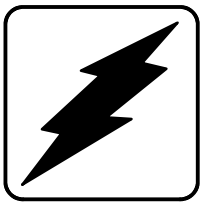
Operation and Installation

Automatic Transfer Switches



Models:

G

GLS

Controller:
M340 Microprocessor

ISO 9001
KOHLER GENERATORS
INTERNATIONALLY REGISTERED

KOHLER®
POWER SYSTEMS

TP-5994 1/99a

Table of Contents

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***.

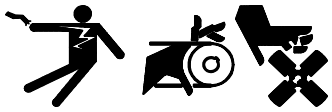
NOTICE

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.

Battery

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

Battery acid. Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in the battery can cause blindness and burn skin. Always wear splashproof safety goggles when working near the battery. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

⚠ WARNING

Explosion.
Can cause severe injury or death. Relays in the battery charger cause arcs or sparks.

Locate the battery in a well-ventilated area. Isolate the battery charger from explosive fumes.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove wristwatch, rings, and other jewelry before handling the battery. Never connect the negative (–) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together. Sparks could ignite the battery gases or fuel vapors. Ventilate the compartments containing batteries to prevent accumulation of explosive gases. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery.

Hazardous Voltage/ Electrical Shock

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(under 600 volt)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(600 volt and above)

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

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

(under 600 volt)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

(600 volt and above)

⚠ WARNING

Hazardous voltage. Moving rotor.
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. Open the main circuit breakers of all power sources before servicing the equipment. Configure the installation to electrically ground the generator set, transfer switch, and related equipment and electrical circuits to comply with applicable codes and standards. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Installing the battery charger. Hazardous voltage can cause severe injury or death. An ungrounded battery charger may cause electrical shock. Connect the battery charger enclosure to the ground of a permanent wiring system. As an alternative, install an equipment grounding conductor with circuit conductors and connect it to the equipment grounding terminal or the lead on the battery charger. Install the battery charger as prescribed in the equipment manual. Install the battery charger in compliance with local codes and ordinances.

Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Hazardous voltage can cause severe injury or death. To prevent electrical shock disconnect the harness plug before installing accessories that will be connected to transformer assembly primary terminals 76, 77, 78, and 79. Terminals are at line voltage. *(Models with E33+, S340, S340+, 340, R340, and R33 controls only)*

Installing accessories to the transformer assembly. Hazardous voltage can cause severe injury or death. To prevent electrical shock disconnect the harness plug before installing accessories that will be connected to the transformer assembly primary terminals on microprocessor logic models. Terminals are at line voltage.

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.

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 wristwatch, rings, and jewelry before servicing the equipment.

Servicing the transfer switch. Hazardous voltage can cause severe injury or death. Deenergize all power sources before servicing. Open 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.

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.

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.

Moving Parts

⚠ WARNING

Hazardous voltage. Moving rotor.

Can cause severe injury or death.

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

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

When replacing hardware, do not substitute with inferior grade hardware. Screws and nuts are available in different hardness ratings. To indicate hardness, American Standard hardware uses a series of markings, and metric hardware uses a numeric system. Check the markings on the bolt heads and nuts for identification.

NOTICE

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

NOTICE

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

NOTICE

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

This manual provides operation and installation instructions for the Kohler® Model GLS transfer switches with M340 microprocessor electrical controls (logic controller.)

All information in this publication represents data available at time of print. Kohler Co. reserves the right to change this literature and the products represented without incurring obligation.

Read through 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 equipment for future reference.

Equipment service requirements are very important to safe and efficient operation; therefore, inspect parts often and perform required service at the prescribed intervals. An authorized service distributor/dealer should perform required service to keep equipment in top condition.

List of Related Materials

This manual covers operation and installation information for the transfer switch's electrical controls. See the power switching device operation and installation manual to decode the transfer switch part number model code and verify that the transfer switch model and electrical controls matches what is shown on the front cover of this manual before proceeding with operation or installation.

A separate power switching device operation and installation manual that covers information specific to the transfer switch's power switching device completes operation and installation instructions for the transfer switch.

One type of transfer switch power switching device is available with the M340 electrical controls described by this manual. The following table lists the available power switching devices and the related operation and installation manual part numbers.

Power Switching Device	Operation/ Installation Manual
Model GL_/GT_ (Contactor)	TP-5991

Separate manuals cover service and parts information for transfer switch power switching devices and electrical controls. The following table lists the available manuals and part numbers.

Electrical Controls	Service Manual
M340 (Microprocessor)	TP-5604

Transfer switches with microprocessor electrical controls and communication accessories can be monitored and controlled with a personal computer and software. The following table lists the available manuals and part numbers.

Communication Item	Operation/ Installation Manual
Remote Monitoring and Control Communication Software DOS Win 95/98/NT	 TP-5823 TP-5972
Controller Communication Kits	TT-847

Service Assistance

Service Information

Please contact a local authorized distributor or dealer for sales, service, or other information about Kohler Generator Division products.

To locate a local authorized distributor or dealer

- Look on the product or the information included with the product
- Consult the Yellow Pages under the heading Generators—Electric
- Visit the Kohler Generator Division web site at www.kohlergenerators.com
- Call 1-800-544-2444 (inside the U.S.A. and Canada) or 920-565-3381 (outside the U.S.A. and Canada)

Product Identification

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

Transfer Switch Identification Numbers

Record the product identification numbers from the transfer switch nameplate.

Part Number _____

Serial Number _____

Accessory Number	Accessory Description

Section 1. Specifications

The following specifications are for the M340 logic controller. See the power switching device operation and installation manual for power switching device specifications and other transfer switch features.

1.1 Standard Features

- Microprocessor-based controller for Model GLS automatic transfer switches (ATS)
- Normal source voltage sensing adjustable from 75% to 100% of nominal for pickup and from 70% to 95% of nominal for dropout; provides line-to-line monitoring of normal source for all phases of 3-phase switches
- LED indicators for switch position and source available—normal and emergency
- Time Delay Engine Start (TDES) adjustable from 0 to 6 seconds, factory set at 5 seconds
- Time Delay Normal to Emergency (TDNE) adjustable from 0 to 5 minutes, factory set at 5 seconds
- Time Delay Emergency to Normal (TDEN) adjustable from 0 to 30 minutes, factory set at 5 minutes
- Time Delay Engine Cooldown (TDEC) adjustable from 0 to 30 minutes, factory set at 5 minutes
- Underfrequency sensing one phase of the normal source
- Main shaft auxiliary contacts—one closed on normal and one closed on emergency
- LCD digital meters for voltage, frequency, operational time, and number of transfers
- LCD status panel with keypad data entry
- Area protection (with override) capability
- Lamp test
- Test switch and remote test capability
- Remote fault annunciation (2)
- Optional 12/24 volt DC controller power input
- All printed circuit boards conformally coated for environmental protection
- Ambient temperature range
  Operation -20° to 150°F (-29° to 66°C)
  Storage -60° to 220°F (-51° to 104°C)
- Humidity range 5% to 95% noncondensing
- Shunt/jumper-controlled accessories (enabled by main logic circuit board jumper configuration and setup procedure, enabled from the factory when the ATS is ordered with a particular optional shunt/jumper-controlled accessory.)
  - Manual override (standard)
  - Extended time delays
  - Unloaded plant exerciser
  - Normal and emergency source monitoring
  - Phase sequence and loss monitoring
  - Inphase monitor

1.2 Optional Features

See Section 3—Accessories for details of optional accessories. The transfer switch nameplate includes a list of factory-installed accessories.

- Emergency source overfrequency sensing 1-phase, over/under voltage and frequency sensing three-phase
- Two-position test switches: Automatic and Test
- Three-position test switches: Test, Automatic, and Engine Start
- Four-position test switches: Test, Automatic, Off, Engine Start
- Pushbuttons to bypass Normal to Emergency or Emergency to Normal time delays
- Main shaft auxiliary contacts—one additional closed on normal and one additional closed on emergency
- Auxiliary relay contacts for
  - Contactor position, normal and emergency
  - Source available, normal and emergency
  - Programming Mode switch not in Off position
  - ATS not in automatic mode
  - System alert
  - Load bank control
- Analog meters for frequency, voltage and current
- Plant exerciser: loaded or loaded/unloaded selectable
- Battery charger: 2-ampere float, 12- or 24-volt
- Manual switch operation with automatic override
- Load shedding contacts
- RS-232 or RS-485 serial communication for monitoring and control by a personal computer and optional software

Notes

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(under 600 volt)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(600 volt and above)

Have preventive maintenance performed on the transfer switch at regular intervals after installation. See Section 4 for preventive maintenance.

Contact an authorized service center to inspect and service the transfer switch when any wear, damage, deterioration, or malfunction of the transfer switch or its components is evident or suspected; *DO NOT ENERGIZE THE SWITCH.*

2.1 Startup

Use this section when power sources have been disconnected to the transfer switch for an extended period after maintenance or service of the standby system, *NOT FOR INITIAL STARTUP*.

For initial startup, follow the instructions in the installation section of the operation and installation manual for the power switching device and Section 5—Installation in this manual.

Follow the following steps to power up the transfer switch and prepare it for automatic operation.

Powerup Procedure

Read and understand all instructions on installation drawings and labels affixed to the switch. Note any accessories that are installed on the switch and review their operation.

1. Move the generator set master switch to the OFF position to prevent the generator set from starting.
2. Ensure that *BOTH* the normal and emergency power sources are disconnected by opening upstream circuit breakers or switches to the transfer switch.
3. Open the enclosure and check that the wire harnesses for the power switching device and the controller are plugged together at the inline disconnect plug P1. See Figure 5-2.
4. Follow the manual operation procedure to prepare the transfer switch for automatic operation. See the power switching device operation and installation manual for manual operation procedures.
5. Close and lock the transfer switch enclosure door.
6. Prepare the generator set that provides standby power for operation. Check the oil level, coolant level, fuel supply, batteries, and items specified by the generator set installation or operation checklist or manual.
7. Move the generator set master switch to the AUTO position. The generator set should start.
8. When loads can be safely energized, reapply power sources to the transfer switch by closing circuit breakers or switches.

NOTE

When initially applying power to the transfer switch, the engine start contacts remain closed signaling the generator to run until the ATS's Time Delay Engine Cooldown (TDEC), if equipped, ends.

9. Perform an automatic operation test. See Section 5.5.2.

2.1.1 Observe Powerup Messages

The ATS controller displays *SET TIME & DATE,* indicating when the time and date need to be set.

The System Alert LED lights during a system alert condition. The controller briefly displays system alert messages when a system alert condition exists. See Appendix C for the system alert message summary.

Press the RESET MENU key and then the LAMP TEST key to verify that the LEDs and the digital display operate. All LEDs light and all digital liquid crystal display (LCD) elements darken briefly during a lamp test.

2.1.2 Set the Time and Date

To set the time and date move the Programming Mode switch to the Local position. See Section 2.12.4, Index 4—Time and Date, to set the time and date. Move the Programming Mode switch to the Off position after setting the time and date.

2.1.3 Check the Normal Power Source

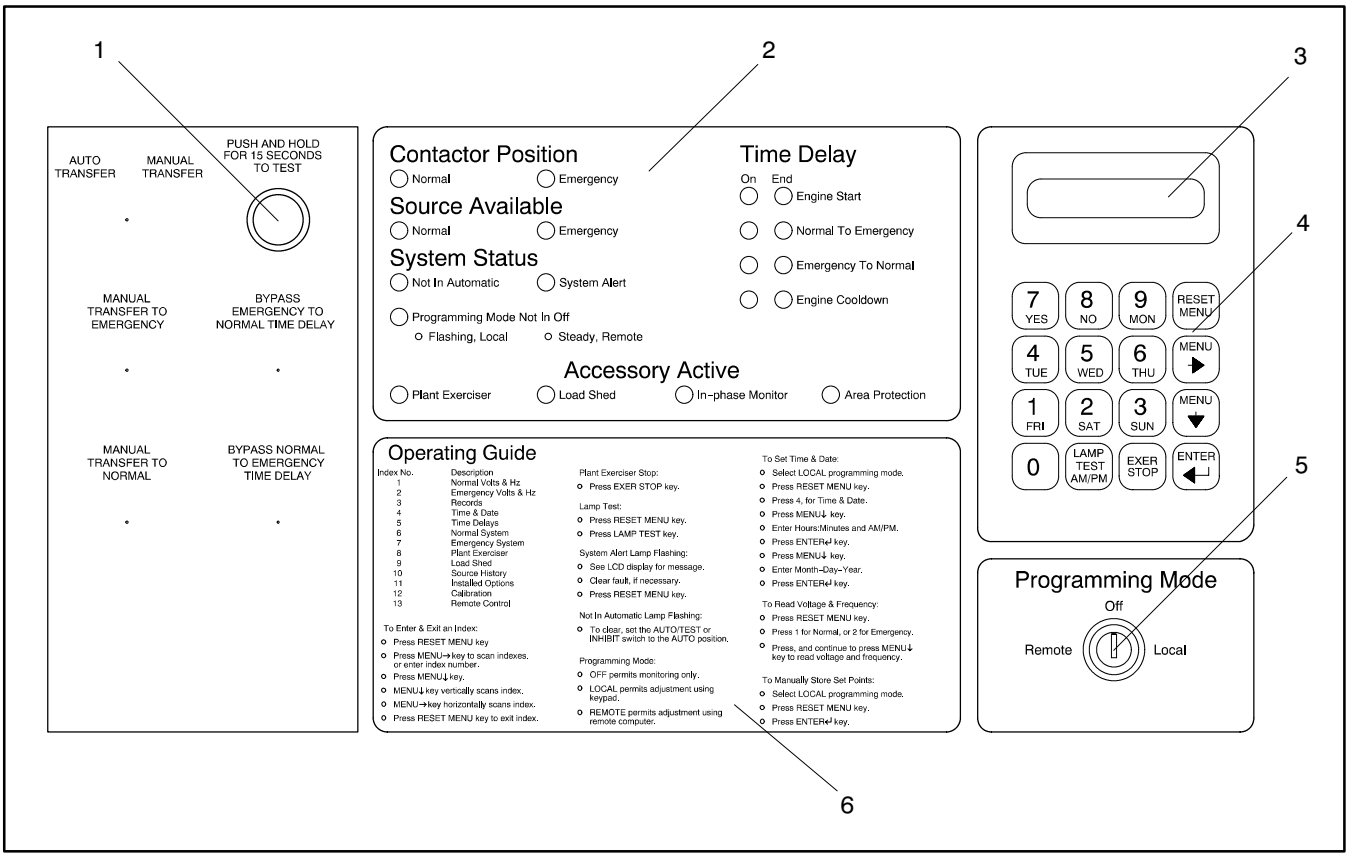
See Section 2.11.1, Index 1—Normal Voltage and Frequency Metering, to monitor normal source AC line-to-line voltages, line frequency, and phase sequence. If the screens shown are not consistent with the electrical system type or are higher or lower than expected, see Section 2.11.6 and check the settings for the normal power source.

