connection	ft./min.	feet per minute
AHWT	anticipatory high water temperature	cont.	continued	ftp	file transfer protocol
AISI	American Iron and Steel	CPVC	chlorinated polyvinyl chloride	g	gram
ALOP	anticipatory low oil pressure	crit.	critical	ga.	gauge (meters, wire size)
alt.	alternator	CSA	Canadian Standards Association	gal.	gallon
Al	aluminum	CT	current transformer	gen.	generator
ANSI	American National Standards Institute (formerly American Standards Association, ASA)	Cu	copper	genset	generator set
AO	anticipatory only	cUL	Canadian Underwriter's Laboratories	GFI	ground fault interrupter
APDC	Air Pollution Control District	CUL	Canadian Underwriter's Laboratories	GND, ⊕	ground
API	American Petroleum Institute	cu. in.	cubic inch	gov.	governor
approx.	approximate, approximately	cw.	clockwise	gph	gallons per hour
APU	Auxiliary Power Unit	CWC	city water-cooled	gpm	gallons per minute
AQMD	Air Quality Management	cyl.	cylinder	gr.	grade, gross
AR	as required, as requested	D/A	digital to analog	GRD	equipment ground
AS	as supplied, as stated, as suggested	DAC	digital to analog converter	gr. wt.	gross weight
ASE	American Society of Engineers	dB	decibel	H x W x D	height by width by depth
ASME	American Society of Engineers	dB(A)	decibel (A weighted)	HC	hex cap
assy.	assembly	DC	direct current	HCHT	high cylinder head
ASTM	American Society for Testing Materials	DCR	direct current resistance	HD	heavy duty
ATDC	after top dead center	deg., °	degree	HET	high exhaust temp., high temp.
ATS	automatic transfer switch	dept.	department	hex	hexagon
auto.	automatic	dia.	diameter	Hg	mercury (element)
aux.	auxiliary	DIN	Deutsches Institut für Normung e. V. (also Deutsche Industrie Normenausschuss)	HH	hex head
avg.	average	DIP	dual inline package	HHC	hex head cap
AVR	automatic voltage regulator	DPDT	double-pole, double-throw	HP	horsepower
AWG	American Wire Gauge	DPST	double-pole, single-throw	hr.	hour
AWM	appliance wiring material	DVR	digital voltage regulator	HS	heat shrink
bat.	battery	E, emer.	emergency (power source)	hsg.	housing
BBDC	before bottom dead center	EBSM	external battery supply module	HVAC	heating, ventilation, and air conditioning
BC	battery charger, battery	ECM	electronic control module, engine control module	HWT	high water temperature
BCA	battery charging alternator	E ² PROM	EEPROM	Hz	hertz (cycles per second)
BCI	Battery Council International	EDI	electrically-erasable programmable read-only memory	IBC	International Building Code
BDC	before dead center	EFR	electronic data interchange	IC	integrated circuit
BHP	brake horsepower	e.g.	emergency frequency relay	ID	inside diameter, identification
blk.	black (paint color), block (engine)	EG	for example (<i>exempli gratia</i>)	IEC	International Electrotechnical Commission
blk. htr.	block heater	EGSA	electronic governor	IEEE	Institute of Electrical and Electronics Engineers
BMEP	brake mean effective pressure	EIA	Electrical Generating Systems Association	IMS	improved motor starting
bps	bits per second	EI/EO	end inlet/end outlet	in.	inch
br.	brass	EMI	electromagnetic interference	in. H ₂ O	inches of water
BTDC	before top dead center	emiss.	emission	in. Hg	inches of mercury
Btu	British thermal unit	eng.	engine	in. lb.	inch pounds
Btu/min.	British thermal units per minute	EPA	Environmental Protection Agency	Inc.	incorporated
C	Celsius, centigrade	EPS	emergency power system	ind.	industrial
cal.	calorie	ER	emergency relay	int.	internal
CAN	controller area network	ERMS	energy reduction maintenance setting	int./ext.	internal/external
CARB	California Air Resources Board	ES	engineering special, engineered	I/O	input/output
CAT5	Category 5 (network cable)	ESD	electrostatic discharge	IP	internet protocol
CB	circuit breaker	est.	estimated	ISO	International Organization for Standardization
CC	crank cycle	E-Stop	emergency stop	J	joule
cc	cubic centimeter	etc.	et cetera (and so forth)	JIS	Japanese Industry Standard
CCA	cold cranking amps	exh.	exhaust	k	kilo (1000)
ccw.	counterclockwise	ext.	external	K	kelvin
CEC	Canadian Electrical Code	F	Fahrenheit, female	kA	kiloampere
cert.	certificate, certification,			KB	kilobyte (2 ¹⁰ bytes)
cfh	cubic feet per hour			KBus	Kohler communication
cfm	cubic feet per minute			kg	kilogram
CG	center of gravity			kg/cm ²	kilograms per square
				kgm	kilogram-meter
				kg/m ³	kilograms per cubic meter
				kHz	kilohertz

