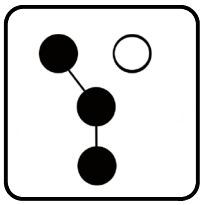
Operation

Automatic Transfer and Bypass/Isolation Switches



Controls:

MPAC™ 1500

Software (Code) Version 2.0 or higher

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

KOHLER® POWER SYSTEMS

TP-6714 10/12b

Table of Contents

Safety Precautions and Instructions **7**

Introduction **9**

List of Related Materials 9

Service Assistance **10**

Section 1 Installation **11**

1.1 Controller Connections 11

1.1.1 Logic Board Input and Output Connections 12

1.1.2 Communication Connections 12

1.1.3 Controller Connection 12

1.1.4 Controller Ground 12

1.2 Extended Transfer Time Relay 13

1.3 Accessory Connections 13

1.4 Controller Powerup/Reset 13

1.5 System Setup 14

1.6 Exerciser Setup 14

1.7 Functional Tests 14

1.8 Warranty Registration 14

Section 2 Operation Tests **15**

2.1 Introduction 15

2.2 Manual Operation Test 15

2.3 Voltage Check 15

2.4 Lamp Test 15

2.5 Automatic Operation Test 15

Section 3 Operation **19**

3.1 Introduction 19

3.2 User Interface Panel 19

3.2.1 Display 19

3.2.2 LED Indicators 20

3.2.3 Pushbuttons 20

3.2.4 Display Contrast 20

3.2.5 Examples 20

3.3 Main Screen 23

3.4 Passwords 24

3.4.1 Changing Passwords 24

3.4.2 Setup Password Reset and Disable 24

3.4.3 Test Password Reset and Disable 24

3.5 Normal Operation Screens 25

3.6 Sequence of Operation, Standard Transition 26

3.6.1 Preferred Source Loss and Return, Standard Transition 26

3.6.2 Exerciser Operation, Standard Transition 26

3.6.3 Test Sequence, Standard Transition 27

3.7 Sequence of Operation, Programmed-Transition 28

3.7.1 Preferred Source Loss and Return, Programmed Transition 28

3.7.2 Exerciser Operation, Programmed Transition 28

3.7.3 Test Sequence, Programmed Transition 29

3.8 Sequence of Operation, Service Entrance Models 30

3.8.1 Preferred Source Loss and Return, Service Entrance Models 30

3.8.2 Exerciser Operation, Service Entrance Models 30

3.8.3 Test Sequence, Service Entrance Models 31

3.9 Sequence of Operation, Closed-Transition Models 32

3.9.1 Preferred Source Loss and Return, Closed Transition 32

Table of Contents, continued

3.9.2 Failure to Synchronize (Programmed-Transition Override) 32
3.9.3 Exerciser Operation, Closed Transition 33
3.9.4 Test Sequence, Closed Transition 33
3.10 System Test 35
3.10.1 Unloaded System Test 36
3.10.2 Loaded System Test 36
3.10.3 Closed-Transition Loaded Test 36
3.10.4 Auto-Loaded System Test 37
3.10.5 Sync Check (closed-transition) 37
3.11 Lamp Test 38
3.12 Exercise 38
3.12.1 Unloaded Exercise 38
3.12.2 Load Bank Control 38
3.12.3 Loaded Exercise 38
3.13 Warnings and Faults 39
3.13.1 Fault Reset 40
3.14 Accessory Module Faults 40
3.14.1 Module Status Change 40
3.14.2 Module Status Conflict 41
3.15 Reset Data 42
3.15.1 Reset Maintenance Records 42
3.15.2 Reset Event History 42
3.15.3 Reset Default Parameters 42
3.15.4 Reset and Disable Test Password 44
3.15.5 File Maintenance 44

Section 4 View Screens 45
4.1 Introduction 45
4.2 Main Screen 45
4.3 View Screens 45
4.4 View Event History 46
4.5 View Maintenance Records 46
4.6 View Exerciser Setup 47
4.7 View Prime Power Setup 47
4.8 View System Setup 47
4.9 View Source Setup 48
4.10 View Time Delays, Source 1 50
4.11 View Time Delays, Source 2 52
4.12 View Inputs/Outputs 54
4.13 View Common Alarms 54
4.14 View Communications Setup 55
4.15 View Control Parameters 55

Section 5 Setup 57
5.1 Introduction 57
5.2 Source Names 57
5.3 Controller DIP Switches 57
5.4 Default Settings and Time Delays 58
5.4.1 System Parameters 58
5.4.2 Time Delays 58
5.5 Setup Screens 59
5.6 Time/Date 60
5.7 Exerciser 61
5.7.1 Setting the Exerciser 61
5.7.2 Source/Source Mode 61

5.8 Prime Power Run 63
5.8.1 Prime Power Mode Setup 63
5.8.2 Prime Power Mode Operation 63
5.9 Time Delays 64
5.9.1 Time Delays 64
5.9.2 Load Control Time Delays 64
5.9.3 Set S1 Time Delays 65
5.9.4 Set S2 Time Delays 67
5.10 Load Control 69
5.10.1 Time-Based Load Control 69
5.10.2 Current-Based Load Control 71
5.11 Source Setup 73
5.11.1 Phase Rotation 73
5.11.2 In-Phase Monitor 73
5.11.3 Preferred Source Selection 73
5.11.4 System Voltage and Frequency 74
5.11.5 Voltage and Frequency Pickup and Dropout Settings 75
5.11.6 Set Sources 76
5.12 Programmable Inputs and Outputs 79
5.12.1 Main Logic Board Inputs and Outputs 79
5.12.2 Input/Output Modules 79
5.12.3 Input Functions 80
5.12.4 Output Functions 81
5.12.5 User-Defined I/O Function Descriptions 82
5.13 Common Alarms 83
5.13.1 Common Alarm Output 83
5.13.2 Audible Alarm 83
5.13.3 Chicago Alarm 83
5.14 Set System 84
5.14.1 Source Type/Source Type 84
5.14.2 Transition Type 84
5.14.3 Service Entrance 84
5.14.4 Rated Current 84
5.14.5 Three Source Engine Start Mode 84
5.14.6 Transfer Commit 84
5.14.7 Remote Test Loading 85
5.14.8 Peak Shave TD Bypass 85
5.14.9 USB Data Logger 85
5.14.10 Min/Max Values 85
5.15 Three-Source Systems 87
5.15.1 Three Source Engine Start Mode 87
5.15.2 Preferred Source Toggle 87
5.15.3 Three Source System Test and Exercise 87
5.15.4 Three-Source System Setup 87
5.15.5 ATS1 and ATS2 System Setup 88
5.16 Communications 91
5.17 Set Passwords 91
5.18 Calibration 92

Section 6 Communications 93
6.1 Introduction 93
6.2 Connections 93
6.2.1 Serial Connections 94
6.2.2 Ethernet Connections 95

Table of Contents, continued

6.3 Communications Setup 97
6.3.1 Serial Communication 98
6.3.2 Ethernet Communication 98
6.4 USB Port 99
6.4.1 File Transfer 100
6.4.2 Event History Files 101
6.4.3 Configuration files 101
6.4.4 Controller Application Program 101
6.4.5 Data Logger Files 102
6.4.6 MinMax Files 102
6.4.7 SyncData Files 102

Section 7 Scheduled Maintenance 103
7.1 Introduction 103
7.2 Testing 104
7.2.1 Weekly Generator Set Exercise 104
7.2.2 Monthly Automatic Control System Test 104
7.3 Inspection and Service 105
7.3.1 General Inspection 105
7.3.2 Model KGS/KGP Bypass/Isolation Switches 105
7.3.3 Other Inspections and Service 105
7.4 Service Schedule 106

Section 8 Accessories 107
8.1 Introduction 107
8.2 Accessory Modules 107
8.2.1 Accessory Module Mounting 107
8.2.2 Input/Output (I/O) Modules 108
8.2.3 External Battery Supply Module (EBSM) 109
8.3 Alarm Module 110
8.3.1 Alarm Board DIP Switches 110
8.3.2 External Alarm 111
8.3.3 Audible Alarm Setup 111
8.3.4 Alarm Operation 111
8.3.5 Alarm Silence Mode 111
8.4 Current Sensing 112
8.5 Digital Meter 114
8.6 Heater 114
8.7 Line-to-Neutral Voltage Monitoring 115
8.8 Load Shed (Forced Transfer to OFF) 115
8.8.1 Description 115
8.8.2 Customer Connection 116
8.9 Logic Disconnect Switch 117
8.10 Monitoring Program 117
8.11 Supervised Transfer Control Switch 117
8.11.1 Manual Transfer 117
8.11.2 Automatic Transfer Switches 118
8.11.3 Non-Automatic Transfer Switches 119
8.12 Surge Protection (SPD) 119
8.12.1 SPD Diagnostic LEDs 121
8.12.2 SPD Remote Status Indicator 121
8.12.3 SPD Replacement 121
8.13 User Interface Cover 122

Appendix A Abbreviations 123

Appendix B Screen Summaries 125

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

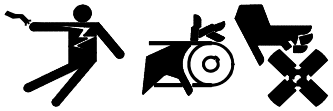
NOTICE

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

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

Accidental Starting

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

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

Hazardous Voltage/ Moving Parts

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

⚠ WARNING

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

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

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

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

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

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

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

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

Servicing the transfer switch controls and accessories within the enclosure. Hazardous voltage can cause severe injury or death. Disconnect the transfer switch controls at the inline connector to deenergize the circuit boards and logic circuitry but allow the transfer switch to continue to supply power to the load. Disconnect all power sources to accessories that are mounted within the enclosure but are not wired through the controls and deenergized by inline connector separation. Test circuits with a voltmeter to verify that they are deenergized before servicing.

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

Heavy Equipment

⚠ WARNING

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

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

Notice

NOTICE

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

NOTICE

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

NOTICE

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 Kohler® MPAC™ 1500 automatic transfer switch controls and related accessories.

This manual applies to MPAC™ 1500 controllers with controller application code (software) version 2.0.0 or higher. To check the code version, go to the View Control Parameters screen. See Section 4 for instructions.

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 instructions for transfer switch installation, manual operation, and bypass/isolation procedures, if applicable.

Literature Item	Part Number
Specification Sheet, Model KCS/KCP	G11-106
Specification Sheet, Model KSS/KSP	G11-108
Specification Sheet, Model KBS/KBP	G11-109
Specification Sheet, Model KGS/KGP	G11-110
Specification Sheet, Model KCC	G11-117
Specification Sheet, Model KBC	G11-118
Specification Sheet, Model KEP	G11-119
Installation Manual, Model KCS/KCP	TP-6446
Installation Manual, Model KSS/KSP	TP-6447
Installation Manual, Model KBS/KBP	TP-6448
Installation Manual, Model KGS/KGP	TP-6449
Installation Manual, Model KCC/KBC	TP-6737
Installation Manual, Model KEP	TP-6738

Service Assistance

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

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

Headquarters Europe, Middle East, Africa (EMEA)
Kohler Power Systems
3 rue de Brennus
93200 Saint Denis
France
Phone: (33) 1 49 178300
Fax: (33) 1 49 178301

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

China
North China Regional Office, Beijing
Phone: (86) 10 6518 7950
(86) 10 6518 7951
(86) 10 6518 7952
Fax: (86) 10 6518 7955

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

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

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

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

This section contains instructions for controller connections. For ATS installation instructions, refer to the transfer switch installation manual supplied with the transfer switch.

1.1 Controller Connections

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

NOTICE

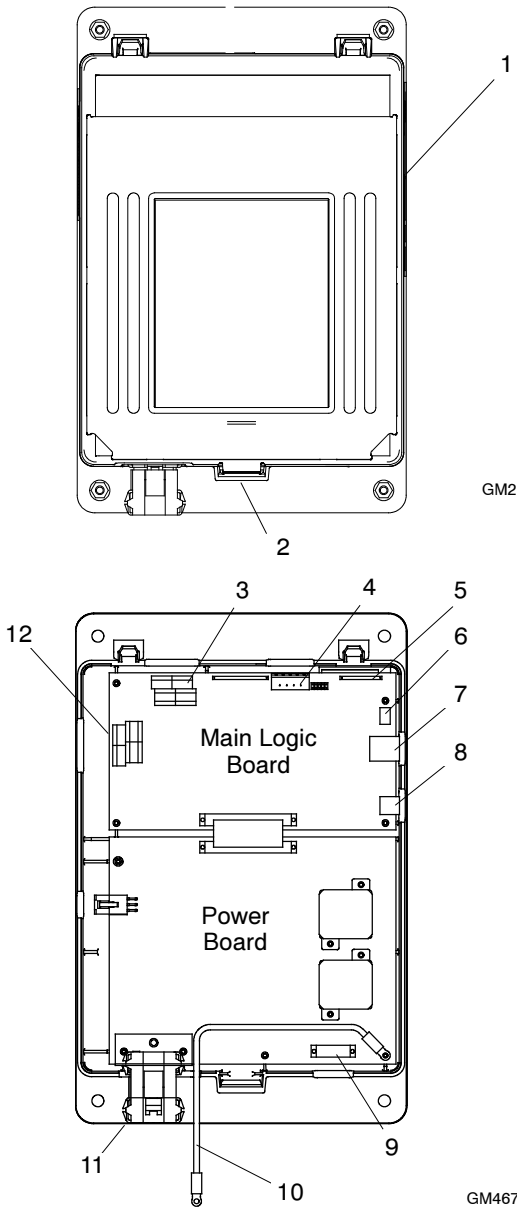
Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance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

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

Opening the cover. To gain access to the DIP switches and terminal strips on the main logic board, open the plastic housing by pushing up on the latch on the bottom of the cover and swinging the cover up and out. The cover is hinged at the top. Lift the cover off the hinges to remove it completely, if necessary.

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

Figure 1-1 shows the locations of the DIP switches and connectors on the main logic board. It is not necessary to open the cover to access the USB or Ethernet connectors.



1. Access openings to RJ-45 and USB connectors
2. Latch
3. RS-485 connection TB2
4. I/O board connection P16
5. User interface connection P14
6. DIP switches SW1
7. RJ-45 Ethernet connection P13
8. USB connection P12
9. Programmed-transition interface board (PTIB) connection (factory connection)
10. Ground wire
11. Contactor harness connection
12. Input/output terminal strip TB1

Figure 1-1 Controller

1.1.1 Logic Board Input and Output Connections

Logic board terminal strip TB1 has two programmable inputs and two programmable outputs. See Figure 1-1 for the connector location.

Note: For bypass/isolation switches, input 1 is factory-connected to the Bypass Contactor Disable circuit.

Note: For service entrance switches, input 1 is factory-connected to the transfer inhibit circuit.

Each input has a signal and a return connection. The outputs are C form contacts with ratings of 500 mA @ 120 VAC. See Figure 1-2 for the connections. Use #12–24 AWG wire and tighten the connections to 0.5 Nm (4.4 in. lbs.).

See Section 8.2.2 for instructions to connect to optional input/output modules.

The controller logic board's programmable inputs and outputs can be assigned to the functions shown in Section 5.12. Refer to the I/O functions shown in Figure 5-18 and Figure 5-19 for planning and connections. You will need to assign functions to the programmable inputs and outputs through the controller interface using the Setup Menu—Set Inputs/Outputs later.

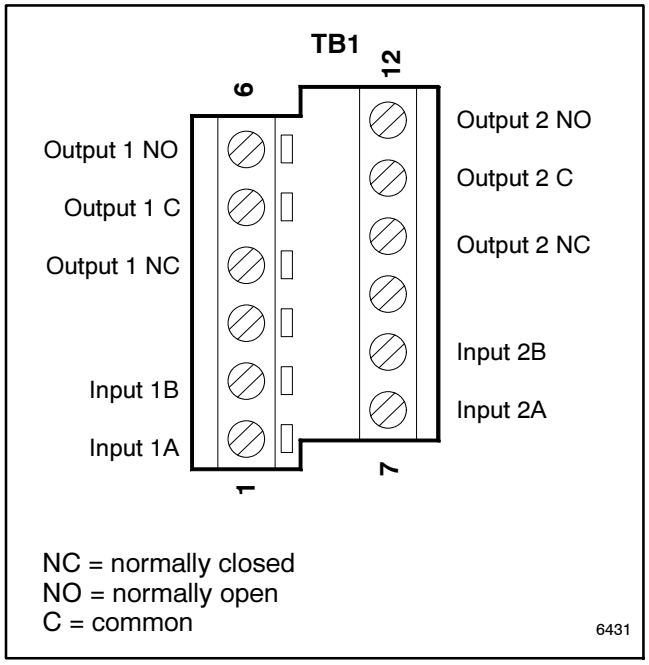


Figure 1-2 Logic Board Input and Output Connections to TB1

1.1.2 Communication Connections

See Section 6 for instructions to connect to the controller's RS-485 serial port or Ethernet port for Modbus communication. See Section 6.4 for instructions to use the USB port for file transfer.

1.1.3 Controller Connection

Verify that the contactor harness is connected at the controller base (or at the logic disconnect switch, if equipped). See Figure 1-3.

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

1.1.4 Controller Ground

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

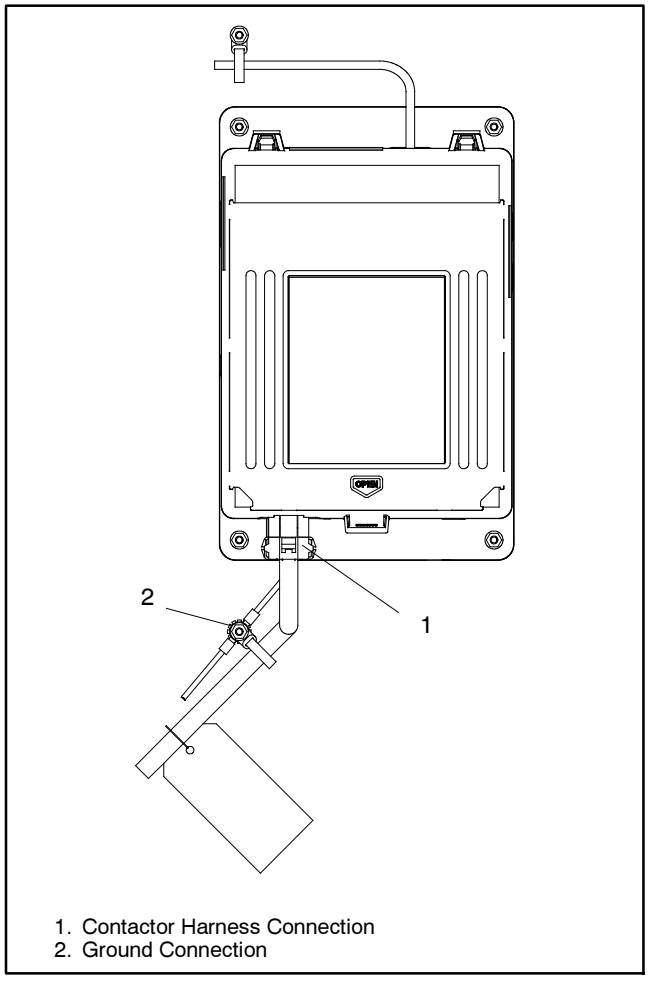


Figure 1-3 Contactor Harness and Controller Ground Connections

1.2 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 ms.

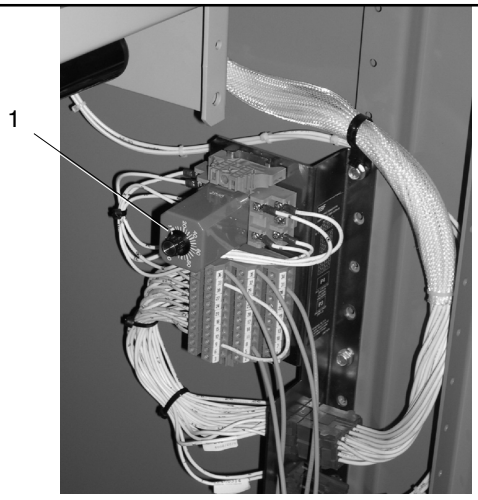
See the transfer switch installation manual for connection instructions.

The relay operation time is adjustable between 100 ms and 10 seconds. The time settings are in percent (%) of the maximum setting, which is 10 seconds, and adjustable in 5% increments. See Figure 1-4. The recommended setting is 1% = 0.1 seconds. If it is necessary to set the relay to a longer time, ensure that the time setting is in accordance with applicable codes.

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.

Setting*	Time
1 %	0.1 seconds (100 ms)
50 %	5 seconds
100 %	10 seconds
* Settings above 1% are adjustable in 5% increments.	

Figure 1-4 Relay Transfer Time Settings



1. Extended transfer time relay

Figure 1-5 Extended Transfer Time Relay

1.3 Accessory Connections

See Section 8 and the transfer switch wiring diagrams for accessory connection instructions.

1.4 Controller Powerup/Reset

Following is an explanation of the sequence of operation for the 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 cooldown 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 cooldown time delay.

1.5 System Setup

Set the controller's current time and date. See Section 5.6 for instructions.

The transfer switch is factory-set with default settings for time delays and other parameters. To view the settings, review the controller operation instructions in Section 3, and then refer to Section 4.3 for instructions to view the setup screens.

If it is necessary to change settings, see Section 5 for instructions.

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

1.6 Exerciser Setup

Set the exerciser to start and run the generator set at least once a week. See Section 5.7 for instructions.

1.7 Functional Tests

Perform the functional tests described in the transfer switch Installation Manual and in Section 2 of this manual before putting the transfer switch into operation.

1.8 Warranty Registration

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

2.1 Introduction

Be sure to perform the functional tests described in the transfer switch Installation Manual and in this section before putting the transfer switch into operation.

The functional tests include the following checks:

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

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

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

2.2 Manual Operation Test

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

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

Follow the instructions in the transfer switch installation manual to check the transfer switch manual operation.

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

2.3 Voltage Check

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

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

2.4 Lamp Test

To test the LEDs on the controller's user interface, go to the Main screen. Press the down arrow button once, then press the Lamp Test button and verify that all 6 LEDs on the user interface illuminate. See Figure 2-1.

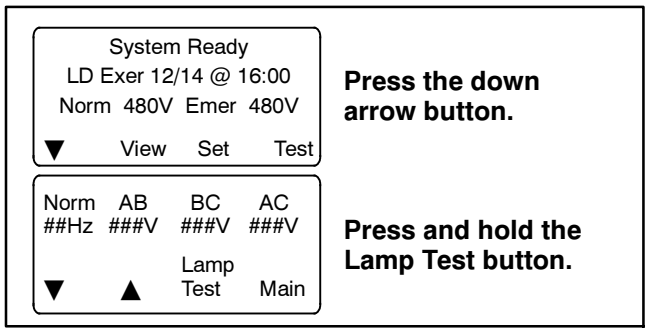


Figure 2-1 Lamp Test

2.5 Automatic Operation Test

Check the transfer switch's automatic control system immediately after the voltage check. Review the operation instructions in Section 3 before proceeding.

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 3-9 or Figure 3-10.

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 Section 3.6.3 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 2-2. 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 Section 3.10.3. 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-to-preferred time delay, check that the Position N LED lights, indicating that the switch has transferred the load to Source N.

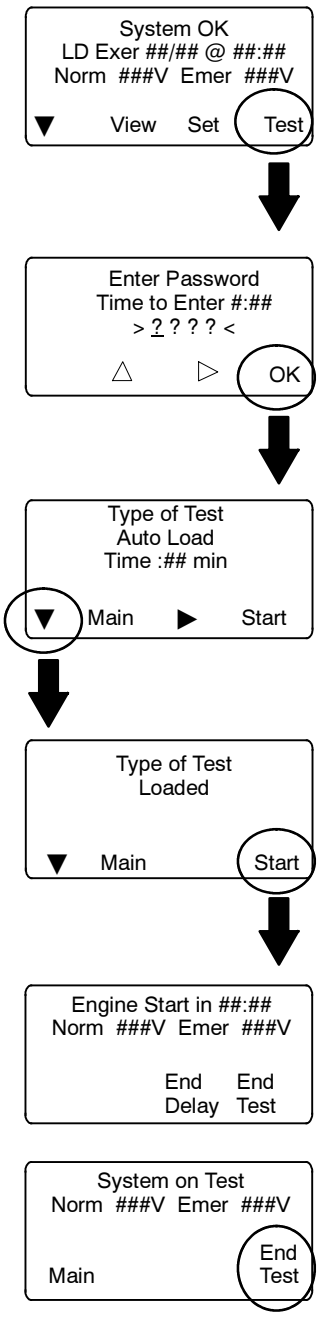
   c. Closed-Transition Models: See Section 3.10.3. After the standby-to-preferred time delay, the controller monitors the sources for synchronization. When the sources are in sync, the ATS transfers the load to Source N and the Position N LED lights. Both sources will be connected for less than 100 milliseconds 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 cooldown time delay expires, the engine start signal is removed. Verify that the generator set stops.

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

This completes the functional tests.



On the main screen, press the Test button.

Use the open arrow buttons to enter the Test password. See Section 3.4 for instructions. Then press the OK button.

Press the down arrow button to step to the loaded test screen.

Press the Start button to initiate the test sequence.

Additional test sequence screens may appear, depending on the system settings.

Press the Main button to return to the main screen during the test, if desired. From the main screen, press Test to return to the test screen.

Press the End Test button to end the test.

Figure 2-2 Starting and Stopping the Automatic Operation Test

Notes

3.1 Introduction

This section contains operation instructions, including:

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

3.2 User Interface Panel

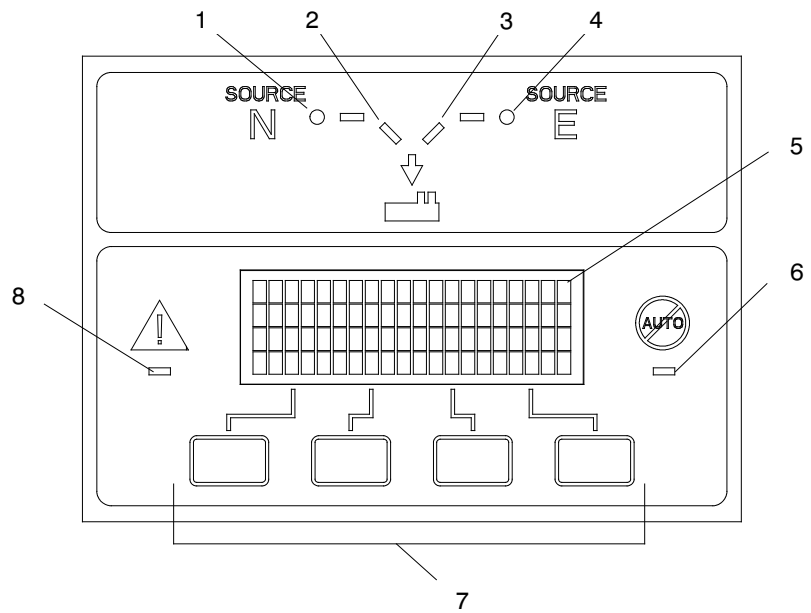
The user interface panel is located on the transfer switch door. Figure 3-1 shows the user interface pushbuttons and LED indicators.

3.2.1 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 screen-to-screen.



1. Source N Available LED
2. Source N Position LED
3. Source E Position LED
4. Source E Available LED
5. Display
6. Not in Auto LED
7. Pushbuttons (4)
8. System Alert LED

Figure 3-1 User Interface Panel

3.2.2 LED Indicators

LEDs on the user interface indicate contactor position, source availability, faults, and other conditions. The table in Figure 3-2 describes the functions of the LED indicators.

See Section 3.13 for more information about warnings and faults.

Some programmable inputs will trigger the LEDs to light or flash. See Section 5.12.

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 3.13.
	Input active: Low Battery Voltage or Remote Common Alarm. See Section 5.12.
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, or Bypass Contactor Disable. See Section 5.12.

Figure 3-2 User Interface LED Indicators

3.2.3 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 screen-to-screen. The pushbutton functions are defined in Figure 3-3.

3.2.4 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 screen after a few seconds if no buttons are pressed.

3.2.5 Examples

Figure 3-4 illustrates how to use the pushbuttons to step through screens and change settings. This example shows setting the time. See Figure 3-5 for another example of navigating through the menus.

▼	Down arrow (closed). Step down to the next screen or scroll through a list.
▲	Up arrow (closed). Step back to the previous screen.
▶	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 screen or submenu.
End Delay	Ends the current time delay.
End Test	Ends an active test sequence. See Section 3.6.3.
OK	Enters the displayed numerical value (password or setting).
Main	Returns to the main screen.
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 screen, moves to the first setup screen.
Start	From the Test screen, starts the test sequence.
Test	From the main screen, moves to the test sequence screens. See Section 3.10.
View	From the main screen, moves to the first view screen.

File transfer commands (USB device connected):

Sel	Select the displayed file.
Del	Delete the displayed file.
Upload	Load the displayed file to the USB device.
Download	Load the displayed file to the controller.

Figure 3-3 Pushbutton Functions

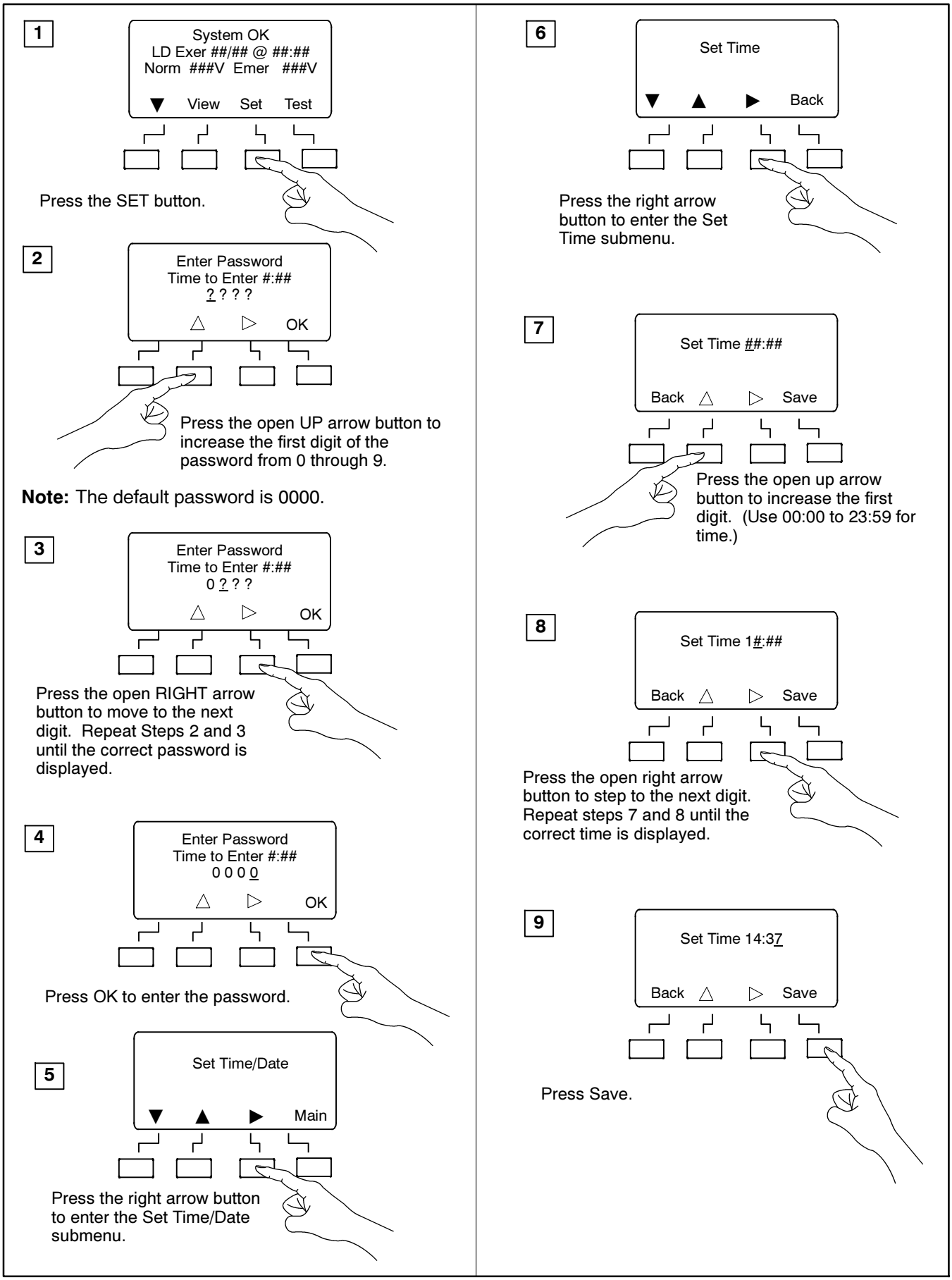


Figure 3-4 Example: Setting the Time

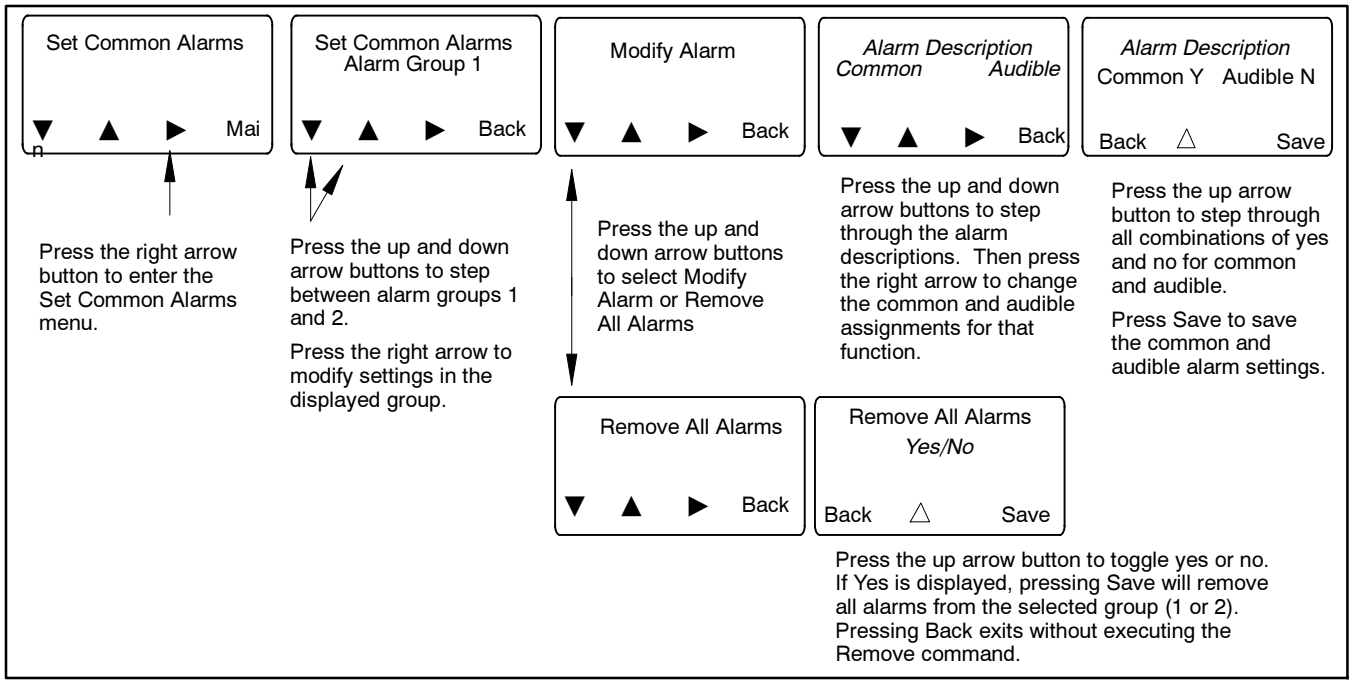


Figure 3-5 Example: Set Common Alarms

3.3 Main Screen

The main screen appears at system startup and displays the following information (see Figure 3-6):

- System Status (see Figure 3-7)
- 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 screens shown in Section 3.5. Step through these screens 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 screen 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 screens displayed during a test or exercise sequence will vary depending on the time delay settings.

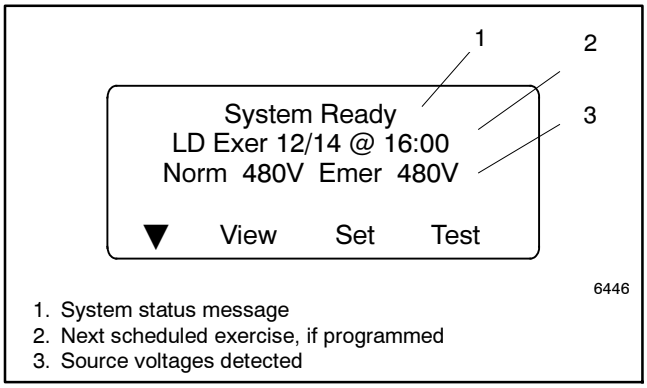
Pressing the View button steps to the view screens shown in Section 4.3.