2.1.4 Record Maintenance Information

Record maintenance information from Index 3—Operational Status, after each startup. See Section 2.11.3.

2.2 Front Panel

Control switches, pushbuttons, and indicators on the transfer switch front control panel and elsewhere on the switch vary depending upon the installed accessories. See Section 3—Accessories for the location of optional accessories. Figure 2-1 shows standard controls and indicators on the front panel.



1. Test pushbutton
2. LED indicators
3. Digital LCD (Liquid Crystal Display)
4. Keypad
5. Programming Mode switch
6. Operating Guide

Figure 2-1. M340 Front Panel Controls and Indicators

2.3 LED Indicators

Figure 2-1 shows the location of LED indicators on the front panel.

2.3.1 Contactor Position and Source Available

Contactor Position LEDs light to indicate the transfer switch position, the power source that is connected to the load—Normal (green) or Emergency (red).

Source Available Green LEDs light when the controller determines that the corresponding source is available (acceptable). See Section 2.7 for an explanation of source acceptability.

2.3.2 System Status

Not in Automatic A red LED flashes when the ATS is not in automatic mode. The ATS is not in automatic mode during a test mode or when an optional automatic/manual switch selects manual operation. When not in automatic mode, the transfer switch may not automatically seek available sources when the connected source fails without operator intervention.

System Alert A red LED flashes when the controller detects a problem with the contactor or controller operation, when the controller receives auxiliary signals from customer-provided circuitry such as from the generator set, or when the controller is waiting for the operator to initiate a manual transfer. The display shows a message indicating cause of the system alert. See Appendix C for a system alert message summary.

Programming Mode Not in Off A yellow LED flashes when the ATS is in the local programming mode and lights steady when the ATS is in the remote programming mode. See Section 2.4.2 for programming mode information.

2.3.3 Time Delays

A yellow LED in the On column lights during the time delay timing cycle. A yellow LED in the End column lights when the time delay ends. LEDs in both columns are off when the time delays are reset.

The controller responds as follows after time delays end.

Engine Start (TDES) The End LED lights when the controller closes the engine start contact, signaling the generator set to start.

Normal to Emergency (TDNE) The End LED lights when TDNE completes its timing cycle.

Emergency to Normal (TDEN) The End LED lights when TDEN completes its timing cycle.

Engine Cooldown (TDEC) The End LED lights when the controller opens the engine start contact, signaling the generator set to shut down.

2.3.4 Accessory Active

The following yellow LEDs indicate accessory status.

Plant Exerciser Lights when the plant exerciser is in operation.

Load Shed Lights when load shedding is active.

Inphase Monitor Lights when the controller is monitoring the sources for phase relationship before transfer. The inphase monitor permits transfer from Emergency to Normal and Normal to Emergency when sources are near synchronization.

Area Protection Lights when the controller is in area protection mode. The controller signals the generator to run and transfers the load to the emergency source while in area protection. When the controller is in area protection mode, it will automatically transfer the load to an available normal source if the emergency source fails.

2.4 Front Panel Controls

2.4.1 Test Switch/Pushbutton

Test Pushbutton Press and hold the test pushbutton to simulate a normal source failure. The Not in Automatic system status LED flashes and a sequence to transfer the load to the emergency source occurs. After the ATS transfers the load to the emergency source, releasing the test pushbutton causes the Not in Automatic system status LED to turn off and a sequence to transfer the load back to the normal source begins.

2.4.2 Programming Mode Switch

NOTE

Keep the Programming Mode switch keys in a safe place to prevent tampering with the transfer switch controller. *DO NOT* leave the programming switch in the Local position with the transfer switch unattended.

The Programming Mode switch is a key-operated switch whose position determines the ATS controller's programming mode.

Remote Monitor status and settings at the local digital display and keypad and monitor and program status and settings using a personal computer (PC) connection.

Off Monitor status and settings using the local digital display and keypad or a PC connection.

Local Monitor and program status and settings from the local digital display and keypad. Monitor status and settings using a PC connection.

2.4.3 Optional Controls

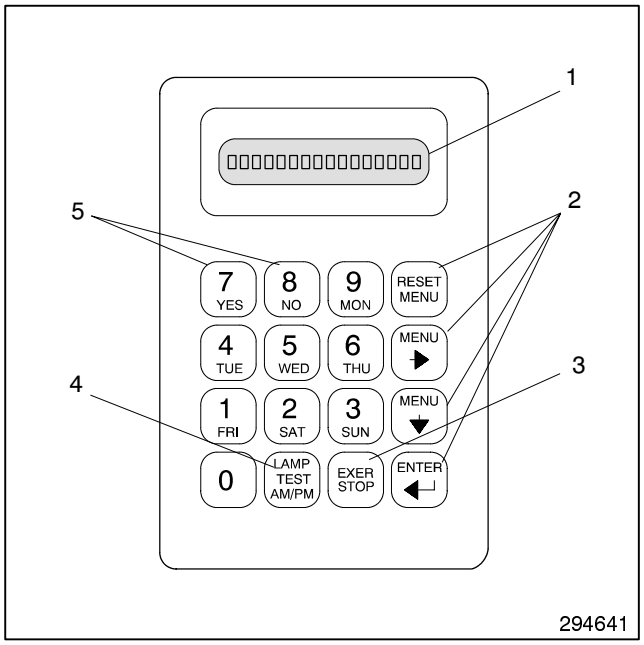
Other controls that may appear on the front panel are optional accessories. See Section 3—Accessories for more information.

Optional Controls

- Two, three, and four-position test switches (KD-6, 7)
- Bypass TDEN and bypass TDNE pushbutton switches (KD-8-C, D)
- Manual operation switches (KD-29)

2.5 Digital Display and Keypad

This section describes viewing and programming ATS status and settings from the digital display and keypad. See Figure 2-2.



1. Digital display
2. Menu keys
3. EXER STOP key
4. LAMP TEST and AM/PM key
5. YES and NO keys

Figure 2-2. Digital Display and Keypad

2.5.1 Keypad

Use the keypad to enter information into the ATS controller.

Digits 0-9 Press when the controller displays a question requiring a numeric answer.

YES, NO Press to answer questions.

MON, TUE, WED, THU, FRI, SAT, SUN Press to enter a day of week into a plant exerciser schedule.

AM/PM Press to toggle between AM and PM to enter the time of day.

LAMP TEST Press the RESET MENU key and then the LAMP TEST key to check the condition of the LEDs and digital display. All LEDs light and all LCD display elements darken briefly during a lamp test.

EXER STOP Press to end the manual one-time plant exerciser. The ATS controller continues to signal the generator set to run until the ATS's TDEC completes timing. The generator may continue to run for an additional period according the the TDEC in the generator set controller.

MENU ↓ The controller allows access to layered menus of data or programming steps. Press the MENU ↓ key to navigate through the menu layers. Press the RESET MENU key to return to the main menu.

NOTE

The MENU ↓ key locks the user into the layers of a given menu. Press the RESET MENU key to access other menus.

MENU → Press to scroll through available menus from the main menu or to access horizontal submenus within the layers of a menu. The right-hand corner of the display contains an arrow when a horizontal submenu exists.

RESET MENU Press to clear error conditions or to exit a menu or any layers within that menu.

ENTER ↵ Press to input information on the display into the controller.

2.5.2 Display Messages

The ATS controller displays messages on a 16 character alphanumerical liquid crystal display (LCD). The following summarizes display messages.

NOTE

Text outside of digital display screen boxes shown in *ITALICS* represents digital display messages.

Right Arrow → Directs the user to submenus within the layers of a menu. Pressing the MENU → key repeatedly loops through the submenus and back to the original starting point in the menu. Some submenus are accessible only in the local programming mode.

Question Mark *?* The controller asks a question; answer the question by pressing the YES, NO, digit 0–9, and/or AM/PM toggle key.

ENTER INDEX 1-13 This message appears after pressing the RESET MENU key and prompts the user to enter a valid index number 1–13.

INDEX NUMBER This message appears after pressing a valid index number and indicates the start of the index menu.

CODE ERROR This message appears after pressing an invalid key. Press the RESET MENU key to clear this error message.

ENTRY ACCEPTED This message appears briefly after entering a valid setting value in the local programming mode.

CHECK KEY-SWITCH This message appears briefly after attempting to access an unavailable menu or submenu or to enter settings when not in the local programming mode. Move the Programming Mode switch to the Local position.

RANGE ERROR This message appears briefly after entering an invalid setting value in the local programming mode. Check the specifications and appendices for valid ranges.

STORE SET-POINTS This message appears briefly after pressing the RESET MENU and then the ENTER keys, indicating that the controller has stored the current settings into nonvolatile memory.

PICK-UP ADJUSTED This message appears briefly when entering normal and emergency dropout setpoints, indicating that the dropout setting entered was less than 2% different from the previous pickup setting and the controller adjusted the pickup setting to be 2% within the dropout setting.

SET TIME & DATE This message appears when the controller is powered up and requires the time and date to be reset in Index 4. See Section 2.12.4.

DISABLED This message appears when a particular accessory is not enabled by the main logic circuit board jumper.

See Appendix C—System Alert Message Summary for system alert display messages.

2.6 Automatic Operation

When the ATS controller is in the automatic mode it determines when a power source is acceptable and responds automatically. See Section 2.7 for an explanation of source acceptability. Generally, a power source has failed (is not acceptable) when the voltage and/or frequency on one or more phases rise or fall outside of preset ranges. Generally, a power source is acceptable when the voltage and/or frequency on all phases rise or fall within preset ranges. A power source is restored when it becomes acceptable after failing. Typical ATS operation is divided into two sequences.

- **Failure of the normal power source** and the resulting transfer to the emergency power source or Emergency.
- **Restoration of the normal power source** and the resulting transfer back to the normal power source or Normal.

The following sections explain these automatic sequences of operation for a standard controller with only a limited number of accessories that could affect the sequence of operation. Because other installed accessories or remote connections can change the sequence of operation given here, review the operation of installed optional accessories and all remote connections to the transfer switch. See Section 3—Accessories and Section 5—Installation.

NOTE

Optional load shedding contacts (accessory KD-35-N) wired to control loads are required for load shed settings to be effective. The controller, however, sequences through all load shed setting time delays regardless of the presence of load shedding contacts on the switch.

2.6.1 Normal Source Failure

The following sequence describes the system response to a normal source failure. See Figure 2-3.

1. The Source Available, Normal LED turns off.
2. The Time Delay Engine Start (TDES) On LED lights to indicate that the time delay is timing.
3. The TDES End LED lights when TDES completes its timing cycle and the controller has closed the engine start contacts to signal the generator engine to start.
4. The Source Available, Emergency LED lights.
5. The Time Delay Normal to Emergency (TDNE) On LED lights to indicate that the time delay is timing.
6. The TDNE End LED lights to indicate that the time delay has completed its timing cycle.
7. The Load Shed LED lights and the switch signals load shedding contacts (if equipped) to disconnect all load blocks. If the normal source has failed completely (voltage or frequency of all sensed phases on the normal source are outside of acceptable ranges) the load shed Time Before Transfer timer is bypassed, otherwise it starts timing. Then, the load shed Time Before Transfer timing cycle completes its timing cycle.
8. If the inphase monitor is enabled, the Inphase Monitor LED lights while the controller monitors the two source voltages for a phase-angle difference approaching zero.
9. The switch transfers the load to the emergency source. The Contactor Position, Normal and the Inphase Monitor LEDs turn off and the Contactor Position, Emergency LED lights.
10. The load shed Time After Transfer timer completes its timing cycle. Then, the switch signals load shedding contacts (if equipped) to return selected shed loads in sequence. The Load Shed LED turns off. All time delay timers are reset and all time delay LEDs are turned off.