kJ	kilojoule	NPSC	National Pipe, Straight-coupling	SPDT	single-pole, double-throw
km	kilometer	NPT	National Standard taper pipe	SPST	single-pole, single-throw
kOhm,	kilo-ohm		thread per general use	spec	specification
kPa	kilopascal	NPTF	National Pipe, Taper-Fine	specs	specification(s)
kph	kilometers per hour	NR	not required, normal relay	sq.	square
kV	kilovolt	ns	nanosecond	sq. cm	square centimeter
kVA	kilovolt ampere	OC	overcrank	sq. in.	square inch
kVAR	kilovolt ampere reactive	OD	outside diameter	SMS	short message service
kW	kilowatt	OEM	original equipment manufacturer	SS	stainless steel
kWh	kilowatt-hour	OF	overfrequency	std.	standard
kWm	kilowatt mechanical	opt.	option, optional	stl.	steel
kWth	kilowatt-thermal	OS	oversize, overspeed	tach.	tachometer
L	liter	OSHA	Occupational Safety and Health	TB	terminal block
LAN	local area network		Administration	TCP	transmission control protocol
L x W x	length by width by height	OV	overvoltage	TD	time delay
lb.	pound, pounds	oz.	ounce	TDC	top dead center
lbm/ft ³	pounds mass per cubic feet	p., pp.	page, pages	TDEC	time delay engine cooldown
LCB	line circuit breaker	PC	personal computer	TDEN	time delay emergency to
LCD	liquid crystal display	PCB	printed circuit board	TDES	time delay engine start
LED	light emitting diode	pF pic	picofarad	TDNE	time delay normal to
Lph	liters per hour	PF	power factor	TDOE	time delay off to emergency
Lpm	liters per minute	ph., Ø	phase	TDON	time delay off to normal
LOP	low oil pressure	PHC	Phillips® head Crimptite®	temp.	temperature
LP	liquefied petroleum		(screw)	term.	terminal
LPG	liquefied petroleum gas	PHH	Phillips® hex head (screw)	THD	total harmonic distortion
LS	left side	PHM	pan head machine (screw)	TIF	telephone influence factor
L _{wa}	sound power level, A weighted	PLC	programmable logic control	tol.	tolerance
LWL	low water level	PMG	permanent magnet generator	turbo.	turbocharger
LWT	low water temperature	pot	potentiometer, potential	typ.	typical (same in multiple
m	meter, milli (1/1000)	ppm	parts per million		locations)
M	mega (106 when used with SI	PROM	programmable read-only	UF	underfrequency
	units), male		memory	UHF	ultrahigh frequency
m ³	cubic meter	psi	pounds per square inch	UIF	user interface
m ³ /hr.	cubic meters per hour	psig	pounds per square inch gauge	UL	Underwriter's Laboratories,
m ³ /min.	cubic meters per minute	pt.	pint	UNC	unified coarse thread (was
mA	milliampere	PTC	positive temperature coefficient	UNF	unified fine thread (was NF)
man.	manual	PTO	power takeoff	univ.	universal
max.	maximum	PVC	polyvinyl chloride	URL	uniform resource locator (web
MB	megabyte (2 ²⁰ bytes)	qt.	quart, quarts		address)
MCCB	molded-case circuit breaker	qty.	quantity	US	undersize, underspeed
MCM	one thousand circular mils	R	replacement (emergency) power	UV	ultraviolet, undervoltage
meggar	megohmmeter		source	V	volt
MHz	megahertz	rad.	radiator, radius	VAC	volts alternating current
mi.	mile	RAM	random access memory	VAR	voltampere reactive
mil	one one-thousandth of an inch	RBUS	RS-485 proprietary	VDC	volts direct current
min.	minimum, minute		communications	VFD	vacuum fluorescent display
misc.	miscellaneous	RDO	relay driver output	VGA	video graphics adapter
MJ	megajoule	ref.	reference	VHF	very high frequency
mJ	millijoule	rem.	remote	W	watt
mm	millimeter	Res/Com	Residential/Commercial	WCR	withstand and closing rating
mOhm,m	milliohm	RFI	radio frequency interference	w/	with
MOhm,M	megaohm	RH	round head	WO	write only
MOV	metal oxide varistor	RHM	round head machine (screw)	w/o	without
MPa	megapascal	rly.	relay	wt.	weight
mpg	miles per gallon	rms	root mean square	xfmr	transformer
mph	miles per hour	rnd.	round		
MS	military standard	RO	read only		
ms	millisecond	ROM	read only memory		
m/sec.	meters per second	rot.	rotate, rotating		
mtg.	mounting	rpm	revolutions per minute		
MTU	Motoren-und Turbinen-Union	RS	right side		
MW	megawatt	RTDs	Resistance Temperature		
mW	milliwatt		Detectors		
µF	microfarad	RTU	remote terminal unit		
N, norm.	Normal (power source)	RTV	room temperature vulcanization		
NA	not available, not applicable	RW	read/write		
nat. gas	natural gas	SAE	Society of Automotive Engineers		
NBS	National Bureau of Standards	s, sec.	second		
NC	normally closed	RW	read/write		
NEC	National Electrical Code	SAE	Society of Automotive Engineers		
NEMA	National Electrical	SI	<i>Systeme internationale d'unites</i> ,		
	Manufacturers Association		International System of Units		
NFPA	National Fire Protection	SI/EO	side in/end out		
	Association	sil.	silencer		
Nm	newton meter	SMTP	simple mail transfer protocol		
NO	normally open	SI/EO	side in/end out		
no., nos.	number, numbers	SNMP	simple network management		
NPS	National Pipe, Straight		protocol		