Passwords are required to enter the setup and test modes. See Section 3.4 for more information about passwords.

Press the Set button to enter the setup mode. A password is required. See Section 5.5 for system setup screens.

Press the Test button to enter the Test mode. A password is required. See Section 3.10.

The display returns to the main screen after 30 minutes of no activity (no buttons pressed).



1. System status message
2. Next scheduled exercise, if programmed
3. Source voltages detected

Figure 3-6 Main Screen

System Status Messages
Aux Switch Fault
Aux Switch Open
Bypass Contactor Dis
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 3-7 System Status Messages

3.4 Passwords

Passwords are required to enter the Test and Setup screens. Passwords are 4-digit numbers. See Figure 3-8 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 screens, 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 Section 3.10.3.

Test Password. The test password controls access to the test sequence screens. 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 screen.

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

3.4.1 Changing Passwords

Use the Passwords Setup Menu to change passwords. See Section 5.17.

3.4.2 Setup Password Reset and Disable

Turning ON the password disable DIP switch SW1-1 disables the setup password and resets it to the factory defaults. When the switch is ON, system setup and programming is allowed without the need to enter a password. See Figure 5-1 for the DIP switch location.

Turning DIP switch SW1-1 ON and then OFF resets the password to the default value, 0000.

The test password is not affected by this DIP switch. Use the Reset Data screen to disable the test password.

3.4.3 Test Password Reset and Disable

The test password can be reset to the default value or disabled. Use the Setup Menu–Reset Data screen. See Figure 3-25.

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.

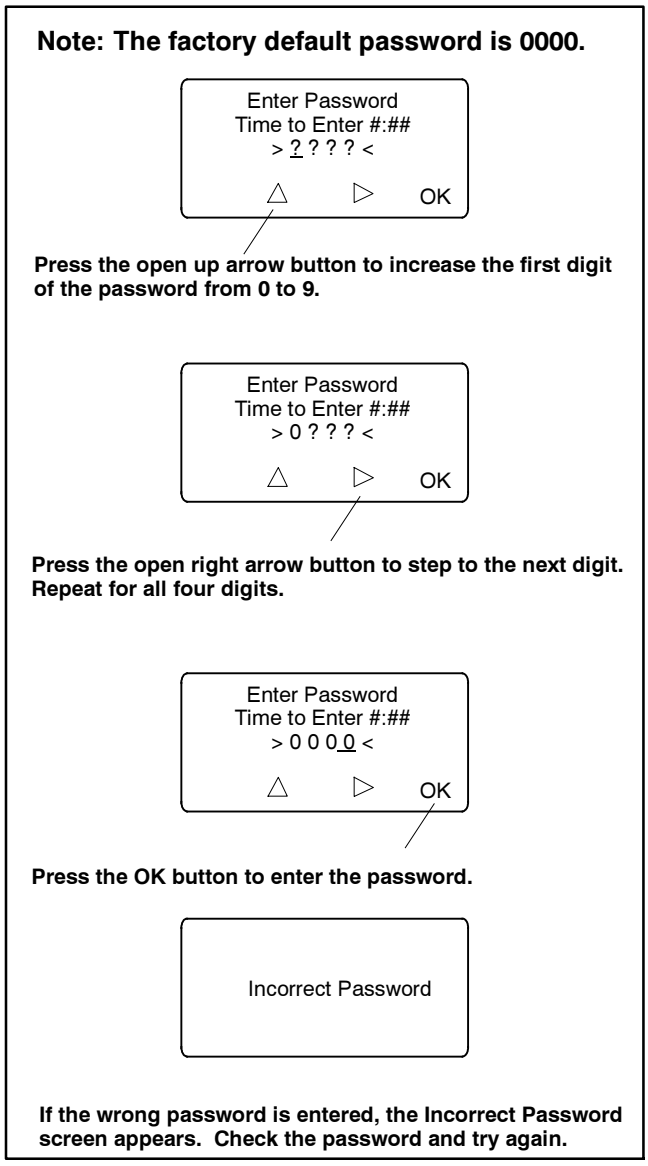


Figure 3-8 Entering a Password

3.5 Normal Operation Screens

During normal transfer switch operation, the screens shown in Figure 3-9 or Figure 3-10 are displayed. Use the up and down arrow buttons to view the system status information as shown. Press Main to return to the main screen from any screen.

The Sequence of Operation descriptions in Sections 3.6 through 3.9 describe the transfer switch normal operation for standard, programmed, and closed transition models, and for service entrance models.

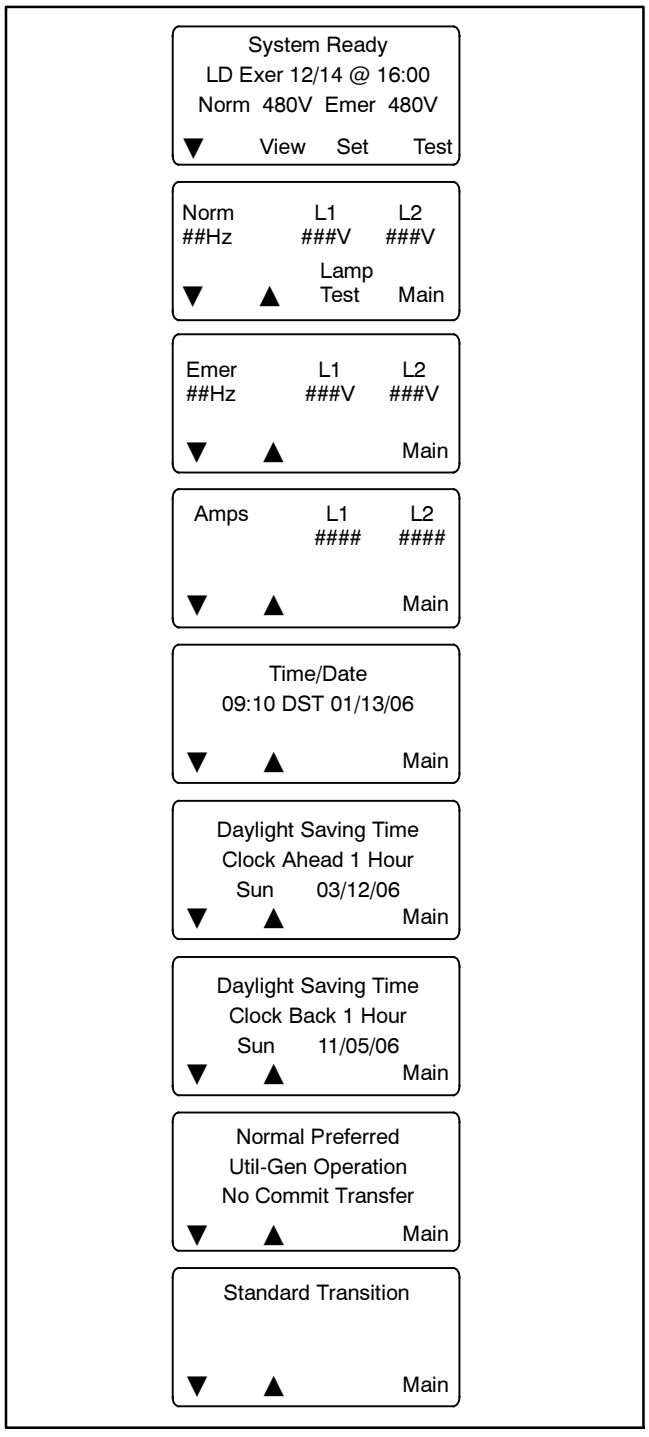


Figure 3-9 Single-Phase Operation

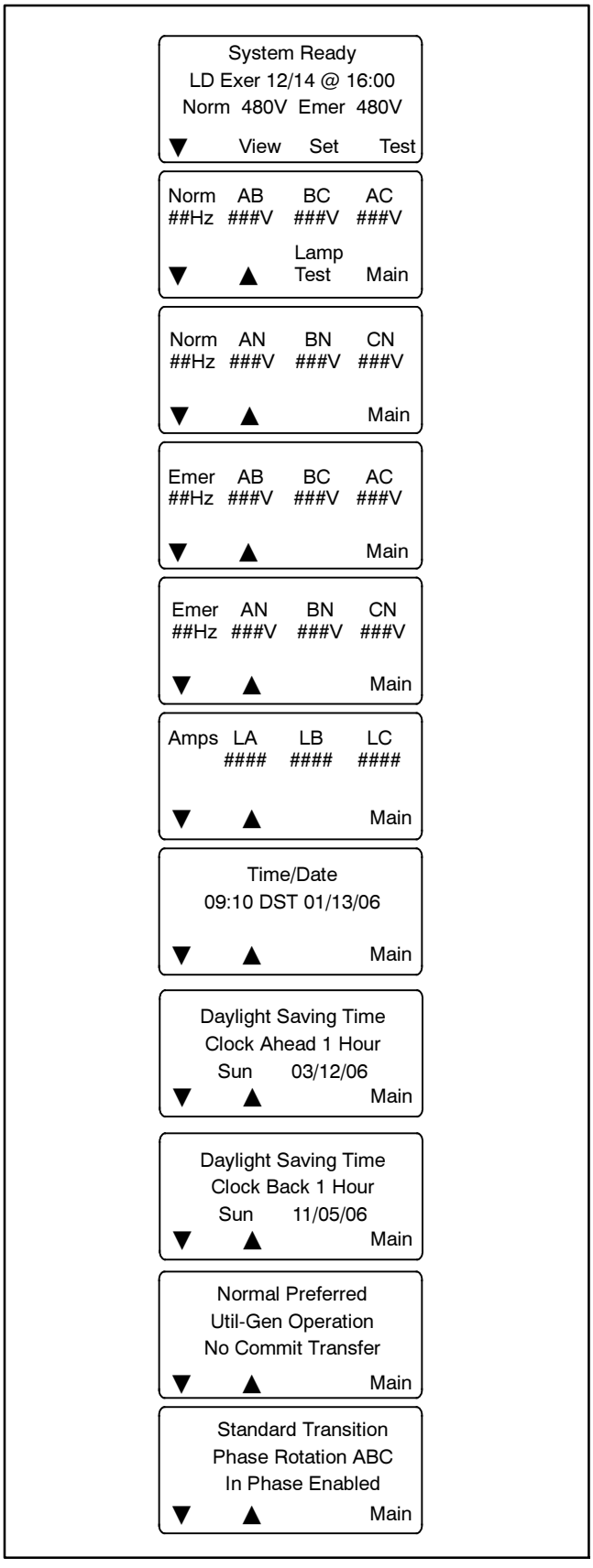


Figure 3-10 Three-Phase Operation

3.6 Sequence of Operation, Standard Transition

The Sequence of Operation descriptions in Sections 3.6 through 3.9 describe the transfer switch normal operation for standard, programmed, and closed transition models, and for service entrance models. Operation can be affected by faults such as the normal or emergency contacts failing to open or close when signaled to do so.

3.6.1 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 cooldown time delay expire.
5. Load control contacts close.
6. The engine start contacts open, signaling the generator to stop.

3.6.2 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 cooldown 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 cooldown 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 cooldown time delay expire.
5. Load control contacts close.
6. The engine start contacts open, signaling the generator to stop.

3.6.3 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 cooldown 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 cooldown 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 cooldown time delay expire.
5. Load control contacts close.
6. The engine start contacts open, signaling the generator to stop.

3.7 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.

3.7.1 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 cooldown time delay expire.
7. Load control contacts close.
8. The generator is signaled to stop (engine start contacts open).

3.7.2 Exerciser Operation, Programmed Transition

Unloaded Exercise

The unloaded exercise sequence is the same as for standard transition. See Section 3.6.2.

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 cooldown 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 cooldown time delay expire.
7. Load control contacts close.
8. The engine start contacts open, signaling the generator to stop.

3.7.3 Test Sequence, Programmed Transition

Unloaded Test Sequence

The unloaded test sequence is the same as for standard transition. See Section 3.6.3.

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.

3.8 Sequence of Operation, 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.

3.8.1 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 cooldown time delay expire.
8. Load control contacts close.
9. The generator is signaled to stop (engine start contacts open).

3.8.2 Exerciser Operation, Service Entrance Models

Unloaded Exercise

The unloaded exercise sequence is the same as for standard transition. See Section 3.6.2.

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 cooldown 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 cooldown time delay expires.
8. The engine start contacts open, signaling the generator to stop.

3.8.3 Test Sequence, Service Entrance Models

Unloaded Test Sequence

The unloaded test sequence is the same as for standard transition. See Section 3.6.3.

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 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. 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 cooldown time delay expire.
7. Load control contacts close.
8. The engine start contacts open, signaling the generator to stop.

3.9 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.

3.9.1 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 Section 3.9.2.

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 ms, the extended transfer time relay trips the standby source breaker.

6. Post-transfer load control sequences and engine cooldown 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).

3.9.2 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 Section 5.14, Set System, to set the programmed-transition override function to automatic or manual. See Section 5.9, Time Delays, 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 cooldown time delay expires and the generator set is signaled to stop (engine start contacts open).

3.9.3 Exerciser Operation, Closed Transition

Unloaded Exercise

The unloaded exercise sequence is the same as for standard transition. See Section 3.6.2.

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 Section 3.9.2.

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 Section 3.9.2.

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 ms, the extended transfer time relay trips the standby source breaker.

6. Post-transfer load control sequences and engine cooldown 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).

3.9.4 Test Sequence, Closed Transition

Unloaded Test Sequence

The unloaded test sequence is the same as for standard transition. See Section 3.6.3.

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 Section 3.9.2.

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 Section 3.9.2.

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 ms, the extended transfer time relay trips the standby source breaker.

6. Post-transfer load control sequences and engine cooldown 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).

3.10 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 3-11 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 3-12 shows the screens displayed during the test run. Screens are dependent on the system settings and time delays. See Figure 3-15 for Sync Check screens 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 screens.

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.

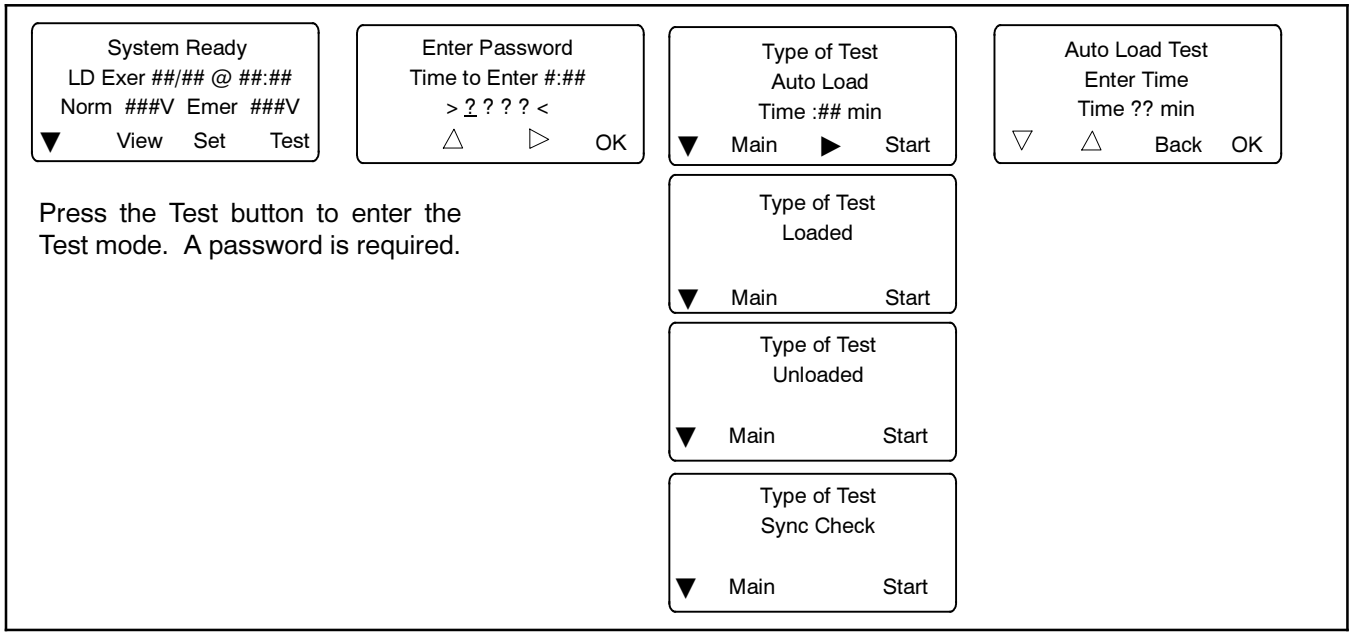


Figure 3-11 Test Selection Screens

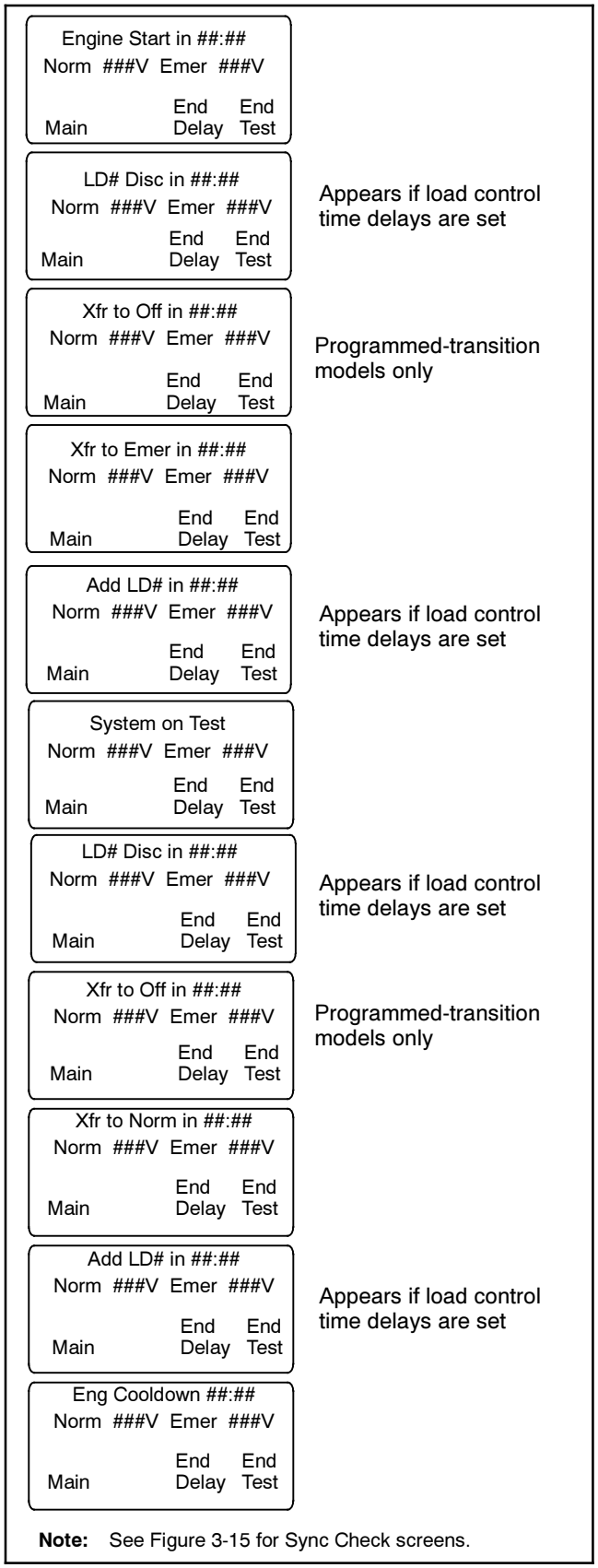


Figure 3-12 Test Sequence Screens

3.10.1 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.)

3.10.2 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.

3.10.3 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 3-13. If neither action is taken, the controller will continue to check for synchronization and transfer if the sources synchronize.

See Section 5.14.2 for instructions to set the programmed-transition override function.

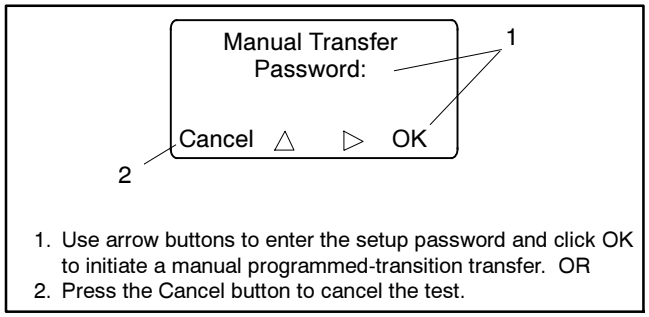


Figure 3-13 Manual Transfer Screen for Programmed-Transition Override

3.10.4 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 3-14.

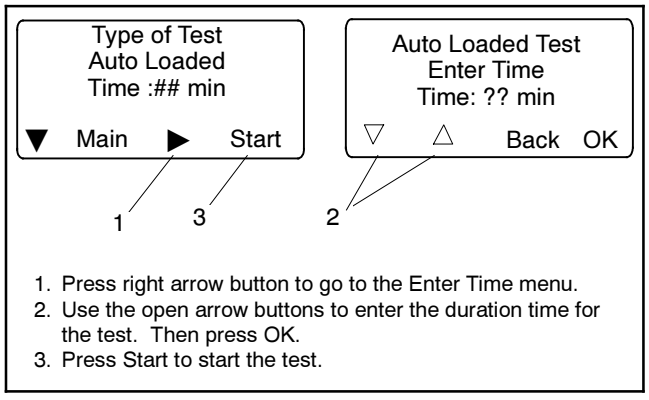


Figure 3-14 Auto Loaded Test Menus

3.10.5 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 3-15. Press the End Test button to end the test.

Time-stamped readings of source phase angle differential, frequency, and voltage during the test are logged in a SyncDataLog.csv file. Data readings are logged approximately once every second for one minute. Simply insert a flash drive into the controller's USB port during the sync check test to save the file. See Section 6.4 for more information about data files.

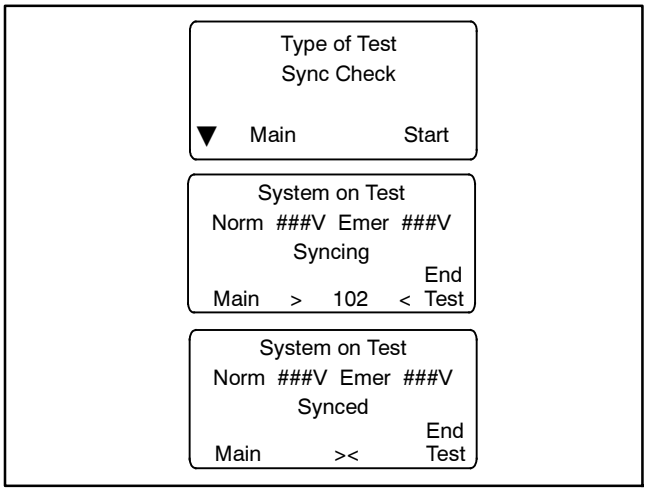


Figure 3-15 Sync Check Screens

3.11 Lamp Test

To test the LEDs on the controller's user interface, go to the Main screen. Press the down arrow button once, then press the Lamp Test button and verify that the LCD screen and all 6 LEDs on the user interface illuminate. See Figure 3-16.

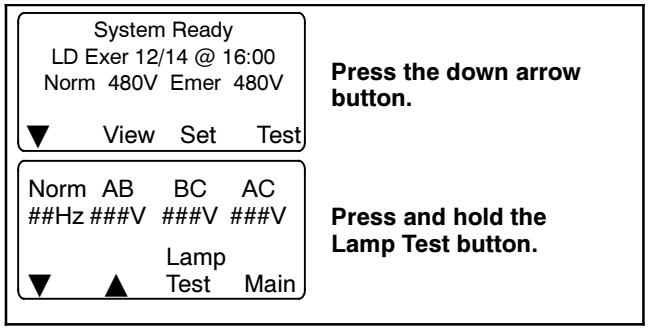


Figure 3-16 Lamp Test

3.12 Exercise

Schedule exercise runs through the Set Exercise screens. See Section 5.7. To run the generator set at a time other than a scheduled exercise sequence, use the Test function. See Section 3.10 for instructions.

When a scheduled exercise is running, the screens shown in Figure 3-17 appear. Press Main to return to the main screen, 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 screens. See Section 5.7.

3.12.1 Unloaded Exercise

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

3.12.2 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.)

3.12.3 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.

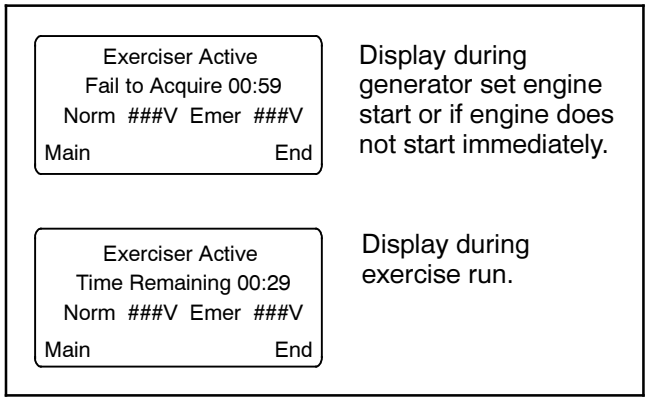
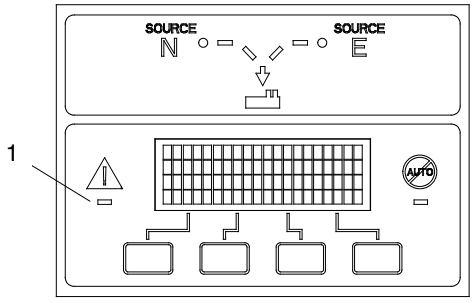


Figure 3-17 Exercise Sequence Screens

3.13 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 3-18 for the location of the System Alert indicator.



1. System Alert LED GM46892

Figure 3-18 Fault Indication

ATS warnings and faults are shown in Figure 3-19. 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 cooldown time delay executes and the engine start contacts open, allowing the generator set to shut down. See Section 3.13.1 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 cooldown 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).
Source1/Source2 Breaker Trip (service entrance models only)	Manual Reset Fault	The Source1 or Source2 circuit breaker in the 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 Section 3.14.1 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 Section 3.14.2 to reset.
External Fault	Self-Resetting Fault	The external input dedicated to this condition is closed.
* Auxiliary switch faults are not applicable to service entrance models. See Source1/Source2 Breaker Trip for service entrance models..		

Figure 3-19 Warnings and Faults

3.13.1 Fault Reset

To clear a fault or warning condition and reset the System Alert LED, go to the Main screen and press the down arrow button to open the Reset screen. See Figure 3-18 and Figure 3-20. Then press the button labeled Reset. A fault reset does not change the controller settings.

See Section 3.14, Accessory Module Faults, for instructions to correct and reset faults related to the I/O modules and other accessory modules.

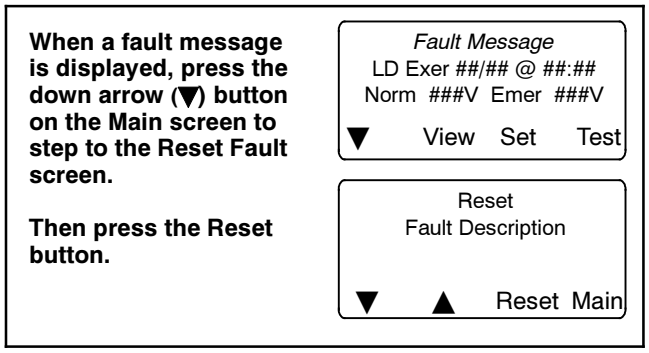


Figure 3-20 Fault Reset

3.14 Accessory Module Faults

3.14.1 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 3-21. Press the Reset button to display Reset New Module. Press the Reset button from that screen. The controller recognizes the module type(s). See Figure 3-22.

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

See Section 5.12 for instructions to assign programmable inputs and outputs to I/O modules. Go to Section 5.13 for instructions to assign functions to the audible alarm for an Alarm Module.

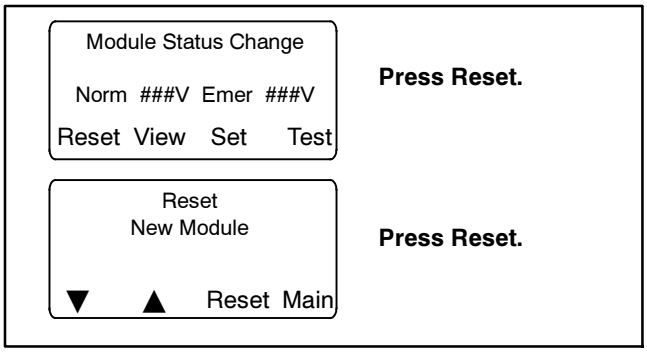


Figure 3-21 Screens after Module Connection

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 3-22 Module Types

Disconnected Module

If one or more accessory modules are disconnected from the controller, the message Module Status Change appears. See Figure 3-23. Pressing the Reset button displays the message Check Module Setup to Clear Fault. Use the following Module Uninstall Procedure to uninstall modules after disconnection.

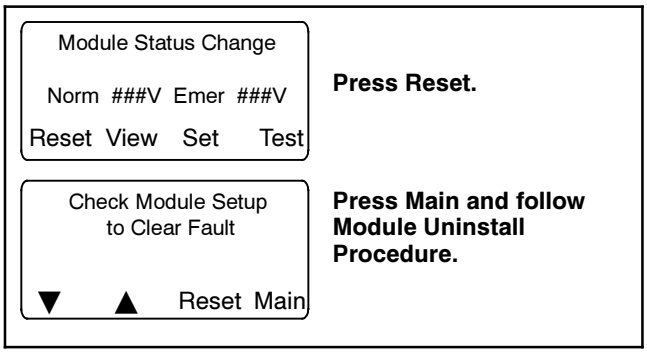


Figure 3-23 Screens after Module Disconnection

Module Uninstall Procedure

1. Press Main to return to the main screen.
2. Press Set to enter setup mode.
3. Enter the setup password.
4. Press the down arrow to step to the Set Inputs/ Outputs screen.
5. Navigate to the Set Auxiliary I/O screen. See Figure 3-24. 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 screen shows Status: Lost.
6. Press the right arrow button to move to the Uninstall Module screen. Verify that the screen 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.

3.14.2 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 Section 3.14.1 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 3-21.
9. Press the button labeled Reset to display *Reset New Module.* Press the reset button from that screen. The controller will now recognize the new module type.
10. Navigate to the Set Auxiliary I/O screen to check the status and settings for the new module. See Figure 3-24. Press the right arrow button to see the status of module 1. Press the down arrow to step to the next module, if necessary,

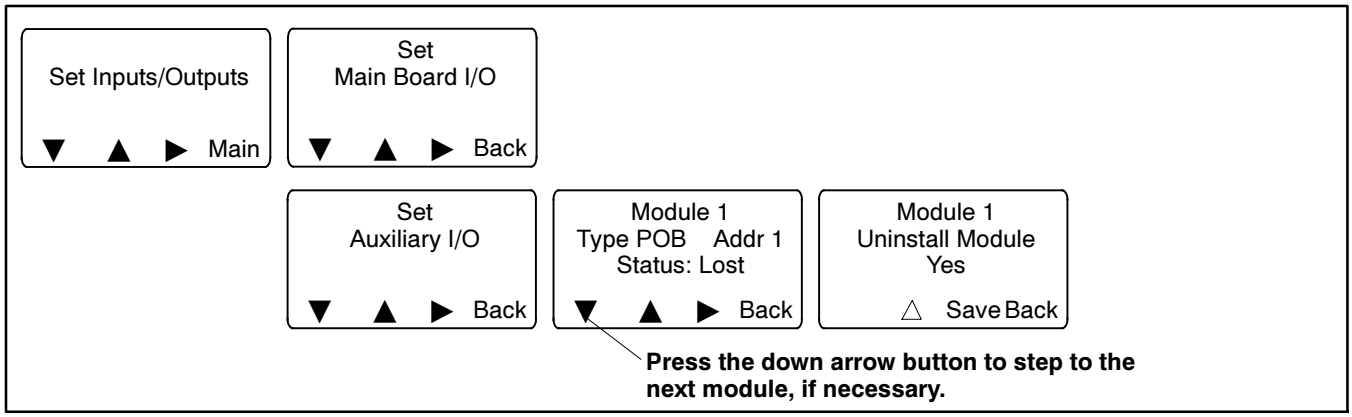


Figure 3-24 Uninstall Module

3.15 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 3-25.

1. Use the black arrow buttons to step to the desired screen.
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 screen without resetting.

3.15.1 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 screen.

3.15.2 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.

Note: The event history can be saved to a file before reset. See Section 3.15.5, File Maintenance.

3.15.3 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 screen 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.

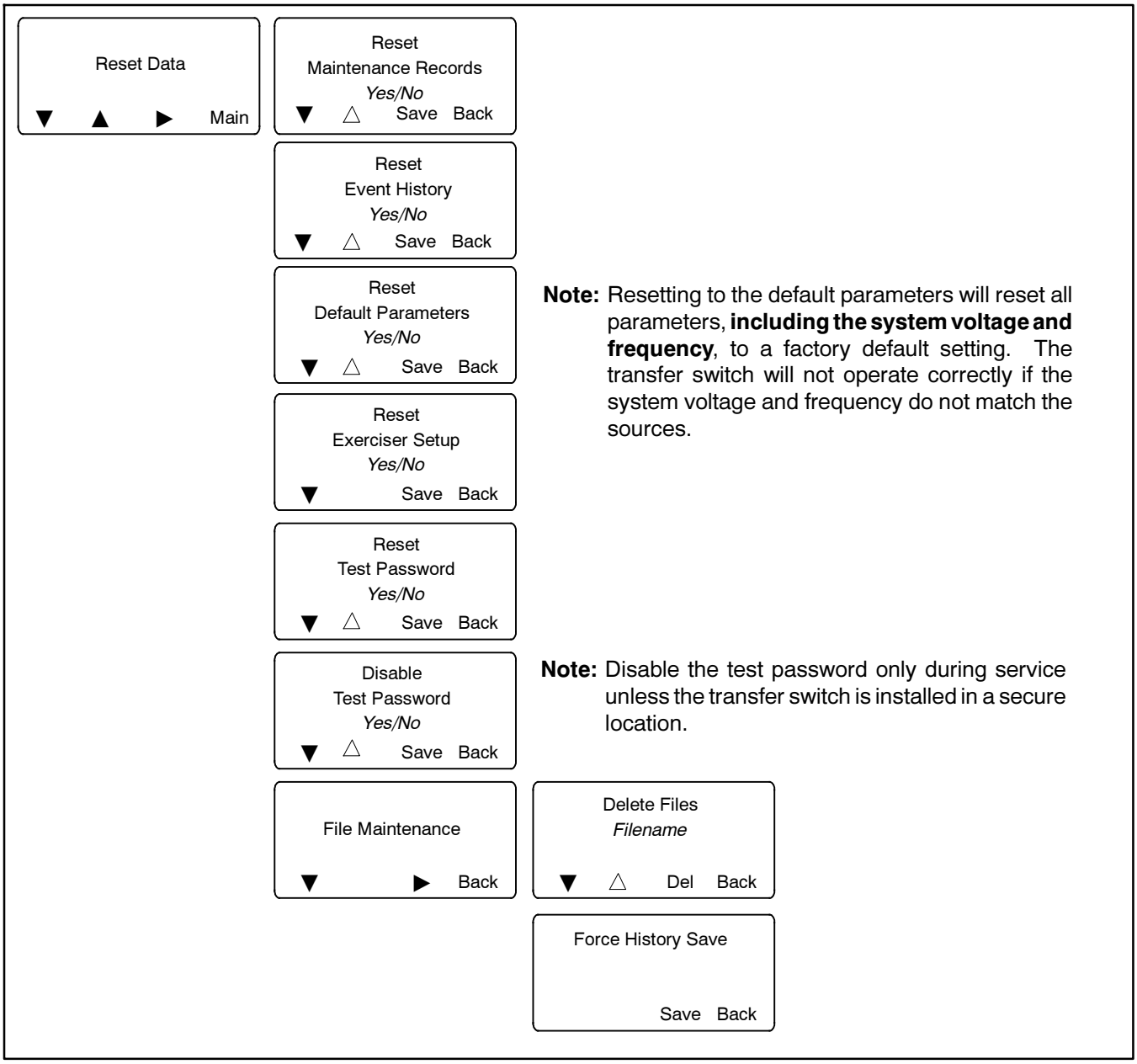


Figure 3-25 Reset Data

3.15.4 Reset and Disable Test Password

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

Disable the test password to allow the user to start a test without entering a password.