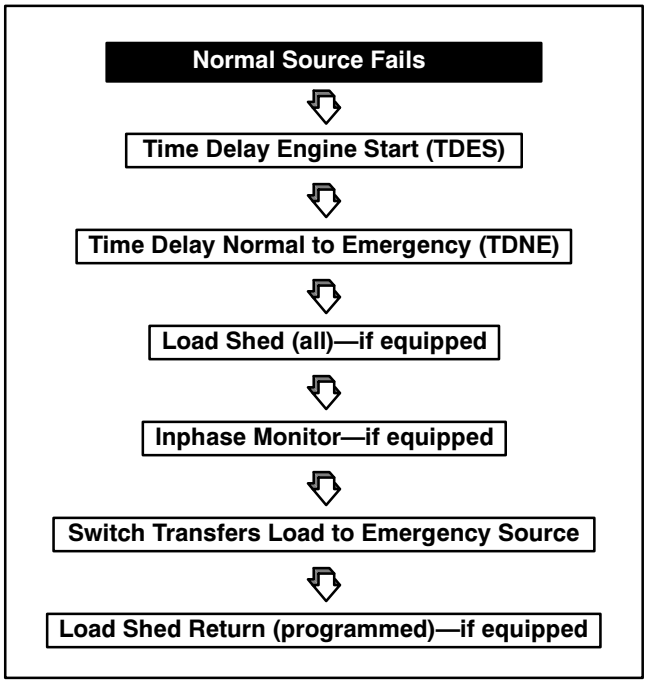


Figure 2-3. ATS Sequence of Operation—Normal Power Failure

2.6.2 Normal Source Restoration

The following sequence describes system response to normal source restoration. See Figure 2-4. In this sequence of operation, if the emergency source fails and the normal source is acceptable, the ATS bypasses all time delays in the sequence and transfers the load immediately to the normal source.

1. The Source Available, Normal LED lights.
2. The Time Delay Emergency to Normal (TDEN) On LED lights, indicating that the time delay is timing.
3. The TDEN End LED lights, indicating that the time delay completed its timing cycle.
4. The Load Shed LED lights and the switch signals load shedding contacts (if equipped) to disconnect all load blocks. The load shed Time Before Transfer timer starts timing. Then, the load shed Time Before Transfer timing cycle ends.
5. If the inphase monitor is enabled, the Inphase Monitor LED lights while the controller monitors the two source voltages for a phase-angle difference approaching zero.
6. The switch transfers the load to the normal source. The Contactor Position, Emergency and the

Inphase Monitor LEDs turn off and the Contactor Position, Normal LED lights.

7. The load shed Time After Transfer timer completes its timing cycle. Then, the switch signals load shedding contacts (if equipped) to return selected shed loads in sequence. The Load Shed LED turns off.
8. The Time Delay Engine Cooldown (TDEC) On LED lights indicating that the generator set engine cooldown timer is timing.
9. The TDEC End LED remains lit until the TDEC timer completes its timing cycle and the controller opens the engine start contacts to signal the generator to shut down. Additional timers on the generator set may keep the generator engine running an additional time period.
10. The Source Available, Emergency LED turns off when the generator set shuts down. All time delay timers are reset and all time delay LEDs are turned off.

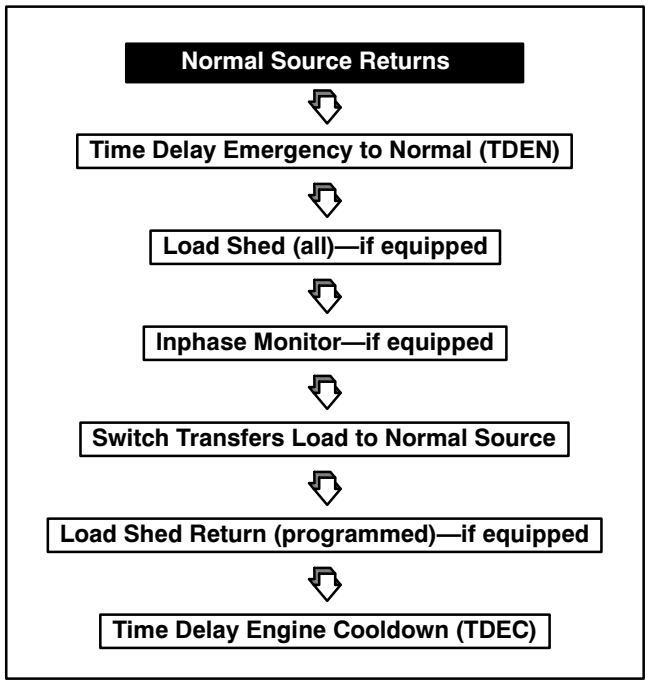


Figure 2-4. ATS Sequence of Operation—Normal Power Restoration

2.7 Source Acceptability

The controller monitors the normal and emergency power sources and determines source acceptability based on factors such as phases sensed, voltage and frequency pickup and dropout settings, and installed accessories. A source has failed when it has become unacceptable.

Phases Sensed The controller can be programmed to sense one phase of the source (phase A-C) or all three phases. Emergency source sensing (accessory KD-5-K) is required for the controller to sense all three phases of the emergency source. The controller applies source acceptability criteria only to sensed phases. Over- and underfrequency conditions are sensed on one phase (A-C) only.

Installed Accessories The controller considers normal and emergency source overvoltage, normal source over- and underfrequency, and emergency source overfrequency setpoints only if voltage and frequency monitoring (accessory KD-34-J) is enabled (see Index 11). If the phase sequence and loss monitoring (accessory KD-34-Z) is enabled (see Index 11), the controller also considers a source to have failed if the phase sequence is not A-B-C or if there is not a 120-degree difference between all phases (indicating a loss of one or more phases) for longer than a fixed time delay. See Figure 2-5. The controller can consider a source restored only when all sensed phases have the correct phase sequence and there is a 120-degree difference between all phases (indicating all phases present.)

Setpoints The controller considers a source to have failed (is not available or acceptable) when its voltage or frequency on any one of the sensed phases rises or falls above or below the dropout setpoints for longer than a fixed time delay. See Figure 2-5. The controller considers a source restored (is available or acceptable) only when its voltage or frequency on all sensed phases rises or falls above or below the pickup setpoints for longer than a fixed time delay. See Figure 2-6.

Condition	Source, Any Sensed Phase	
	Normal (delay 0.5 sec.)	Emergency (delay 2 sec.)
Overvoltage [a]	> N-OV DRO	> E-OV DRO
Undervoltage	< N-UV DRO	< E-UV DRO
Overfrequency [a b]	> N-OF DRO	> E-OF DRO
Underfrequency [b]	< N-UF DRO [a]	< E-UF DRO
Phase sequence [c]	not A-B-C	not A-B-C
Phase loss [c]	$\Delta\theta \neq 120$ deg.	$\Delta\theta \neq 120$ deg.

a Considered only when KD-34-J is enabled (see Index 11)

b Over- and underfrequency sensed on one phase (A-C) only

c Considered only when accessory KD-34-Z is enabled (see Index 11) and accessory KD-5-K is installed

Figure 2-5. Source Failure Criteria

Condition	Source, All Sensed Phases	
	Normal (delay 0.5 sec.)	Emergency (delay 0.5 sec.)
Overvoltage [a]	<= N-OV PKU	<= E-OV PKU
Undervoltage	>= N-UV PKU	>= E-UV PKU
Overfrequency [a b]	<= N-OF PKU	<= E-OF PKU
Underfrequency [b]	>= N-UF PKU [a]	>= E-OF PKU
Phase sequence [c]	A-B-C	A-B-C
Phase loss [c]	$\Delta\theta = 120$ deg.	$\Delta\theta = 120$ deg.

a Considered only when KD-34-J is enabled (see Index 11)

b Over- and underfrequency sensed on one phase (A-C) only

c Considered only when accessory KD-34-Z is enabled (see Index 11) and accessory KD-5-K is installed

Figure 2-6. Source Restoration Criteria

See Section 2.11.6—Index 6 to review setpoints for the normal source. See Section 2.11.7—Index 7 to review setpoints for the emergency source.

2.8 Menu List Summary

The menu list on the following pages is an overview of the various menus that allow monitoring and programming of ATS status and settings. Use the menu list to become familiar with the ATS features and to determine where to view information or view or change settings. The menu list only shows how to change selected settings. Details of each menu selection appear immediately later in two different operating modes: Section 2.11—Monitoring (off or remote programming mode) and Section 2.12—Programming (local programming mode.) Use the Monitoring section to view data and some settings without modifying them. Use the Programming section to view data and program settings.

The information in menu list display boxes shows either default values or typical data displayed at the transfer switch during regular operation when the normal power source is available on all phases and the emergency source is not present (generator not running.) Single-phase examples show a 240-volt, 60-hertz system. Three-phase examples show a 480-volt 60-hertz system. The operator's digital display data may differ because of application differences. The system allows access to some menus and selections only in the local programming mode and with certain system settings or accessories installed or enabled.

The down arrow key ↓ connecting the boxes represents use of the MENU ↓ key to move to the next screen. The right arrow → connecting the boxes represents the use of the MENU → key. In some cases other keys are pressed and are shown next to the lines connecting the display boxes.

A right arrow in the displayed text within the boxes informs the user that submenus are available using the MENU → key. The system allows access to some of these submenus only in the local programming mode.

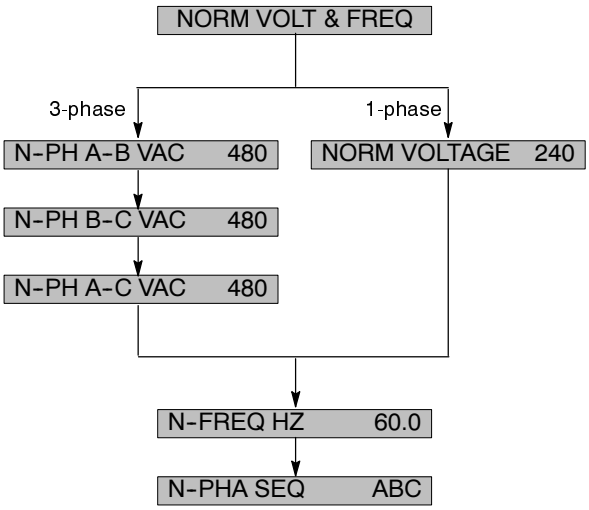
NOTE

Text outside of digital display screen boxes shown in *ITALICS* represents digital display messages.

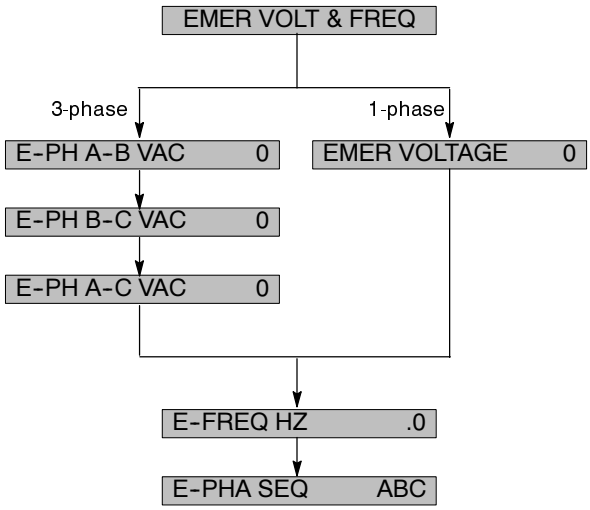
Read and understand Section 2.12—Programming before programming settings. Reprogrammed settings can affect product operation. Use the YES or NO keys to answer questions, or type in numerical data using keys 0–9. Confirm the entry using the ENTER ↵ key. The system responds with *ENTRY ACCEPTED* and returns to the screen with the value changed.

Menu List

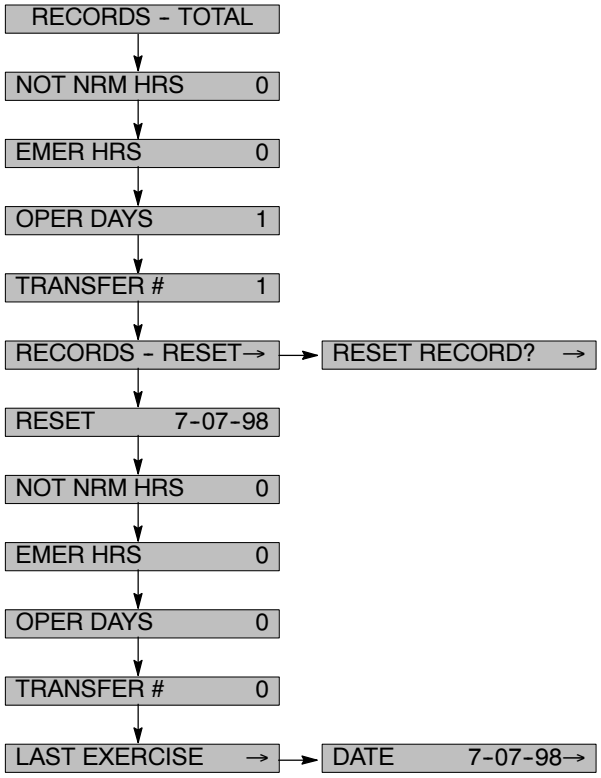
Index 1
Normal Source Voltage and Frequency Metering



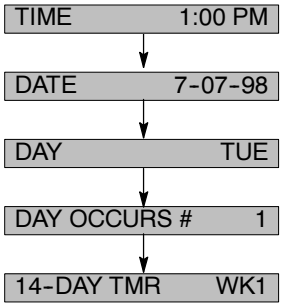
Index 2
Emergency Source Voltage and Frequency Metering