Appendix B. Screen Summaries

For reference, this section lists the items displayed during normal operation, and the information and settings shown in the View screens and Setup menus.

Operation Screens

Main Screen

- System Status
- Next Exercise Time and Date
- Normal and Emergency Voltage
- Frequency
- Lamp Test
- Current, Amps
- Time/Date
- Daylight Saving Time Info
- Preferred Source
- Source-Source Type (Util-Gen)
- Commit/No Commit to Transfer
- Standard/Programmed/Closed Transition
- Phase Rotation (3-phase only)
- In-Phase Monitoring Enabled/Disabled

Test Sequence Screens

- Enter Password
- Type of Test
 - Loaded/Unloaded/Auto Load/Sync Check
 - Auto Load Test Run Time
- Test Sequence Status Screens
 - Active Time Delay with Time Remaining
 - Source Voltages
 - End Delay Button
 - End Test Button
 - Phase Angle (sync check only)

Exerciser Sequence (during exercise run)

- Exerciser Active
- Source Voltages
- Time Remaining (in exercise run)
- End Exercise Button

View Screens

Main Screen

- System Status
- Next Exercise Time and Date
- Normal and Emergency Voltage

View Event History

- Event Description
- Date and Time of event

View Maintenance Records

- Total Min Not Preferred
- Reset Min Not Preferred
- Total Min in Standby
- Reset Min in Standby
- Total Min Operation
- Reset Min Operation
- Total Transfers
- Reset Transfers
- Total Fail Transfer
- Reset Fail Transfer
- Total Loss Pref Tran
- Reset Loss Pref Tran
- Transfer Time N>E
- Transfer Time E>N
- System Start Date
- Last Maint Date
- Last Loss Duration
- Last Loss Date/Time
- Dual Source Connect Time
- S1 to Open Time
- S1 to Close time
- S2 to Open Time
- S2 to Close Time

View Exerciser Setup

- Exercise Event Number
- Enabled/Disabled
- Exercise Run Time
- Start Date
- Start Time
- Weekly/Biweekly
- Loaded/Unloaded