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

3.15.5 File Maintenance

Delete Files. Use the File Maintenance>Delete Files command to remove unneeded files. Use the up arrow button to step through the list of files until the desired filename is displayed. Then press the Del button to delete the file. See Figure 3-26 and Figure 3-25. See Section 6.4 for more information about controller data files.

Force History Save. Event history files are periodically updated by the controller. Use the Force History Save command to ensure that the most recent events are included before transferring the file to a mass storage device, if desired.

Event history files have filenames of the form presentyymmdd.his, where yymmdd (year, month, day) is the date of the file as read from the controller. Refer to Section 6.4 for instructions to transfer files to a mass storage device for viewing on a personal computer.

File Name	Description
MPAC1500_#######.cfg	Parameter settings (configuration)
present*yymmdd*.his	Event history
alarm_settings.alm	Common alarms
MPAC1500_cal.cal	Calibration
history_param.hstp	Internal use only
Param_back.bak	Internal use only
present*yymmdd*.raw	Internal use only
history_pback.hbak	Internal use only

Figure 3-26 Files listed under File Maintenance>Delete Files

4.1 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 5.

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.

4.2 Main Screen

The main screen appears at system startup. See Figure 4-1.

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

The display returns to the main screen after 30 minutes of no activity (no buttons pressed).

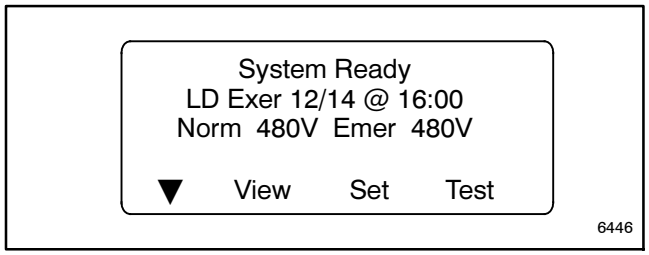
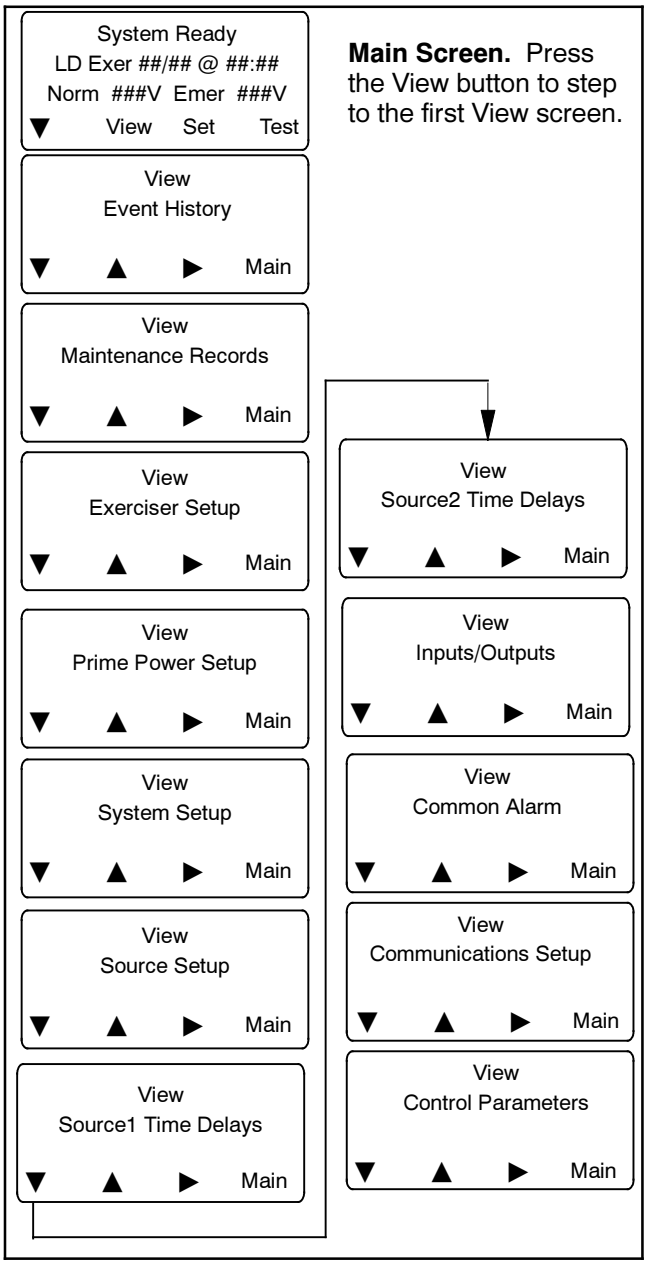


Figure 4-1 Main Screen

4.3 View Screens

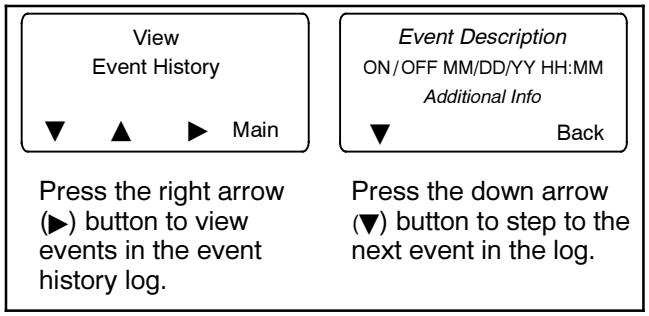
From the main screen, press the View button to step to the first view screen, View Event History.

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



4.4 View Event History

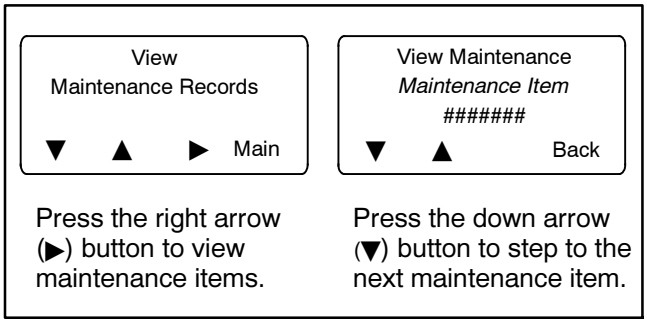
The Event History screens show recent transfer switch events. Examples of events recorded in the event history are shown in Figure 4-2. Events are time- and date-stamped. Check the event history for recent transfer switch operation, faults, or changes to settings. The event history is especially useful for transfer switch troubleshooting.



Event Descriptions	
End Time Delay Btn	Bypass Contactor Dis
Test Btn	3 Src System Disable
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	USB Connected
Peak Shave Mode	USB Disconnected
Inhibit Transfer	Minimum Values
Remote Test	Maximum Values
Low Battery Voltage	Breaker Trip
Remote Common Alarm	

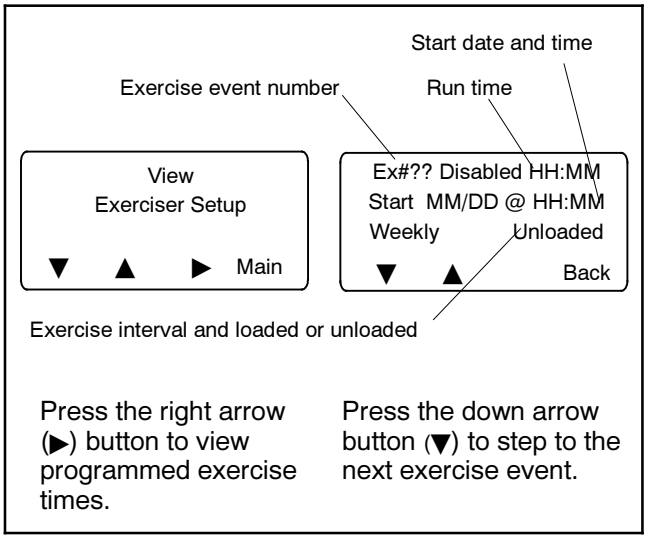
Figure 4-2 Examples of Event Descriptions

4.5 View Maintenance Records

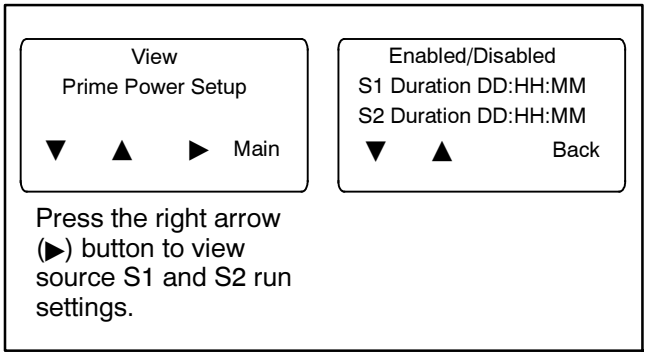


Maintenance Items	
Minimum Values	Reset Loss Pref Tran
Maximum Values	Transfer Time N>E
Total Min not in Pref	Transfer Time E>N
Reset Min Not Pref	Dual Src Conn Time
Total Min in Standby	S1 to Open Time
Reset Min in Standby	S1 to Close Time
Total Min Operation	S2 to Open Time
Reset Min Operation	S2 to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

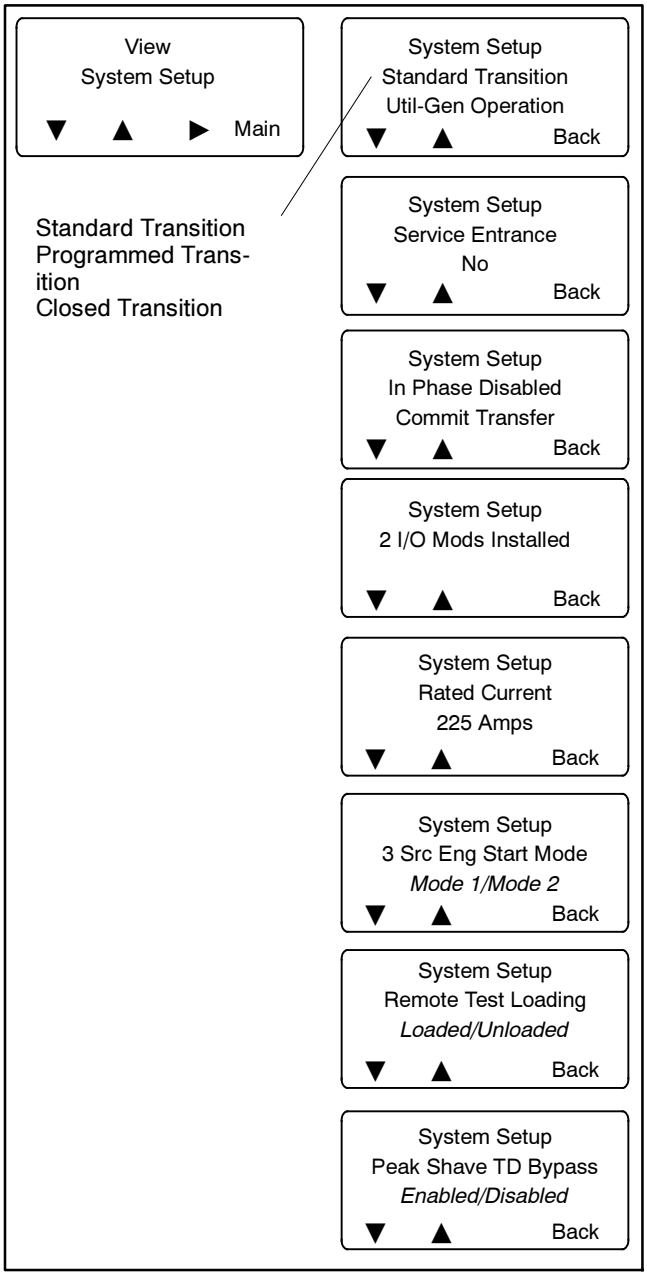
4.6 View Exerciser Setup



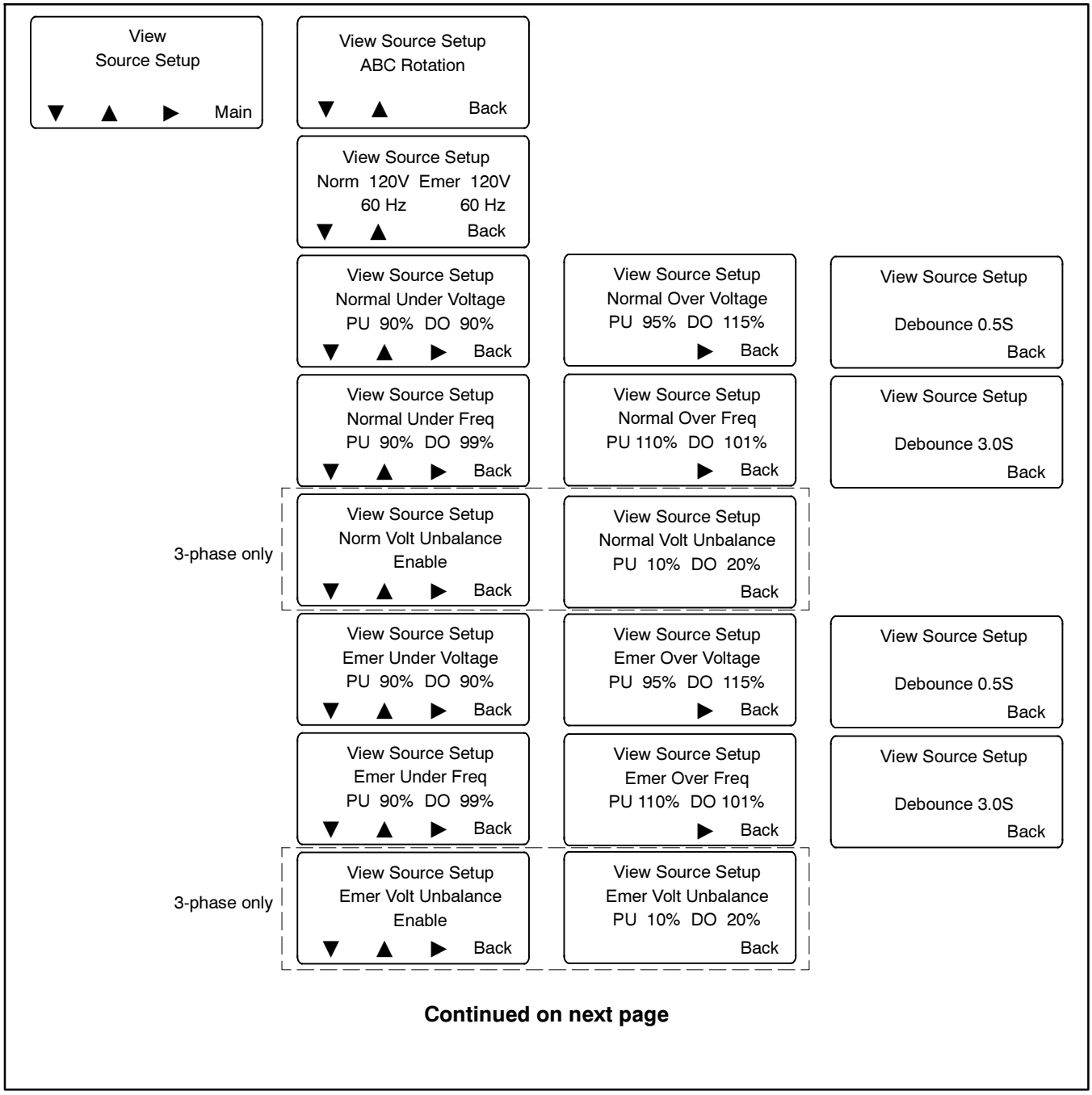
4.7 View Prime Power Setup



4.8 View System Setup

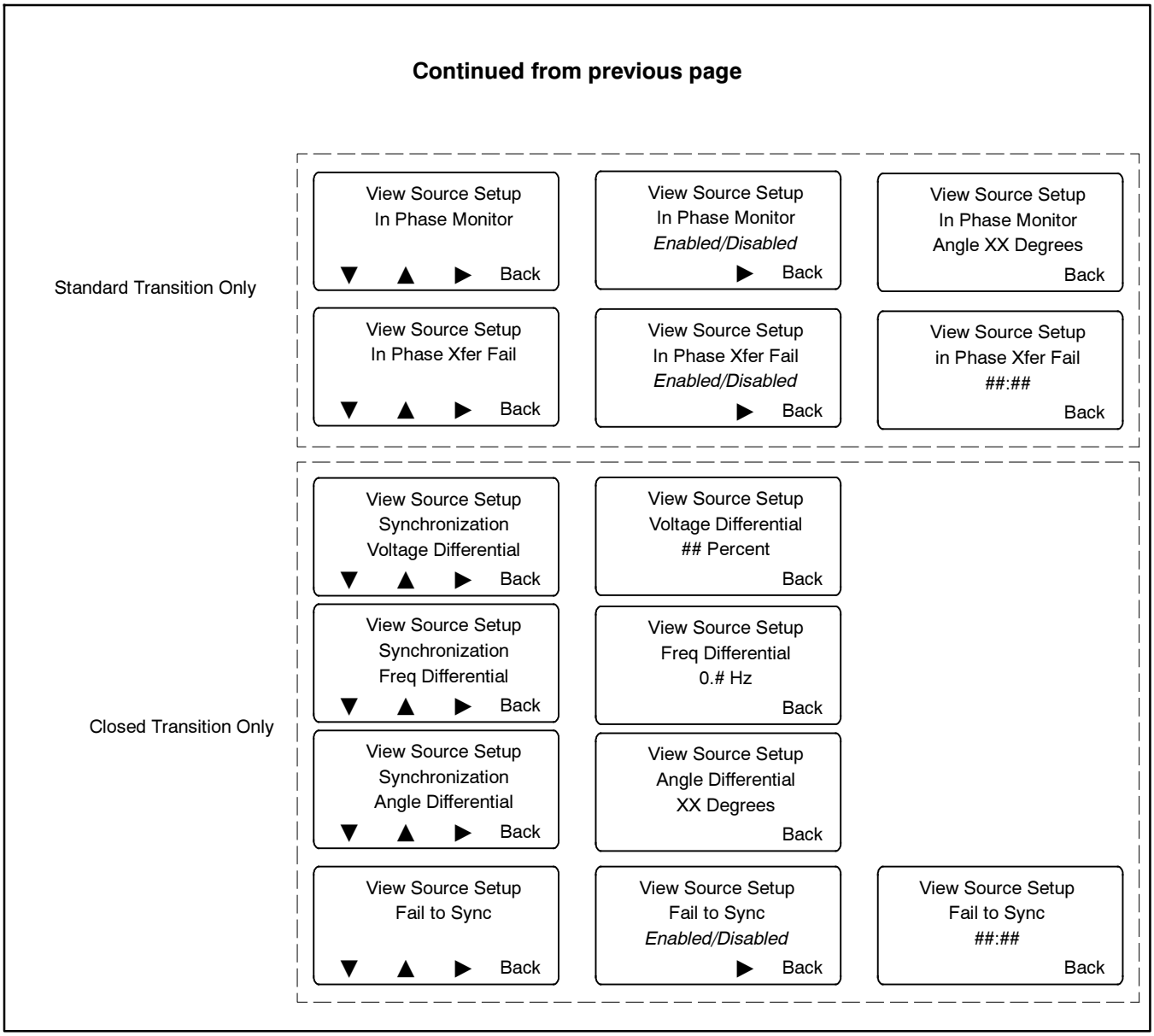


4.9 View Source Setup

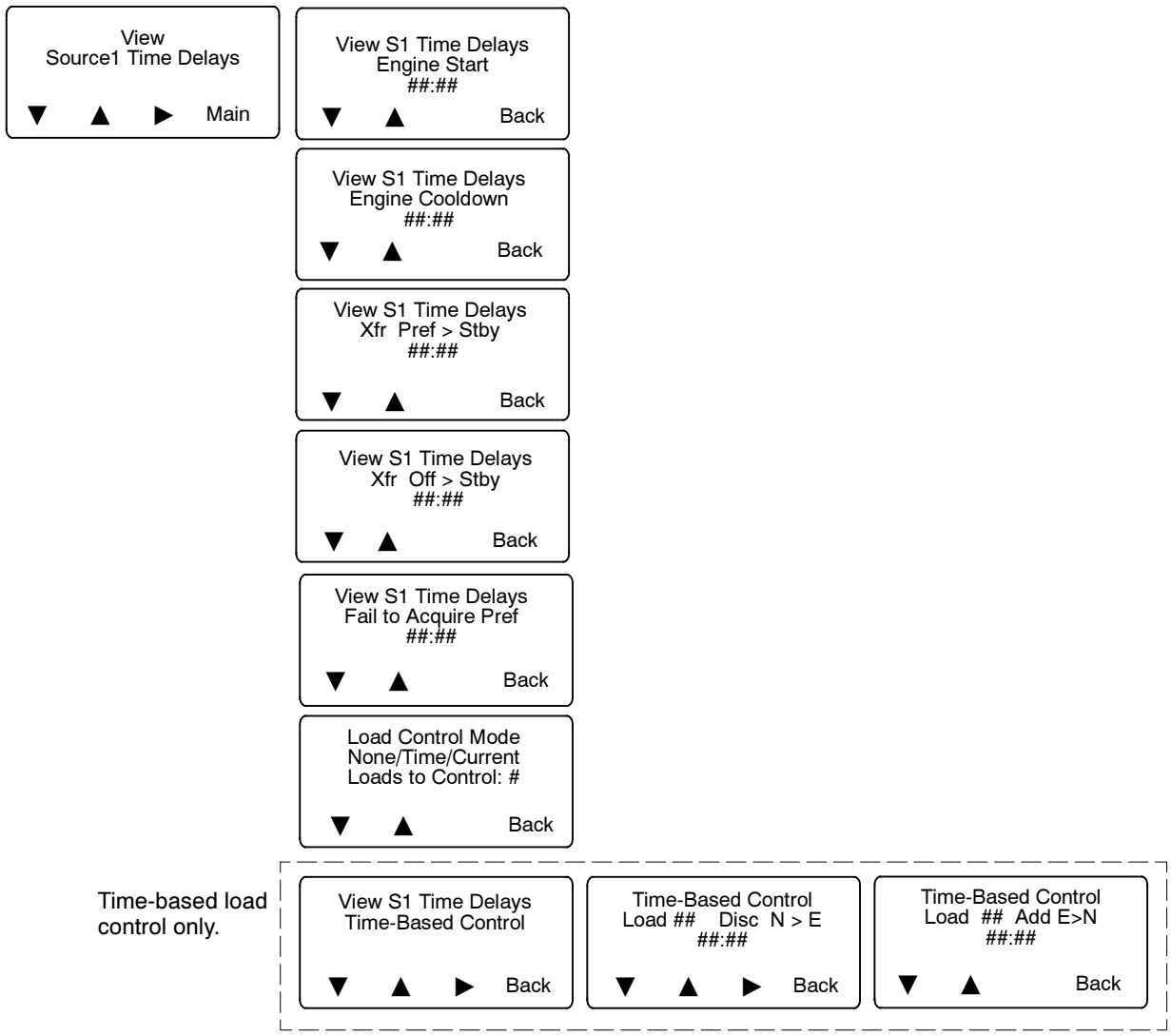


Continued on next page

Continued from previous page



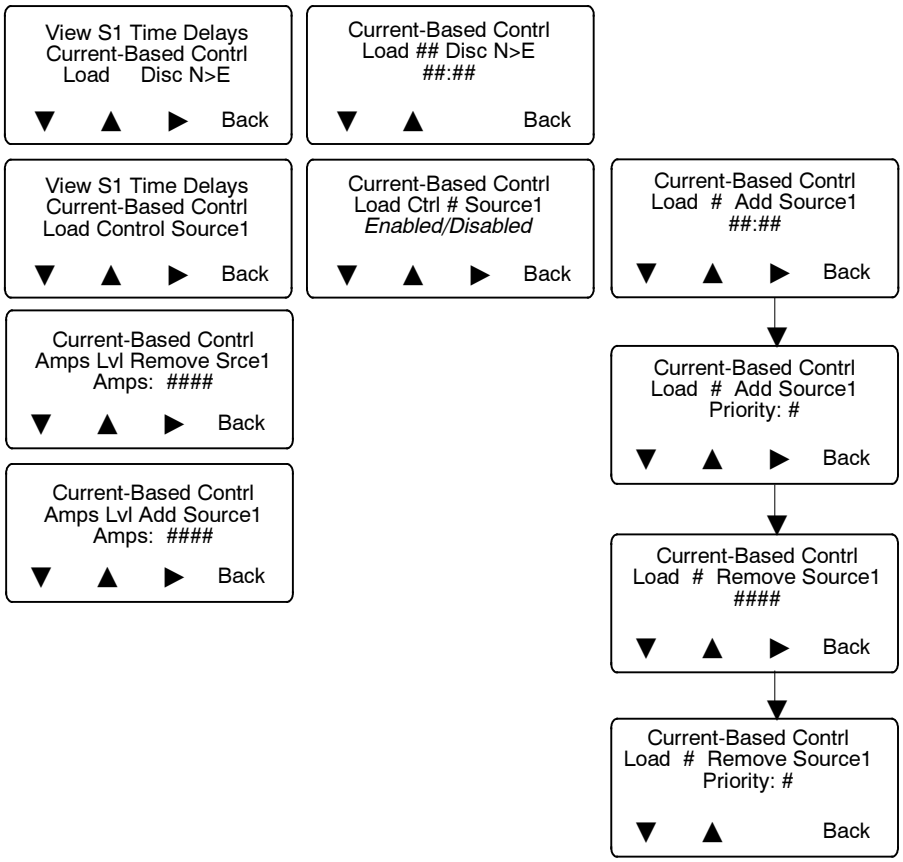
4.10 View Time Delays, Source 1



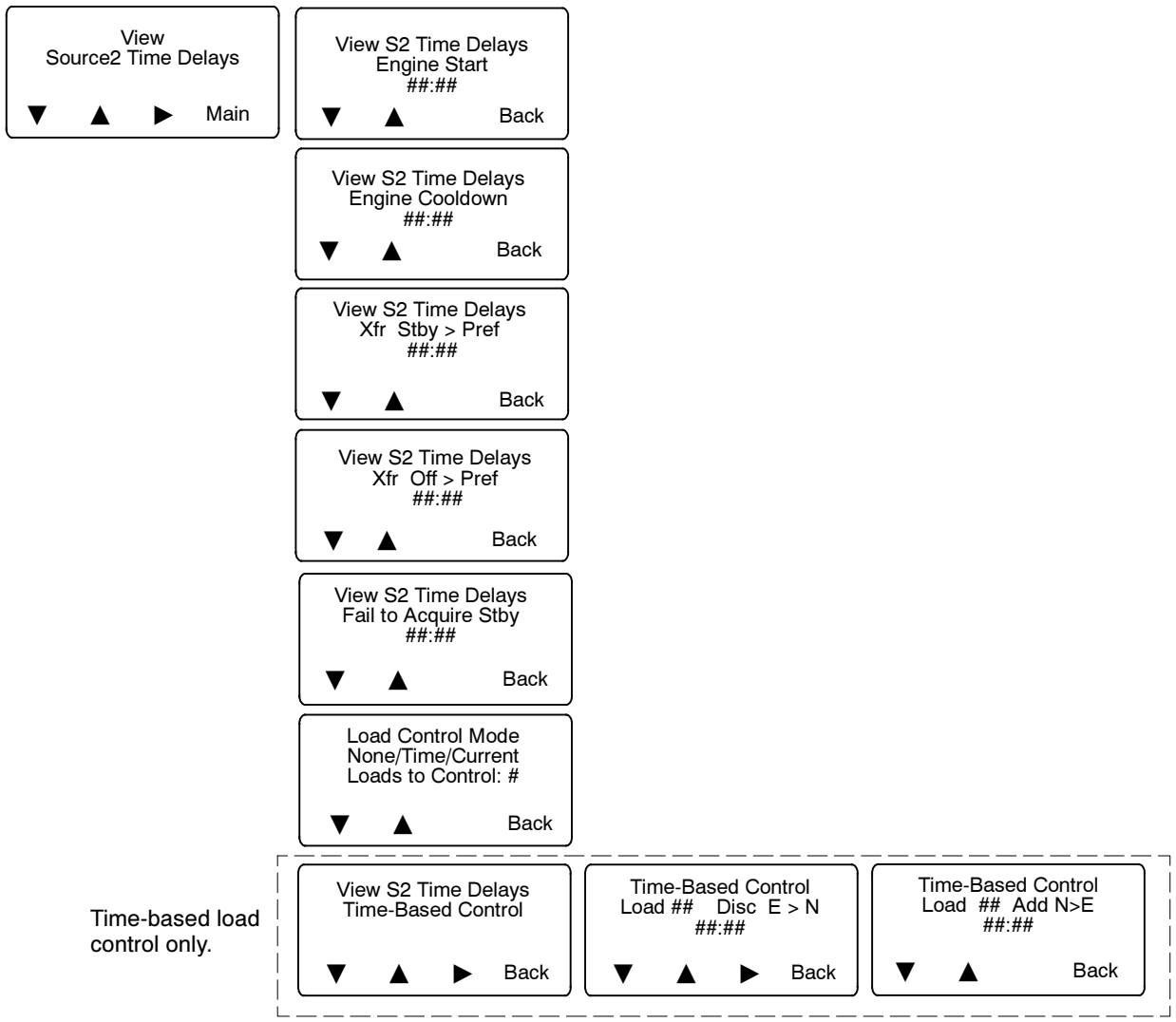
See current-based load control screens in the following figure.

View Time Delays, Source 1, Continued

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



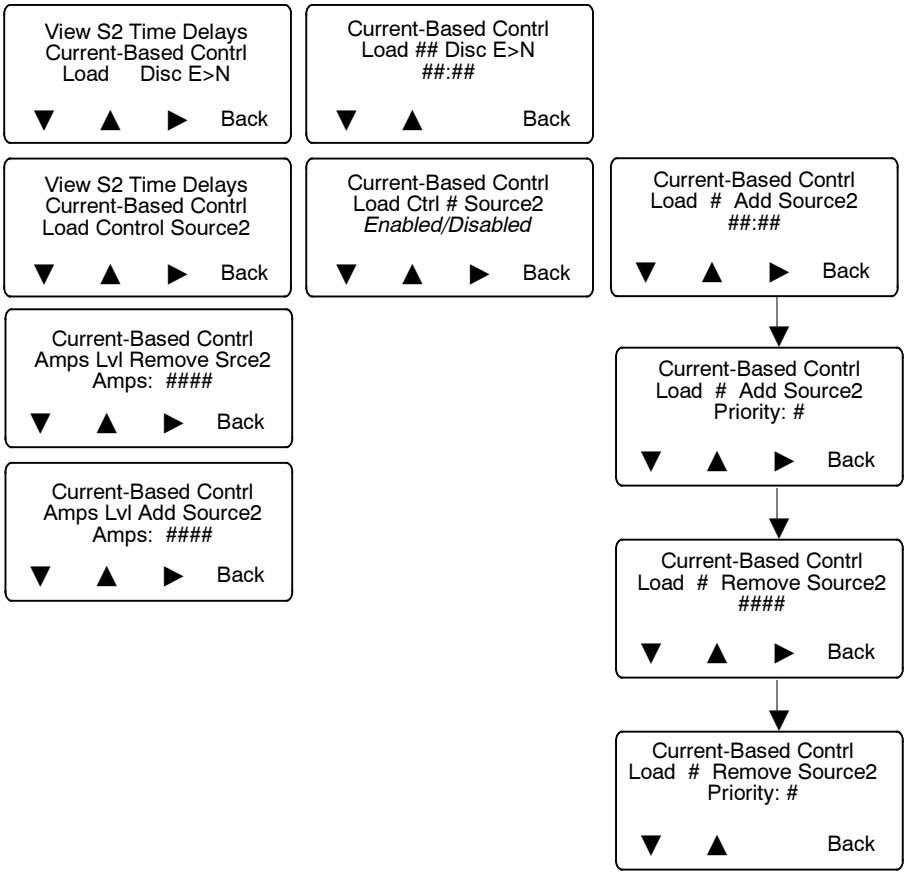
4.11 View Time Delays, Source 2



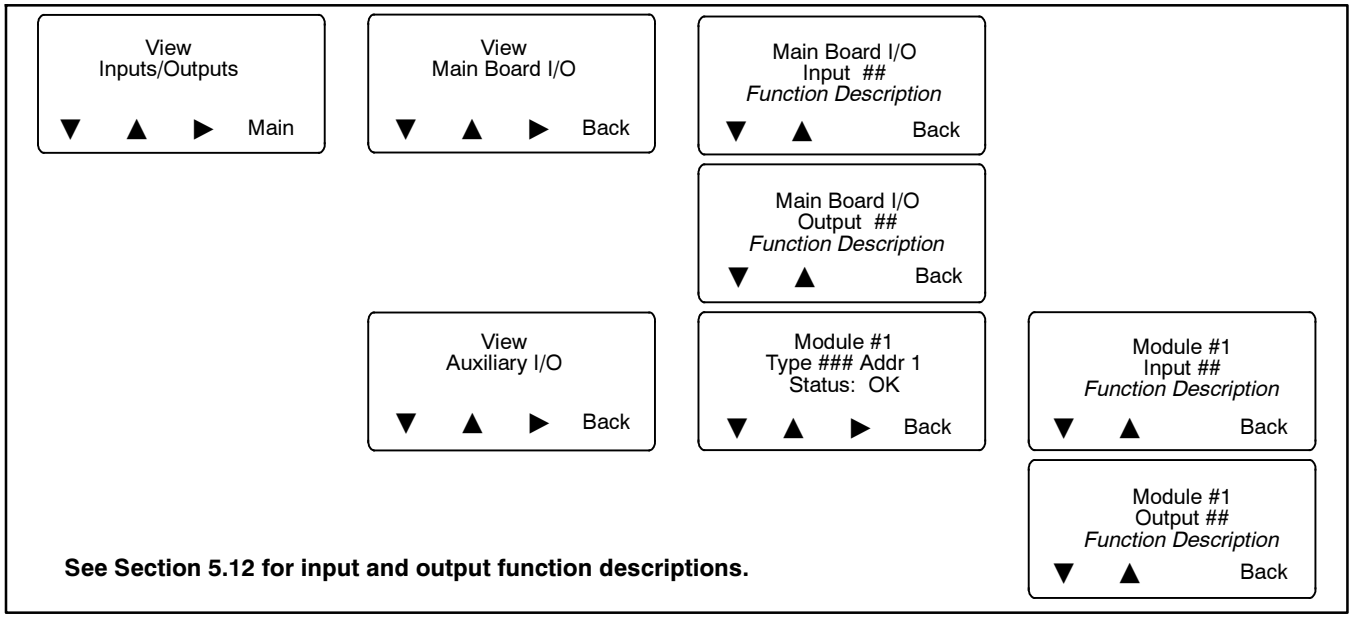
See current-based load control screens in the following figure.