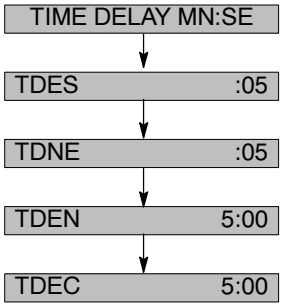
Index 3
Operational Status Records



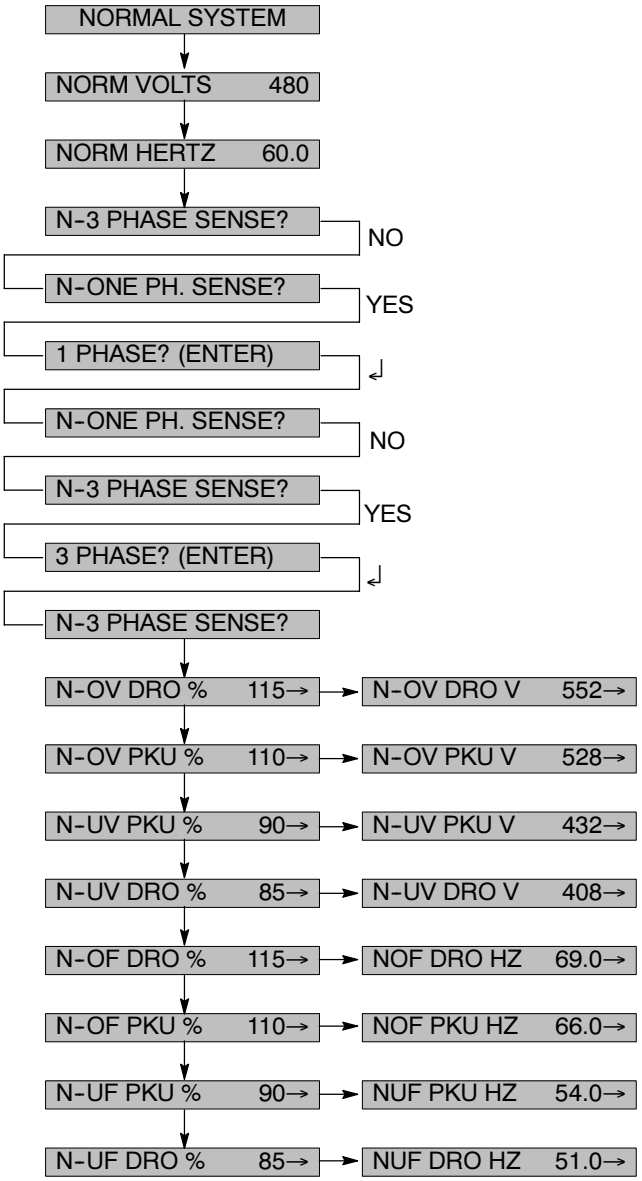
Index 4
Time and Date



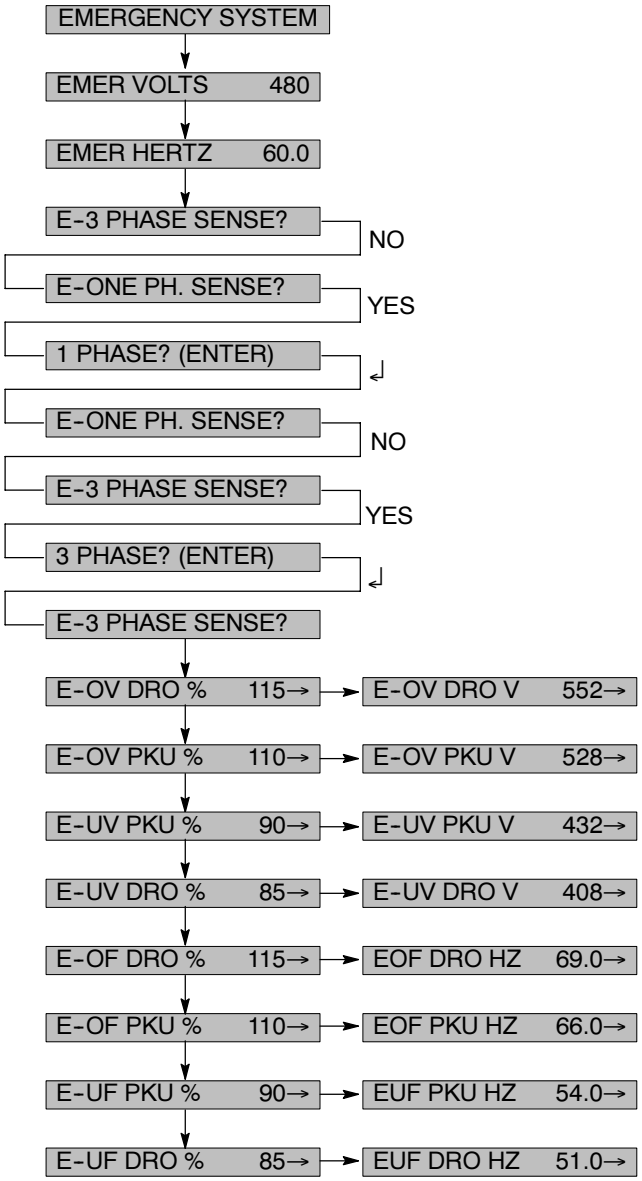
Index 5
Time Delays



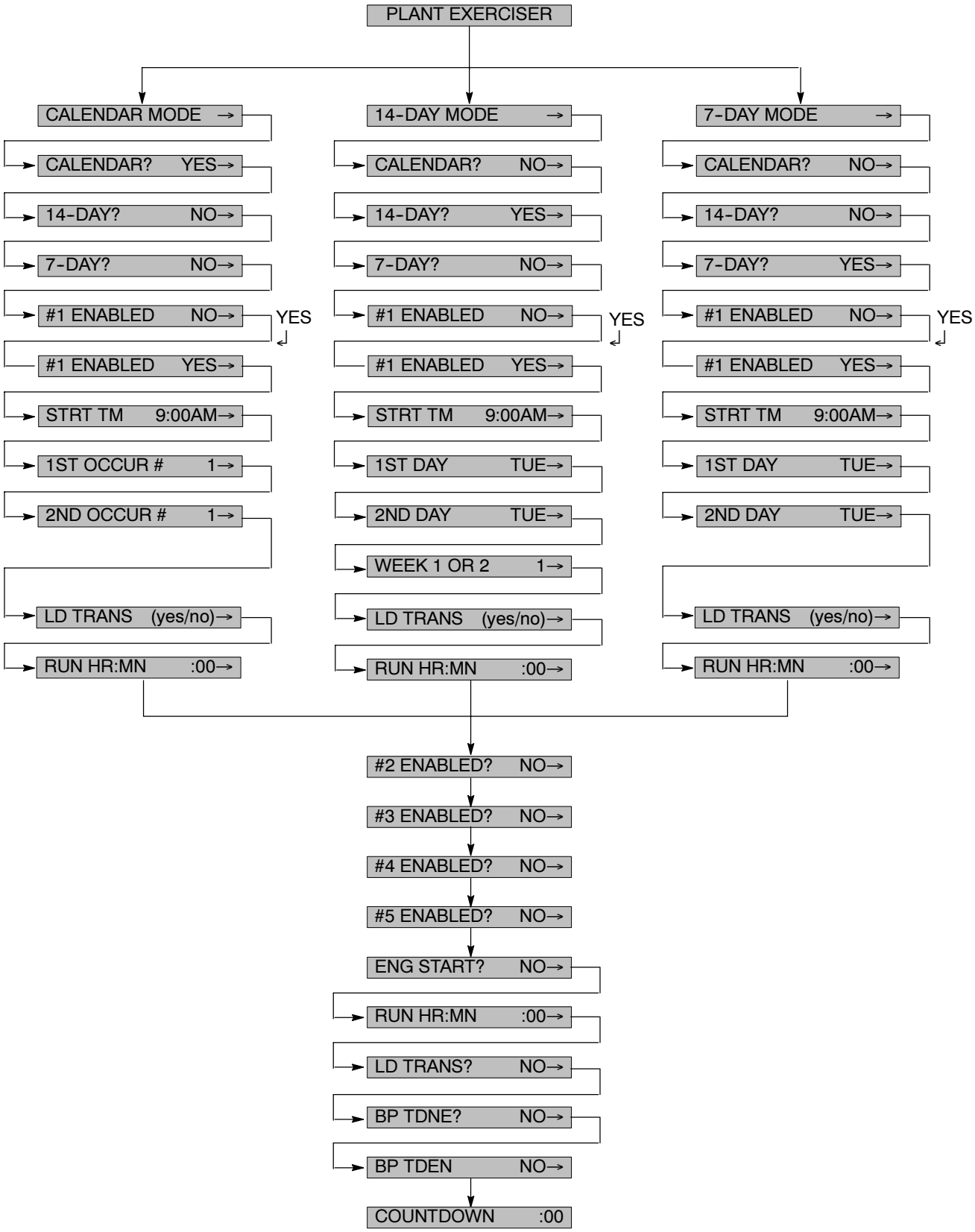
Index 6
Normal Source Voltage and Frequency Settings



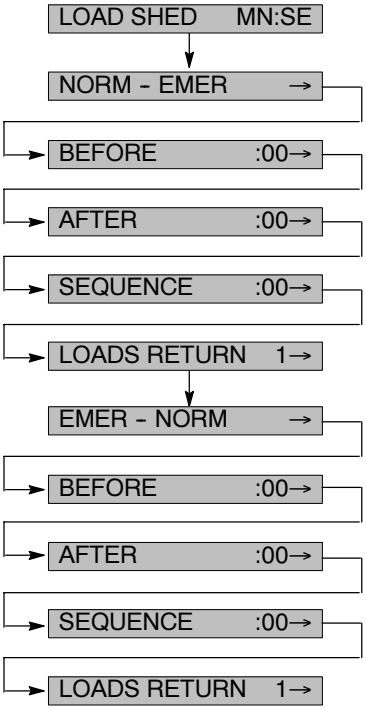
Index 7
Emergency Source Voltage and Frequency Settings



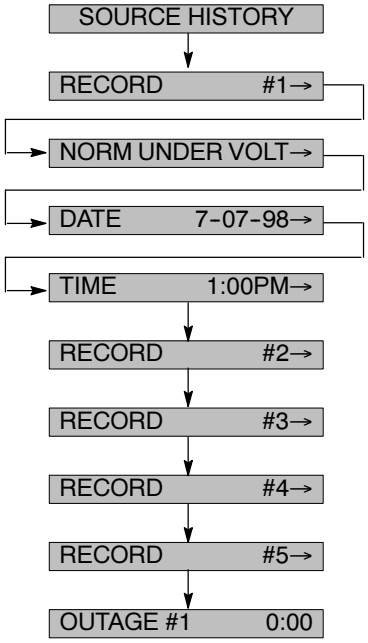
Index 8
Plant Exerciser



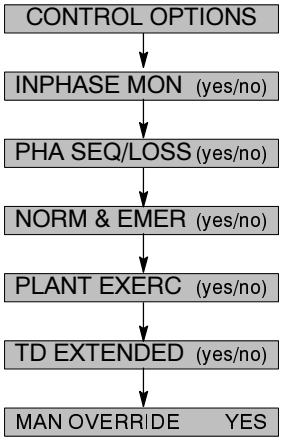
Index 9
Load Shed Settings



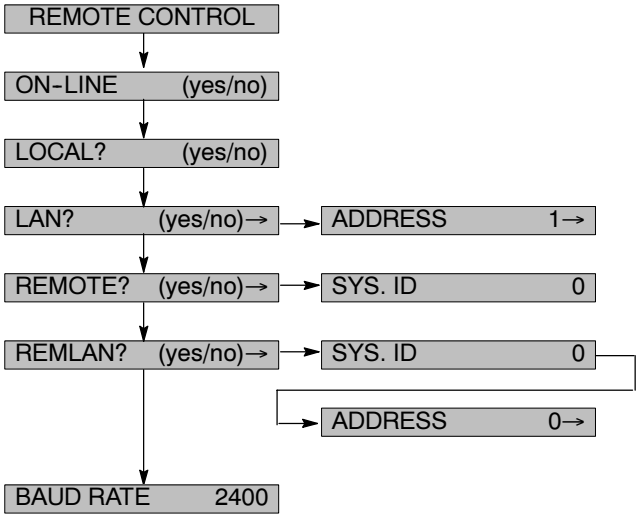
Index 10
Source History



Index 11
Control Options Status



Index 13
Remote Control



2.9 Monitoring and Programming Setup

This section describes setting up the remote control and programming mode for monitoring and programming for local or online PC connections. See Section 2.10 for details about the various online PC connections.

2.9.1 Programming Mode

The ATS controller programming mode (local, remote, or off) is set by the position of the Programming Mode switch on the front control panel. See Section 2.4.2.

2.9.2 Remote Control

Enable and configure remote (PC) communication in Index 13—Remote Control. See Section 2.12.13.

Local Keypad and Display Access To use the local display and keypad for monitoring and programming or exclusively for monitoring, enter the settings provided in Figure 2-7 to disable online PC connections. Program the settings in Index 13—Remote Control and then set the programming mode to off or local. Skip the rest of this section and Section 2.10 if the ATS will not use an online PC connection.

Online Access An online PC connection is local, meaning a direct cable connection, or remote, meaning a connection using a telephone line and modem. It is possible to connect to a single device or a local area network (LAN) of devices, resulting in four PC connection types: local single, local area network, remote single, and remote area network.

Each of the four PC connection types works with or without online programming for a total of eight combinations of settings for online PC connections. The table in Figure 2-8 lists the settings for each combination. While programming settings in Index 13—Remote Control, enter the following additional settings as required. See the operation and installation manual for the Remote Monitoring and Control Communication Software for more information. See List of Related Materials in the Introduction section in this manual.

- **Baud Rate** Set the baud rate to the same value used by the COM port in the Remote Monitoring and Control Communication Software.
- **Network Address** All devices on the same local area network require a unique address 1–128. Assign addresses from 1 to the number of devices on the network. If a network is not used, leave the network address set to the default value of 1.
- **System ID** This value works like a password to allow modem access to software having the correct system ID number. If using modem access, change the default value and record this value in the program configuration screen on the Remote Monitoring and Control Communication Software.