View Prime Power Setup

- Enabled/Disabled
- Source1 Duration
- Source2 Duration

View System Setup	View Time Delays, Source S1 and Source S2
<ul style="list-style-type: none"> • Open/Programmed/Closed Transition • Source Type: Util/Gen, Gen/Gen, Util/Util or Util/Gen/Gen • Service Entrance: MCCB/ICCB/(KEP); Contactor(KUS/KUP); No (non-service entrance models) • Service Disconnect Position: OFF or SRC/E (KEP); HOLD (KUS/KUP) • In-Phase Monitor Enabled/Disabled • Commit/No Commit to Transfer • # I/O Modules Installed • 3 Src Engine Start Mode Mode1/Mode2 • Rated Current • Remote Test Loading Loaded/Unloaded • Peak Shave Delay Enabled/Disabled 	<ul style="list-style-type: none"> • Engine Start (Source S2 only) • Engine Cooldown (Source S2 only) • Xfr Preferred>Standby (Standby>Preferred) • Xfr Off > Standby (Off >Preferred) (programmed-transition only) • Fail to Acquire Preferred (Standby) • Load Control <ul style="list-style-type: none"> ○ Mode: None/Time ○ Loads to Control (1-9) • Time-Based Control <ul style="list-style-type: none"> ○ Load Disconnect N>E (E>N) Time Delay min:sec ○ Load Reconnect E>N (N>E) Time Delay min:sec • Current-Based Control <ul style="list-style-type: none"> ○ Load Disc N>E (E>N) time delay min:sec ○ Load control Source1 (Source2) Enabled/Disabled ○ Load Add Source1 (Source2) Time Delay min:sec ○ Load Add Source1 (Source2) Priority ○ Load Remove Source1 (Source2) Time Delay min:sec ○ Load RemoveSource1 (Source2) Priority ○ Amps Level Remove Source1 (Source2) ○ Amps Level Add Source1 (Source2)
View Source Setup	View Inputs/Outputs
<ul style="list-style-type: none"> • ABC/BAC Rotation (3-phase only) • System Voltage, Normal/Emergency • Frequency (Hz), Source N and E • Normal Under Voltage PU% and DO% <ul style="list-style-type: none"> ○ Normal Over Voltage PU% and DO% ○ Debounce Time, Seconds • Normal Under Frequency PU% and DO% <ul style="list-style-type: none"> ○ Normal Over Frequency PU% and DO% ○ Debounce Time • Normal Voltage Unbalance Enable/Disable <ul style="list-style-type: none"> ○ Normal Voltage Unbalance PU% and DO% • Emergency Under Voltage PU% and DO% <ul style="list-style-type: none"> ○ Emergency Over Voltage PU% and DO% ○ Debounce Time • Emergency Under Frequency PU% and DO% <ul style="list-style-type: none"> ○ Emergency Over Frequency PU% and DO% ○ Debounce Time • Emergency Voltage Unbalance Enable/Disable <ul style="list-style-type: none"> ○ Emergency Voltage Unbalance PU% and DO% • In-Phase Monitor <ul style="list-style-type: none"> ○ Enabled/Disabled ○ Angle, degrees • In-Phase Transfer Fail <ul style="list-style-type: none"> ○ Enabled/Disabled ○ Time Delay min:sec • Synchronization (for closed-transition) <ul style="list-style-type: none"> ○ Voltage Differential ○ Frequency Differential ○ Angle differential • Fail to Sync <ul style="list-style-type: none"> ○ Enabled/Disabled ○ Time Delay min:sec 	<ul style="list-style-type: none"> • Main Board I/O <ul style="list-style-type: none"> ○ Input Function Descriptions (2) ○ Output Function Descriptions (2) • Auxiliary Inputs/ Outputs <ul style="list-style-type: none"> ○ Module Type and Address ○ Module Status ○ Input Function Descriptions ○ Output Function Descriptions
	View Common Alarms
	<ul style="list-style-type: none"> • Alarm Group (1 and 2) • Alarm Description • Audible (Yes or No) • Common (Yes or No)
	View Communications Setup
	<ul style="list-style-type: none"> • Modbus Server TCP Enabled/Disabled • Modbus Server Port 0, Enable/Disabled • Modbus Address Port 0 • Baud Rate Port 0, 9600/19200/57600 • Modbus TCP Unit ID • IP Address • Subnet Mask • MAC Address
	View Control Parameters
<ul style="list-style-type: none"> • Application Version (factory-set) • ATS Serial Number (factory-set) • Controller Serial Number (factory-set) • Contactor Serial Number (factory-set) • Site Designation (optional; use SiteTech to set) • Load Description (optional; use SiteTech to set) • Branch Description (optional; use SiteTech to set) • Location (optional; use SiteTech to set) 	<ul style="list-style-type: none"> • Application Version (factory-set) • ATS Serial Number (factory-set) • Controller Serial Number (factory-set) • Contactor Serial Number (factory-set) • Site Designation (optional; use SiteTech to set) • Load Description (optional; use SiteTech to set) • Branch Description (optional; use SiteTech to set) • Location (optional; use SiteTech to set)

Setup Menus

Set Time/Date

- Set Time
- Set Date
- Set Automatic Daylight Saving Time

Set Exerciser

For each exerciser event:

- Enable/Disable
- Loaded/Unloaded
- Interval
- Repeat Rate
- Duration
- Start Date
- Start Time

Set Prime Power Run

- Enable/Disable
- Duration at Source1 DD:HH:MM
- Duration at Source2 DD:HH:MM
- Sequence Start/Stop

Set S1 Time Delays (S2 Time Delays)