View Time Delays, Source 2, Continued

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

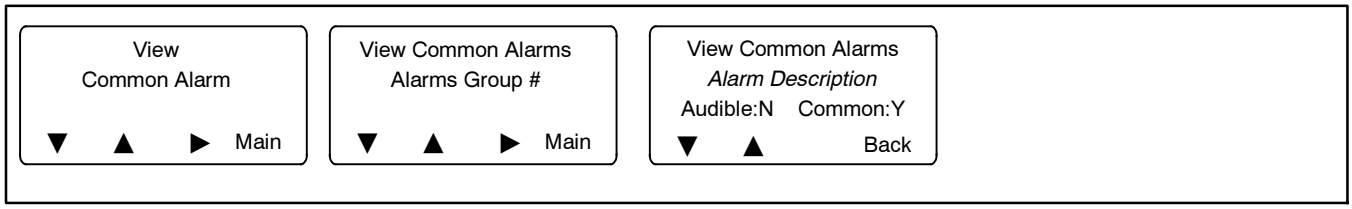


4.12 View Inputs/Outputs

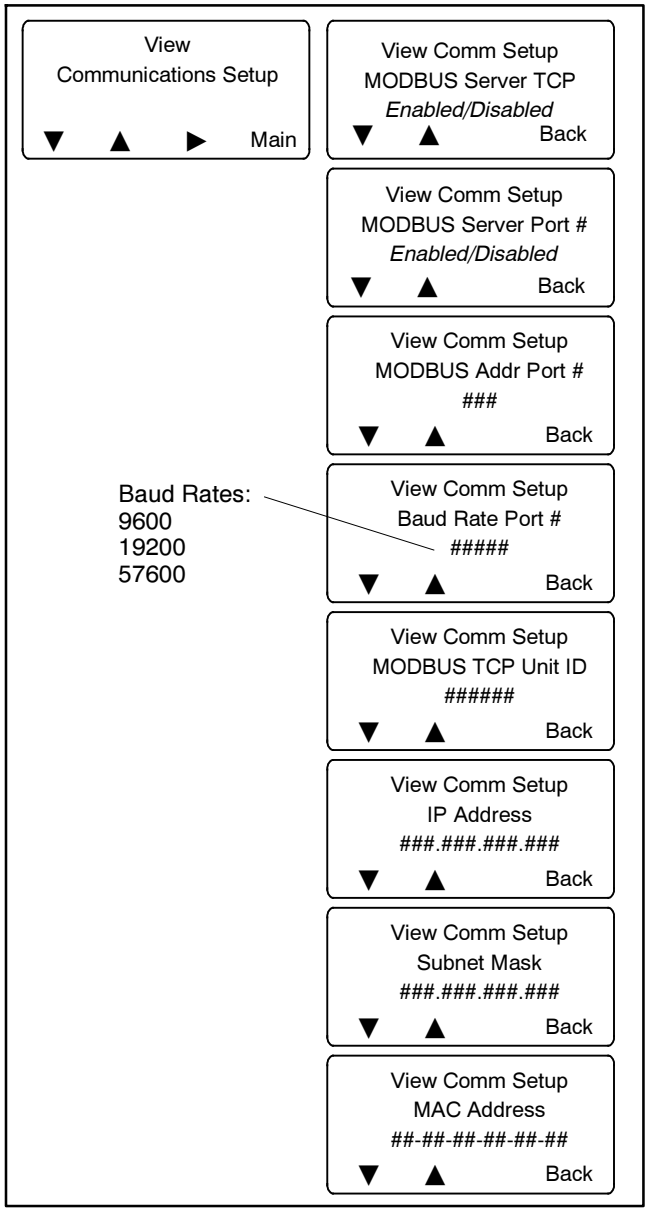


See Section 5.12 for input and output function descriptions.

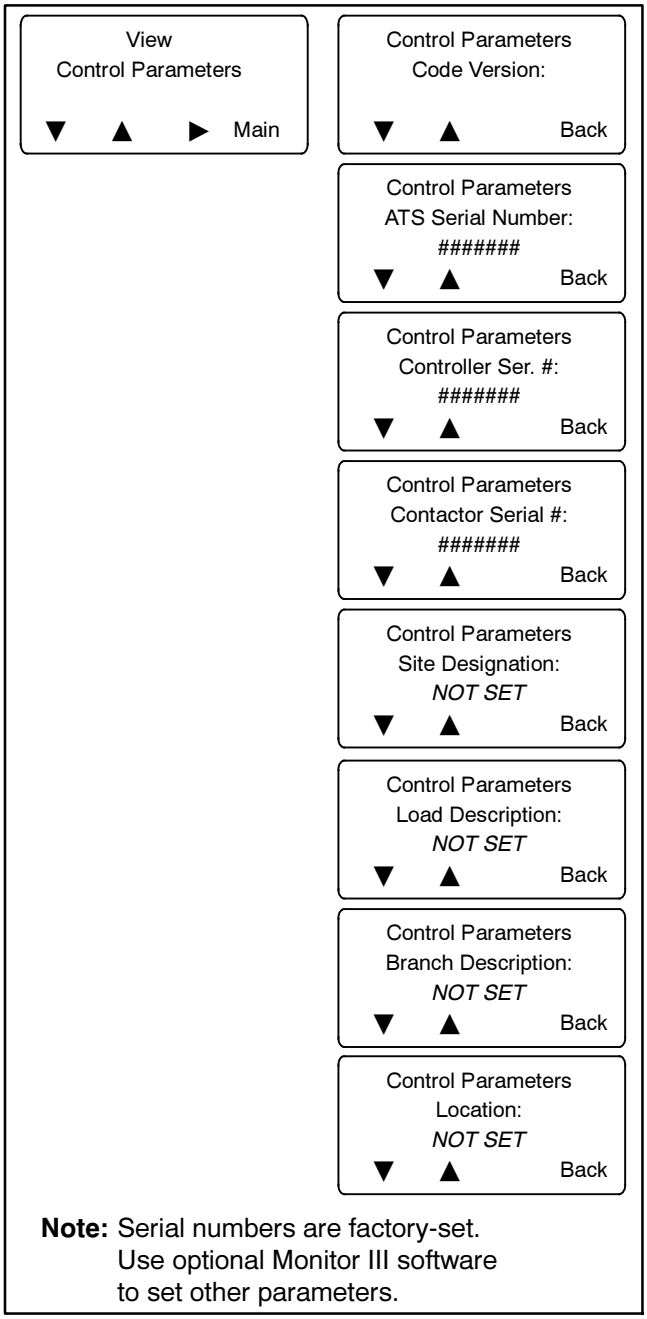
4.13 View Common Alarms



4.14 View Communications Setup



4.15 View Control Parameters



Note: Serial numbers are factory-set. Use optional Monitor III software to set other parameters.

Notes

5.1 Introduction

This section contains setup instructions, including:

- Controller DIP switch settings
- Default settings
- Passwords
- Changing parameter settings using the setup menus

5.2 Source Names

The controller uses various designations for the sources. Source S1 is connected to the Normal side of the transfer switch. Source S2 is connected to the Emergency side of the transfer switch. In a typical application, Source S1 is the utility source, and source S2 is the standby generator set. Other applications may use different configurations, such as the gen-gen configuration which uses two generator set sources and no utility.

The Preferred Source is the source that will be used if both sources are available. Typically, this is the normal utility source, S1. The Set Preferred Source menu allows the operator to select either source as the preferred source. Source S2 (connected to the emergency side of the contactor) can be set as the preferred source using this menu. See Section 5.11.3 for more information about preferred source selection.

In the load control setup menus, N is the preferred source and E is the standby source.

5.3 Controller DIP Switches

Two DIP switches on the main logic board are assigned functions. Switches 3 and 4 are not used. The DIP switches are located on the controller's main logic board on the inside of the enclosure door. Figure 5-1 shows the locations of the switches on the controller circuit board. It is not necessary to remove the logic assembly cover to see or adjust the DIP switches.

SW1-1, Password Disable. Turning ON the password disable DIP switch SW1-1 disables the setup password and resets it to the factory defaults. When the switch is ON, system setup and programming is allowed without the need to enter a password.

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

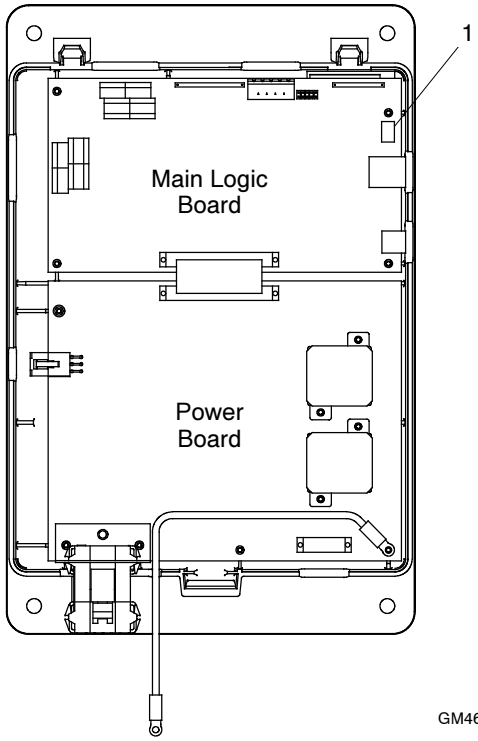
Turning DIP switch SW1-1 ON and then OFF resets the password to the default value, 0000.

The test password is not affected by this DIP switch. Use the Reset Data screen to disable the test password.

SW1-2, Maintenance. The maintenance DIP switch inhibits transfer. Use it to prevent transfers while servicing the ATS. When this switch is in the ON position, sensing, timing, engine start and contactor functions are disabled. A preferred source failure will be ignored. The Not in Auto LED flashes red and the message Maintenance Mode is indicated on the LCD screen. In addition, a programmable digital output is turned on and an entry in the event log indicates that the maintenance mode has been activated. System monitoring and setup are allowed while in maintenance mode.

Switch SW1-2 should be ON only during maintenance or service. It must be OFF during normal operation.

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



1. DIP switches SW1

Figure 5-1 DIP Switch Location (cover removed)

5.4 Default Settings and Time Delays

The system can be operated using the factory settings listed in the following sections.

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

5.4.1 System Parameters

The system parameter factory settings are shown in Figure 5-2. The controller voltage and frequency sensing are factory-set to the default values shown in Figure 5-3. The voltage and frequency debounce time delays prevent nuisance transfers caused by brief spikes and dips in the power supply.

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 5-2 System Parameters

Voltage and Frequency Sensing	
Parameter	**Default**
Under voltage pickup	90% of nominal
Under voltage dropout	90% of pickup
Over voltage dropout	110% of nominal
Over voltage pickup	95% of dropout
Voltage debounce time	0.5 sec.
Under frequency pickup	90% of nominal
Under frequency dropout	99% of pickup
Over frequency dropout	101% of pickup
Over frequency pickup	110% of nominal
Frequency debounce time	3 sec.

Figure 5-3 Factory Settings, Voltage and Frequency

5.4.2 Time Delays

The factory settings for the time delays are shown in Figure 5-10.

The pre-transfer time delays operate only when both sources are available. These delays allow time to disconnect selected loads before transfer. The load control LED on the user interface lights when the pre-transfer signal is active. The pre-transfer and post-transfer time delays overlap the preferred-to-standby and standby-to-preferred transfer time delays.

Time Delay Description	Default Time
Emergency engine start (emergency source – Util/Gen and Gen/Gen modes)	3 sec
Normal engine start (normal source – Gen/Gen mode)	0 sec
Emergency engine cooldown (emergency source – Util/Gen and Gen/Gen modes)	
Normal engine cooldown (normal source – Gen/Gen mode)	0 sec
Fail to acquire standby source	1 min
Preferred to standby	1 sec
Pre-transfer to standby source	3 sec
Post-transfer to standby source	0 sec
Standby to preferred	15 min
Pre-transfer to preferred source	0 sec
Post-transfer to preferred source	0 sec
Fail to synchronize	1 min
Off (Preferred to Standby for programmed transition)	1 sec
Off (Standby to Preferred for programmed transition)	1 sec

Figure 5-4 Factory Settings, Time Delays

5.5 Setup Screens

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

The setup password is required. The default password is 0000. (The password can be disabled; see Section 3.4.2.)

After entering the system password, use the black arrow keys to step through the setup screens as shown in Figure 5-5.

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

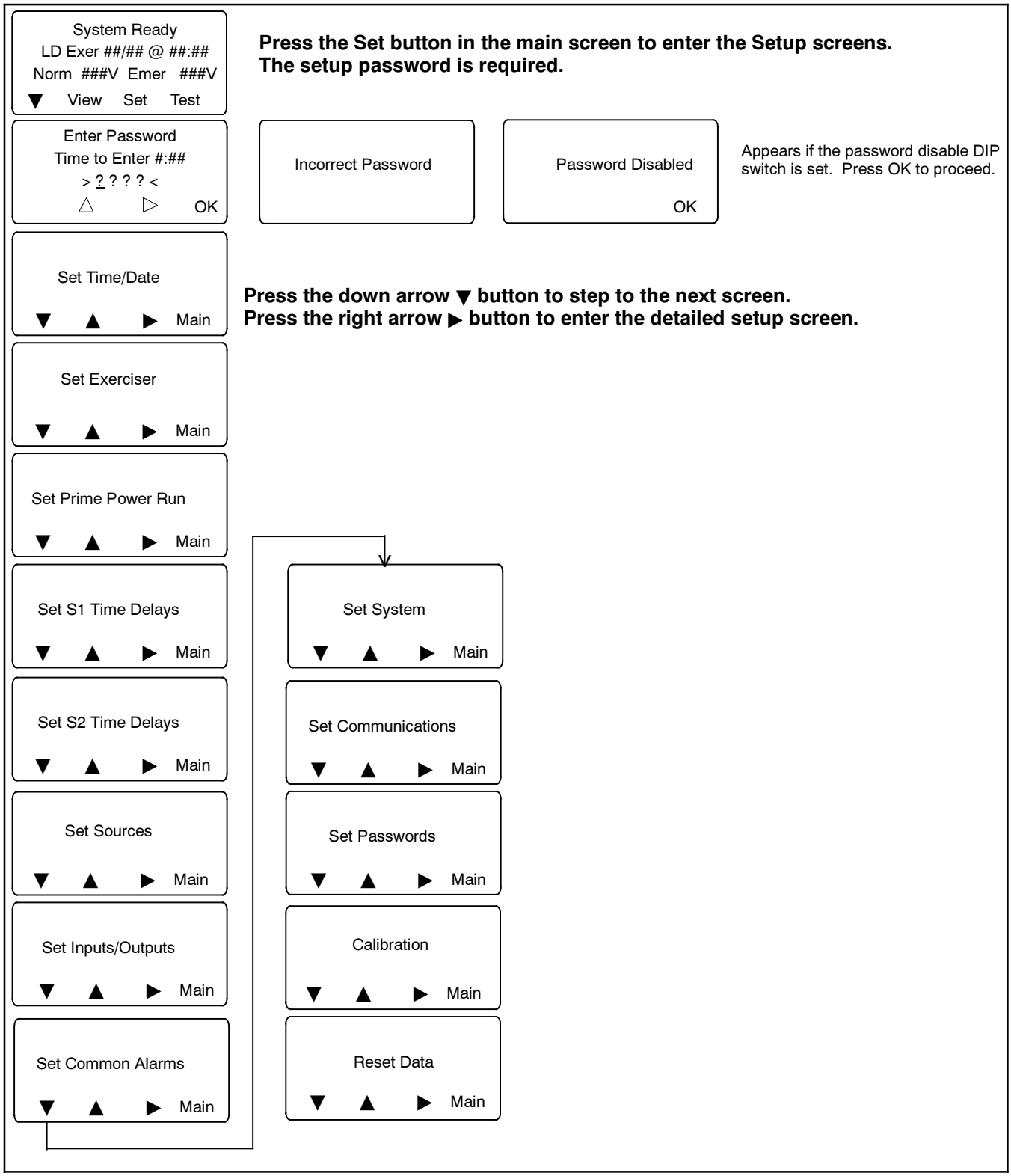


Figure 5-5 Main Setup Screen

5.6 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 screen includes the option to enable automatic Daylight Saving Time and set the start and stop date. See Figure 5-6.

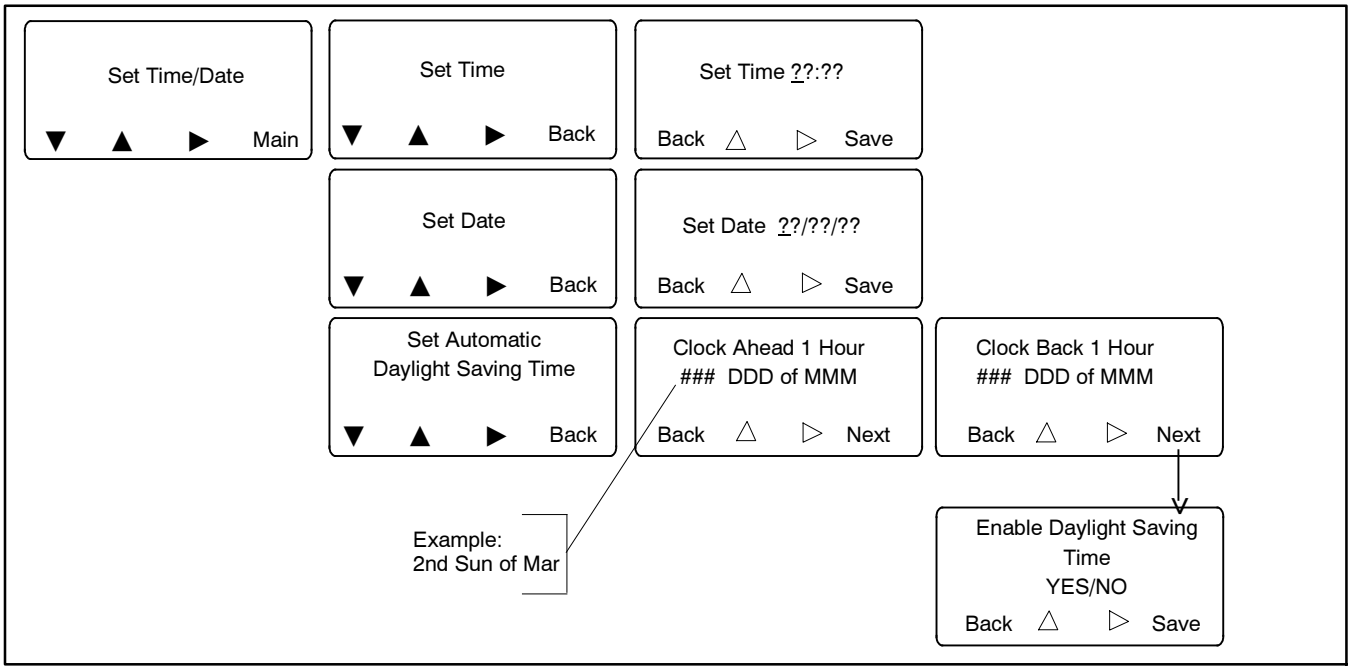


Figure 5-6 Setting the Time and Date

5.7 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 screen. (See Figure 3-6.)

5.7.1 Setting the Exerciser

See Figure 5-7 and Figure 5-8.

5.7.2 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.

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 *Day* 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 5-7 Exerciser Settings

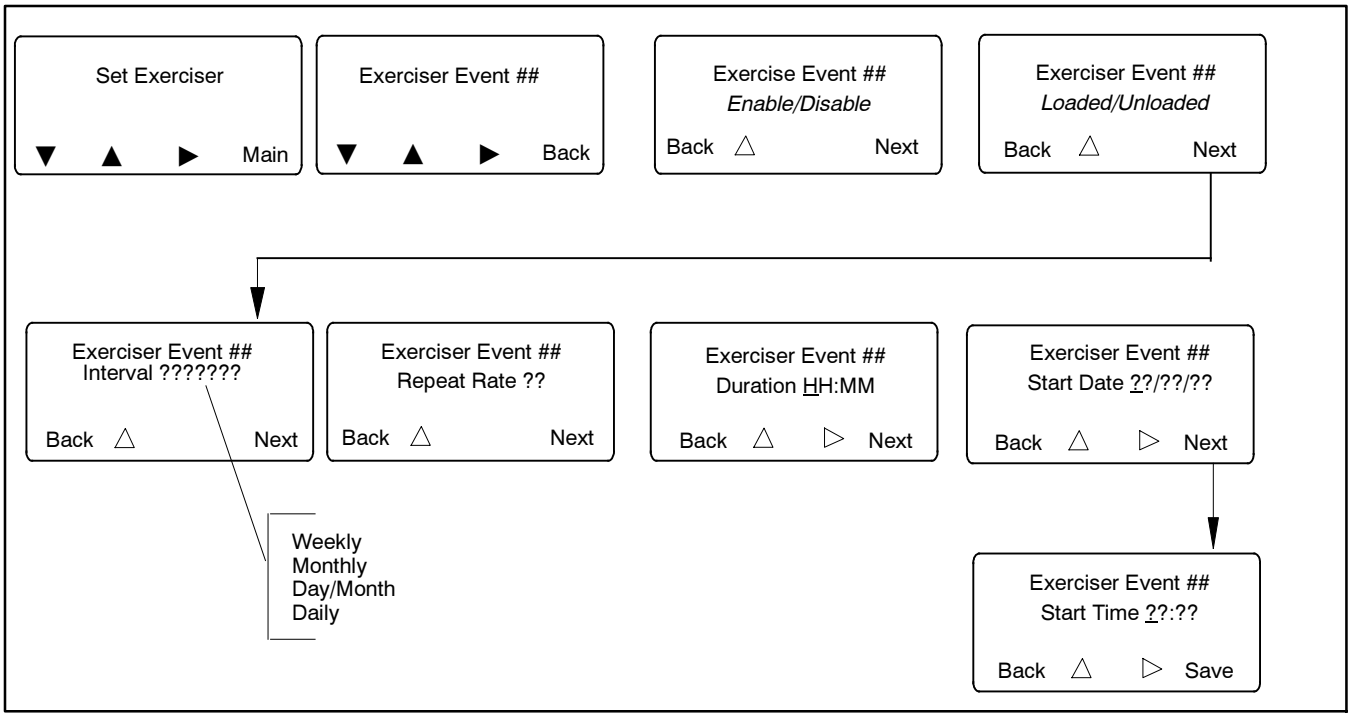


Figure 5-8 Setting the Exerciser

5.8 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 Section 8.2.3.

5.8.1 Prime Power Mode Setup

- In the Set System menu, set the source type to Gen-Gen. See Section 5.14, Set System.
- 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 Section 5.12, Programmable Inputs and Outputs.
- Check the overfrequency and underfrequency pick up and drop out settings for both sources, and adjust if necessary.
- Set the normal source engine start and engine cooldown 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 5-9.
- In the Prime Power Event screen, 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.

5.8.2 Prime Power Mode Operation

During a prime power run sequence, the main screen 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 cooldown 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.

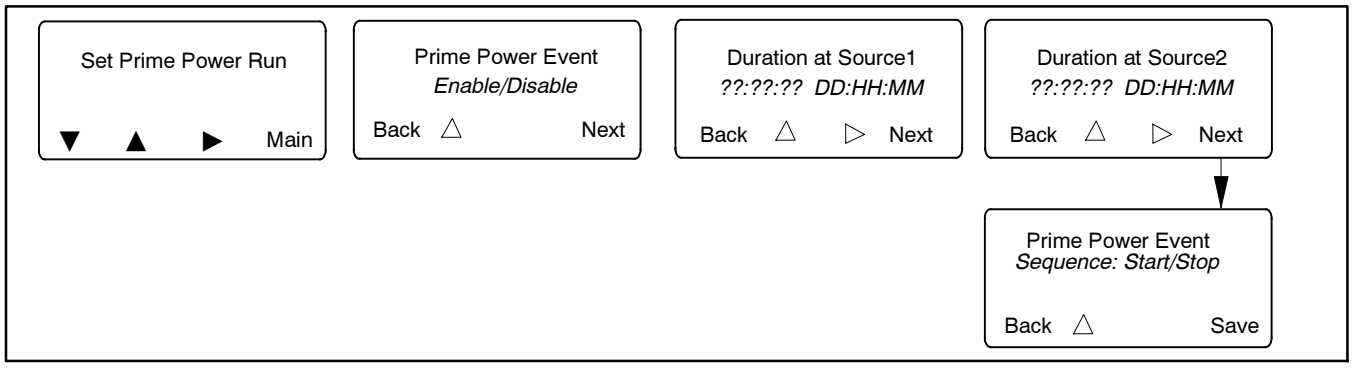


Figure 5-9 Set Prime Power Run Menu

5.9 Time Delays

5.9.1 Time Delays

The factory settings and adjustment ranges for the time delays are shown in Figure 5-10.

The engine start time delay and transfer time delays can prevent nuisance transfers caused by brief voltage dips or surges.

The engine cooldown 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.

5.9.2 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.

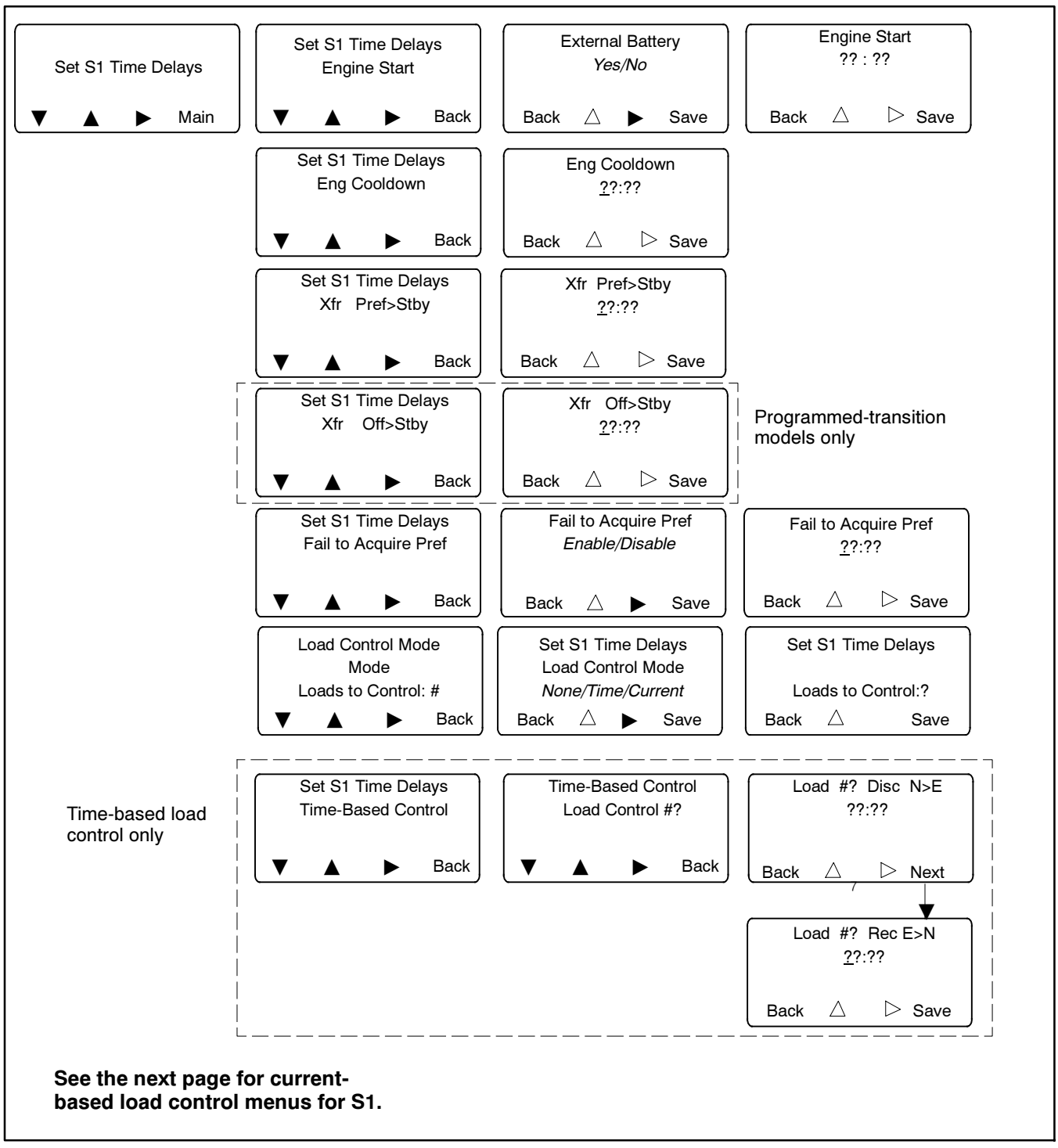
Current-based load control is also available. Current-based load control uses the Load Disconnect, Load Add Source1/Source2, and Load Remove Source1/Source2 time delays. See Section 5.10.2 for more information about the time delays used for current-based load control.

Proceed to Section 5.10, Load Control, for more information.

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 Cooldown, Source S2	Source S2 - Util/Gen and Gen/Gen modes	5 sec	0-60 min
Engine Cooldown, 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	
Xfr OFF>Pref	Time in the OFF position (Standby to Preferred for programmed transition models only)	1 sec	
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	
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	0-60 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 Section 5.11.	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 Section 5.10.	0 sec	0-60 min
Load # Rec N>E	Reconnect load after-transfer to standby source. Used for time-based load control. See Section 5.10.	0 sec	0-60 min
Load # Disc E>N	Disconnect load before-transfer to preferred source. Used for time-based and current-based load control. See Section 5.10.	0 sec	0-60 min
Load # Rec E>N	Reconnect load after-transfer to preferred source. Used for time-based load control. See Section 5.10.	0 sec	0-60 min
Load # Add Source1/Source2	For current-based load control. See Section 5.10.2.	0 sec	0-60 min
Load # Remove Srce1/Srce2	For current-based load control. See Section 5.10.2.		
* The optional external battery module allows extended engine start time delays from 0-60 min.			

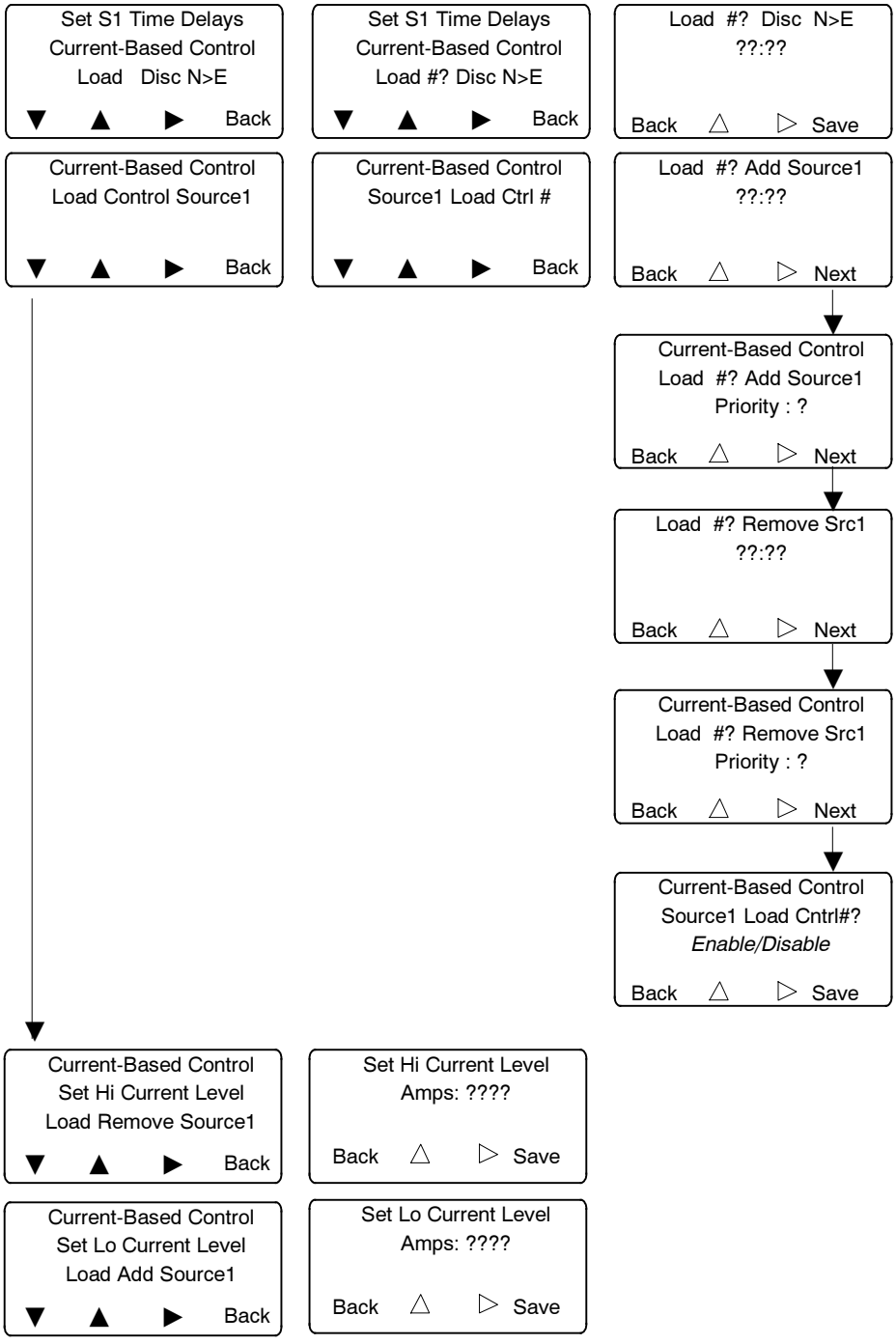
Figure 5-10 Time Delay Settings

5.9.3 Set S1 Time Delays

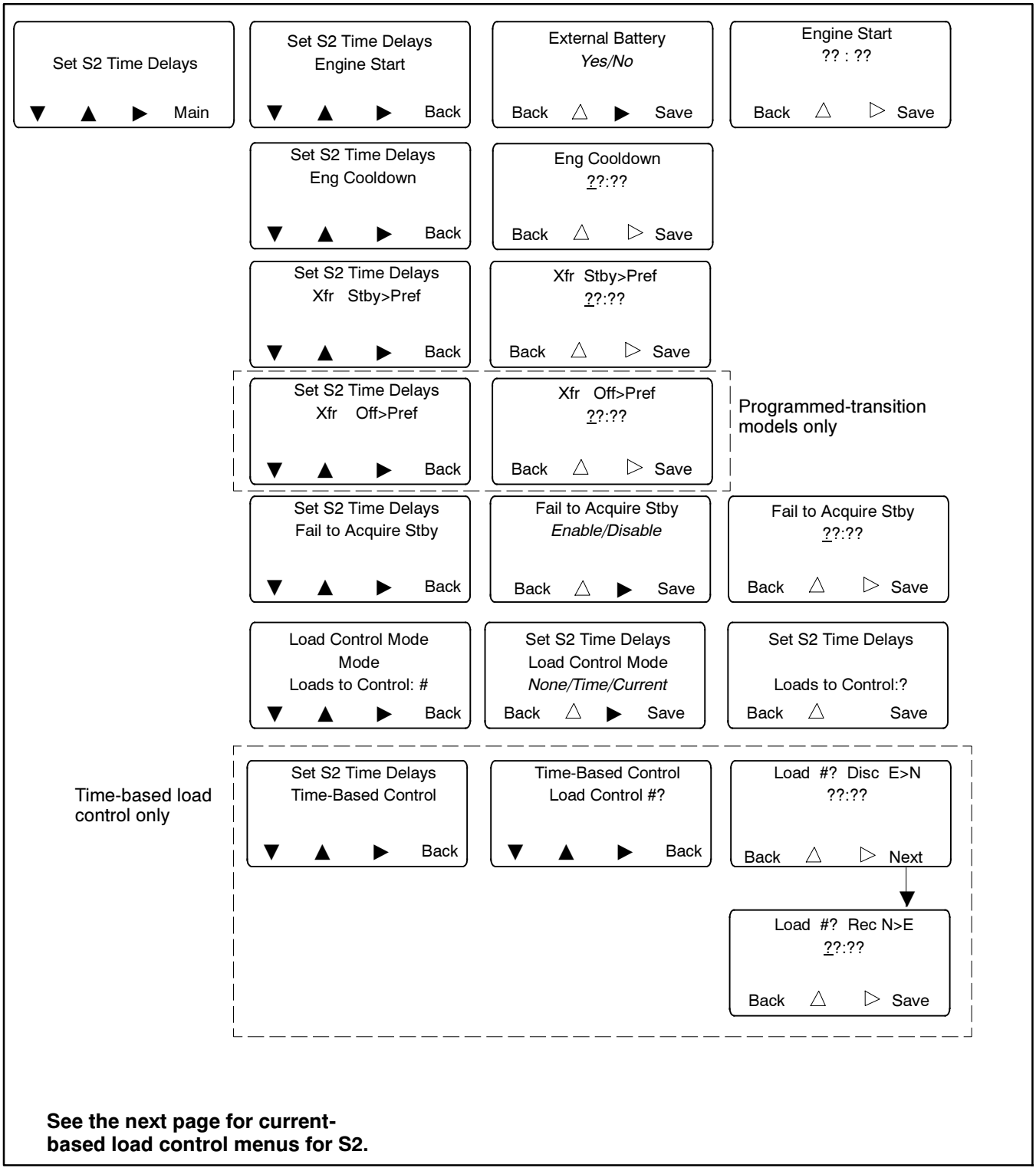


See the next page for current-based load control menus for S1.