While monitoring the system using an online connection, the user can perform programming locally or disable all programming. See the note at the bottom of Figure 2-8. The local display always allows monitoring regardless of online PC connection settings.

Program the settings for Index 13—Remote Control, and then set the programming mode.

	Index 13—Remote Control					Programming Mode		
User Activity	Online?	Local?	LAN?	Remote?	RemLAN?	Local	Remote	Off
Monitor only	No	—	—	—	—	No	No	Yes
Monitor and Program	No	—	—	—	—	Yes	No	No

— Irrelevant settings.

Figure 2-7. Settings for Using the Local Keypad and Display for Monitoring or Programming

		Index 13—Remote Control					Programming Mode		
User Activity	Connection Type	Online?	Local?	LAN?	Remote?	RemLAN?	Local	Remote	Off
Monitor only	Local Single	Yes	Yes	No	No	No	X	No	X*
	Local Area Network		No	Yes	No	No			
	Remote Single		No	No	Yes	No			
	Remote Area Network		No	No	No	Yes			
Monitor and Program	Local Single		Yes	No	No	No	No	Yes	No
	Local Area Network		No	Yes	No	No			
	Remote Single		No	No	Yes	No			
	Remote Area Network		No	No	No	Yes			
X, X* While monitoring the system using an online connection, set the programming mode to local to program locally or to off to disable all programming.									

Figure 2-8. Settings for Using an Online PC Connection for Monitoring or Programming

2.10 PC Communication Connections

A PC can communicate with one or more generator set controllers, automatic transfer switch controllers, and power monitors. PC connections require the following optional items.

- Remote Monitoring and Control Communication Software for the PC
- A communication module in each device (generator set controller, automatic transfer switch controller, or power monitor)
- Other hardware to connect the devices and the PC

See the operation and installation manual for the Remote Monitoring and Control Communication Software or Controller Communication Kits for details. See List of Related Materials in the Introduction section in this manual.

Use only Kohler® communication products specified for use with Kohler® products. Kohler assumes no responsibility for the use of non-Kohler products.

There are four ways for a PC to communicate with the transfer switch controller: local single connection, local area network, remote single connection, and remote area network.

2.10.1 Local Single

For connections from a PC to one device, such as a transfer switch controller, use a local single connection.

- For distances up to 50 ft. (15.2 m) see Figure 2-9.
- For distances up to 4000 ft. (1220 m) see Figure 2-10.

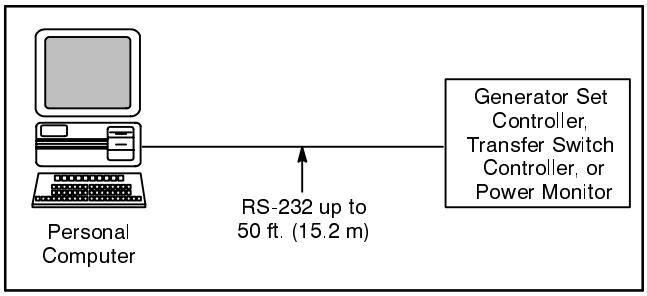


Figure 2-9. Local Single Connection up to 50 Feet (15.2 meters)

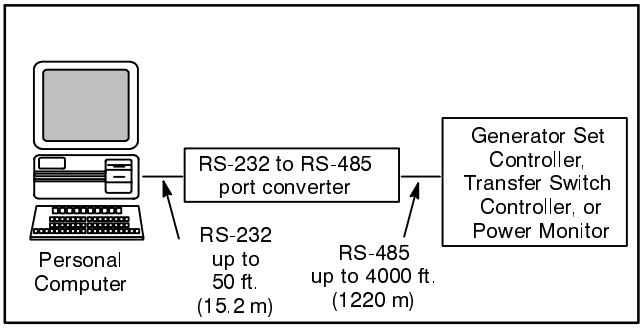


Figure 2-10. Local Single Connection up to 4000 Feet (1220 meters)

2.10.2 Local Area Network

A PC connects to an RS-485 local area network (LAN) of up to 128 devices. Acceptable LAN devices include the Decision-Maker™ 340 controller, M340 and M340+ automatic transfer switch controllers, and PM340 power monitor. See Figure 2-11.

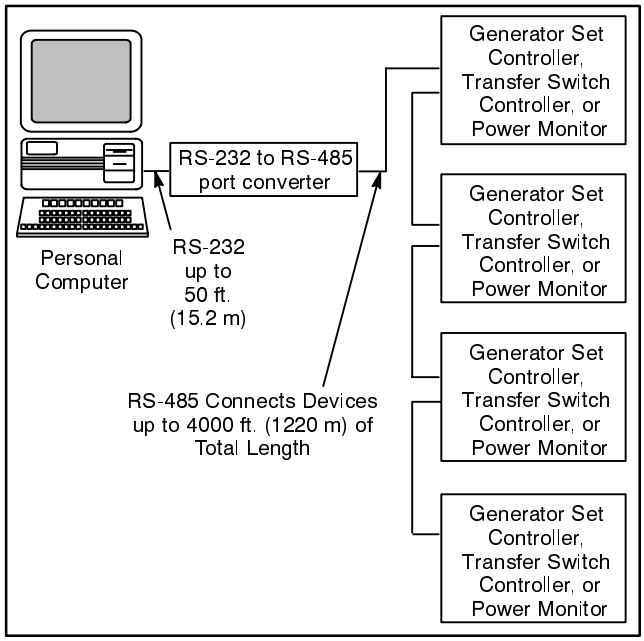


Figure 2-11. Local Area Network

2.10.3 Remote Single

A PC connects to a modem and a single device connects to another modem. The PC communicates to the device using the modems and the telephone network. Locate the PC anywhere a telephone line is available. See Figure 2-12.

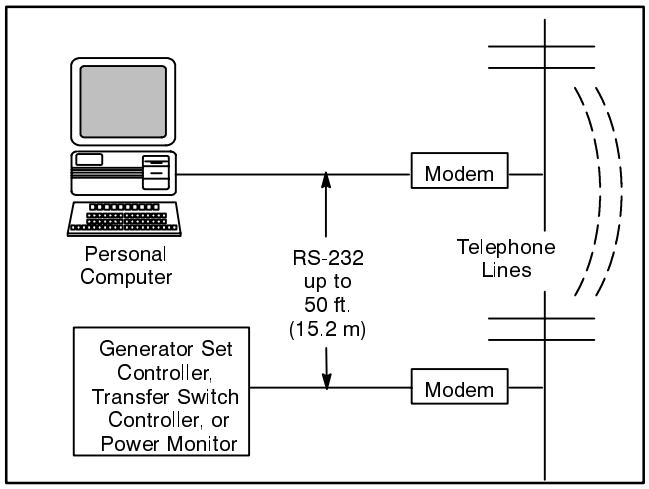


Figure 2-12. Remote Single Connection

2.10.4 Remote Area Network

A PC connects to one modem and up to 128 devices connect to an RS-485 LAN connected to another modem. The PC communicates with the devices via the modems and the telephone network. Locate the PC based on telephone line availability. See Figure 2-13.

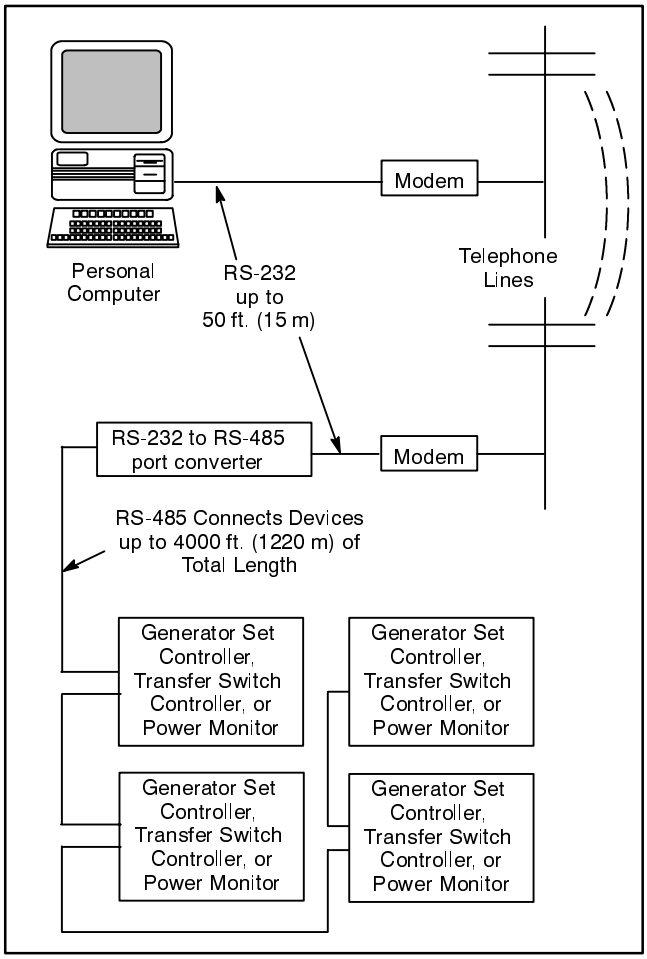


Figure 2-13. Remote Area Network

2.10.5 PC Communication Hardware

The M340 transfer switch controller must have a communication module accessory (accessory KD-51-A or KD-51-B) installed to support PC communication. See Section 3.14.

Notes

2.11 Monitoring (Off or Remote Programming Mode)

Move the Programming Mode switch to the Off or Remote position before using this section. Use this section to monitor the system readings and settings without programming. This section shows readings and settings for a controller with factory default settings unless otherwise noted. The actual digital display data may differ because of application differences.

Text outside of digital display screen boxes shown in *ITALICS* represents digital display messages.

The word OR between groups helps clarify alternatives. The alternative used depends upon the display information or the key to press to perform a certain operation.

CODE ERROR This message appears after pressing an invalid key. Press the RESET MENU key to clear this error message.

CHECK KEY SWITCH This message appears briefly after pressing a key to perform an operation that requires the controller to be in the local programming mode. Move the Programming Mode switch to the Local position to enable the local programming mode. See Section 2.12 for menus in the local programming mode.

- **Index 1—Normal Source Voltage and Frequency Metering** displays normal source voltage, frequency, and phase sequence.
- **Index 2—Emergency Voltage and Frequency Metering** displays emergency source voltage, frequency, and phase sequence.
- **Index 3—Operational Status Records** displays TOTAL and RESET records. TOTAL records are cumulative since factory setup. RESET records are kept since the last reset.
- **Index 4—Time and Date** displays time and date. Displays day and other information for plant exerciser modes.
- **Index 5—Time Delays** displays time delay settings associated with On-End LEDs on the front panel.
- **Index 6—Normal Source Voltage and Frequency Settings** displays normal-source system and setpoint settings that initiate transfer sequences.
- **Index 7—Emergency Source Voltage and Frequency Settings** displays emergency source system and setpoint settings that initiate transfer sequences.
- **Index 8—Plant Exerciser** displays the generator exerciser schedule type selections and settings for scheduled days and times.
- **Index 9—Load Shed Settings** displays settings for the number of load blocks to be shed and/or returned and the time between each load shed and/or return.
- **Index 10—Source History** displays fault status and summaries describing the last four source failures.
- **Index 11—Control Options Status** displays controller shunt/jumper-controlled accessories status.
- **Index 12—Voltage Calibration** displays normal and emergency voltages. Have a local distributor/dealer perform calibration.
- **Index 13—Remote Control** displays connection type and communication settings for monitoring and controlling the transfer switch using a personal computer.

2.11.1 Index 1—Normal Source Voltage and Frequency Metering

Index 1 displays normal source voltage and frequency and phase sequence for a three-phase source if phase sequence is enabled.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
1 FRI	INDEX NUMBER 1	Press 1 to access the Normal Source Voltage and Frequency Metering menu. Press the MENU ↓ key to access menu layers.
MENU ↓	NORM VOLT & FREQ	Displays the top of the Normal Source Voltage and Frequency Metering menu.

Note: Press the ENTER ↵ key at any screen in this index to automatically cycle through the metering screens, briefly pausing to display each screen. To stop this feature, press any key except the ENTER ↵ and EXER STOP keys.

Displays the following when single-phase sensing is selected under Index 6.

MENU ↓	NORM VOLTAGE 0	Normal source voltage (phase A-C).

OR

Displays the following when three-phase sensing is selected under Index 6.

MENU ↓	N-PH A-B VAC 0	Normal source voltage on phase A-B.
MENU ↓	N-PH B-C VAC 0	Normal source voltage on phase B-C.
MENU ↓	N-PH A-C VAC 0	Normal source voltage on phase A-C.

MENU →	IN-PHASE VAC 0	Displays the normal source reference voltage required for inphase transfers.
MENU ↓	N-FREQ HZ .0	Displays the normal source frequency (phase A-C).
MENU ↓	N-PHA SEQ ABC	Displays phase sequence only when three-phase sensing is selected (see Index 6) and when phase sequence and loss monitoring (accessory KD-34-Z) is enabled (see Index 11). Correct phase sequence is A-B-C. A phase sequence of B-A-C indicates the loss of phase sequence, the loss of phase voltage, or a phase sequence that is not A-B-C.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.2 Index 2—Emergency Source Voltage and Frequency Metering

Index 2 displays emergency source voltage and frequency and phase sequence for three-phase sources if phase sequence is enabled.