- Engine Start
 - External Battery? Y or N
 - Time Delay min:sec
- Engine Cooldown Time Delay min:sec
- Xfr Preferred>Standby (Standby>Preferred)
- Xfr Off > Standby (Off >Preferred) (programmed-transition only)
- Fail to Acquire Preferred (Standby)
 - Enable/Disable
 - Time Delay min:sec
- Load Control
 - Mode: None/Time/Current
 - Loads to Control (1-9)
- Time-Based Control (for each connected load)
 - Load Disconnect N>E (E>N) Time Delay min:sec
 - Load Reconnect E>N (N>E) Time Delay min:sec
- Current-Based Control
 - Load Disc N>E (E>N) time delay min:sec
 - For each connected load:
 - Load Add Source1 (Source2) Time Delay min:sec
 - Load Add Source1 (Source2) Priority
 - Load Remove Source1 (Source2) Time Delay min:sec
 - Load Remove Source1 (Source2) Priority
 - Load Control Enable/Disable
 - Set Hi current Level, Load Remove Source1 (Source2)
 - Set Lo Current Level, Load Add Source1 (Source2)

Set Source

- Phase Rotation ABC/BAC/Disabled
- Set In-Phase Monitor
 - Enable/Disable
 - Angle
 - In-Phase Transfer Fail Time Delay
 - Enable/Disable
 - Time Delay min:sec
- Set Synchronization (closed-transition models only)
 - Voltage Differential
 - Frequency Differential
 - Angle Differential
 - Fail to Sync
 - Enable/Disable
 - Time Delay min:sec
- Set Preferred Source Normal/Emergency (alarm module required)
- Set Normal (Emergency) Source:
 - Number of Phases
 - Voltage
 - Frequency
 - Under Voltage Pickup
 - Under Voltage Dropout
 - Over Voltage Pickup
 - Over Voltage dropout
 - Voltage Debounce Time
 - Voltage Unbalance Enable/Disable (3 phase only)
 - Voltage Unbalance Pickup (3 phase only)
 - Voltage Unbalance Dropout (3 phase only)
 - Under Frequency Pickup (Emergency source only)
 - Under Frequency Dropout (Emergency source only)
 - Over Frequency Pickup (Emergency source only)
 - Over Frequency Dropout (Emergency source only)
 - Frequency Debounce time (Emergency source only)

Set Input/Output

- Set Main Board I/O
 - Set Input Functions *
 - Set Output Functions †
 - Set Auxiliary I/O (Modules)
 - Set Input Functions *
 - Set Output Functions †
- * See the Input Functions Section
† See the Output Functions Section

Set Common Alarms

- Alarm Group 1 or 2
 - Modify Alarm
 - Audible (Yes/No)
 - Common (Yes/No)
- Remove All Alarms Yes/No

Set System

- Source Type: Utility/Generator, Generator/Generator, Utility/Utility, Utility/Generator/Generator (3-source system)
- Transition Type: Standard/Programmed/Closed
 - Prog Transition Override Automatic/Manual (closed-transition only)
- Service Entrance: (KEP Models only)
 - Disconnect to OFF/ Disconnect to SRC/E
 - No/MCCB/ICCB
- Service Entrance (KUS/KUP)
 - Contactor
- 3 Source Engine Start Mode
 - Mode1/Mode2
 - Preferred Source Toggle Enable/Disable
- Transfer Commit Commit/No Commit
- Remote Test Loading Loaded/Unloaded
- Peak Shave TD Bypass Enable/Disable

Set Communications

- Modbus Server TCP Enable/Disable
- Modbus Server Port 0, Enable/Disable
- Modbus Address Port 0
- Baud Rate Port 0, 9600/19200/57600
- Modbus TCP Unit ID
- IP Address
- Subnet Mask
- Default Gateway
- DHCP Status

Set Passwords

- Setup Password
- Test Password

Calibration

- Line-Neutral Voltages, Source N and E, all phases
- Line-Line Voltages, Source N and E, all phases
- Load Current, LA, LB, and LC

Reset Data

- Reset Maintenance Records, Yes or No
- Reset Event History, Yes or No
- Reset Default Parameters, Yes or No
- Reset Exercise Setup, Yes or No
- Reset Test Password, Yes or No
- Disable Test Password, Yes or No
- File Maintenance
 - Delete Files
 - Force History Save

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Original Instructions (English)

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KOHLER®

KOHLER CO. Kohler, Wisconsin 53044
Phone 920-457-4441, Fax 920-459-1646
For the nearest sales/service outlet in the
US and Canada, phone 1-800-544-2444
KOHLERPower.com