Current-Based Load Control Menus Continued from Previous Page:

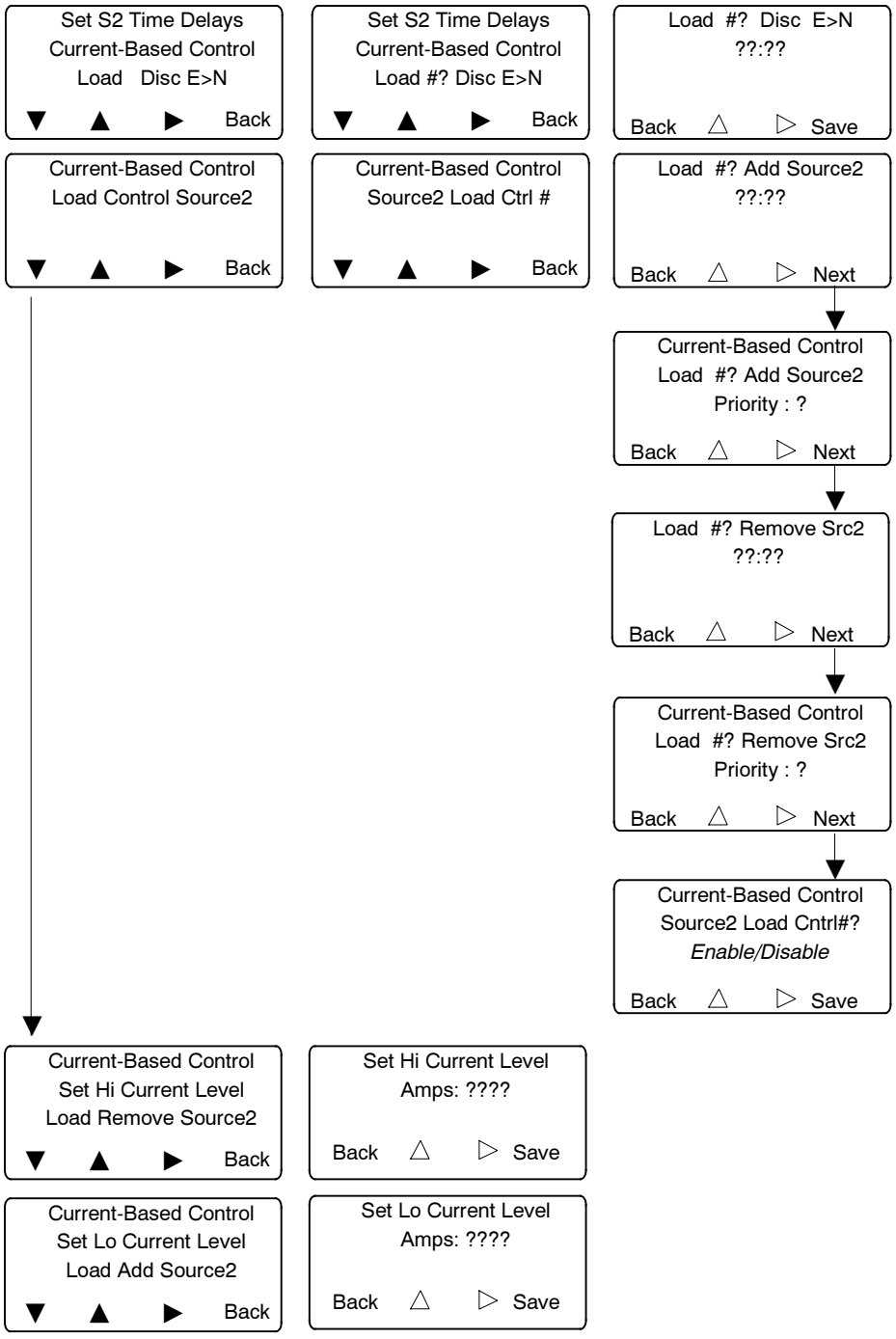


5.9.4 Set S2 Time Delays



See the next page for current-based load control menus for S2.

Current-Based Load Control Menus Continued from Previous Page:



5.10 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.

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. Load Control setup parameters are found in the Set Time Delays menus.

Note: The load control setup parameters are found in the Set S1 Time Delays and Set S2 Time Delays menus.

5.10.1 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 5-11. The longer delay determines the time delay before transfer.

Time-Based Load Control Setup

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 screen to assign the connected output to one of the load control outputs 1–9. See Section 5.12.
3. Proceed to step 4 to set time-based load control for source 1, if required. Skip to step 7 if time-based load control is only needed for source 2 (standby source).
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: 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.
   b. Load # Rec 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.
   c. Loads to Add: Enter the number of loads that have been connected to load control outputs for pre-transfer disconnect and delayed reconnect.

Repeat for source 2 if time-based load control is required for source 2:

7. In the Set S2 Time Delays menu, select Time as the load control mode.

8. Enter the number of loads to control, which is equal to the number of loads connected to outputs in step 1.

9. Use the Set S2 Time Delays menu to set the following associated time delays.

   a. Load # Disc E>N: pre-transfer time delay disconnects loads a programmed time before transfer from Emergency to Normal. When the normal source returns, selected loads can be disconnected from power at different times before transfer.

   b. Load # Rec N>E: post-transfer time delay reconnects loads a programmed time after transfer to Emergency. 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.

   c. Loads to Add: Enter the number of loads that have been connected to load control outputs for pre-transfer disconnect and delayed reconnect.

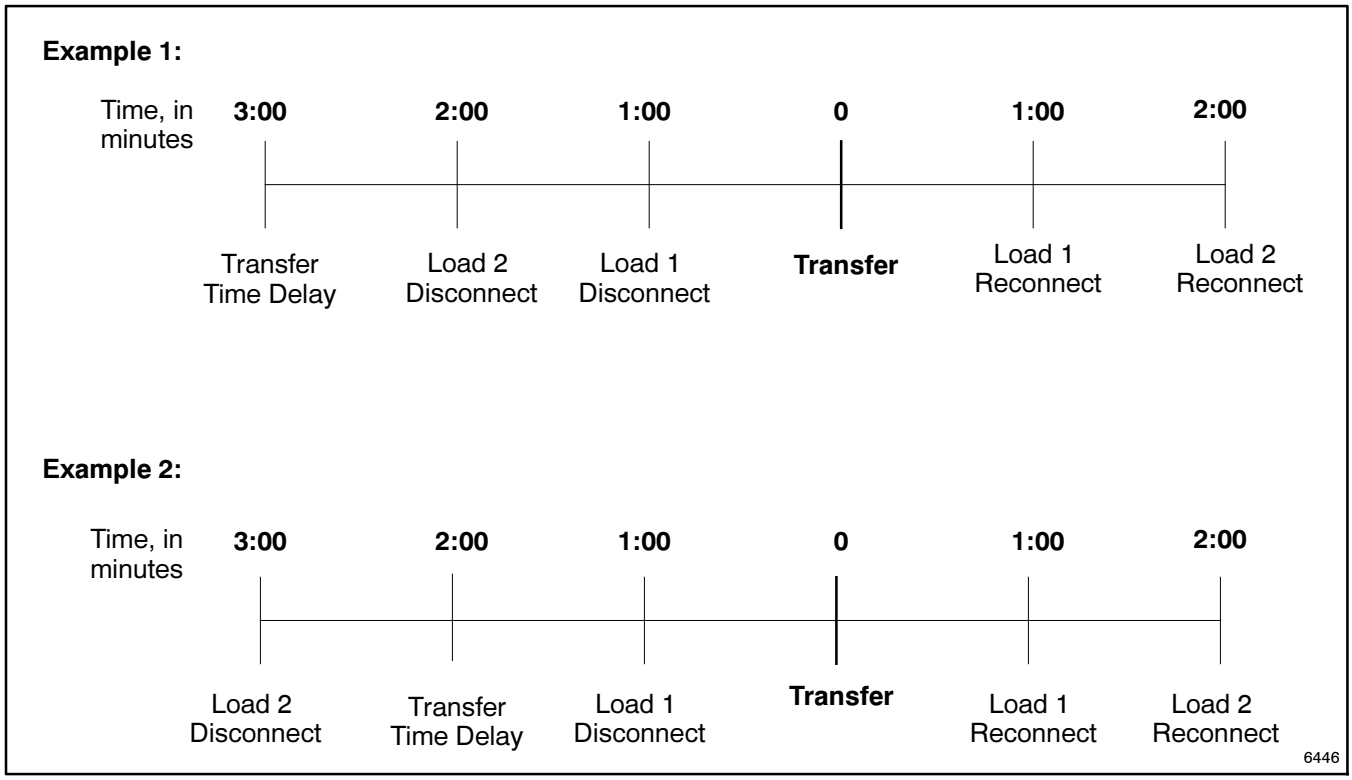


Figure 5-11 Time-Based Load Control and Transfer Time Delays

5.10.2 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 Section 8.4, Current Sensing.

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 5-12 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 screen to assign the connected output to one of the load control outputs 1–9. See Section 5.12.

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 screen under Set S1 Time Delays or Set S2 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 5-12. 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 5-12.

   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 5-12.

   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 their 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 5.12, programmable Inputs and outputs.	Load Control Out 1–9
Load Control Mode	Select Current for current-based load control. See Section 5.10.2 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 5-12 Current-Based Load Control Parameters

5.11 Source Setup

5.11.1 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.

5.11.2 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 5-13.

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	0–60 min.	30 sec.

Figure 5-13 Synchronization Settings for Closed-Transition Switches

5.11.3 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 Section 8.3.

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.

Source Types. The transfer switch is factory-set for the utility-generator set source types. 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 connected generator set and does not change assignment when the preferred source selection is changed. In this mode, if the preferred source selection is set to Source E, the system operates the generator set indefinitely, transferring to utility power only if the generator set fails.

Use the Set System, Source type screen to change the source types to generator set-generator set or utility-utility if necessary. The gen-gen type uses two generator sets and requires the assignment of a second engine start output. Use the Input/Output Setup screen to assign one of the main logic board terminal strip or I/O module outputs to Start Source N Generator, and connect the engine start leads for the Source N generator set to the corresponding terminals on the terminal strip or I/O module terminals. See Section 5.12. 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. This source type does not use the engine start outputs.

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 5-14 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.

5.11.4 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.

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 cooldown time delay	Source	N	N
Source E engine cooldown 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 5-14 Preferred Source Selection Effect on System Parameters and Time Delays

5.11.5 Voltage and Frequency Pickup and Dropout Settings

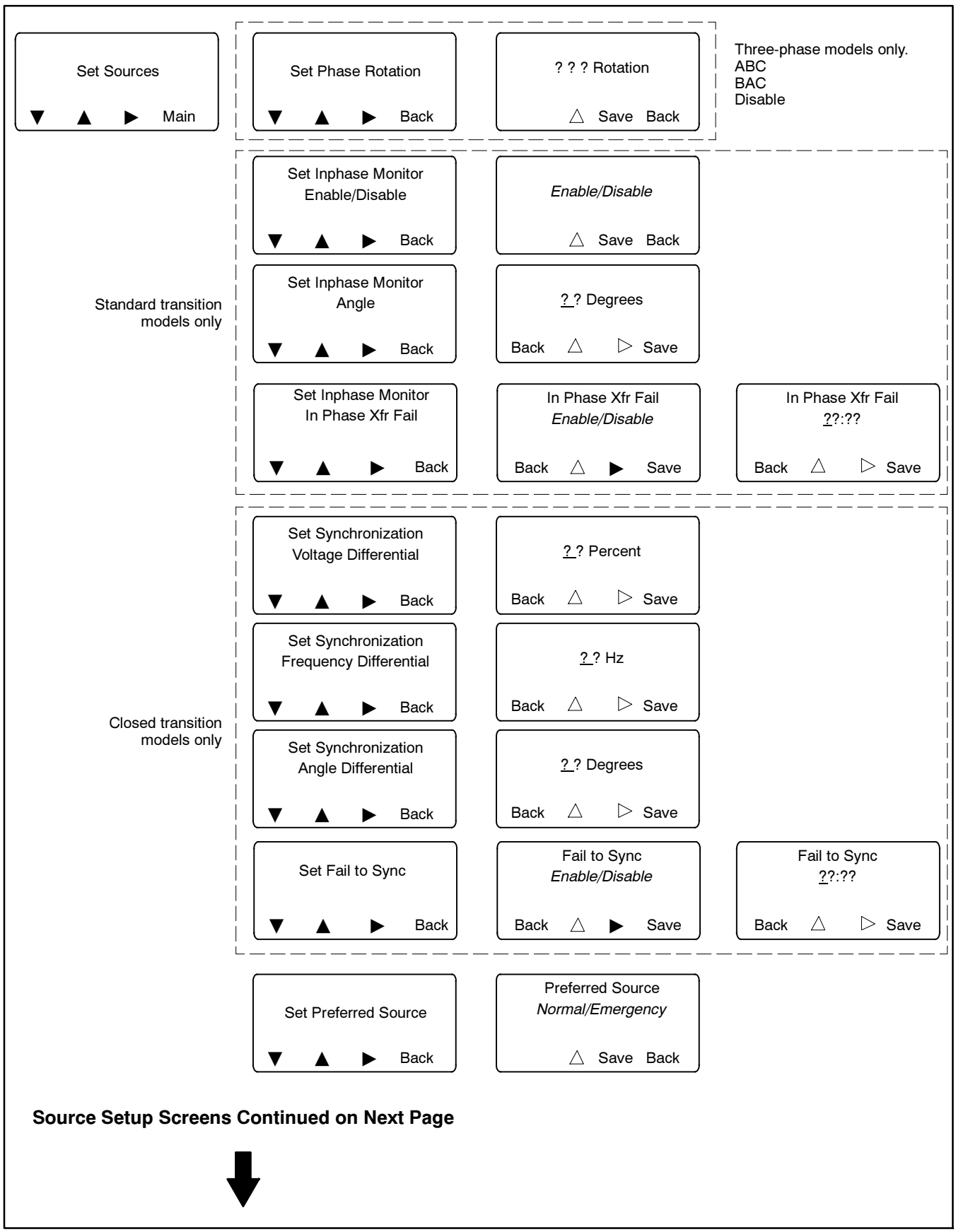
The controller senses the voltage on both sources with an accuracy of ±0.5%. A source is considered available when its voltage and frequency are within the range of dropout settings. The debounce time prevents nuisance transfers caused by brief voltage spikes and dips. If the voltage or frequency of 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 5-15 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 5-15 Pickup and Dropout Settings

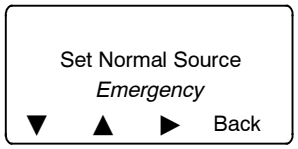
5.11.6 Set Sources



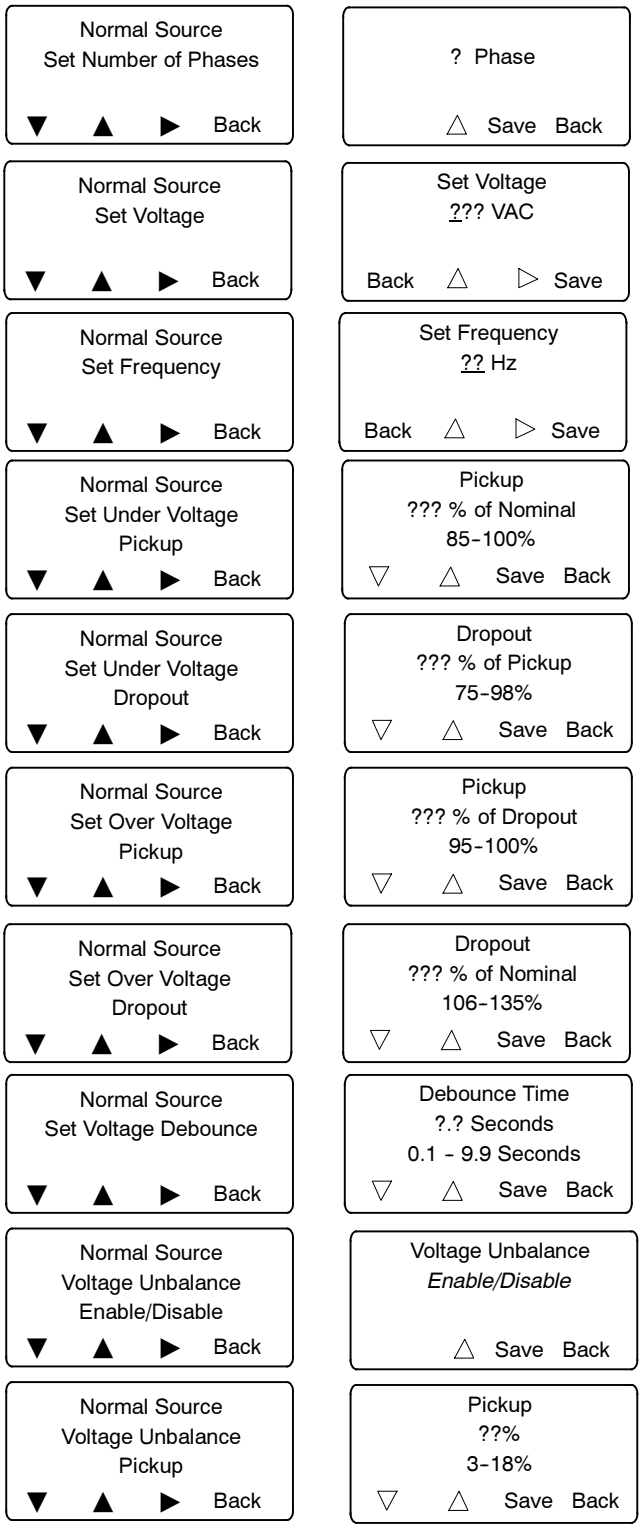
Source Setup Screens Continued on Next Page

Set Sources, continued

Source Setup Screens Continued from Previous Page:

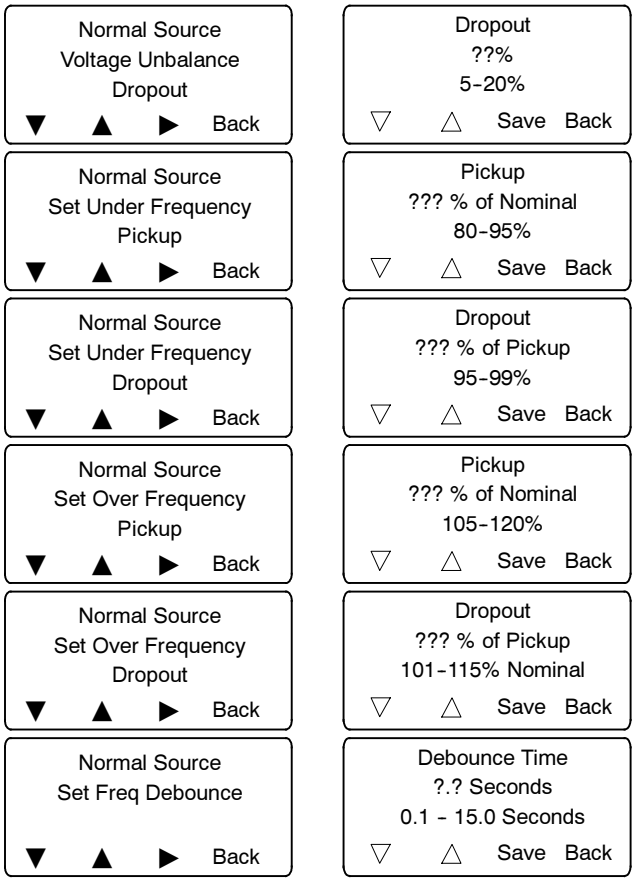


Note: The same menus are available for the Emergency source.



Set Sources, continued

Source Setup Screens Continued from Previous Page:



5.12 Programmable Inputs and Outputs

Inputs and outputs are unassigned (except as noted in Figure 5-17) until the installer or operator assigns a function to the I/O.

The programmable inputs and outputs on the controller's main logic board and input/output (I/O) modules can be assigned to the functions shown in Figure 5-18 and Figure 5-19. Use the Input/Output Setup Screen to assign input and output functions . See Figure 5-16.

Input and output functions can also be assigned over Modbus using Monitor III software. Refer to the Monitor III operation manual for instructions.

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.

5.12.1 Main Logic Board Inputs and Outputs

There are two programmable inputs and two programmable outputs on the controller's main logic board. 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.

5.12.2 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 Section 8.2.2.

See Section 8.2.2 for I/O module connection information.

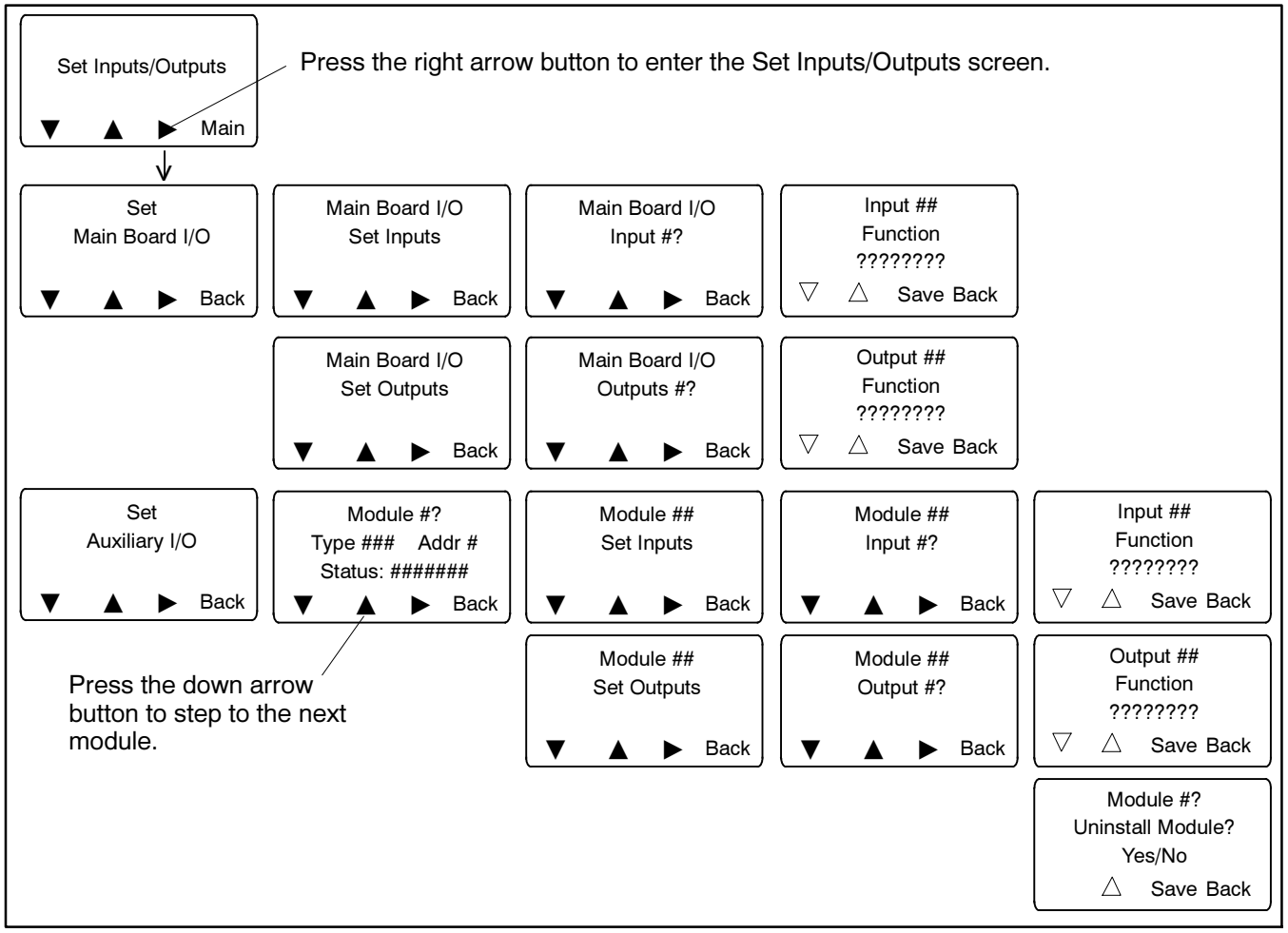


Figure 5-16 Assigning Inputs and Outputs

5.12.3 Input Functions

Available input functions are shown in Figure 5-18. Some inputs will trigger an indicator LED on the user interface and/or display a message on the LCD screen when they are activated.

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

Note: Some models have factory-set input functions as shown in Figure 5-17. Do not change these settings.

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

Figure 5-17 Factory Set Inputs

Forced Transfer to OFF Input. This function requires the load shed accessory installed on a programmed-transition model transfer switch. 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.

See Section 8.8 for more information about the load shed (forced transfer to OFF) function.

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 via Modbus messages only (i.e. through Monitor III software or other Modbus application).

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 cooldown 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 Section 5.14.8 for information about the Peak Shave TD Bypass.

Remote Bypass 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.

Programmable Inputs *	⚠ LED	⊘ LED	Display Message
Bypass Contactor Disable*	None	Flashing	Bypass Contactor Disable *
Forced Transfer to OFF* (programmed-transition models only; 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 screens. See Section 3.10.
Remote Monitor In #1–4	None	None	None
Three-Source System Disable	None	None	None
* See Figure 5-17 for factory-set input functions for selected models. Do not change the factory settings.			

Figure 5-18 Available Programmable Inputs

5.12.4 Output Functions

Output functions are shown in Figure 5-19. Information about selected output functions is shown below. Refer to the section number shown in Figure 5-19 for more information about the output function.

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 Section 5.11.2 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 Sections 1.1.1 and 8.2.2 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 Section 5.11.

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 screen to set up the load control sequences. See Section 5.9 for the Time Delay setup menus, and Section 5.10 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 Section 5.15 for more on three-source systems. See Section 5.8 for more about prime power mode.

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

Programmable Output	Type	See Section
3 Src Sys Disabled	Control	5.15
Alarm Silenced	Monitor	8.3
Audible Alarm	Control	8.3
Aux Switch Fault	Fault	3.13
Aux Switch Open	Fault	3.13
Battery Backup Low (not used) *	Monitor	*
Common Alarm Active (1 and 2)	Fault	5.13
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	5.7, 3.6.2
Fail to Acquire Preferred	Fault	3.13
Fail to Acquire Standby	Fault	3.13
Fail to Transfer	Fault	3.13
Fail to Open Source1	Fault	—
Fail to Close Source1	Fault	—
Fail to Open Source2	Fault	—
Fail to Close Source2	Fault	—
I/O Module Lost Comm	Fault	3.13
In-Phase Monitor Sync	Control	5.12.4, 5.11.2
Load Bank Control Active	Control	5.12.4
Load Control Active	Monitor	5.10.1
Load Control Out 1–9	Control	5.10.1
Low Battery (external battery)	Monitor	8.2.3
Maintenance Mode	Monitor	5.3
Non-Emergency Transfer	Monitor	—
Not in Auto	Monitor	3.2.2
Peak Shave Active	Monitor	5.14.8
Preferred Source Available	Monitor	5.11.5
MBUS Control RDO #1–4	Control	5.12.4
Source E (Phase) Rotation Error	Fault	—
Source E Loss of Phase	Fault	—
Source E Over Frequency	Fault	5.11.5
Source E Over Voltage	Fault	5.11.5
Source E Start Signal	Control	5.12.4
Source E Under Frequency	Fault	5.11.5
Source E Under Voltage	Fault	5.11.5
Source E Voltage Unbalance	Fault	5.11.5
Source N (Phase) Rotation Error	Fault	—
Source N Loss of Phase	Fault	—
Source N Over Frequency	Fault	5.11.5
Source N Over Voltage	Fault	5.11.5
Source N Start Signal	Control	5.12.4, 5.15
Source N Under Frequency	Fault	5.11.5
Source N Under Voltage	Fault	5.11.5
Source N Voltage Unbalance	Fault	5.11.5
Standby Source Available	Monitor	5.11.5
Test Mode Active	Monitor	3.10

* Do not use the Backup Battery Low output. A design improvement has eliminated the need for a backup battery.

Figure 5-19 Available Programmable Outputs

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 5-20.

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.

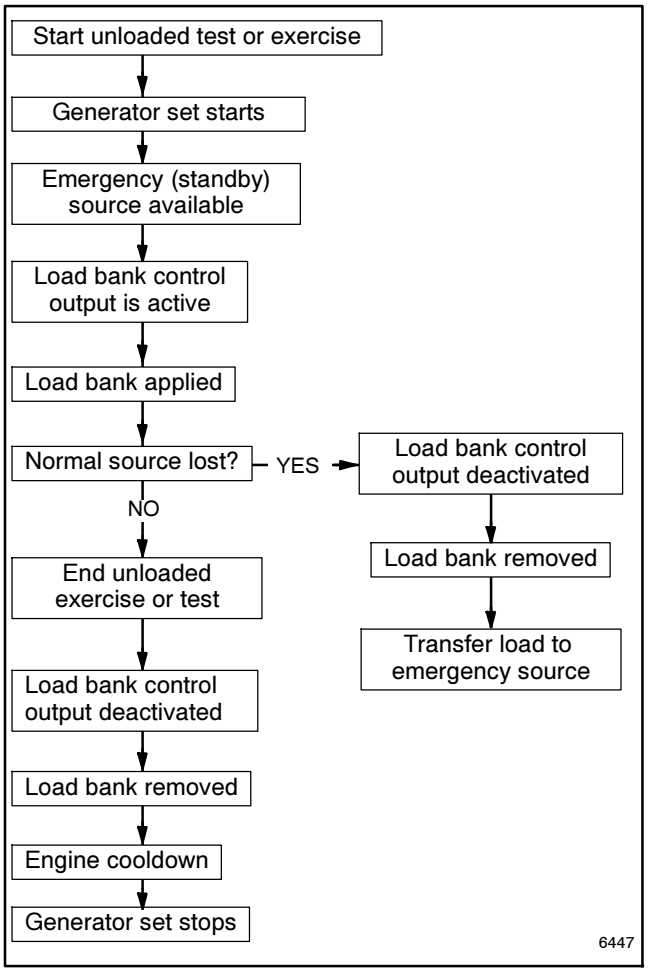


Figure 5-20 Load Bank Control Sequence

5.12.5 User-Defined I/O Function Descriptions

The controller can store a 19-character string description for each of the 9 user controllable/monitored I/Os. Use Monitor III software to enter descriptions. Descriptions are not used by the controller and are only available for reading and writing over Modbus.

5.13 Common Alarms

Use the Common Alarms setup screen to assign events to the controller's common alarm groups. See Figure 5-21 for a list of functions that can be assigned to the common alarm and the audible alarm.

Alarm Descriptions	
Aux Switch Fault*	Src E Over Voltage
Aux Switch Open*	Src E Rotation Err *
Contactor in Off	Src E Under Freq
Contactor in Pref	Src E Under Voltage
Contactor in Src E	Src E Voltage Unbal
Contactor in Src N	Src N Loss of Phase
Contactor 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 5-21 Alarm Descriptions

5.13.1 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 Section 5.12, Programmable Inputs and Outputs, for more information about programmable outputs.

5.13.2 Audible Alarm

The audible alarm setting requires the Alarm Module accessory for operation. See Section 8.3 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.*

5.13.3 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 deenergized when the transfer switch returns to the Normal position.

For Chicago Alarm Mode, use the Common Alarm Setup screen 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.

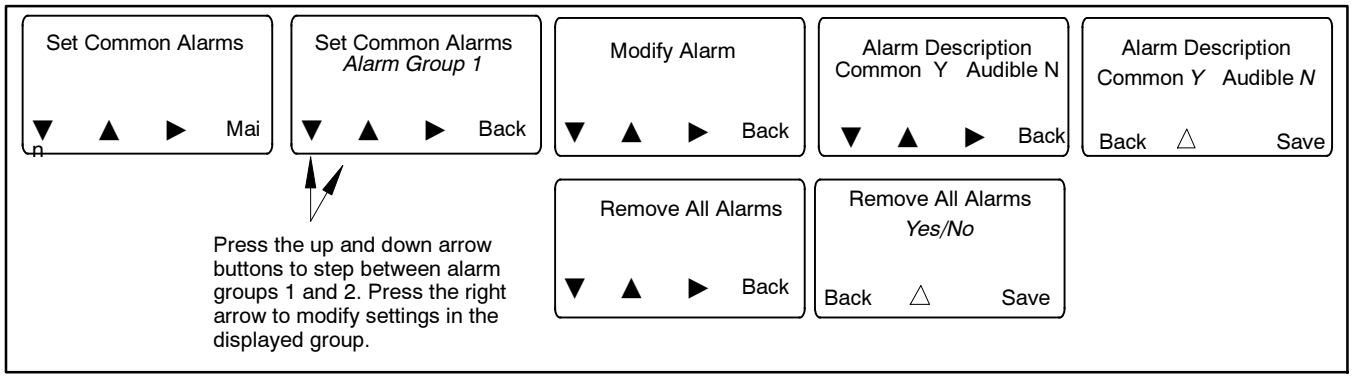


Figure 5-22 Setting Common Alarms

5.14 Set System

5.14.1 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 Section 5.8.)
- Two separate utility sources
- One utility source and two generator sets for a three-source system (see Section 5.15)

5.14.2 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 determined by the ATS model as indicated Figure 5-23. Do not attempt to change the transition type to one that is not listed for your model.

Model	Transition Type
KBS	Standard
KCS	
KGS	
KSS	
KBP	Programmed
KCP	
KSP	
KEP	
KGP	
KBC	Closed
KCC	

Figure 5-23 Transition Types by Model

Standard-transition (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 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 5.9.

Closed-transition 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 5.4.2 for the default time delays.

5.14.3 Service Entrance

The model KEP is a service entrance rated programmed-transition transfer switches. 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.

5.14.4 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.

5.14.5 Three Source Engine Start Mode

See Section 5.15, Three-Source Systems.

5.14.6 Transfer Commit

The transfer commit function 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).

- Setting this function to Commit allows the complete transfer sequence to execute even if the preferred source returns before the load has been transferred to standby.

- Setting this function to No Commit causes the transfer sequence to be cancelled without transfer if the preferred source returns before the load has been transferred to standby.

5.14.7 Remote Test Loading

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

5.14.8 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.

5.14.9 USB Data Logger

The controller can transfer and save time-stamped readings of voltage, frequency and phase angle for both sources onto a flash drive. Use this setup menu to set the collection period in seconds, minutes. hours, or days, and the press the Save button.

To start and stop the data logger:

1. Insert a flash drive into the controller's USB port.

2. When the USB Connected menu appears, navigate to the USB Data Logger screen and press the Start button. See Section 6.4.

3. Press the Stop button to stop logging data.

The data logger creates a time- and date-stamped file named DataLog*YYMMDDHHMMSS*.csv on the flash drive and writes data directly to the file. The data log file can be loaded onto a computer and opened using spreadsheet software.

5.14.10 Min/Max Values

The controller can record the minimum and maximum values of current and voltage within a programmed period of time. The data is recorded with a date/time stamp. Select the data monitoring time period as shown in Figure 5-24. Then set the start and stop dates or times, or set the number of days or weeks to monitor.

After the collection period is selected, press Next to go to the start/stop menu. Use the up arrow to toggle start or stop and then press Save to start or stop data collection.

See Section 6.4 for instructions to save the data file to a flash drive connected to the USB port.

Time Period Selection	Description
Cal	Calendar. Allows selection of data collection start and stop dates and times by month/date/year (MM/DD/YY) and HH:MM.
Cont	Continuous. Monitors and records minimum and maximum values continuously, until data collection is stopped.
Days	Collects minimum and maximum values over a selected number of days.
Weeks	Collects minimum and maximum values over a selected number of weeks.