NOTE

If a generator set is used as the emergency source, the display reads 0 for the voltage and frequency unless the generator engine is running.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
2 SAT	INDEX NUMBER 2	Press 2 to access the Emergency Source Voltage and Frequency Metering menu. Press the MENU ↓ key to access menu layers.
MENU ↓	EMER VOLT & FREQ	Displays the top of the Emergency Source Voltage and Frequency Metering menu.

Note: Press the ENTER ↵ key at any screen in this index to automatically cycle through the metering screens, briefly pausing to display each screen. To stop this feature, press any key except the ENTER ↵ and EXER STOP keys.

Displays the following when single-phase sensing is selected under Index 7.

MENU ↓	EMER VOLTAGE 0	Emergency source voltage (phase A-C).

OR

Displays the following when three-phase sensing is selected under Index 7.

MENU ↓	E-PH A-B VAC 0	Emergency source voltage on phase A-B.
MENU ↓	E-PH B-C VAC 0	Emergency source voltage on phase B-C. **Note:** Displays 0 unless emergency three-phase sensing is installed on the transfer switch.
MENU ↓	E-PH A-C VAC 0	Emergency source voltage on phase A-C. **Note:** Displays 0 unless emergency three-phase sensing (accessory KD-05-K) is installed on the transfer switch.

MENU ↓	E-FREQ HZ .0	Displays the emergency source frequency (phase A-C).
MENU ↓	E-PHA SEQ ABC	Displays phase sequence only when three-phase sensing is selected (see Index 6) and when the phase sequence and loss monitoring (accessory KD-34-Z) is enabled (see Index 11). Correct phase sequence is A-B-C. A phase sequence of B-A-C indicates the loss of phase sequence, the loss of phase voltage, or a phase sequence that is not A-B-C.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.3 Index 3—Operational Status Records

Index 3 displays transfer switch operational status records. The first part of the index *TOTAL* displays cumulative data since factory setup and is normally not resettable. The second part of the index *RESET* displays records since the last reset.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
3 SUN	INDEX NUMBER 3	Press 3 to access the Total and Resettable Records menus. Press the MENU ↓ key to access menu layers.
MENU ↓	RECORDS - TOTAL	Displays the top of the Records Total menu. Total records since factory setup.
MENU ↓	NOT NRM HRS 0	Total hours the transfer switch has not been in the normal position since factory setup.
MENU ↓	EMER HRS 0	Total hours the emergency source has been available including exercise periods since factory setup.
MENU ↓	OPER DAYS 0	Total days that the controller has been energized since factory setup.
MENU ↓	TRANSFER # 0	Total number of transfers in either direction since factory setup.
MENU ↓	RECORDS - RESET→	Displays the top of the Records Resettable menu. Total records since last reset.
MENU →	RESET RECORD? →	Side menu to reset records in local programming mode. **Note:** Resetting records erases the following information useful for maintenance.
MENU ↓	RESET 00-00-00	Date of last record reset.
MENU ↓	NOT NRM HRS 0	Hours the transfer switch has been in the emergency position since last record reset.
MENU ↓	EMER HRS 0	Hours of emergency source availability since last record reset including exercise periods.
MENU ↓	OPER DAYS 0	Days of operation since last record reset.
MENU ↓	TRANSFER # 0	Total number of transfers in either direction since last record reset.
Displays the following when the Plant Exerciser is enabled (see Index 11):		
MENU ↓	LAST EXERCISE →	The date on which the last plant exerciser run started is available by pressing the MENU → key.
MENU →	DATE 00-00-00	The start date of last exercise period.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.4 Index 4—Time and Date

Index 4 displays controller time and date information.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
4 TUE	INDEX NUMBER 4	Press 4 to access the Time and Date menu. Press the MENU ↓ key to access menu layers.
MENU ↓	TIME 1:00 PM	Displays current time-of-day.
MENU ↓	DATE 7-07-98	Displays current month-day-year.
MENU ↓	DAY TUE	Displays current day of week.
MENU ↓	DAY OCCURS # 1	Displays the occurrence number 1-5 for the current day of the week in the current month. If the current day is Tuesday, this screen example displays that it is the first Tuesday of the month. The controller uses the occurrence number in the calendar exercise mode to determine when to exercise the generator set.
MENU ↓	14-DAY TMR WK1	When the 14-day exerciser mode is selected, shows week 1 or 2 of the current 2-week period.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.5 Index 5—Time Delays

Index 5 displays controller time delays. Time delays are shown in minutes and seconds and include the following:

- **TDES.** Time Delay Engine Start
- **TDNE.** Time Delay Normal to Emergency
- **TDEN.** Time Delay Emergency to Normal
- **TDEC.** Time Delay Engine Cooldown

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
5 WED	INDEX NUMBER 5	Press 5 to access the Time Delays menu. Press the MENU ↓ key to access menu layers.
MENU ↓	TIME DELAY MN:SE	Displays the top of the Time Delays menu.

Displays the following time delay settings in minutes:seconds:

MENU ↓	TDES :05	Time Delay Engine Start.
MENU ↓	TDNE :05	Time Delay Normal to Emergency.
MENU ↓	TDEN 5:00	Time Delay Emergency to Normal.
MENU ↓	TDEC 5:00	Time Delay Engine Cooldown.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.6 Index 6—Normal Source Voltage and Frequency Settings

Index 6 displays normal source voltage and frequency system settings and pickup and dropout setpoints.

NOTE

The controller displays and accepts pickup and dropout setpoint settings as percentages of nominal system voltage or frequency. A pickup setpoint must be at least 2% within the dropout setpoint. The settings shown are default settings for the transfer switch and are shown with a 480-volt system voltage and a 60-hertz system frequency.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
6 THU	INDEX NUMBER 6	Press 6 to access the Normal Source Voltage and Frequency Setpoints menu. Press the MENU ↓ key to access menu layers.
MENU ↓	NORMAL SYSTEM	Displays the top of the Normal Source Voltage and Frequency Settings menu.
Displays system settings for the normal source.		
MENU ↓	NORM VOLTS 480	Nominal system voltage for setpoint reference.
MENU ↓	NORM HERTZ 60.0	Nominal system frequency for setpoint reference.
MENU ↓	N-ONE PH. SENSE?	Normal source sensing is single-phase.
OR		
MENU ↓	N-3 PHASE SENSE?	Normal source sensing is three-phase.

Index 6—Normal Source Voltage and Frequency Settings, continued

Key Entry	Display	Description

Normal source pickup and dropout setpoint settings.

Press MENU → at each setpoint to see the setpoint in actual voltage or frequency.

Displays the normal source overvoltage pickup and dropout setpoints.

The following setpoints are available only when voltage and frequency monitoring (accessory KD-34-J) is enabled.

MENU ↓	N-OV DRO % 115→	MENU →	N-OV DRO V 552→	Normal overvoltage dropout setpoint and voltage.
MENU ↓	N-OV PKU % 110→	MENU →	N-OV PKU V 528→	Normal overvoltage pickup setpoint and voltage.

Displays the normal source undervoltage pickup and dropout setpoints.

MENU ↓	N-UV PKU % 90→	MENU →	N-UV PKU V 432→	Normal undervoltage pickup setpoint and voltage.
MENU ↓	N-UV DRO % 85→	MENU →	N-UV DRO V 408→	Normal undervoltage dropout setpoint and voltage.

Displays the normal source frequency pickup and dropout setpoints.

The following setpoints are available only when voltage and frequency monitoring (accessory KD-34-J) is enabled.

MENU ↓	N-OF DRO % 115→	MENU →	NOF DRO HZ 69.0→	Normal overfrequency dropout setpoint and frequency in Hz.
MENU ↓	N-OF PKU % 110→	MENU →	NOF PKU HZ 66.0→	Normal overfrequency pickup setpoint and frequency in Hz.
MENU ↓	N-UF PKU % 90→	MENU →	NUF PKU HZ 54.0→	Normal underfrequency pickup setpoint and frequency in Hz.
MENU ↓	N-UF DRO % 85→	MENU →	NUF DRO HZ 51.0→	Normal underfrequency dropout setpoint and frequency in Hz.

RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.7 Index 7—Emergency Source Voltage and Frequency Settings

Index 7 displays emergency source voltage and frequency system settings and pickup and dropout setpoints.

NOTE

The controller displays and accepts pickup and dropout setpoint settings as percentages of nominal system voltage or frequency A pickup setpoint must be at least 2% within the dropout setpoint. The setpoints shown are default settings for the transfer switch and are shown with a 480-volt system voltage and a 60-hertz system frequency.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
7 YES	INDEX NUMBER 7	Press 7 to access the Emergency Source Voltage and Frequency Settings menu. Press MENU ↓ key to access menu layers.
MENU ↓	EMERGENCY SYSTEM	Displays the top of the Emergency Source Voltage and Frequency Setpoints menu.
Displays system settings for the emergency source.		
MENU ↓	EMER VOLTS 480	Nominal system voltage for setpoint reference.
MENU ↓	EMER HERTZ 60.0	Nominal system frequency for setpoint reference.
MENU ↓	E-ONE PH. SENSE?	Emergency source sensing is single-phase.
OR		
MENU ↓	E-3 PHASE SENSE?	Emergency source sensing is three-phase.

Index 7—Emergency Source Voltage and Frequency Settings, continued

Key Entry	Display	Description

Emergency source pickup and dropout setpoint settings.

Press MENU → at each setpoint to see setpoint in actual voltage or frequency.

Displays the emergency source overvoltage pickup and dropout setpoints.

The following setpoints are available only when voltage and frequency monitoring (accessory KD-34-J) is enabled.

MENU ↓	E-OV DRO % 115→	MENU →	E-OV DRO V 552→	Emergency overvoltage dropout setpoint and voltage.
MENU ↓	E-OV PKU % 110→	MENU →	E-OV PKU V 528→	Emergency overvoltage pickup setpoint and voltage.

Displays the emergency source undervoltage pickup and dropout setpoints.

MENU ↓	E-UV PKU % 90→	MENU →	E-UV PKU V 432→	Emergency undervoltage pickup setpoint and voltage.
MENU ↓	E-UV DRO % 85→	MENU →	E-UV DRO V 408→	Emergency undervoltage dropout setpoint and voltage.

Displays the emergency source frequency pickup and dropout setpoints.

The following setpoints are available only when voltage and frequency monitoring (accessory KD-34-J) is enabled.

MENU ↓	E-OF DRO % 115→	MENU →	EOF DRO HZ 69.0→	Emergency overfrequency dropout setpoint and frequency in Hz.
MENU ↓	E-OF PKU % 110→	MENU →	EOF PKU HZ 66.0→	Emergency overfrequency pickup setpoint and frequency in Hz.
MENU ↓	E-UF PKU % 90→	MENU →	EUF PKU HZ 54.0→	Emergency underfrequency pickup setpoint and frequency in Hz.
MENU ↓	E-UF DRO % 85→	MENU →	EUF DRO HZ 51.0→	Emergency underfrequency dropout setpoint and frequency in Hz.
RESET MENU	ENTER INDEX 1-13			Press the RESET MENU key to return to the main menu and access another index.

2.11.8 Index 8—Plant Exerciser

Index 8 displays plant exerciser settings when the plant exerciser (accessory KD-23) is enabled. This index also displays settings and status of the manual one-time plant exerciser.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
8 NO	INDEX NUMBER 8	Press 8 to access the Plant Exerciser menu if the plant exerciser (accessory KD-23) is enabled. Press MENU ↓ key to access menu layers. The controller displays *DISABLED* if the Plant Exerciser is disabled.
MENU ↓	PLANT EXERCISER	Displays the top of the Plant Exerciser menu.

Displays exerciser mode either Calendar, 14-day, or 7-day. See Section 2.12.8 (local programming mode) for plant exerciser mode details.

MENU ↓	CALENDAR MODE →	
OR		
MENU ↓	14-DAY MODE →	
OR		
MENU ↓	7-DAY MODE →	

Displays the exerciser event #1 status.

MENU ↓	#1 ENABLED? NO→	Displays NO (default setting) when exercise event #1 is enabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.
OR		
MENU ↓	#1 ENABLED? YES→	Displays YES when exercise event #1 is disabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.

Key Entry	Display	Description

Displays exerciser event #1 settings.

Note: Setting descriptions assume that exerciser event #1 is enabled.

MENU → `STRT TM 9:00AM` — Displays exercise period start time for event #1. Default setting is 9:00 AM.

Calendar mode.

MENU → `DAY OF WEEK TUE→` — Displays first day of event #1 when system is to exercise. Default setting is TUE (Tuesday).

MENU → `1ST OCCUR # 1→` — Displays occurrence number of day for first exercise run of event #. Default setting is 1 (first TUEsday of month).

MENU → `2ND OCCUR # 1→` — Displays occurrence number of day for second exercise run of event. Default setting is 1 (first TUEsday of month).

OR

7- or 14-day modes.

MENU → `1ST DAY TUE→` — Displays day of week for first exercise run of event #1. Default setting is TUE (Tuesday).

MENU → `2ND DAY TUE→` — Displays day of week for second exercise run of event #1. Default setting is TUE (Tuesday).

`WEEK 1 OR 2 1` — **14-day mode only.** Displays week 1 or 2 of 14-day period for event #1. See Index 4 for current week of 14-day period. Default setting is week 1.

MENU → `RUN HR:MN :00→` — Displays length of run time (default is zero) set for each exercise run in hours:minutes for event #1.

MENU → `LD TRANS NO→` — Displays NO when the load is not transferred to the emergency source during the exercise run. Displayed when the transfer switch is equipped with accessory KD-23-C or accessory KD-23-G with the Load/No Load selector switch in the NO LOAD position.