Figure 5-24 Min/Max Data Monitoring

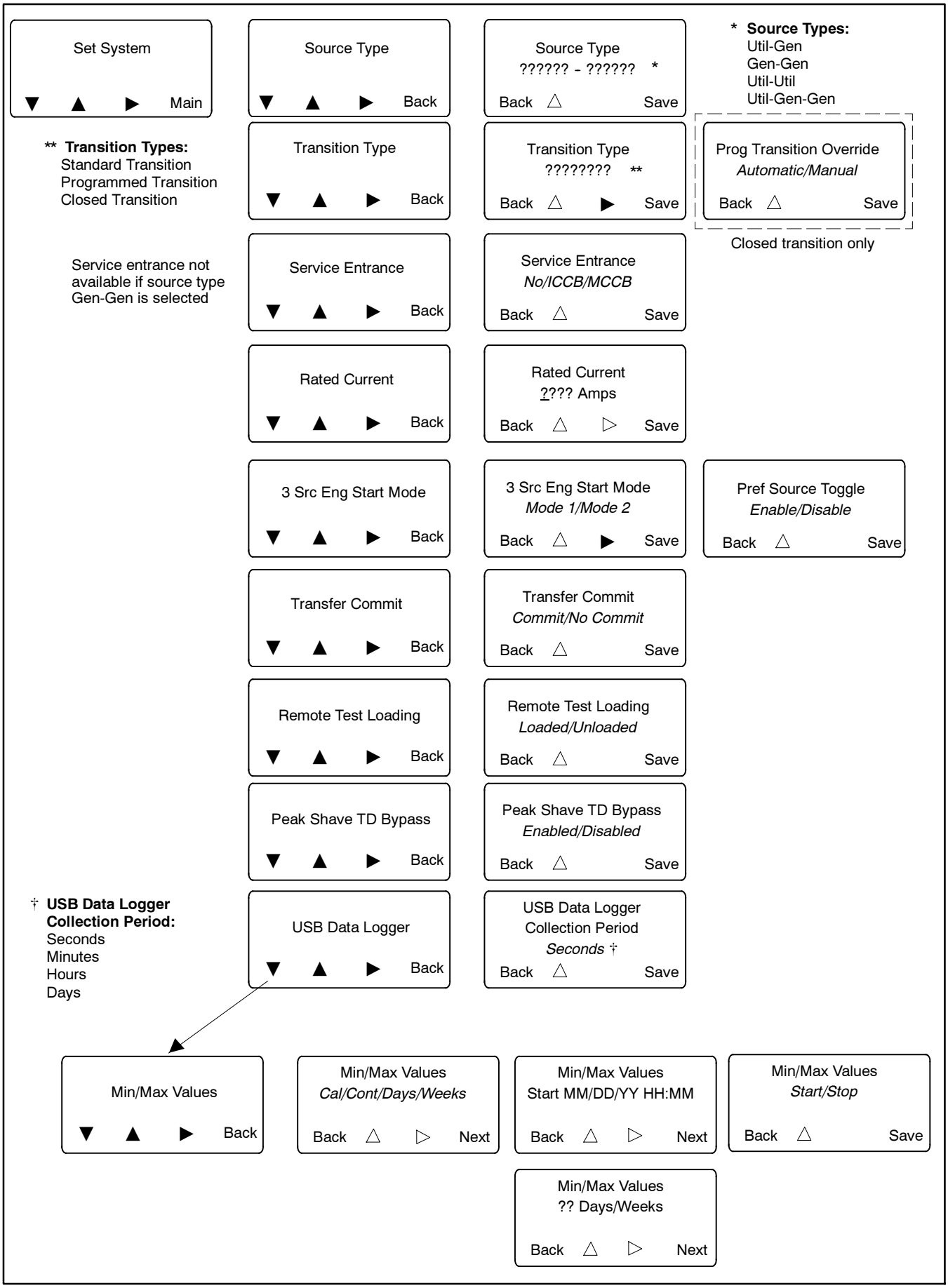


Figure 5-25 System Setup

5.15 Three-Source Systems

A three-source system provides the means to connect a utility and two generators to a single load. See Figure 5-27. Two generators and two transfer switches are required.

Note: The second transfer switch (ATS2) requires an external battery supply module (EBSM) 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 5.15.1 and 5.15.2.

5.15.1 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).

5.15.2 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.

5.15.3 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.

5.15.4 Three-Source System Setup

See Figure 5-27 and Figure 5-28 for connections 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 5-27 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 5-28. Use wire sizes from #14 AWG to #20 AWG for EBSM and I/O module connections.

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

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

   b. Connect one ATS1 main logic board programmable output to one ATS2 main logic board programmable input as shown in Figure 5-28. This I/O connection will be set to Three-Source System Disable.

   c. Connect one ATS2 main logic board programmable output 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). (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 8-10 and Figure 8-11.

   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) to 12 or 24VDC.

   Note: See Section 8.2.3 for more information on the EBSM.

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 main logic board programmable input 1 to Three-Source System Disable.

   b. Assign the ATS2 main logic board programmable output connected in step 2c. to Source N Start Signal.

5.15.5 ATS1 and ATS2 System Setup

Use the System Setup Screen on each transfer switch to set the following:

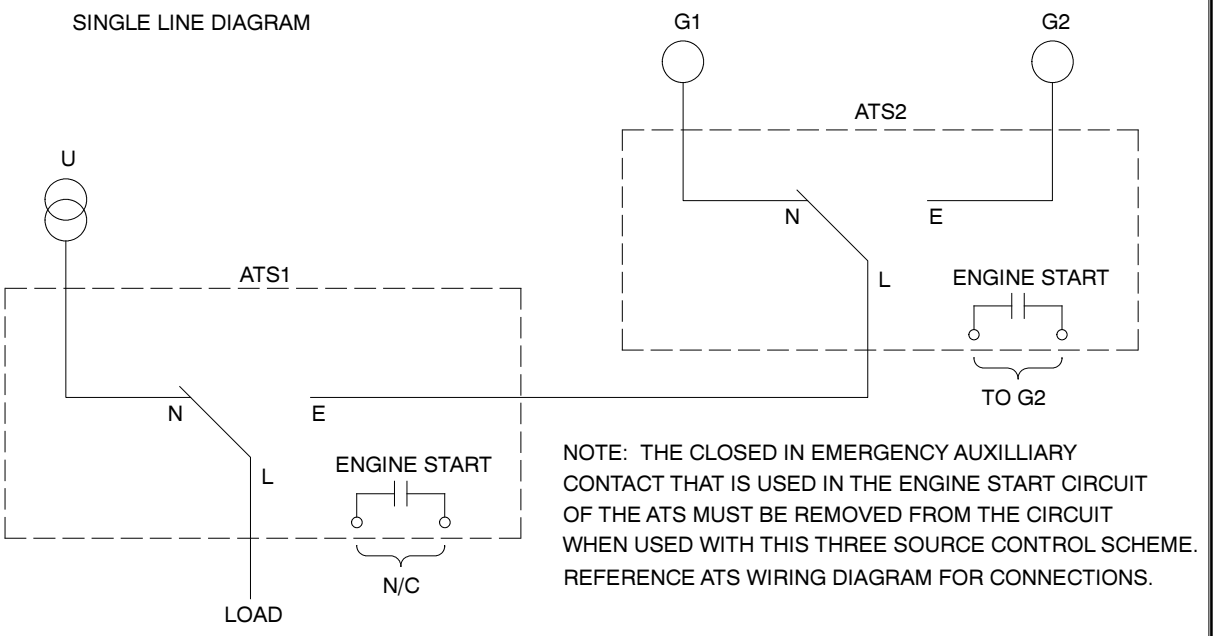
ATS1: Set the Source type to Util-Gen.

ATS2: 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 5.15.1.

The transfer switch settings are summarized in Figure 5-26.

Transfer Switch	Source Type	3 Src Engine Start Mode	Preferred Source Toggle	Inputs	Outputs
ATS1	Util-Gen	Not Required	Not Required	Not Required	Three Source System Disable
ATS2	Util-Gen-Gen	Mode 1 or Mode 2 (See Section 5.15.1)	Enable or Disable See Section 5.15.2	Three Source System Disable	Source N Start Signal

Figure 5-26 Transfer Switch Settings for Three-Source Systems



LEGEND

ATS - AUTOMATIC TRANSFER SWITCH
EBSM - EXTERNAL BATTERY SUPPLY MODULE
G1 - GENERATOR #1
G2 - GENERATOR #2
K1 - NORMAL RELAY
K2 - EMERGENCY RELAY
LED1 - LIGHT EMITTING DIODE (BATTERY 1 REVERSED)
LED2 - LIGHT EMITTING DIODE (BATTERY 1 REVERSED)
LED3 - LIGHT EMITTING DIODE (BATTERY SUPPLYING POWER)
MLB - MAIN LOGIC BOARD
P(#) - CONNECTOR
PIOM - PROGRAMMABLE INPUT/OUTPUT MODULE
MLB - MAIN LOGIC BOARD
TB(#) - TERMINAL BLOCK
SW - SWITCH
U - UTILITY

Note: ATS2 requires an external battery module to maintain power to the controller.

OPERATION

WHEN UTILITY FAILS ATS2 STARTS G1. ATS1 TRANSFERS TO THE EMERGENCY POSITION. IF G1 FAILS ATS2 WILL START G2 AND ATS2 WILL TRANSFER TO EMERGENCY. IF G1 RETURNS THEN ATS2 WILL RE-TRANSFER BACK TO NORMAL. ATS1 WILL RE-TRANSFER BACK TO NORMAL AFTER THE UTILITY RETURNS. WHEN THE UTIITY IS AVAILABLE, THE BATTERY SUPPLY MODULE WILL PROVIDE POWER TO THE CONTROLLER ON ATS2. THE 3 SOURCE SYSTEM DISABLE INPUT AND OUTPUT WILL PREVENT ATS2 FROM STARTING EITHER GENSET WHILE THE UTILITY SOURCE IS AVAILABLE.

THE BATTERY SUPPLY MODULE USES UP TO TWO BATTERY INPUTS (9-36VDC) AND PROVIDES A 12V OUTPUT THAT POWERS THE ATS CONTROLLER. THIS IS CONNECTED TO THE CONTROLLER BY SNAPPING IT TO AN EXISTING I/O MODULE OR THROUGH A HARNESS TO P3 ON THE CONTROLLER (WHEN AN I/O MODULE IS NOT USED). THE BATTERY SUPPLY MODULE WILL CONTINUALLY PROVIDE POWER TO THE CONTROLLER UNLESS THE ON/OFF INPUT ON THE BATTERY SUPPLY MODULE IS ENABLED.
THE ON/OFF INPUT ON TB1 OF THE BATTERY SUPPLY MODULE CAN BE USED IN CONJUNCTION WITH THE NORMALLY OPEN CONTACT OF A PROGRAMMABLE OUTPUT FROM AN INPUT/OUTPUT MODULE TO TURN THE BATTERY SUPPLY MODULE OFF WHEN A SOURCE IS AVAILABLE.

GM28627B

Figure 5-27 Three-Source System Transfer Switch and Source Connections

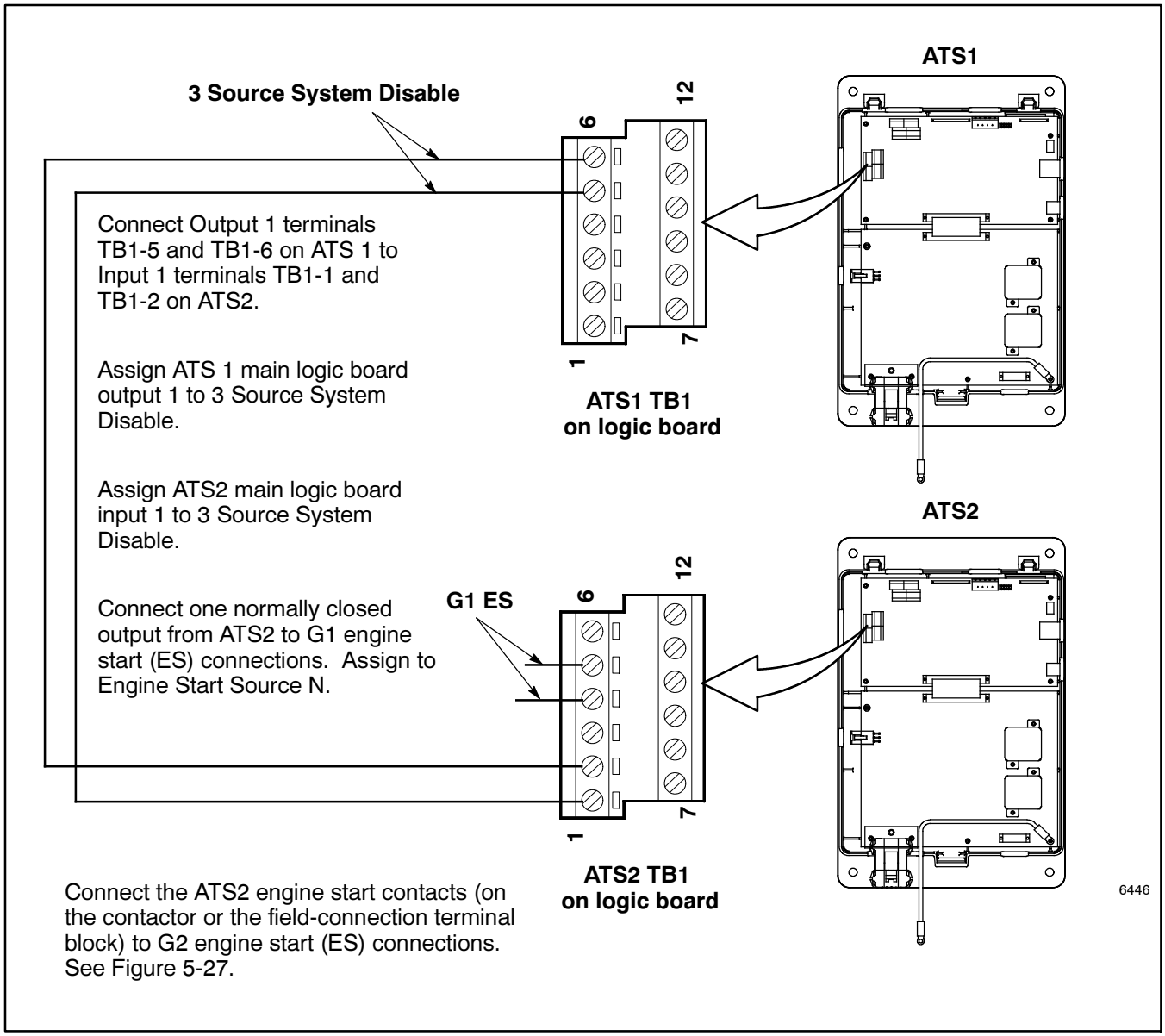


Figure 5-28 Input and Output Connections for Three-Source Systems

5.16 Communications

Use the communications setup screen to set the communication parameters for serial or ethernet connections. See Section 6, Communications, for instructions.

5.17 Set Passwords

Two passwords control access to the Test and Setup screens. 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 screens 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.

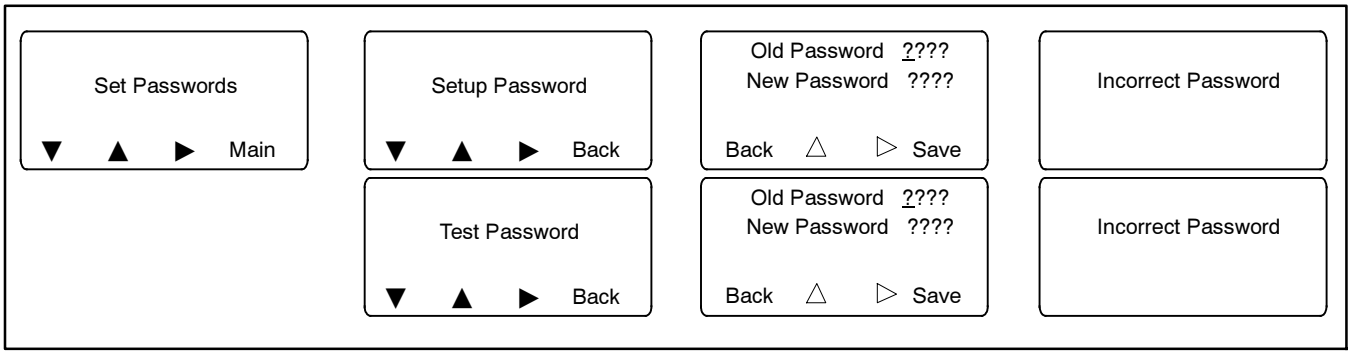


Figure 5-29 Setting/Changing Passwords

5.18 Calibration

DANGER

Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

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

The transfer switch voltage and current sensing (if equipped) are calibrated at the factory. If voltage recalibration is necessary, refer to the Test Section for instructions to check the voltages. and then use the Setup Screen–Calibration to enter the measured values. See Figure 5-30.

The current sensing accessory is required in order for the transfer switch to measure and display the current values. See Section 8.4. Use a clamp-on current sensing meter to measure the current and enter the measured values through the Setup Screen–Calibration shown below.

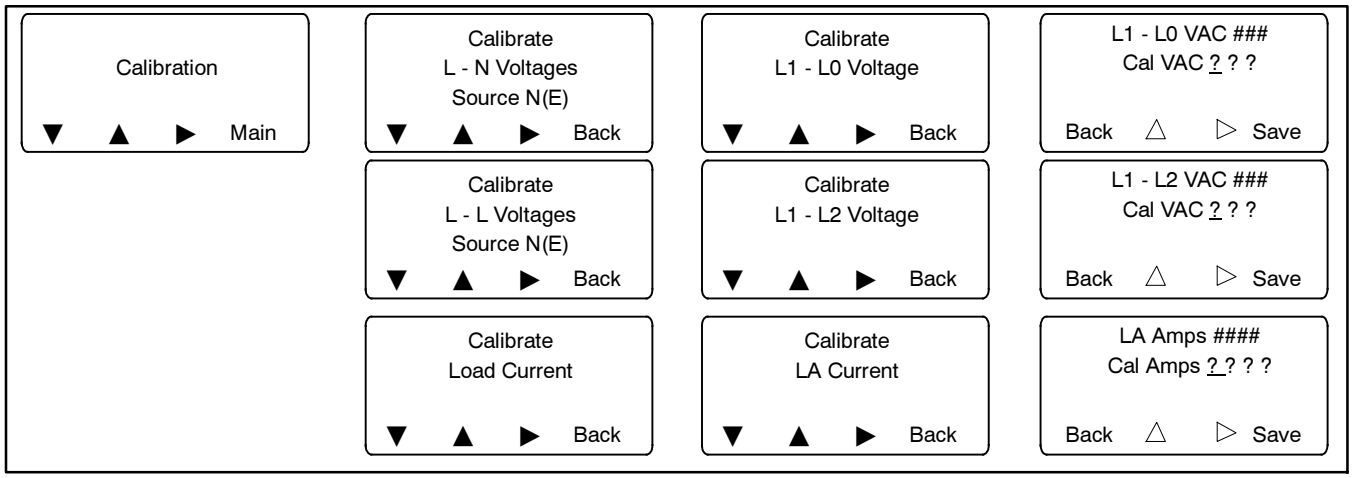


Figure 5-30 Calibration

6.1 Introduction

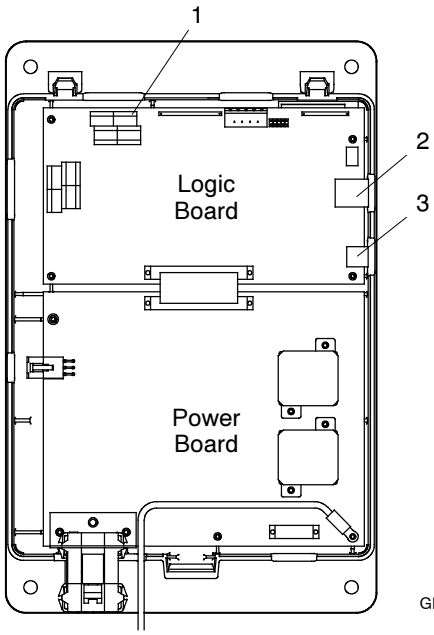
The MPAC™ 1500 controller has three types of communications connections: an RS-485 serial port, an ethernet port, and a USB port.

Use Ethernet or serial connections to connect the transfer switch to a personal computer for system monitoring and control using Kohler® Monitor III software or other Modbus applications.

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

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

The USB port is used for file transfer between the controller and a memory device. The USB port is a standard 4-pin USB connector. The USB Access screen appears when a device is connected to the USB port. See Section 6.4 for instructions to transfer files through the USB port.



1. RS-485 connection TB2
2. Ethernet connection RJ-45P13
3. USB connection P12

Figure 6-1 Communication Connections (controller cover removed for illustration only)

6.2 Connections

See Figure 6-1 for the connector locations.

Modbus® is a registered trademark of Schneider Electric.

6.2.1 Serial Connections

Use serial connections to TB2 on the controller's logic board to connect the transfer switch to a personal computer, the optional ATS remote annunciator, or a Modbus network. System monitoring and control using Kohler® Monitor III software requires serial connection to a personal computer as described in this section. See Figure 6-1 for the location of TB2.

See Figure 6-2. Notice that a terminating resistor is recommended on the last device in a network. If there is only one device, a terminating resistor may be required depending on the cable distance and communication speed. Long cables and fast speeds will increase the need for a terminating resistor.

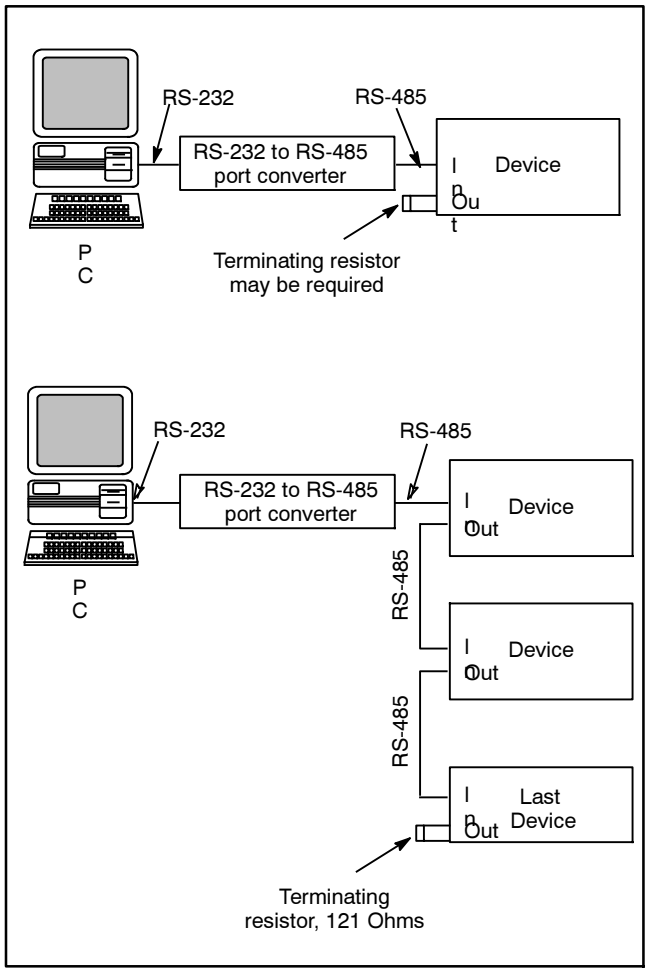


Figure 6-2 Serial Connections

The serial port is an isolated RS-485 port with connection speeds of 9.6, 19.2, and 57.6 kbps. Use shielded twisted-pair cable to connect to the RS-485 connectors on the main logic board terminal strip TB2 for serial connections. For connection to a PC, use an RS-485 to RS-232 converter GM41096 and connect to the PC's serial port.

Connect the Modbus input and output to the terminals shown in Figure 6-3. Use #12-24 AWG twisted-pair wire. Belden cable #9841 or equivalent is recommended. Connect the shield to ground. Tighten the connections to 0.5 Nm (4.4 in. lb.).

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

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

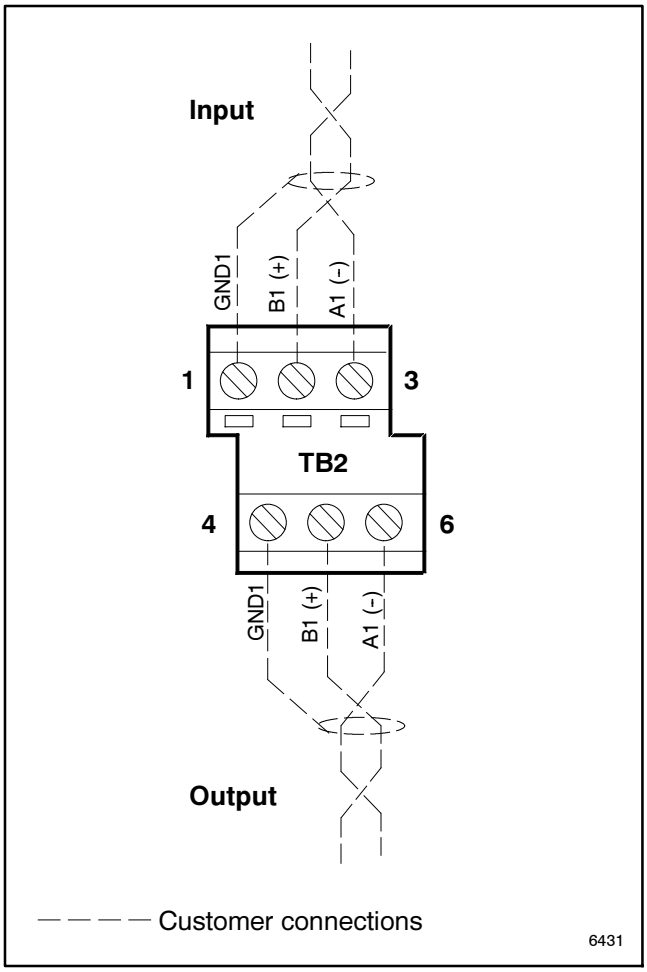


Figure 6-3 Main Logic Board Modbus RS-485 Connections to TB2

6.2.2 Ethernet Connections

The transfer switch can be connected to a building's ethernet network to communicate with personal computers connected to the same subnet. Work with the building's network manager to obtain an IP address and subnet mask information.

Ethernet Port. The ethernet port is a standard RJ-45 female plug on the controller's main logic board. See Figure 6-1 for the location of the Ethernet port. Use Category 5e or better cable to connect the controller to the building's network. The ethernet connection allows the controller to communicate with a personal computer on the network to run Monitor III Software or other Modbus applications.

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

Use the Setup menus to assign a port number, IP address, and subnet mask number from the controller's front panel. The controller may have a default IP address assigned at the factory for test purposes. See Figure 6-4. **Change the IP address to an address owned by the user.** See Section 5.16 for instructions to set the communication parameters.

The series 1500 controller does not operate as a Modbus-to-Ethernet converter for other devices in a network. For multiple device networks connected to the personal computer through the Ethernet, use a Modbus-to-Ethernet converter for the other devices in the network. See Figure 6-5 and instruction sheet TT-1405, provided with the converter, for connection instructions.

The controller can communicate with up to eight (8) simultaneous TCP/IP (ethernet) connections. If anyone attempts to establish a ninth connection, the first connection that was established will be dropped. These eight connections do not include the RS-485 serial port. In the extreme case, eight 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 nine communication channels. As the controller is asked to communicate with more and more outside devices, its performance will slow down.

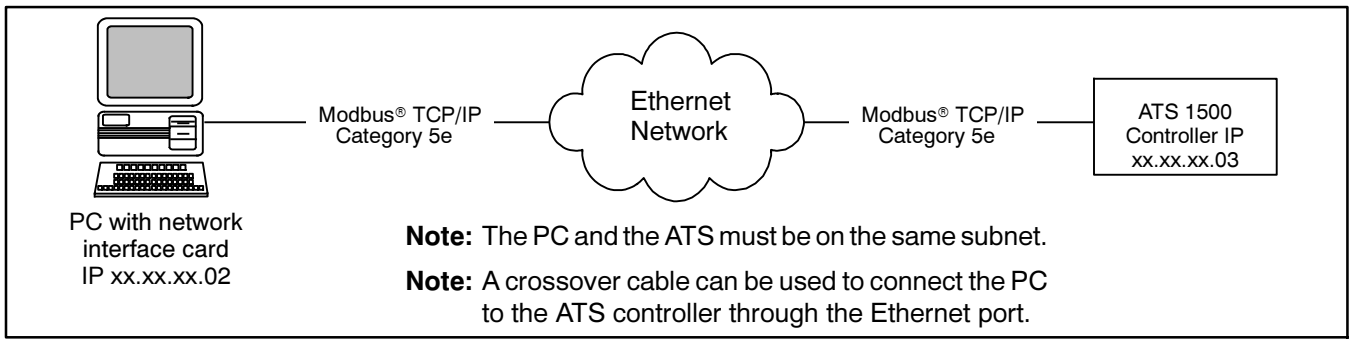


Figure 6-4 Remote Network (Ethernet) Connection

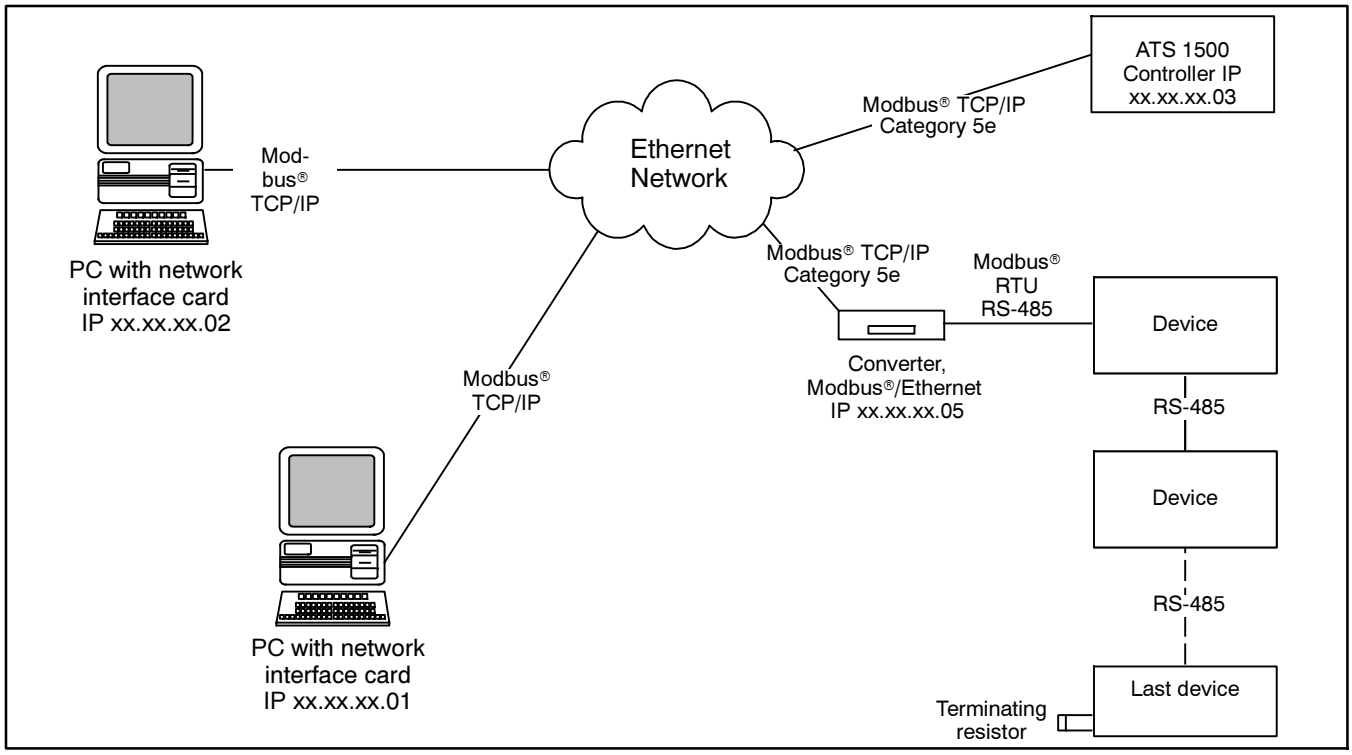


Figure 6-5 Ethernet Connections to Multiple-Device Network

6.3 Communications Setup

Use the communications setup screen to set the communication parameters for serial or ethernet connections. See Figure 6-6. The controller uses Modbus® communication protocol.

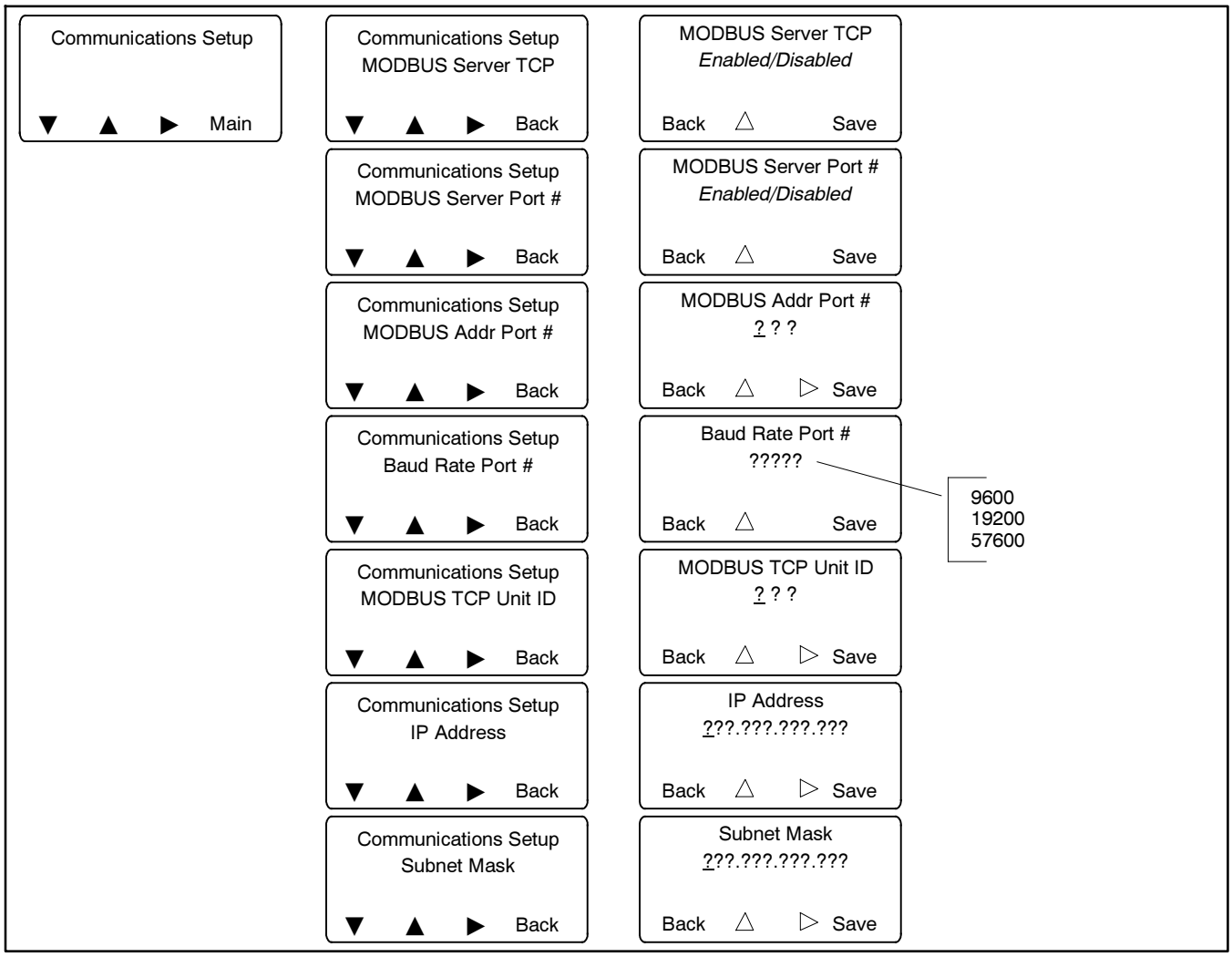


Figure 6-6 Communications Setup

6.3.1 Serial Communication

Set the following communication parameters for serial communication. Also see Figure 6-7.

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

Modbus Server. Enable the serial port for Modbus communication.

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

6.3.2 Ethernet Communication

Work with your local network administrator to set the following communication parameters for ethernet communication. Also see Figure 6-7.

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

Modbus Address. Assign a unique Modbus address to each device on the network. Monitor III software requires a unique Modbus address to identify the controller. Record the address to enter into Monitor III software.

Modbus TCP Unit ID. A 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.

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

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

Setting	Range	Needed for Connection Type:			Notes
		Serial	Remote Serial (modem)	Ethernet	
Modbus Server TCP	Enabled or Disabled			X	Enable for network communication through the ethernet port.
Modbus Server	Enabled or Disabled	X	X		Enable for Modbus communication through the serial port on the main logic board. See Section 6.2.
Modbus Addr	001-247 default 1	X	X		Address for the RS-485 serial port (on the logic board).
Baud Rate	9600, 19200, 57600	X	X		Baud rate in bits per second for serial communication between the controller and a personal computer's COM port.
Modbus TCP Unit ID	—	—	—	X	Factory-set to 3. A 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.
IP Address	—	—	—	X	Obtain from your local network administrator. Every device on the network must have a unique IP address.
Subnet Mask	—	—	—	X	Obtain from your local network administrator.
MAC Address	Factory-set	—	—	X	Hardware address, entered at the factory. Not adjustable. Appears only in the Communications View screen.

Figure 6-7 Communication Parameters

6.4 USB Port

The Universal Serial Bus (USB) port on the main logic board allows file transfer to and from a USB mass storage device (removeable flash drive). Figure 6-8 shows a typical device. The removeable drive must be compatible with the USB 2.0 and USB Mass Storage Device Class specifications.

Parameter settings, event history, and other information files can be saved to a memory device and then transferred to a personal computer for viewing and saving. Available controller files are shown in Figure 6-9.

Three types of data files can be created by the controller and saved on a flash drive: the data logger file, the min/max file, and the sync check file. Data files have the extension .csv and can be opened with spreadsheet software.

Sections 6.4.2 through 6.4.4 contain more information about specific file types. See Section 3.15.5 for additional information about controller file maintenance.

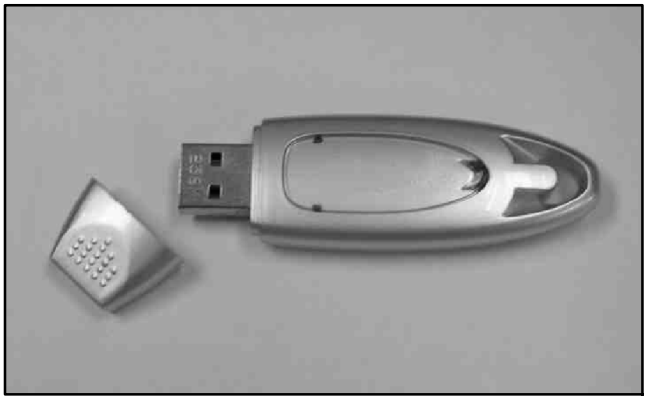


Figure 6-8 Typical Mass Storage Device

File name	Description	Download to Control	Upload to USB
MPAC1500v###.bin	Controller application program	X	
MPAC1500_######.cfg	Parameter settings (configuration)	X	X
present*yymmdd*.his	Event history (yymmdd is year, month, day)		X
alarm_settings.alm	Common alarms		X
DataLog*yymmddhhmmss*.csv	Data log. File name includes date and time.		X
MinMax.csv	Minimum/Maximum values		X
SyncDataLog.csv	Source synchronization data from sync test		X
history_param.hstp	Internal use only		X
MPAC1500_cal.cal	Calibration		X
Param_back.bak	Internal use only		X
present*yymmdd*.raw	Internal use only		X
history_pback.hbak	Internal use only		X

Figure 6-9 Recognized File Types

6.4.1 File Transfer

The USB Access screen opens automatically when a device is connected to the controller's USB port. See Figure 6-10. Select Upload or Download as described in the following procedure.

Procedure to Transfer Files

1. Insert the USB mass storage device into the USB port on the controller's main logic board. See Figure 6-1 for the port location.
2. Press the Download button to load new files from a memory device to the controller. Or, press the Upload button to load files from the controller through the USB port to a memory device.
3. Use the down button to scroll through the list of available files.
4. When the desired file is displayed, press the Sel button to select the file and start transferring the file. See Figure 6-9 for file names.

   Note: Do not disconnect the device from the USB port during file transfer.

   A message on the display indicates when file transfer is complete.

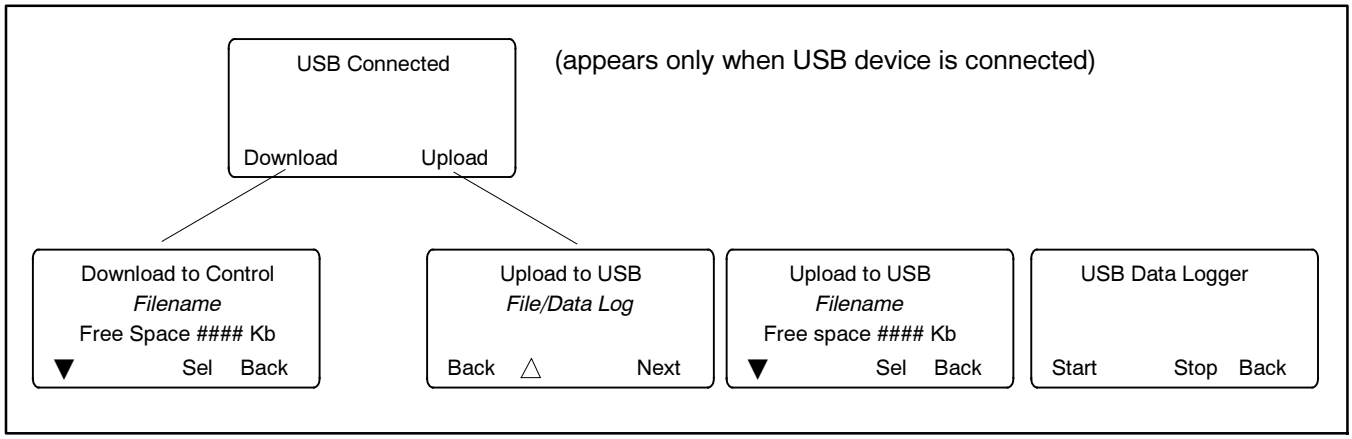


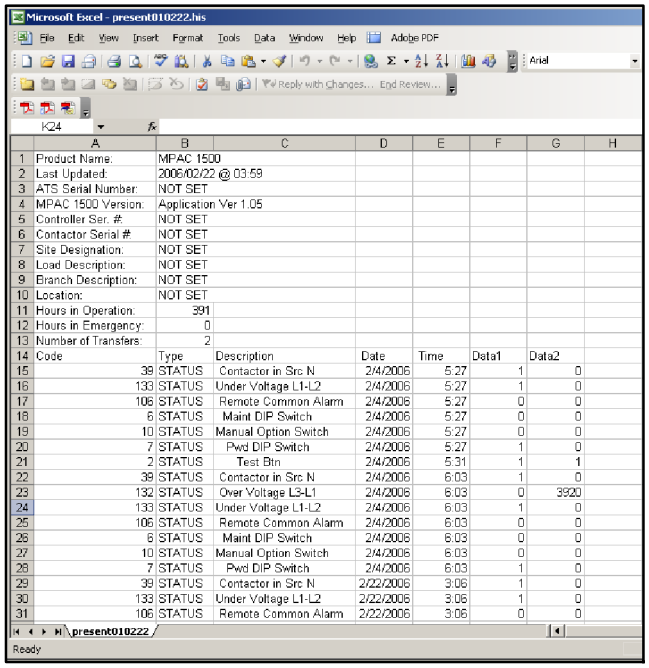
Figure 6-10 USB Access Screens

6.4.2 Event History Files

The event history files can be opened with spreadsheet software. Event history files have filenames of the form presentyymmdd.his, where yymmdd (year, month, day) is the date of the file as read from the controller.

- Event history files are updated periodically by the controller. See Section 3.15.5 for instructions to use the Force History Save command to save the most recent events to the event history file.
- Transfer (upload) the file from the controller to a USB storage device as instructed in Section 6.4.1.
- Use a personal computer to select the presentyymmdd.his file on the storage device. Save the file to the computer, if desired.
- Use a spreadsheet program to open the file on the computer.

The resulting file includes the events with time and date formatted into spreadsheet columns. See Figure 6-11 for an example of an event history file viewed with spreadsheet software.


Microsoft Excel - present010222.his

	A	B	C	D	E	F	G	H
1	Product Name:	MPAC 1500						
2	Last Updated:	2006/02/22 @ 03:59						
3	ATS Serial Number:	NOT SET						
4	MPAC 1500 Version:	Application Ver 1.05						
5	Controller Ser. #:	NOT SET						
6	Contactor Serial #:	NOT SET						
7	Site Designation:	NOT SET						
8	Load Description:	NOT SET						
9	Branch Description:	NOT SET						
10	Location:	NOT SET						
11	Hours in Operation:	391						
12	Hours in Emergency:	0						
13	Number of Transfers:	2						
14	Code	Type	Description	Date	Time	Data1	Data2	
15	39	STATUS	Contactor in Src N	2/4/2006	5:27	1	0	
16	133	STATUS	Under Voltage L1-L2	2/4/2006	5:27	1	0	
17	106	STATUS	Remote Common Alarm	2/4/2006	5:27	0	0	
18	6	STATUS	Maint DIP Switch	2/4/2006	5:27	0	0	
19	10	STATUS	Manual Option Switch	2/4/2006	5:27	0	0	
20	7	STATUS	Pwd DIP Switch	2/4/2006	5:27	1	0	
21	2	STATUS	Test Btn	2/4/2006	5:31	1	1	
22	39	STATUS	Contactor in Src N	2/4/2006	6:03	1	0	
23	132	STATUS	Over Voltage L3-L1	2/4/2006	6:03	0	3920	
24	133	STATUS	Under Voltage L1-L2	2/4/2006	6:03	1	0	
25	106	STATUS	Remote Common Alarm	2/4/2006	6:03	0	0	
26	6	STATUS	Maint DIP Switch	2/4/2006	6:03	0	0	
27	10	STATUS	Manual Option Switch	2/4/2006	6:03	0	0	
28	7	STATUS	Pwd DIP Switch	2/4/2006	6:03	1	0	
29	39	STATUS	Contactor in Src N	2/22/2006	3:06	1	0	
30	133	STATUS	Under Voltage L1-L2	2/22/2006	3:06	1	0	
31	106	STATUS	Remote Common Alarm	2/22/2006	3:06	0	0	

present010222

Ready

Figure 6-11 Sample Event History Spreadsheet File

6.4.3 Configuration files

The configuration (.cfg) file contains the transfer switch settings, including:

- System setup
- Source setup, including voltage and frequency pickup and dropouts
- Time delays
- Inputs and outputs
- Communications settings
- Calibration factors

The configuration file is automatically updated when the operator changes the transfer switch settings. A backup configuration file is also created automatically.

Configuration files from one transfer switch can be saved to a mass storage device and then loaded onto other transfer switches for quick setup of multiple switches. Serial numbers and descriptions entered through Monitor III software (or other Modbus application) are not changed by downloading configuration files to a transfer switch.

Check the settings and run a test sequence after loading the configuration file to verify correct operation. See Section 3.10 for instructions to run a test.

6.4.4 Controller Application Program

The controller application program can be updated through the USB port. Have an authorized distributor/ dealer load an updated version of the controller application program, if necessary.

6.4.5 Data Logger Files

Data log files are generated by the USB Data Logger function. The data log files can be opened with spreadsheet software. Data log files have the form DataLogYYMMDDHHMMSS.csv where YYMMDD is the date (year/month/day), and HHMMSS is the time that the file was created in hours:minute:seconds. The file contains time- and date-stamped readings of voltage, frequency, and contactor position (source 1 or 2).

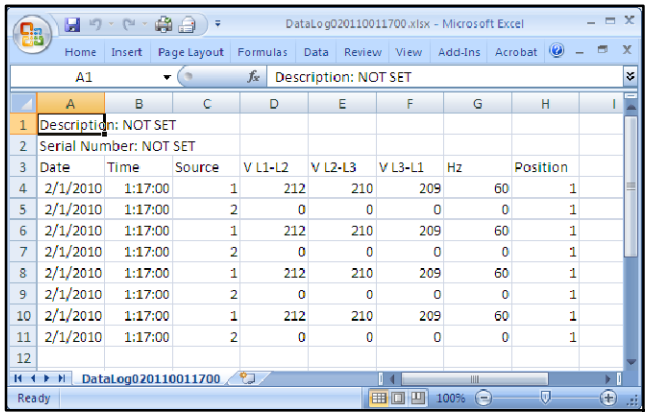


Figure 6-12 Sample Data Log File

6.4.6 MinMax Files

MinMax files are generated by the MinMax function and can be opened with spreadsheet software. The file name is MinMax.csv. The file contains minimum and maximum readings of voltage and current supplied to the load. The MinMax file is overwritten each time the MinMax operation is performed.

6.4.7 SyncData Files

The SyncDataLog file is generated during a synchronization check test sequence. See Section 3.10.5. The source1 and source2 voltages, frequencies, and relative phase angle are monitored and recorded approximately once per second for one minute during the sync check sequence.

7.1 Introduction

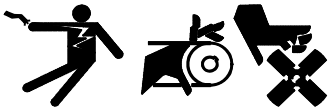
Regular preventive maintenance ensures safe and reliable operation and extends the life of the transfer switch. Preventive maintenance includes periodic testing, cleaning, inspection, and replacement of worn or missing components. Section 7.4 contains a service schedule for recommended maintenance tasks.

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

Keep records of all maintenance or service.

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

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

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

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the enclosure.

⚠ WARNING

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

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

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

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

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

NOTICE

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

NOTICE

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

7.2 Testing

7.2.1 Weekly Generator Set Exercise

Use the exerciser to start and run the generator set under load once a week to maximize the reliability of the emergency power system. See Section 5.7 for instructions to program the exerciser.

7.2.2 Monthly Automatic Control System Test

Test the transfer switch's automatic control system monthly. See Section 2.5 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.

7.3 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.

7.3.1 General Inspection

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

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

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

Internal Inspection. 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.

7.3.2 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.

7.3.3 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 7.4, Service Schedule, for the recommended maintenance items and service intervals.

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

7.4 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	7.3.1	X	X				Y
Check the contactor's external operating mechanism for cleanliness; clean and relubricate if dirty *	7.3.1	X			D (clean and lube)		Y
Inspect wiring insulation for deterioration, cuts, or abrasion. Repair or replace deteriorated or damaged wiring	7.3.1	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 KGS/KGP bypass/isolation switches, perform the additional checks in Section 7.3.2.	7.3.2, S/M		D	D		D	Y
Control System							
Exercise the generator set under load	7.2.1					X	W
Test the transfer switch's automatic control system	7.2.2 2.5	X				X	M
Test all indicators (LEDs) and all remote control systems for operation	2.4	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 *	7.3.1	X			X		M
Check that all external hardware is in place, tightened, and not badly worn	7.3.1	X	X	X			M
Inspect the inside of transfer switch for any signs of excessive vibration, leakage, high temperature, contamination, or deterioration*	7.3.3	D	D		D		Y
Check that all internal hardware is in place, tightened, and not badly worn	7.3.3	X	D	D			Y

* Service more frequently if the transfer switch is operated in dusty or dirty areas.

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

Visually Inspect: Examine these items visually.

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

Adjust, Repair, Replace: Includes tightening hardware and lubricating the mechanism. May require replacement of components depending upon the severity of the problem.

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

Test: May require tools, equipment, or training available only through an authorized distributor/dealer.

Symbols used in the chart:

X= The transfer switch operator can perform these tasks.

D=An authorized distributor/dealer must perform these tasks.

S/M = Service Manual. An authorized distributor/dealer must perform these tasks.

W=Weekly

M=Monthly

Q=Quarterly

S=Semiannually (every six months)

Y=Yearly (annually)

8.1 Introduction

This section describes the hardware options that will interface with the MPAC™ 1500 controls. The following accessories are available:

- Accessory modules, including:
  - Standard I/O module
  - High Power I/O module
  - Alarm Module with preferred source and Chicago alarm functions
  - External battery module
- Current monitoring
- Digital meter: V, A, kW, VA, VAR, PF, and Hz
- Load shed module (available on programmed-transition models only)
- Logic disconnect switch
- Line-to-neutral voltage monitoring
- Monitoring software
- Surge Protection Device (SPD)
- Supervised transfer control switch
- User interface cover

8.2 Accessory Modules

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

The mounting kit holds up to five optional modules. The maximum total current draw is 300 mA. See Figure 8-1. If an External Battery Module is installed, there is no current restriction. The External Battery Module, if used, must be the last board on the bus.

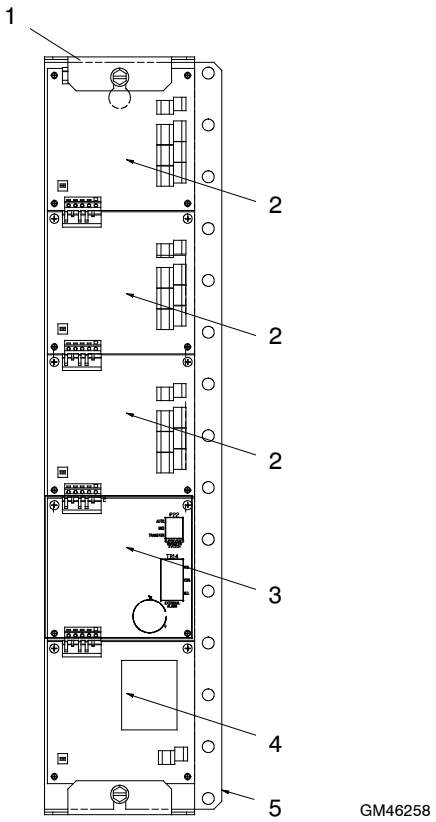
Module Current Draw Specifications, mA	
Alarm Module	75
Standard I/O Module	75
High Power I/O Module	100

Figure 8-1 Option Board Types

8.2.1 Accessory Module Mounting

Mount the accessory modules on the module mounting plate. Starting at the end of the module mounting assembly nearest the cable connection, install any I/O modules first, then install the alarm board, if used. The external battery module, if used, must be the last module. See Figure 8-2. The alarm board has a fixed Modbus address = 5.

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



1. Cable connection (defined as the TOP regardless of orientation)
2. I/O modules (if equipped)
3. Alarm module (if equipped)
4. External battery module (must be last, if equipped)
5. Mounting plate

Figure 8-2 Module Mounting

8.2.2 Input/Output (I/O) Modules

Two types of input/output modules are available. The standard I/O Module has two inputs and six outputs. The high-power I/O module has two inputs and three outputs. See Figure 8-3 and Figure 8-4 for I/O module specifications.

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 8-3 Standard Input/Output Module

Inputs	
Available Inputs	2
Input Definition	Contact Closure
Current	5 mA Max
Connection Type	Terminal Strip
Wire Size	#14-24 AWG
Max Distance	700 feet
Outputs	
Outputs Available	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 8-4 High-Power Input/Output Module

Use 14-24 AWG cable to connect to input and outputs. Each output is a form C SPDT contact.

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

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 8-5. 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 screen to assign input and output functions. See Section 5.12 for instructions.

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

Figure 8-5 Address DIP Switch Settings

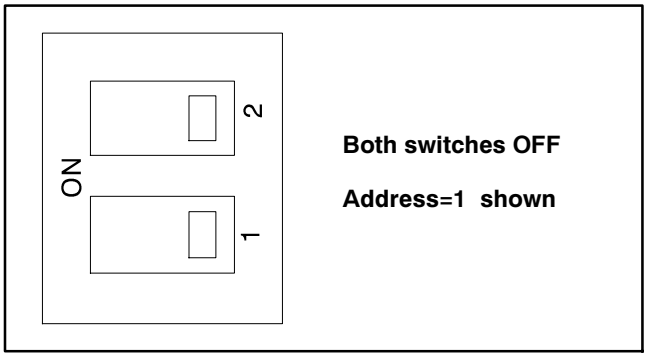


Figure 8-6 Address DIP Switches

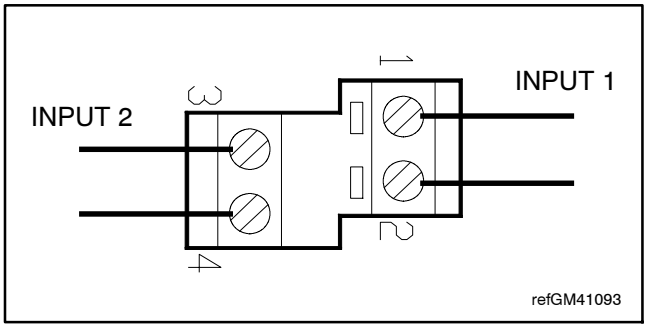
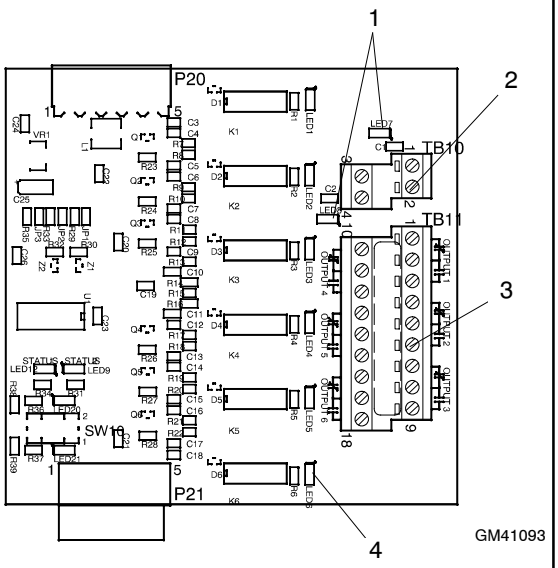
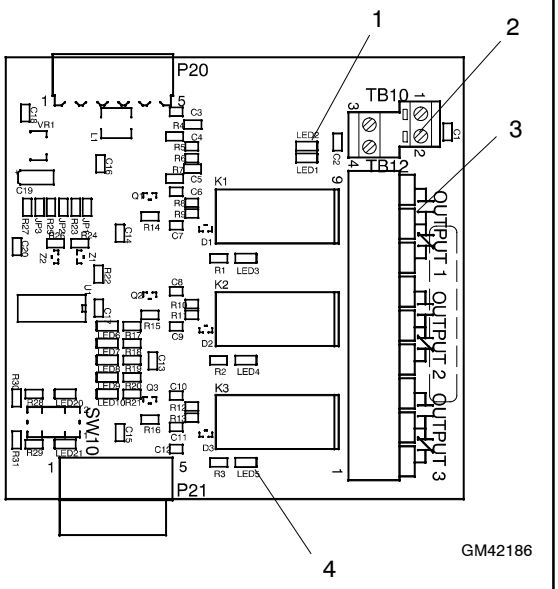


Figure 8-7 I/O Module Input Connections (TB1 or TB10)



1. Input LEDs 7 and 8 for inputs 1 and 2
2. Input connector (see Figure 8-7)
3. Output connector
4. Output LEDs 1–6

Figure 8-8 Standard I/O Module



1. Input LEDs 1 and 2
2. Input connector (see Figure 8-7)
3. Output connector
4. Output LEDs 3–5 for outputs 1, 2, and 3

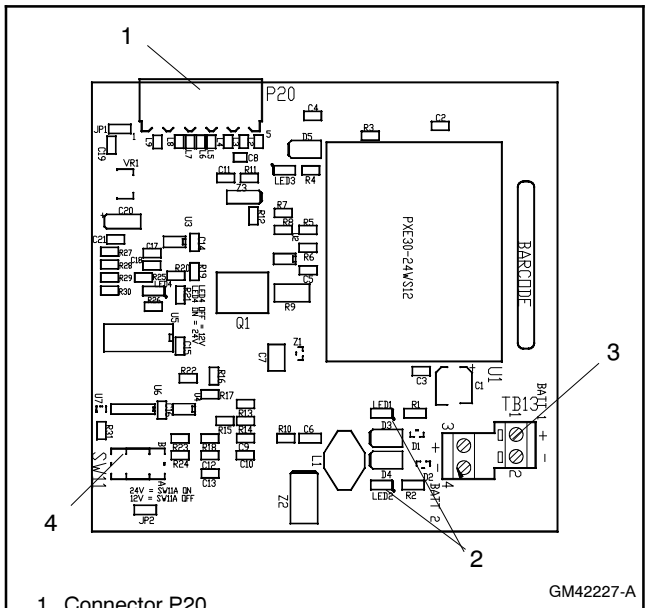
Figure 8-9 High-Power I/O Module

8.2.3 External Battery Supply Module (EBSM)

The external battery supply module kit allows connection to the generator set engine start battery(ies) or other batteries to provide 12 VDC power to the ATS controller. The external battery supply module 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.
- **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 5.15 for instructions to set up a three-source system.
- **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.

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.



1. Connector P20
2. LED indicators
3. Battery input connection terminal block TB13
4. 12/24 volt DIP switch SW11-1. OFF=12 VDC, ON = 24 VDC

Figure 8-10 External Battery Supply Module

The external battery supply module kit includes one external battery supply circuit board and the circuit board mounting components. See Figure 8-10.

A module mounting kit is required for installation of the external battery supply module. The module connects to an adjacent I/O module or to the interface harness included with the I/O module mounting assembly kit. The I/O module mounting assembly kit allows the

installation of up to four I/O modules plus one external battery supply module. Obtain a module mounting kit if one is not already installed and follow the instructions provided with the kits to install the mounting assembly and modules.

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

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

Figure 8-11 Battery Voltage Selection

Connection and Voltage Setting

1. Use #14-28 AWG wire to connect one or two batteries to terminal block TB13. (A second battery can be connected but is not required.) Follow the marking on the board for the positive (+) and negative (–) connections. See Figure 8-10 and Figure 8-11.

   Note: If the battery connections are reversed, red LED1 or LED2 will light. See Figure 8-10.

2. Set voltage selector switch SW11-1 to 12 or 24VDC. See Figure 8-10 and Figure 8-11. Switch SW11-2 is not used.

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

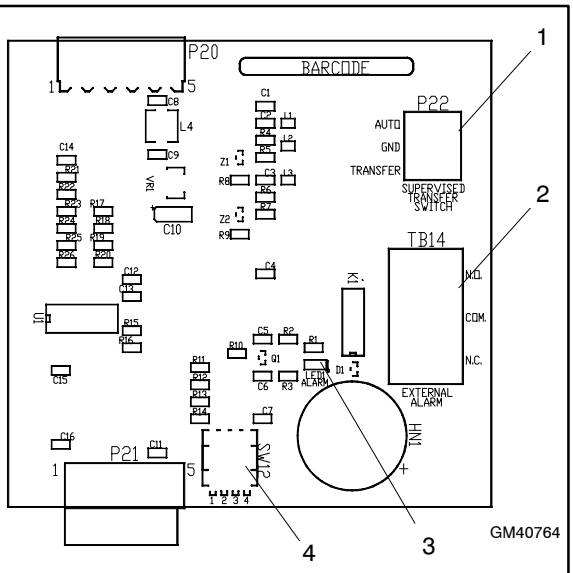
8.3 Alarm Module

See Figure 8-12 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.



1. Supervised Transfer Switch Connection, P22
2. External Alarm Connection, TB 14
3. Alarm Indicator, LED1
4. DIP Switches

Figure 8-12 Alarm Module

8.3.1 Alarm Board DIP Switches

There are four DIP switches on the alarm module board. Two of the switches are not used at this time. See Figure 8-13. To enable the preferred source selection function, 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 enable
2	Supervised transfer enable
3	Not used
4	Not used

Figure 8-13 Alarm Board DIP Switches

8.3.2 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.

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

Figure 8-14 External Alarm Connection Specifications

8.3.3 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 screen to assign functions to the audible alarm. See Section 5.13 for instructions to set Audible Alarm: Y for each function that should trigger the alarm.

8.3.4 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 screen to assign the necessary faults and conditions to the audible alarm. See Section 5.13. 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. See Section 8.3.2.

8.3.5 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 5.12 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 screen above the first button. See Figure 8-15. Press the Alarm button to open the Reset screen. Then press the button labeled Reset to silence the alarm.

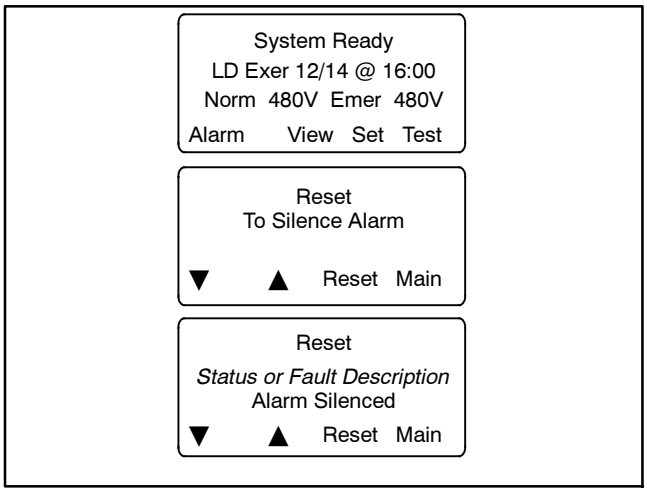


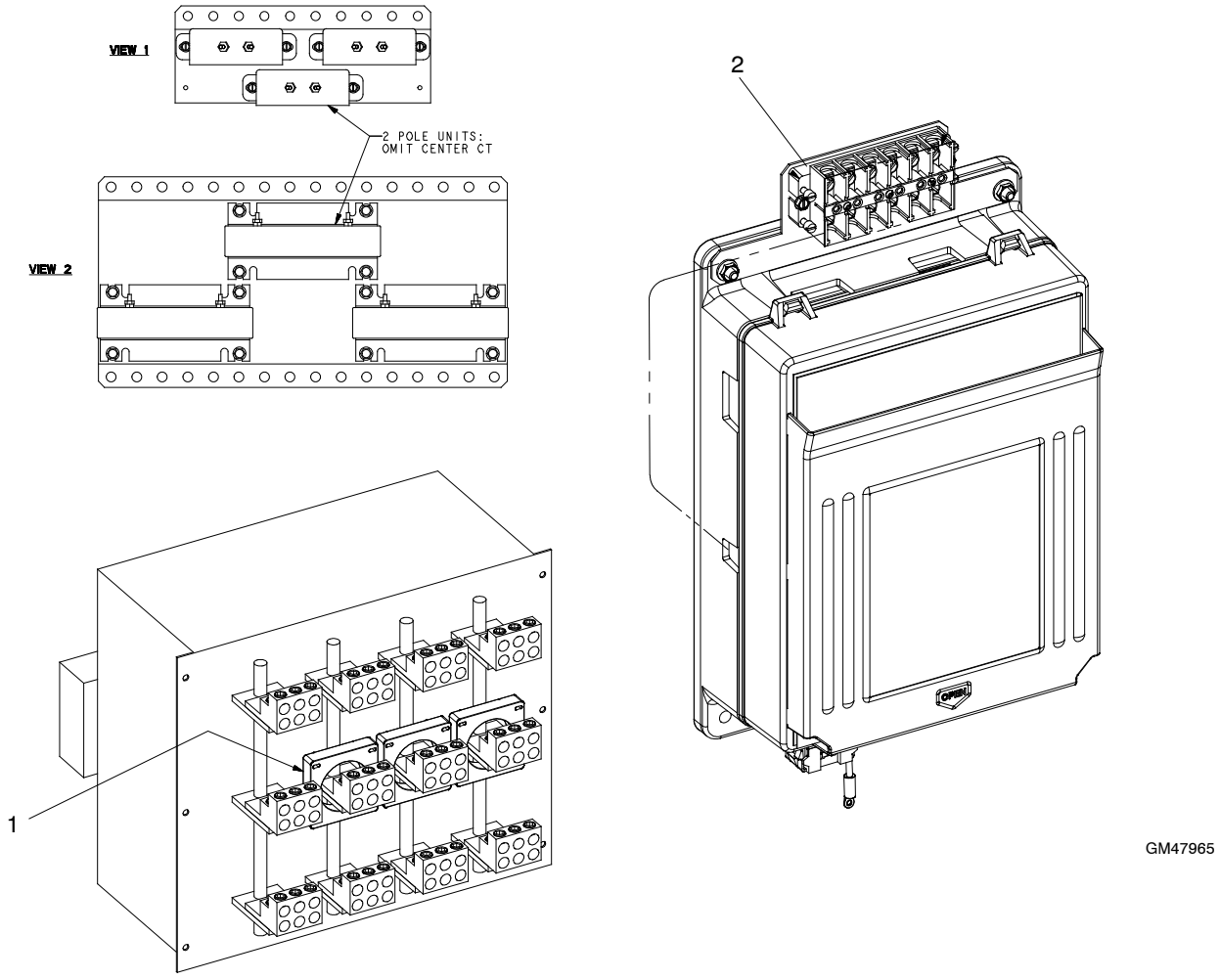
Figure 8-15 Alarm Silence

8.4 Current Sensing

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 screen. See Section 3.5, 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 screen. See Section 5.18.



1. Current transformers on load bus
2. Terminal block TB1 (see wiring diagram GM47803)

Figure 8-16 Current Sensing Kit

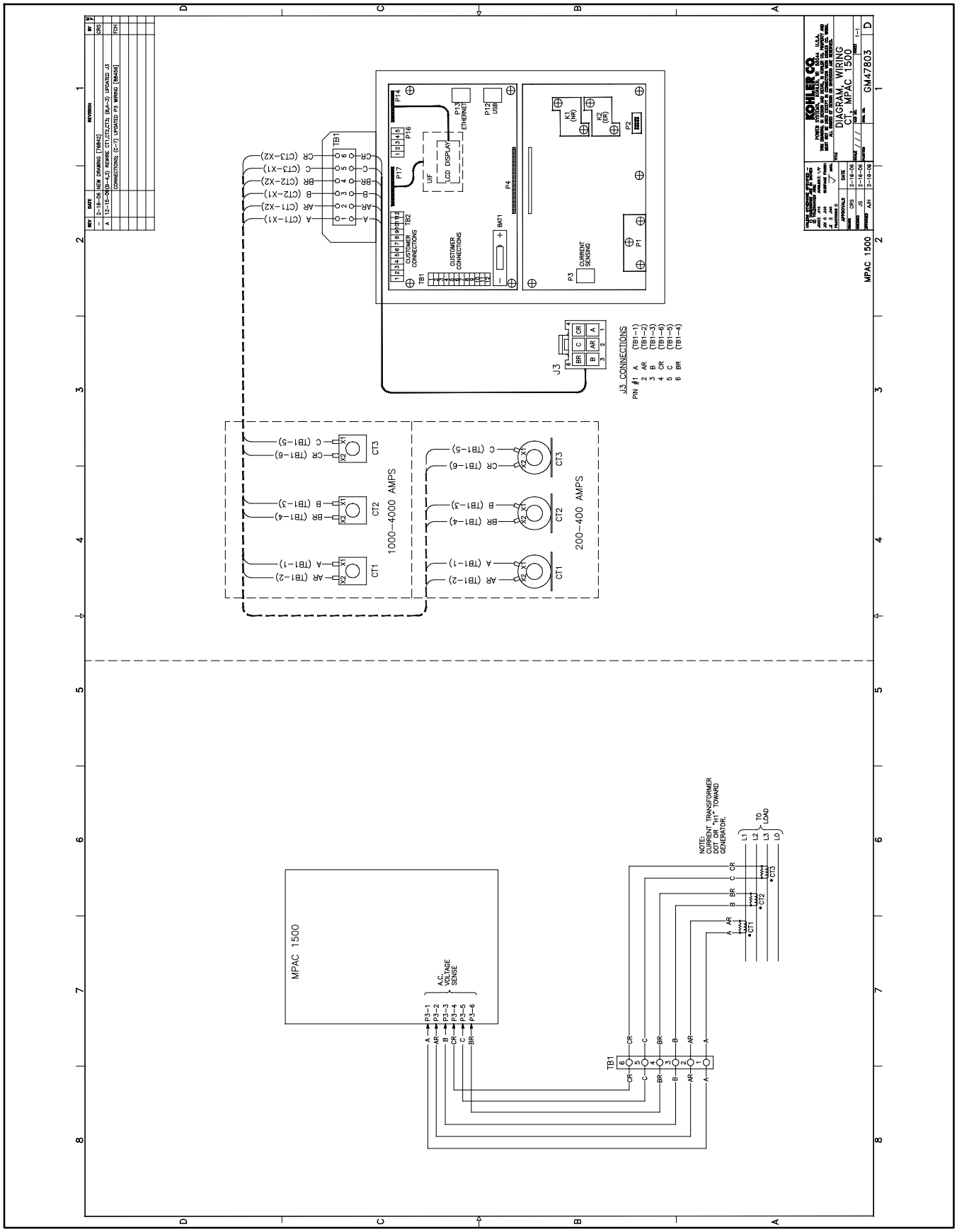


Figure 8-17 Current Sensing Wiring Diagram

8.5 Digital Meter

The digital power meter displays voltage, current, frequency, and power on both sources. See Figure 8-18. The meter also provides programmable visual alarms for high and low voltage and high current conditions. Programming menus are password-protected.

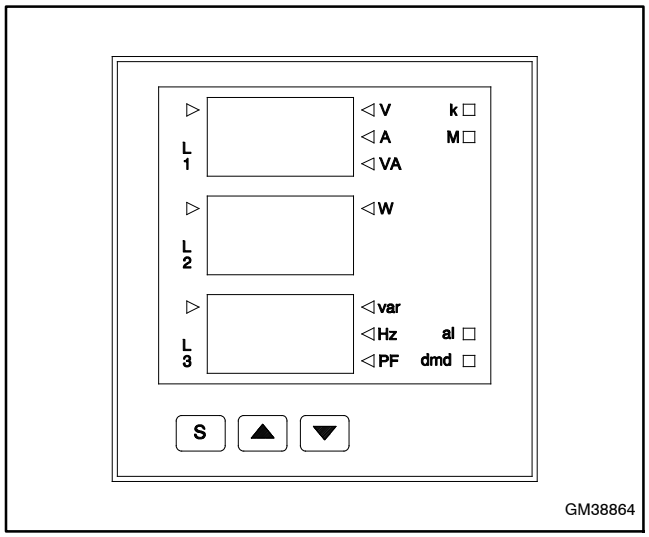


Figure 8-18 Digital Meter

The meter kit includes a 3-position selector switch. Use the switch to select the source to be monitored by the meter, Normal or Emergency. See Figure 8-19.