OR

MENU → `LD TRANS YES→` — Displays YES when the load is transferred to an acceptable emergency source during the exercise run. Displayed when the transfer switch is equipped with accessory KD-23-D or accessory KD-23-G with the Load/No Load selector switch in the LOAD position.

Index 8—Plant Exciser, continued

Key Entry	Display	Description
Displays exciser event #2-5 status. Press the MENU → key to view exciser event #2-5 settings.		
MENU	#2 ENABLED? NO→	Displays NO (default setting) when exercise event #2 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.
OR		
MENU	#2 ENABLED? YES→	Displays YES when exercise event #2 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.
MENU	#3 ENABLED? NO→	Displays NO (default setting) when exercise event #3 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.
OR		
MENU	#3 ENABLED? YES→	Displays YES when exercise event #3 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.
MENU	#4 ENABLED? NO→	Displays NO (default setting) when exercise event #4 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.
OR		
MENU	#4 ENABLED? YES→	Displays YES when exercise event #4 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.
MENU	#5 ENABLED? NO→	Displays NO (default setting) when exercise event #5 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.
OR		
MENU	#5 ENABLED? YES→	Displays YES when exercise event #5 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.

Key Entry	Display	Description

One-time manual plant exerciser.

Displays the settings for the manual one-time plant exerciser. The manual one-time plant exerciser starts and runs the generator set loaded or unloaded regardless of the type of plant exerciser mode or schedule selected, the Plant Exerciser accessory type, and/or the position of the optional Load/No Load selector switch. The manual one-time plant exerciser also provides a provision to bypass TDNE and TDEN time delays to allow the operator to shorten the duration of the exercise sequence without changing time delay settings.

MENU ↓ — `ENG START? NO→` — Displays NO when the one-time exercise is disabled. The Plant Exerciser LED is off.

OR

MENU ↓ — `ENG START? YES→` — Displays YES when the one-time exercise is enabled. The Plant Exerciser LED lights.

Note: Press the EXER STOP key to stop the exerciser run. The ATS runs the generator set for TDEC before signaling the generator set to shut down.

Note: The one-time exercise settings reset to :00/NO after an engine-start run sequence completes or the EXER STOP key is pressed.

MENU → — `RUN HR:MN :00→` — Displays length of run time (default 0) for the one-time exercise up to 72:00 hours:minutes.

MENU → — `LD TRANS NO→` — Displays NO (default setting) when the controller does not transfer the load to the emergency source during the one-time exercise.

OR

MENU → — `LD TRANS YES→` — Displays YES when the controller transfers the load to an acceptable emergency source during the one-time exercise.

MENU → — `BP TDNE? NO→` — Displays NO (default setting) when TDNE runs in the transfer sequence during the one-time exerciser.

OR

MENU → — `BP TDNE? YES→` — Displays YES when TDNE is bypassed in the transfer sequence during the one-time exerciser.

MENU → — `BP TDEN? NO→` — Displays NO (default setting) when TDEN runs in the transfer sequence during the one-time exercise.

OR

MENU → — `BP TDEN? YES→` — Displays YES when TDEN is bypassed in the transfer sequence during the one-time exercise.

MENU ↓ — `COUNTDOWN :00` — Displays the time remaining in the one-time exercise in hours:minutes.

RESET MENU — `ENTER INDEX 1-13` — Press the RESET MENU key to return to the main menu and access another index.

2.11.9 Index 9—Load Shed Settings

Index 9 displays load shed settings including the time delays before and after, normal-to-emergency transfer, and emergency-to-normal transfer. The sequence timing and number of loads to be shed and returned are also shown.

NOTE

Optional load shedding contacts (accessory KD-35-N) wired to control loads are required for load shed settings to be effective. The controller, however, sequences through all load shed setting time delays regardless of the presence of load shedding contacts on the switch.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
9 MON	INDEX NUMBER 9	Press 9 to access the Load Shed menu. Press the MENU ↓ key to access menu layers.
MENU ↓	LOAD SHED MN:SE	Displays the top of the Load Shed Settings menu. Load shed times are shown in minutes:seconds before and after transfer. See Appendix D for standard and extended setting ranges.
Load shed settings for transfers from Normal to Emergency.		
MENU ↓	NORM - EMER →	Press the MENU → key to view load shed settings for normal-to-emergency transfers.
MENU →	BEFORE :00→	Displays time that all 9 load blocks are shed in minutes:seconds after TDNE ends before the start of the transfer to emergency.
MENU →	AFTER :00→	Displays time, in minutes:seconds, after transfer to emergency that all 9 load blocks remain shed.
MENU →	SEQUENCE :00→	Displays the sequence time in minutes:seconds between reconnection of load blocks from block 1 to a maximum number (see next screen). If the sequence time is :00, the load blocks are reconnected immediately.
MENU →	LOADS RETURN 9→	Displays the maximum number of loads up to 9 reconnected in a timed sequence. Load blocks above this number remain shed when the switch is in the emergency position.
Load shed settings for transfers from Emergency to Normal.		
MENU ↓	EMER - NORM →	Press the MENU → key to view load shed settings for emergency-to-normal transfers.
MENU →	BEFORE :00→	Displays time that all 9 load blocks are shed in minutes:seconds after TDEN ends before the start of the transfer to normal.
MENU →	AFTER :00→	Displays time, in minutes:seconds, after transfer to normal that all 9 load blocks remain shed.
MENU →	SEQUENCE :00→	Displays the sequence time in minutes:seconds between reconnection of load blocks from block 1 to a maximum number (see next screen). If the sequence time is :00, the load blocks are reconnected immediately.
MENU →	LOADS RETURN 9→	Displays the maximum number of loads up to 9 reconnected in a timed sequence. Load blocks above this number remain shed when the switch is in the normal position.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.10 Index 10—Source History

Index 10 displays the source, type, and date of the four most recent source failures. A manual test at the transfer switch records as a normal source failure.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
1 FRI, 0	INDEX NUMBER 10	Press 10 to access the Source History menu. Press the MENU ↓ key to access menu layers.
MENU ↓	SOURCE HISTORY	Displays the top of the Source History menu.
MENU ↓	RECORD #1→	Press the MENU → key to view a description of the most recent failure.
MENU →	EMER UNDER FREQ	Displays a message indicating the type of source failure. See Appendix B for a list of source failure messages. This example shows an EMERgency UNDER FREQuency shutdown.
MENU →	DATE 7-15-98→	Month, date, and year of failure.
MENU →	TIME 1:00PM	Time of day of failure.
MENU ↓	RECORD #2→	Press the MENU → key to view a description of the second-most-recent failure.
MENU ↓	RECORD #3→	Press the MENU → key to view a description of the third-most-recent failure.
MENU ↓	RECORD #4→	Press the MENU → key to view a description of the fourth-most-recent failure.
MENU ↓	OUTAGE #1 00:00	Displays time elapsed during most recent source outage or fault (hours:minutes for record #1 only). Resets to zero after 24 hours.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.11 Index 11—Control Options Status

Index 11 displays the shunt/jumper-controlled accessories status. See Section 3.2 for more information on shunt/jumper-controlled accessories.

NOTE

Shunt/jumper-controlled accessories are enabled by hardware shunt/jumpers and cannot be enabled or disabled from the keypad.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
1 FRI, 1 FRI	INDEX NUMBER 11	Press 11 to access the Control Options Status menu. Press the MENU ↓ key to access menu layers.
MENU ↓	CONTROL OPTIONS	Displays the top of the Control Options Status menu.
MENU ↓	INPHASE MON NO	Displays YES when the inphase monitor (accessory KD-34-A) is disabled.
OR		
MENU ↓	INPHASE MON YES	Displays NO when the inphase monitor (accessory KD-34-A) is enabled.
MENU ↓	PHA SEQ/LOSS NO	Displays NO when phase sequence and loss source monitoring (accessory KD-34-Z) is disabled.
OR		
MENU ↓	PHA SEQ/LOSS YES	Displays YES when phase sequence and loss monitoring (accessory KD-34-Z) is enabled.
MENU ↓	NORM & EMER NO	Displays NO when voltage and frequency monitoring (accessory KD-34-J) is disabled.
OR		
MENU ↓	NORM & EMER YES	Displays YES when voltage and frequency monitoring (accessory KD-34-J) is enabled.
MENU ↓	PLANT EXERC NO	Displays NO when the plant exerciser (accessory KD-23) is disabled.
OR		
MENU ↓	PLANT EXERC YES	Displays YES when the plant exerciser (accessory KD-23) is enabled.
MENU ↓	TD EXTENDED NO	Displays NO when extended time delay (accessory KD-100-B) is disabled.
OR		
MENU ↓	TD EXTENDED YES	Displays YES when extended time delay (accessory KD-100-B) is enabled.

Index 11—Control Options Status, continued

Key Entry	Display	Description
MENU ▼	MAN OVERRIDE NO	Displays NO when the manual override (accessory KD-29) is disabled.
OR		
MENU ▼	MAN OVERRIDE YES	Displays YES when the manual override (accessory KD-29) is enabled.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.12 Index 12—Voltage Calibration

Index 12 displays the same voltages as Index 1 and Index 2. The transfer switch is factory calibrated to its rated system voltage and requires no user calibration. Calibrate should only be necessary after some types of servicing, when applying the transfer switch at a different system voltage, or when the controller displays readings that differ from those obtained by equipment calibrated to accepted electrical industry standards by an amount exceeding specifications.

NOTE

Have trained and qualified personnel from a local distributor/dealer perform calibration.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
1 FRI, 2 SAT	INDEX NUMBER 12	Press 12 to access the Voltage Calibration menu. Press the MENU ↓ key to access menu layers.
MENU ↓	CALIBRATION	Displays the top of the Voltage Calibration menu.
MENU ↓	N-AUTO-ZERO ?	Displays the autozero option used to calibrate the ATS for zero normal source voltage.

Displays the following voltages when single-phase sensing is selected under Index 6.

MENU ↓	N-VOLT VAC 000	Normal source voltage (phase A-C).

OR

Displays the following voltages when three-phase sensing is selected under Index 6.

MENU ↓	N-PH A-B VAC 0	Normal source voltage on phase A-B.
MENU ↓	N-PH B-C VAC 0	Normal source voltage on phase B-C.
MENU ↓	N-PH A-C VAC 0	Normal source voltage on phase A-C.

Index 12—Voltage Calibration, continued

Key Entry	Display	Description
MENU	E-AUTO-ZERO ?	Displays the autozero option used to calibrate the ATS for zero emergency source voltage.

Displays the following voltages when single-phase sensing is selected under Index 6.

MENU	E-VOLT VAC 000	Emergency source voltage (phase A-C).

OR

Displays the following voltages when three-phase sensing is selected under Index 6.

MENU	E-PH A-B VAC 0	Emergency source voltage on phase A-B.
MENU	E-PH B-C VAC 0	Emergency source voltage on phase B-C.
MENU	E-PH A-C VAC 0	Emergency source voltage on phase A-C.

RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.11.13 Index 13—Remote Control

Index 13 displays remote monitoring and control connection information for online PC connections. See Section 2.12.13—Remote Control (local programming mode) to change and access all remote control information. Refer to the operation and installation manual for the Remote Monitoring and Control Communication Software for details on remote monitoring and control.

NOTE

There are four remote monitoring and control connection types: local single, local area network, remote single, and remote area network. The display shows only one of these connection types enabled (*YES*) and shows the other three disabled (*NO*).

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
1 FRI, 3 SUN	INDEX NUMBER 13	Enter 13 to access the Remote Control menu. Press the MENU ↓ key to access menu layers.
MENU ↓	REMOTE CONTROL	Displays the top of the Remote Control menu.
Displays online status.		
MENU ↓	ON-LINE? NO	Monitoring and control by a PC connection disabled. The remaining items on this menu are irrelevant.
OR		
MENU ↓	ON-LINE? YES	Monitoring and control by a PC connection enabled. Press the MENU ↓ key to access more PC connection information.
Displays local single connection status.		
MENU ↓	LOCAL? NO	Monitoring and control by a local (direct) PC connection to a single device disabled.
OR		
MENU ↓	LOCAL? YES	Monitoring and control by a local (direct) PC connection to a single device enabled.
Displays local area network connection status and settings.		
MENU ↓	LAN? NO→	Monitoring and control by a local (direct) PC connection to a local area network (LAN) of devices disabled.
OR		
MENU ↓	LAN? YES→	Monitoring and control by a local (direct) PC connection to a local area network (LAN) of devices enabled.
MENU →	ADDRESS 1→	Displays the controller Address 1-128 on the LAN.

Index 13—Remote Control, continued

Key Entry	Display	Description
Displays remote single connection status and settings.		
MENU ▼	REMOTE? NO→	Monitoring and control by a remote (via modem) PC connection to a single device disabled.
OR		
MENU ▼	REMOTE? YES→	Monitoring and control by a remote (via modem) PC connection to a single device enabled.
MENU ▶	SYS. ID 0	Displays the System ID, a password for remote (via modem) PC connections.
Displays remote area network connection status and settings.		
MENU ▼	REMLAN? NO→	Monitoring and control by a remote (via modem) PC connection to a local area network (LAN) of devices disabled.
OR		
MENU ▼	REMLAN? YES→	Monitoring and control by a remote (via modem) PC connection to a local area network (LAN) of devices enabled.
MENU ▶	SYS. ID 0	Displays the System ID, a password for remote (via modem) PC connections.
MENU ▶	ADDRESS 1→	Displays the controller Address 1–128 on the LAN.
Displays the baud rate.		
MENU ▼	BAUD RATE 9600	Indicates active baud rate.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.12 Programming (Local Programming Mode)

Move the Programming Mode switch to the Local position before using this section. Each menu in this section contains a step-by-step procedure for programming the transfer switch controller. See Section 1—Features and the appendices at the back of this manual for setting ranges, defaults, and setup worksheets. This section shows readings and settings for a controller with factory default settings unless otherwise noted, the actual digital display data may differ because of application differences.