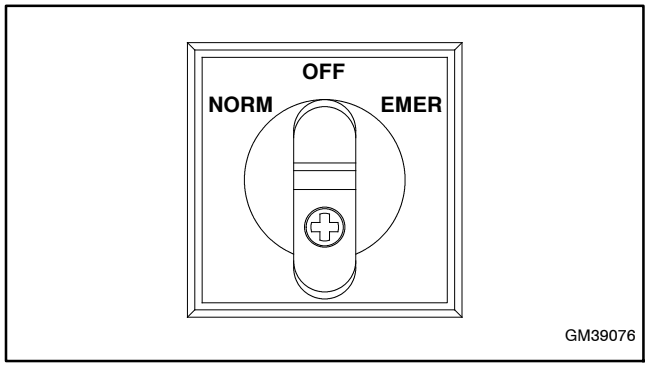


Figure 8-19 Three-Position Selector Switch

The meters are available factory-installed on transfer switches equipped with MPAC™ 1500 transfer switch controllers.

8.6 Heater

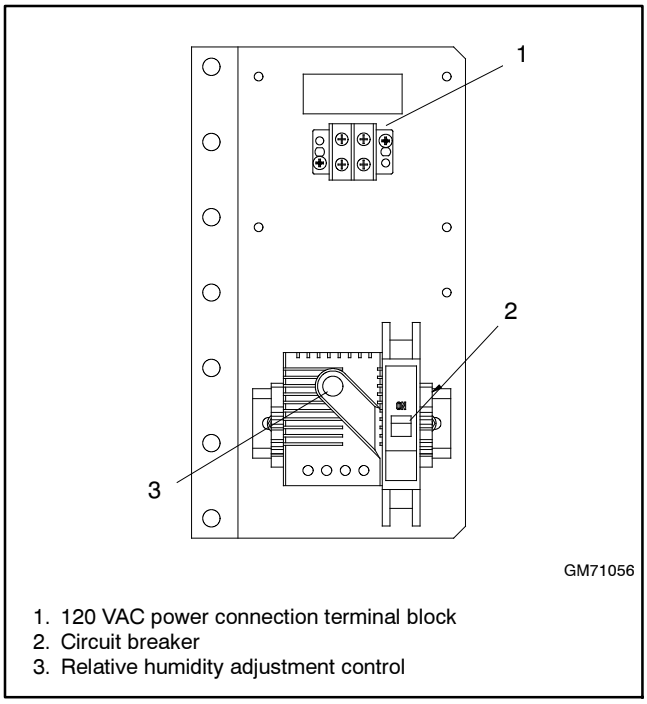
An anti-condensation heater kit is available. The strip heater is controlled by a hygrostat to raise the temperature inside the enclosure above the dew point to prevent condensation. Figure 8-21 shows a typical location of the heater kit components inside the enclosure.

The installer must connect 120 VAC power to the terminal block near the hygrostat. See Figure 8-20. 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.

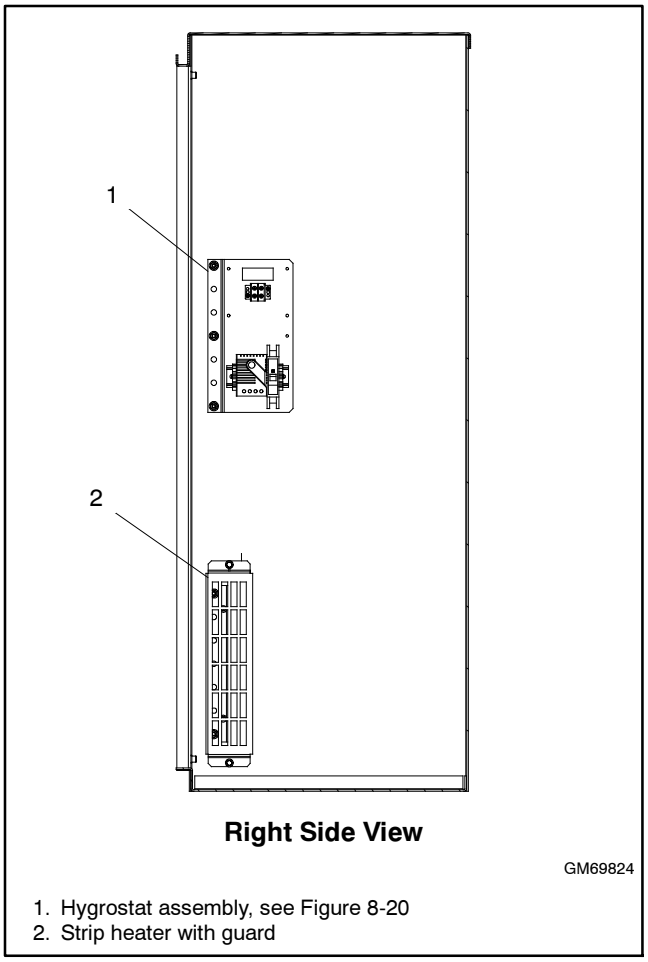
Because of space limitations in the smaller enclosures, the following models can include either an enclosure heater or a surge suppressor (TVSS), but not both:

Model KCS 30–200 Amps
Model KSS 40–225 Amps



1. 120 VAC power connection terminal block
2. Circuit breaker
3. Relative humidity adjustment control

Figure 8-20 Hygrostat Assembly, Typical



1. Hygrostat assembly, see Figure 8-20
2. Strip heater with guard

Figure 8-21 Heater Location, Typical

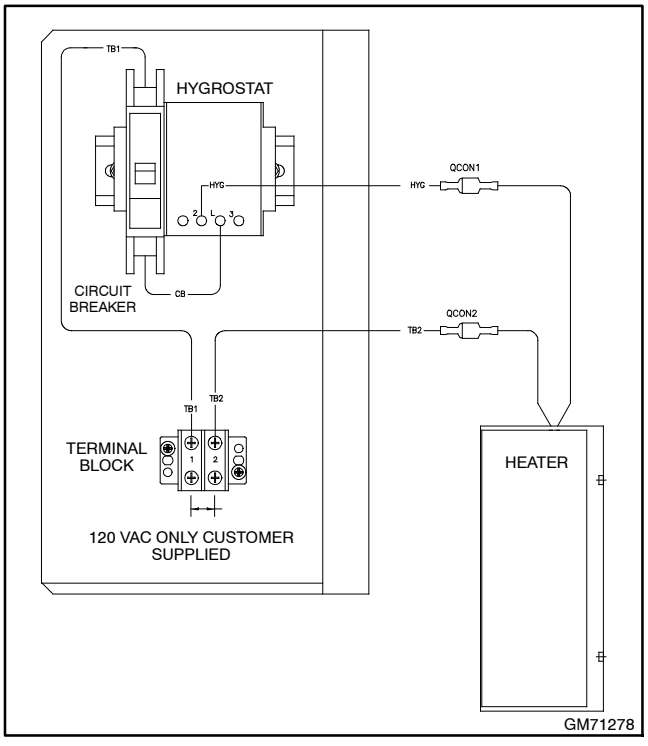


Figure 8-22 Heater Connections

8.7 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 3.5. 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.

8.8 Load Shed (Forced Transfer to OFF)

The load shed (forced transfer to OFF) accessory must be factory-installed. The load shed accessory is available only on programmed-transition transfer switches. On Model KSP switches, the load shed accessory is available on 600 Amp models.

8.8.1 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.

8.8.2 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 main logic board. See Figure 8-24. Use #12–24 AWG wire and tighten to 0.5 Nm (4.4 in. lb.).

Note: Bypass/isolation modules may use input #1 for the bypass contactor disable function. Connect the forced transfer to off contact to input #2 or any available programmable input in this case.

Use the Input/Output setup screen to assign the connected input (Main Board Input #1 or #2) 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.

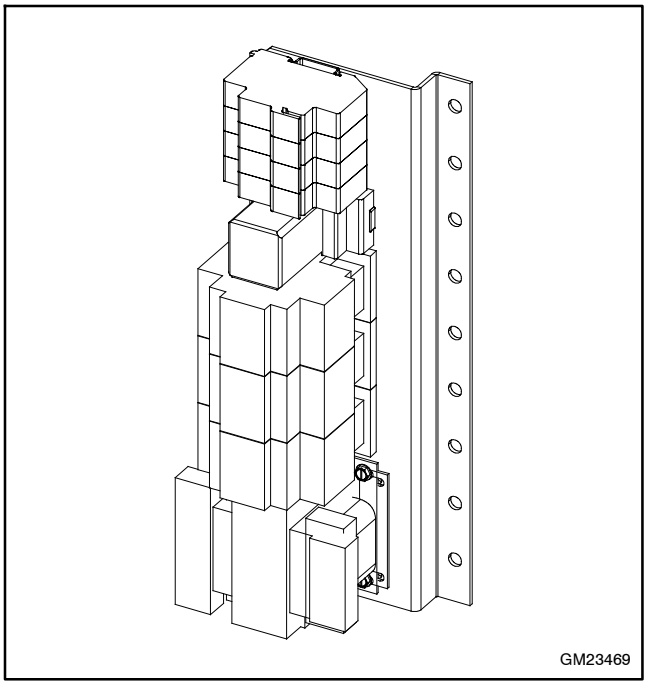


Figure 8-23 Load Shed Accessory (for identification)

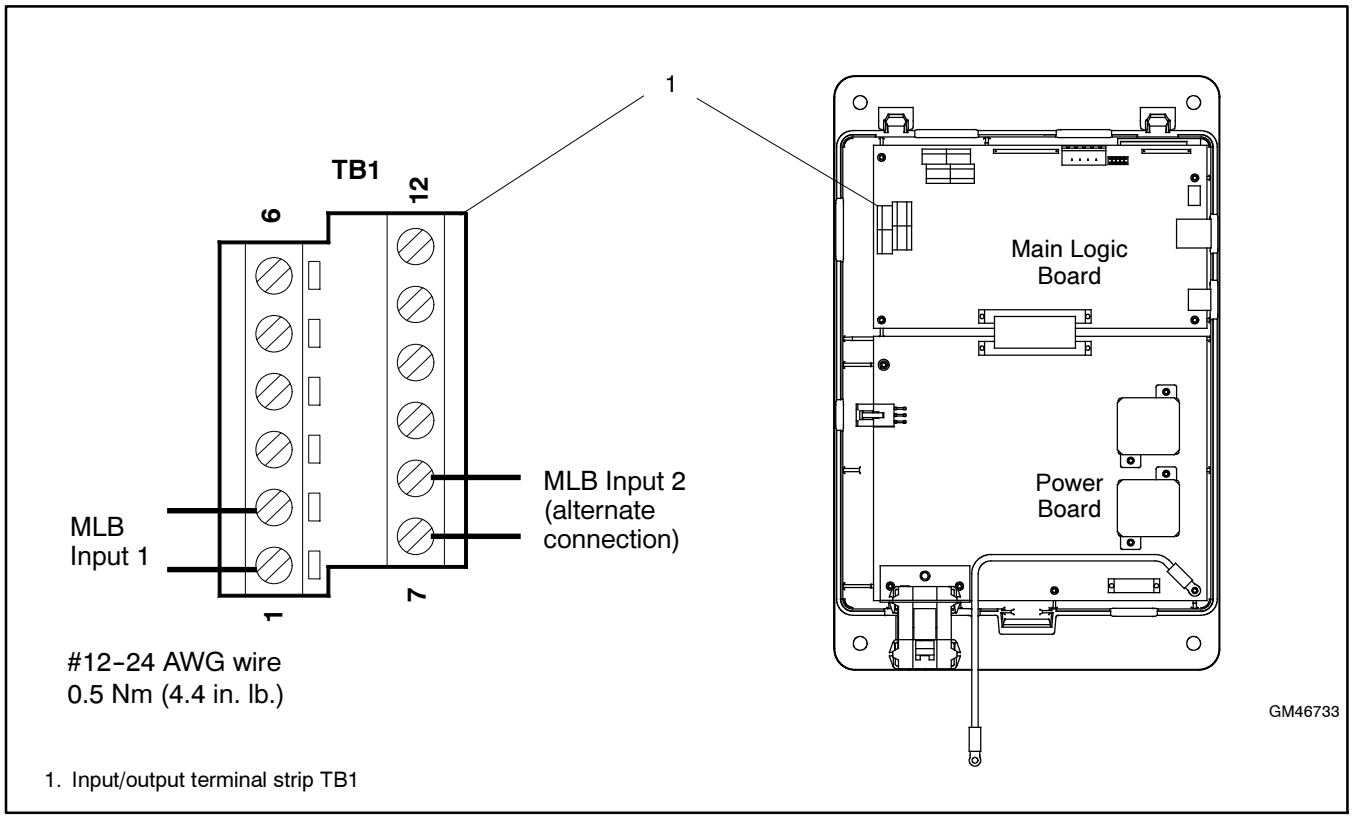
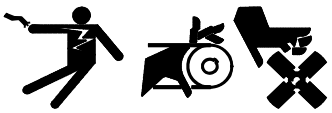


Figure 8-24 Forced Transfer to Off Input Connection (for factory-installed load shed kits)

8.9 Logic Disconnect Switch

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

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

The logic disconnect switch allows disconnection of the power to the controller during maintenance and service.

The switch has two positions, auto and disconnect. The disconnect position disconnects the voltage sensing leads for normal and emergency (A, B, C, N) and the engine start signal.

Note: Disable the generator set before using the logic disconnect switch to disconnect power to the ATS controls.

Disconnecting power to the controls will cause the ATS to signal the generator set to start. Prevent the generator set from starting by moving the generator set master switch to OFF and disconnecting the battery charger and battery. Refer to the generator set operation manual for specific instructions.

The logic disconnect switch is not available for service entrance models, which are equipped with a control circuit isolation switch as standard equipment.

8.10 Monitoring Program

Monitor III software allows power system monitoring and control using a personal computer connected to the controller through RS-485 connections or through a building's ethernet network. Refer to the Operation Manual provided with the software for instructions.

8.11 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 8-12.

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 8-25 shows the switch.

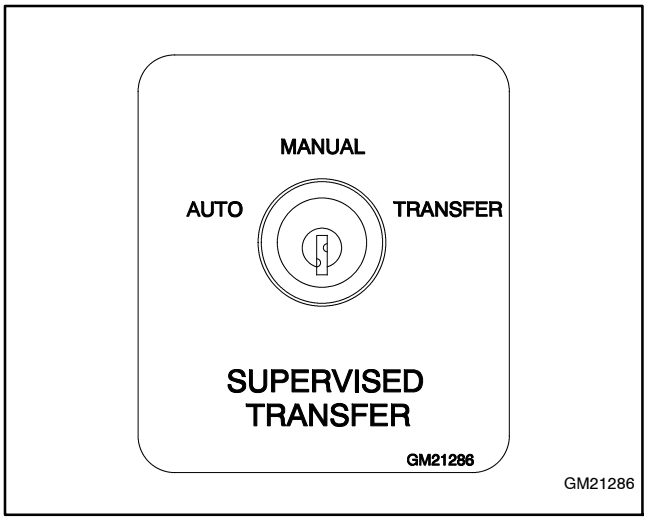


Figure 8-25 Supervised Transfer Control Switch

8.11.1 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 MPAC™ 1500 controller 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 keyswitch 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 keyswitch 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 8-26.

8.11.2 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.

Switch Position	Automatic Switches	Non-Automatic Switches
AUTO	• 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	• 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.	• Does not automatically transfer to an available source when the connected source is lost. • Test, peak shave, and loded 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)	• Does not initiate an engine start sequence. Generator set engine must be signalled 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 8-26 Supervised Transfer Control Switch Operation for Automatic and Non-Automatic Transfer Switches

8.11.3 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 8.11.1.

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.

8.12 Surge Protection (SPD)

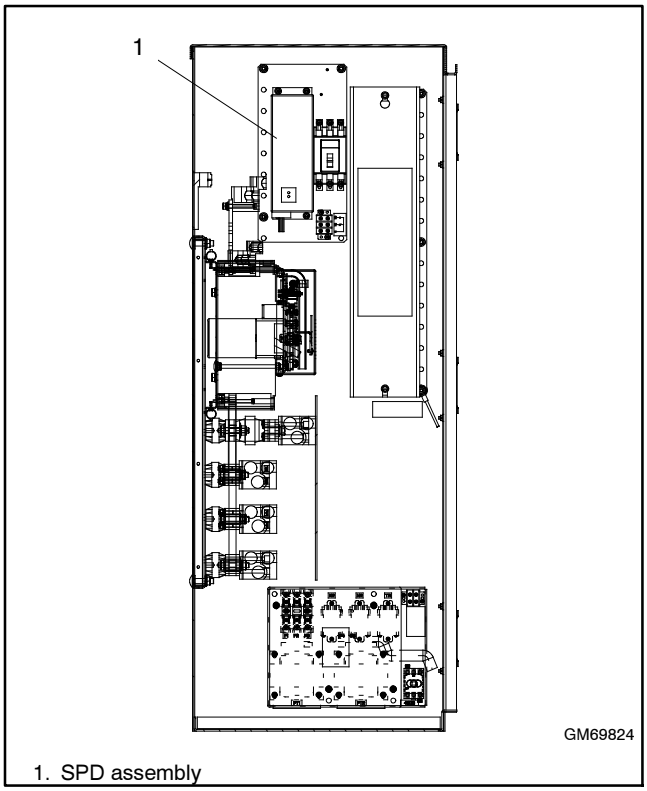
A surge protection device (SPD) is available for the transfer switch. Installed on the Normal source side, the SPD protects the system from voltage surges, preventing damage to household loads. The SPD resets automatically. See Figure 8-27 for SPD specifications. See Figure 8-28 for the typical SPD assembly location inside the ATS enclosure.

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

Model KCS 30–200 Amps
Model KSS 40–225 Amps

Working Voltage	kA	Limiting voltage	
		@ 3 kA	@ 10 kA
120/208	100	470	780
120/240	100	470/890	780/1200
220/380	100	890	1200
240/415	100	890	1200
277/480	100	890	1200

Figure 8-27 SPD Specifications



1. SPD assembly

Figure 8-28 SPD Location, Typical

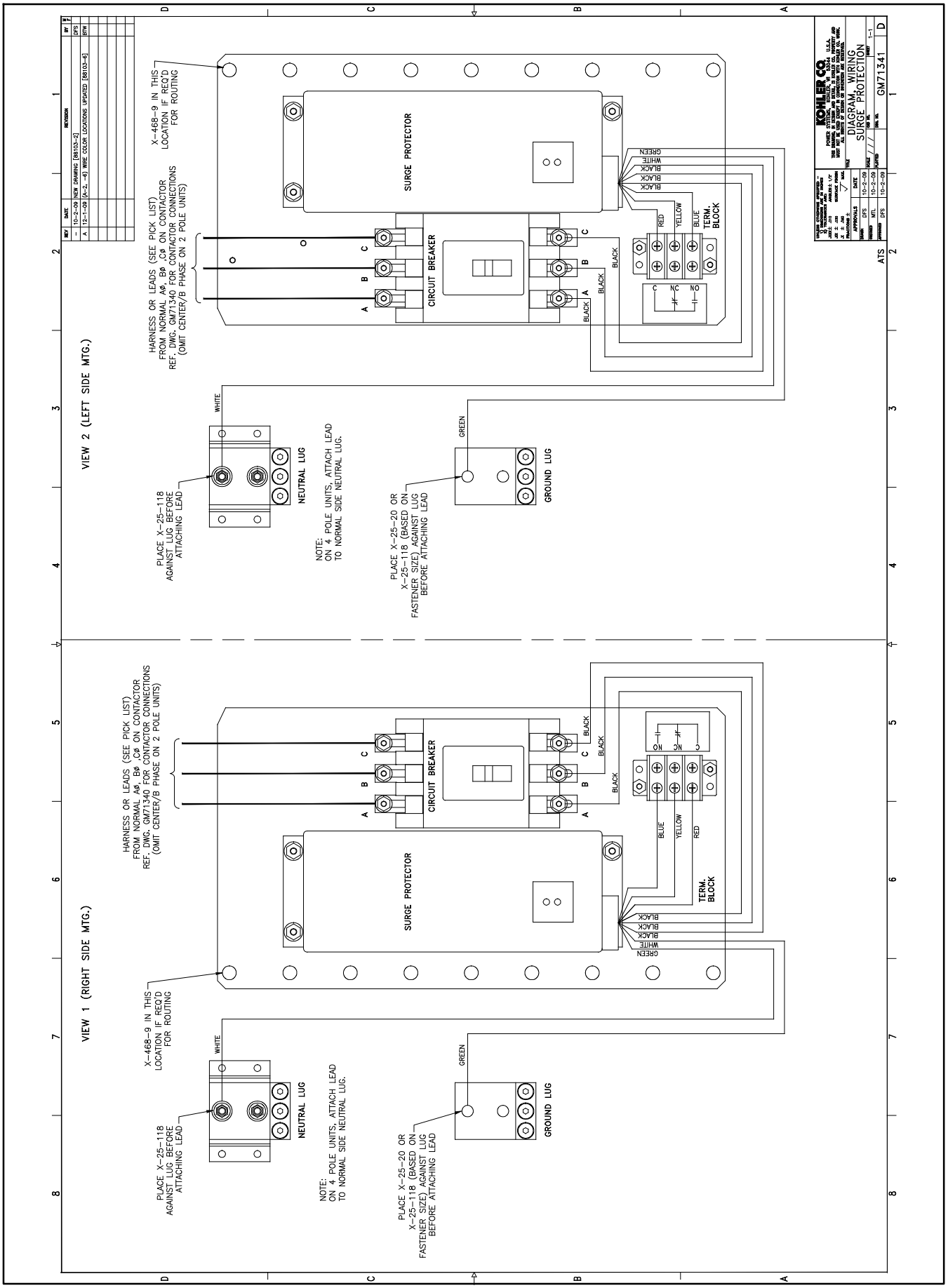


Figure 8-29 SPD Wiring Diagram, GM71341

8.12.1 SPD Diagnostic LEDs

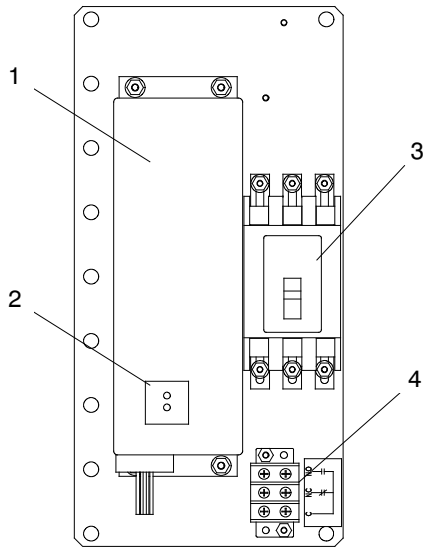
Red and green indicators on each Transient Voltage Surge Suppression (TVSS) module indicate protection status and SPD condition (good or needs replacement). See Figure 8-30 and Figure 8-31.

Note: All leads must be connected and power applied for the LEDs to illuminate.

If the red indicator is on, the SPD no longer provides protection. Replace the SPD module. See Section 8.12.3 for replacement instructions.

Green LED	Red LED	Status
ON	OFF	AC power is present and protection is provided.
OFF	ON	AC power is present but the SPD module needs replacement. The remote indication changes state.
OFF	OFF	AC power or ground is missing: Verify that wire connections are correct. Make sure that circuit breaker is engaged. Check panel for power.

Figure 8-30 SPD Diagnostic Indication



1. Surge suppressor
2. SPD status indicators
3. Circuit breaker
4. Auxiliary contact terminal block

Figure 8-31 SPD Assembly, Typical

8.12.2 SPD Remote Status Indicator

A customer-supplied indicator for the optional transient voltage surge suppressor (TVSS) 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 terminal block TB1. See Figure 8-32 for the contact rating and Figure 8-31 for the terminal block location. See the decal on the SPD assembly or the transfer switch wiring diagram for connections.

Description	Contact Rating
SPD Remote Indication Contact	2 A @ 250 VAC

Figure 8-32 SPD Auxiliary Contact Rating

8.12.3 SPD Replacement

The green indicator light goes out if the suppressor capability is exceeded or if there is an internal safety component failure in the SPD module. See Figure 8-30. Replace the module if the green indicator is off and the red indicator is on. 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 can cause severe injury or death. Deenergize all power sources before servicing. Turn off the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

SPD Replacement Procedure

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.
2. Disconnect power to the transfer switch.
   a. 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. 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 circuit breaker on the SPD assembly.
5. Refer to Figure 8-29. Note connections and disconnect the SPD leads to the circuit breaker, ground lug, and neutral lug. Disconnect the SPD red, yellow, and blue leads from the customer connection terminal block.
6. Remove four mounting screws to remove the SPD assembly.
7. Install the new module and tighten the mounting screws to 3 Nm (26 in. lb.).
8. Connect the SPD leads. See Figure 8-29 for connections.
9. Close the SPD circuit breaker.
10. Replace the enclosure's inner panel, if equipped.
11. Reconnect power to the transfer switch by closing the normal and emergency source circuit breakers.
12. Check the SPD status indicators. See Figure 8-30.
13. Reconnect the generator set engine starting battery, negative (-) lead last.
14. Reconnect power to the battery charger.
15. Close and lock the ATS enclosure door.
16. Move the generator set master switch to the AUTO position.

8.13 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 with or without a window for NEMA 1 enclosures. NEMA 3R enclosures include a windowless cover as standard equipment.

Appendix A Abbreviations

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

A, amp	ampere
ABDC	after bottom dead center
AC	alternating current
A/D	analog to digital
ADC	advanced digital control; analog to digital converter
adj.	adjust, adjustment
ADV	advertising dimensional drawing
Ah	amp-hour
AHWT	anticipatory high water temperature
AISI	American Iron and Steel Institute
ALOP	anticipatory low oil pressure
alt.	alternator
Al	aluminum
ANSI	American National Standards Institute (formerly American Standards Association, ASA)
AO	anticipatory only
APDC	Air Pollution Control District
API	American Petroleum Institute
approx.	approximate, approximately
APU	Auxiliary Power Unit
AQMD	Air Quality Management District
AR	as required, as requested
AS	as supplied, as stated, as suggested
ASE	American Society of Engineers
ASME	American Society of Mechanical Engineers
assy.	assembly
ASTM	American Society for Testing Materials
ATDC	after top dead center
ATS	automatic transfer switch
auto.	automatic
aux.	auxiliary
avg.	average
AVR	automatic voltage regulator
AWG	American Wire Gauge
AWM	appliance wiring material
bat.	battery
BBDC	before bottom dead center
BC	battery charger, battery charging
BCA	battery charging alternator
BCI	Battery Council International
BDC	before dead center
BHP	brake horsepower
blk.	black (paint color), block (engine)
blk. htr.	block heater
BMEP	brake mean effective pressure
bps	bits per second
br.	brass
BTDC	before top dead center
Btu	British thermal unit
Btu/min.	British thermal units per minute
C	Celsius, centigrade
cal.	calorie
CAN	controller area network
CARB	California Air Resources Board
CAT5	Category 5 (network cable)
CB	circuit breaker
CC	crank cycle
cc	cubic centimeter
CCA	cold cranking amps
ccw.	counterclockwise
CEC	Canadian Electrical Code
cert.	certificate, certification, certified
cfh	cubic feet per hour
cfm	cubic feet per minute
CG	center of gravity
CID	cubic inch displacement
CL	centerline
cm	centimeter
CMOS	complementary metal oxide substrate (semiconductor)
com	communications (port)
coml	commercial
Coml/Rec	Commercial/Recreational
conn.	connection
cont.	continued
CPVC	chlorinated polyvinyl chloride
crit.	critical
CSA	Canadian Standards Association
CT	current transformer
Cu	copper
cUL	Canadian Underwriter's Laboratories
CUL	Canadian Underwriter's Laboratories
cu. in.	cubic inch
cw.	clockwise
CWC	city water-cooled
cyl.	cylinder
D/A	digital to analog
DAC	digital to analog converter
dB	decibel
dB(A)	decibel (A weighted)
DC	direct current
DCR	direct current resistance
deg., °	degree
dept.	department
dia.	diameter
DI/EO	dual inlet/end outlet
DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)
DIP	dual inline package
DPDT	double-pole, double-throw
DPST	double-pole, single-throw
DS	disconnect switch
DVR	digital voltage regulator
E^2PROM, EEPROM	electrically-erasable programmable read-only memory
E, emer.	emergency (power source)
ECM	electronic control module, engine control module
EDI	electronic data interchange
EFR	emergency frequency relay
e.g.	for example (*exempli gratia)*
EG	electronic governor
EGSA	Electrical Generating Systems Association
EIA	Electronic Industries Association
EI/EO	end inlet/end outlet
EMI	electromagnetic interference
emiss.	emission
eng.	engine
EPA	Environmental Protection Agency
EPS	emergency power system
ER	emergency relay
ES	engineering special, engineered special
ESD	electrostatic discharge
est.	estimated
E-Stop	emergency stop
etc.	et cetera (and so forth)
exh.	exhaust
ext.	external
F	Fahrenheit, female
FHM	flat head machine (screw)
fl. oz.	fluid ounce
flex.	flexible
freq.	frequency
FS	full scale
ft.	foot, feet
ft. lb.	foot pounds (torque)
ft./min.	feet per minute
ftp	file transfer protocol
g	gram
ga.	gauge (meters, wire size)
gal.	gallon
gen.	generator
genset	generator set
GFI	ground fault interrupter
GND, ⏚	ground
gov.	governor
gph	gallons per hour
gpm	gallons per minute
gr.	grade, gross
GRD	equipment ground
gr. wt.	gross weight
H x W x D	height by width by depth
HC	hex cap
HCHT	high cylinder head temperature
HD	heavy duty
HET	high exhaust temp., high engine temp.
hex	hexagon
Hg	mercury (element)
HH	hex head
HHC	hex head cap
HP	horsepower
hr.	hour
HS	heat shrink
hsg.	housing
HVAC	heating, ventilation, and air conditioning
HWT	high water temperature
Hz	hertz (cycles per second)
IBC	International Building Code
IC	integrated circuit
ID	inside diameter, identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMS	improved motor starting
in.	inch
in. H_2O	inches of water
in. Hg	inches of mercury
in. lb.	inch pounds
Inc.	incorporated
ind.	industrial
int.	internal
int./ext.	internal/external
I/O	input/output
IP	internet protocol
ISO	International Organization for Standardization
J	joule
JIS	Japanese Industry Standard
k	kilo (1000)

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

Appendix B Screen Summaries

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

Operation Screens

Main Screen

- System Status
- Next Exercise Time and Date
- Normal and Emergency Voltage
- Frequency
- Normal Source Voltage
- Lamp Test
- Emergency Source Voltage
- Current, Amps
- Time/Date
- Daylight Saving Time Info
- Preferred Source
- Source-Source Type
- Commit/No Commit to Transfer
- Standard/Programmed 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 Lodd Pref Tran
- Transfer Time N>E
- Transfer Time E>N
- System Start Date
- Last Maint Date
- Last Loss Duration
- Last Loss Date/Time
- Minimum Values
- Maximum Values
- 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 System Setup

- Open/Programmed/Closed Transition
- Source Type: Util/Gen, Gen/Gen, Util/Util or Util/Gen/Gen
- Service Entrance: Yes/No
- In-Phase Monitor Enabled/Disabled
- Commit/No Commit to Transfer
- # I/O Modules Installed
- Rated Current
- 3 Src Engine Start Mode Mode1/Mode2
- Remote Test Loading Loaded/Unloaded
- Peak Shave Delay Enabled/Disabled

View Source Setup

- ABC/BAC Rotation (3-phase only)
- System Voltage, Normal/Emergency
- Frequency (Hz), Source N and E
- Normal Under Voltage PU% and DO%
  - Normal Over Voltage PU% and DO%
  - Debounce Time, Seconds
- Normal Under Frequency PU% and DO%
  - Debounce Time
- Normal Voltage Unbalance Enable/Disable
  - Normal Voltage Unbalance PU% and DO%
- Emergency Under Voltage PU% and DO%
  - Emergency Over Voltage PU% and DO%
  - Debounce Time
- Emergency Under Frequency PU% and DO%
  - Emergency Over Frequency PU% and DO%
  - Debounce Time
- Emergency Voltage Unbalance Enable/Disable
  - Emergency Voltage Unbalance PU% and DO%
- In-Phase Monitor
  - Enabled/Disabled
  - Angle, degrees
- In-Phase Transfer Fail
  - Enabled/Disabled
  - Time Delay min:sec

View Source Setup, Continued

- Synchronization (for closed-transition)
  - Voltage Differential
  - Frequency Differential
  - Angle differential
- Fail toSync
  - Enabled/Disabled
  - Time Delay min:sec

View Time Delays, Source S1 and Source S2

- Engine Start (gen set only)
- Engine Cooldown
- Xfr Preferred>Standby (Standby>Preferred)
- Xfr Off > Standby (Off >Preferred) (programmed-transition only)
- Fail to Acquire Preferred (Standby)
- Load Control
  - Mode: None/Time/Current
  - Loads to Control (1-9)
- Time-Based Control
  - Load Disconnect N>E (E>N) Time Delay min:sec
  - Load Add E>N (N>E) Time Delay min:sec
- Current-Based Control
  - 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 Inputs/Outputs

- Main Board I/O
  - Input Function Descriptions (2)
  - Output Function Descriptions (2)
- Auxiliary Inputs/ Outputs
  - Aux I/O Module
    - Module Type and Address
    - Module Status
    - Input Function Descriptions
    - Output Function Descriptions

View Common Alarms

- Alarm Group (1 and 2)
- Alarm Description
- Audible (Yes or No)
- Common (Yes or No)

View Communications Setup

- Modbus Server TCP Enabled/Disabled
- Modbus Server Port 1 and 2 Enable/Disabled
- Modbus Address Port 1 and 2
- Baud Rate Port 1 and 2 9600/19200/57600
- Modbus TCP Unit ID
- IP Address
- Subnet Mask
- MAC Address

View Control Parameters

- Code Version (factory-set)
- ATS Serial Number (factory-set)
- Controller Serial Number (factory-set)
- Contactor Serial Number (factory-set)
- Site Designation (optional; use Monitor III to set)
- Load Description (optional; use Monitor III to set)
- Branch Description (optional; use Monitor III to set)
- Location (optional; use Monitor III to set)

Setup Screens

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 (Set 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 Add 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 RemoveSource1 (Source2) Priority
    - Load Control Enable/Diable
  - 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
  - Voltage Differential
  - Frequency Differential
  - Angle Differential
  - Fail to Sync
    - Enable/Disable
    - Time Delay min:sec
- Set Preferred Source Normal/Emergency
- 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
  - Voltage Unbalance Pickup
  - Voltage Unbalance Dropout
  - Under Frequency Pickup
  - Under Frequency Dropout
  - Over Frequency Pickup
  - Over Frequency Dropout
  - Frequency Debounce time

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 Section 5.12.3, Input Functions
† See Section 5.12.4, Output Fundtions.

Set Common Alarms

- Alarm Group 1 or 2
- Modify Alarm
  - Common (Yes/No)
  - Audible (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 No/ICCB/MCCB
- Rated Current, Amps
- 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
- USB Data Logger Collection Period seconds/minutes/hours/days
  - Min/Max Values Calendar/Continuous/Days/Weeks
  - Start Date and Time
  - Days/Weeks
  - Start/stop

Set Communications

- Modbus Server TCP Enable/Disable
- Modbus Server Port 1 or 2 Enable/Disable
- Modbus Address Port 1 or 2
- Baud Rate Port 1 or 2 9600/19200/57600
- Modbus TCP Unit ID
- IP Address
- Subnet Mask

Set Passwords

- Setup Password
- Test Password

Calibration

- Line-Neutral Voltages, Source N and E
- Line-Line Voltages, Source N and E
- 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

USB Access Screen (appears only when a device is connected to the USB port)

- Download to Controller
- Upload to USB
  - File/Data Log
  - Filename and Free Space, kB
  - USB Data Logger Start/Stop

Notes

KOHLER®
POWER SYSTEMS

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

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

TP-6714 10/12b