Read and understand this section before attempting any programming. Factory settings are adjustable, and inadvertent changes may affect equipment operation. Do not operate the transfer switch in the local programming mode unless there is a need to edit programming. Limit programming responsibilities to individuals with training and authority. Move the Programming Mode switch to the Remote or Off position when viewing transfer switch data and previously programmed information and when there is no need to perform programming.

Text outside of digital display screen boxes shown in *ITALICS* represents digital display messages.

The word OR between groups help clarify alternatives. The alternative used depends upon the display information or the key to press to perform a certain operation.

CODE ERROR This message appears after pressing an invalid key. Press the RESET MENU key to clear this error message.

RANGE ERROR This message appears briefly after entering an invalid setting value in the local programming mode. Check the specifications for valid ranges.

STORE SET-POINTS This message appears briefly after the RESET MENU then the ENTER ↲ keys are pressed and means that the controller has stored current settings into nonvolatile memory.

PICK-UP ADJUSTED This message appears briefly after entering normal and emergency dropout setpoints that are less than 2% different than the previous pickup setpoint and indicates that the controller automatically adjusted the pickup setpoint to be 2% within the dropout setpoint.

Press the RESET MENU key and then press the ENTER ↲ key after making changes to settings on the transfer switch controller to ensure that the settings are stored in the controller's nonvolatile memory.

- **Index 1—Normal Source Voltage and Frequency Metering** displays normal source voltage, frequency, and phase sequence.
- **Index 2—Emergency Voltage and Frequency Metering** displays emergency source voltage, frequency, and phase sequence.
- **Index 3—Operational Records** displays TOTAL records and RESET records. TOTAL records are cumulative since factory setup. RESET records are kept since last reset. Permits clearing of RESET records.
- **Index 4—Time and Date** displays and permits changes to time and date. Displays day and other information for plant exerciser modes.
- **Index 5—Time Delays** displays and permits changes to time delay settings associated with On-End LEDs on the front panel.
- **Index 6—Normal Source Voltage and Frequency Settings** displays and permits changes to normal-source system and setpoint settings that initiate transfer sequences.
- **Index 7—Emergency Source Voltage and Frequency Settings** displays and permits changes to emergency-source trip point settings that initiate a transfer sequence.
- **Index 8—Plant Exerciser** displays and permits changes to the generator exerciser schedule type selections and settings for scheduled days and times. Allows setup and initiation of manual one-time plant exerciser.
- **Index 9—Load Shed Settings** displays and permits changes to settings for the number of load blocks to be shed and/or returned and the time between each load shed and/or return.
- **Index 10—Source History** displays fault status and summaries describing the last four source failures.
- **Index 11—Control Options Status** displays controller shunt/jumper-controlled accessories status.
- **Index 12—Voltage Calibration** is used to field calibrate the normal and emergency voltage source sensing. Have a local distributor/dealer perform calibration.
- **Index 13—Remote Control** displays and permits changes to connection type and communication settings for monitoring and controlling the transfer switch using a personal computer.

2.12.1 Index 1—Normal Source Voltage and Frequency Metering

Index 1 displays normal source voltage and frequency and phase sequence for a three-phase source if phase sequence is enabled. There are no alterable data or settings in this menu.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
1 FRI	INDEX NUMBER 1	Press 1 to access the Normal Source Voltage and Frequency Metering menu. Press the MENU ↓ key to access menu layers.
MENU ↓	NORM VOLT & FREQ	Displays the top of the Normal Source Voltage and Frequency Metering menu.

Note: Press the ENTER ↵ key at any screen this index and the controller automatically cycles through the metering screens, briefly pausing to display each screen. To stop this feature, press any key except the ENTER ↵ and EXER STOP keys.

Displays the following when single-phase sensing is selected under Index 6.

MENU ↓	NORM VOLTAGE 0	Normal source voltage (phase A-C).

Displays the following when three-phase sensing is selected under Index 6.

MENU ↓	N-PH A-B VAC 0	Normal source voltage on phase A-B.
MENU ↓	N-PH B-C VAC 0	Normal source voltage on phase B-C.
MENU ↓	N-PH A-C VAC 0	Normal source voltage on phase A-C.

MENU →	IN-PHASE VAC 0	Displays the normal source reference voltage required for inphase transfers.
MENU ↓	N-FREQ HZ .0	Displays the normal source frequency (phase A-C).
MENU ↓	N-PHA SEQ ABC	Displays phase sequence only when three-phase sensing is selected (see Index 6) and when the phase sequence and loss monitoring (accessory KD-34-Z) is enabled (see Index 11.) Correct phase sequence is A-B-C. A phase sequence of B-A-C indicates the loss of phase sequence, the loss of phase voltage, or a phase sequence that is not A-B-C.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.12.2 Index 2—Emergency Source Voltage and Frequency Metering

Index 2 displays emergency source voltage and frequency and phase sequence for three-phase sources if phase sequence is enabled. There are no alterable data or settings in this menu.

NOTE

If a generator set is used as the emergency source, the display reads 0 for the voltage and frequency unless the generator engine is running.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
2 SAT	INDEX NUMBER 2	Press 2 to access the Emergency Source Voltage and Frequency Metering menu. Press the MENU ↓ key to access menu layers.
MENU ↓	EMER VOLT & FREQ	Displays the top of the Emergency Source Voltage and Frequency Metering menu.

Note: Press the ENTER ↵ key at any screen in this index to automatically cycle through the metering screens, briefly pausing to display each screen. To stop this feature, press any key except the ENTER ↵ and EXER STOP keys.

Displays the following when single-phase sensing is selected under Index 7.

MENU ↓	EMER VOLTAGE 0	Emergency source voltage (phase A-C).

Displays the following when three-phase sensing is selected under Index 7.

MENU ↓	E-PH A-B VAC 0	Emergency source voltage on phase A-B.
MENU ↓	E-PH B-C VAC 0	Emergency source voltage on phase B-C. Note: Displays 0 unless emergency three-phase sensing (accessory KD-05-K) is installed on the transfer switch.
MENU ↓	E-PH A-C VAC 0	Emergency source voltage on phase A-C. Note: Displays 0 unless emergency three-phase sensing (accessory KD-05-K) is installed on the transfer switch.
MENU ↓	E-FREQ HZ .0	Displays the emergency source frequency (phase A-C).
MENU ↓	E-PHA SEQ ABC	Displays phase sequence only when three-phase sensing is selected (see Index 6) and when the phase sequence and loss monitoring (accessory KD-34-Z) is enabled (see Index 11.) Correct phase sequence is A-B-C. A phase sequence of B-A-C indicates the loss of phase sequence, the loss of phase voltage, or a phase sequence that is not A-B-C.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.12.3 Index 3—Operational Status Records

Index 3 displays transfer switch operational status records. The first part of the index *TOTAL* displays cumulative data since factory setup and is normally not resettable. The second part of the index *RESET* displays records since the last reset to zero and allows the user to reset the *RESET* records to zero.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
3 SUN	INDEX NUMBER 3	Press 3 to access the Operational Status Records menus. Press the MENU ↓ key to access menu layers.
MENU ↓	RECORDS - TOTAL	Displays the top of the Records Total menu. Total records since factory setup.
MENU ↓	NOT NRM HRS 0	Total hours the transfer switch has not been in the normal position since factory setup.
MENU ↓	EMER HRS 0	Total hours the emergency source has been available including exercise periods since factory setup.
MENU ↓	OPER DAYS 0	Total days that the controller has been energized since factory setup.
MENU ↓	TRANSFER # 0	Total number of transfers in either direction since factory setup.
MENU ↓	RECORDS - RESET→	Displays the top of the Records Resettable menu. Total records since last reset.
MENU →	RESET RECORD? →	Press the YES key to erase RESET records. Note: Resetting records erases the following information useful for maintenance.
7 YES	RESET RECORD?YES	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	RESET RECORD? →	RESET records erased (set to zero). Current date recorded.
MENU ↓	RESET 00-00-00	Date of last record reset.
MENU ↓	NOT NRM HRS 0	Hours the transfer switch has been in the emergency position since last record reset.
MENU ↓	EMER HRS 0	Hours of emergency source availability since last record reset including exercise periods.
MENU ↓	OPER DAYS 0	Days of operation since last record reset.
MENU ↓	TRANSFER # 0	Total number of transfers in either direction since last record reset.

Index 3—Operational Status Records, continued

Key Entry	Display	Description
Displays the following when the plant exerciser (accessory KD-23) is enabled (see Index 11).		
MENU ↓	LAST EXERCISE →	The date on which the last plant exerciser run started is available by pressing the MENU → key.
MENU →	DATE 00-00-00	Displays the start date of last exercise period.
RESET MENU, ENTER ↵	STORE SET-POINTS	Press the RESET MENU and then the ENTER↵ key to store setpoints to ensure that changes are retained after controller power interruption.
	ENTER INDEX 1-13	Return to the main menu allows access to another index.

2.12.4 Index 4—Time and Date

Index 4 displays and permits changes to controller time and date information.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
4 TUE	INDEX NUMBER 4	Press 4 to access the Time and Date menu. Press the MENU ↓ key to access menu layers.
MENU ↓	TIME 1:00 PM	Displays current time-of-day. Enter the present time using the numeric keys and the AM/PM key to toggle between AM and PM. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	TIME 12:00 AM	Time-of-day changed.
MENU ↓	DATE 7-07-98	Displays current month-day-year. Enter a new date using the numeric keys. Press the ENTER ↵ key to confirm and return to screen with date and time shown above.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	DATE 7-08-98	Date changed.
MENU ↓	DAY WED	Displays current day of week.
MENU ↓	DAY OCCURS # 2	Displays the occurrence number 1-5 for the current day of the week in the current month. If the current day is Tuesday, this screen example displays that it is the second Tuesday of the month. The controller uses the occurrence number in the calendar exercise mode to determine when to exercise the generator set.
MENU ↓	14-DAY TMR WK1	When the 14-day exerciser mode is selected, shows week 1 or 2 of the current 2-week period.
RESET MENU, ENTER ↵	STORE SET-POINTS	Press the RESET MENU and then the ENTER ↵ key to store setpoints to ensure that changes are retained after controller power interruption.
	ENTER INDEX 1-13	Return to the main menu allows access to another index.

2.12.5 Index 5—Time Delays

Index 5 displays and permits changes to controller time delays. Time delays are shown in minutes and seconds and include the following:

- **TDES.** Time Delay Engine Start
- **TDNE.** Time Delay Normal to Emergency
- **TDEN.** Time Delay Emergency to Normal
- **TDEC.** Time Delay Engine Cooldown

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
5 WED	INDEX NUMBER 5	Press 5 to access the Time Delays menu. Press the MENU ↓ key to access menu layers.
MENU ↓	TIME DELAY MN:SE	Displays the top of the Time Delays menu.

Displays and permits changes to the following time delay settings in minutes:seconds.

MENU ↓	TDES :05	Time Delay Engine Start. Enter a new time delay using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	TDES :10	Time delay changed.
MENU ↓	TDNE :05	Time Delay Normal to Emergency. Enter a new time delay using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	TDNE :10	Time delay changed.
MENU ↓	TDEN 5:00	Time Delay Emergency to Normal. Enter a new time delay using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	TDEN 4:00	Time delay changed.
MENU ↓	TDEC 5:00	Time Delay Engine Cooldown. Enter a new time delay using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	TDEC 10:00	Time delay changed.
RESET MENU, ENTER ↵	STORE SET-POINTS	Press the RESET MENU and then the ENTER↵ key to store setpoints to ensure that changes are retained after controller power interruption.
	ENTER INDEX 1-13	Return to the main menu allows access to another index.

2.12.6 Index 6—Normal Source Voltage and Frequency Settings

Index 6 displays and permits changes to normal source voltage and frequency system settings and pickup and dropout setpoints.

NOTE

The controller displays and accepts pickup and dropout setpoint settings as percentages of nominal system voltage or frequency. A pickup setpoint must be at least 2% within the dropout setpoint. The setpoints shown are default setpoints for a transfer switch with a 480-volt system voltage and a 60-hertz system frequency.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
6 THU	INDEX NUMBER 6	Press 6 to access the Normal Source Voltage and Frequency Settings menu. Press the MENU ↓ key to access menu layers.
MENU ↓	NORMAL SYSTEM	Displays the top of the Normal Source Voltage and Frequency Settings menu.
Displays and permits changes to system settings for the normal source.		
MENU ↓	NORM VOLTS 208	Nominal system voltage for setpoint reference. Use the numeric keys to enter a new voltage. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	NORM VOLTS 480	Nominal system voltage changed.
MENU ↓	NORM HERTZ 50.0	Nominal system frequency for setpoint reference.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	NORM HERTZ 60.0	Nominal system frequency for setpoint reference.
MENU ↓	N-ONE PH. SENSE?	Normal source sensing is single-phase. To change to three-phase press the NO key.
8 NO	N-3 PHASE SENSE?	Then press the YES key.
7 YES	3 PHASE? (ENTER)	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	N-3 PHASE SENSE?	Normal source sensing changed to three-phase.

Key Entry	Display	Description
	OR	
MENU ↓	N-3 PHASE SENSE?	Normal source sensing is three-phase. To change to single-phase press the NO key.
8 NO	N-ONE PH. SENSE?	Then press the YES key.
7 YES	1 PHASE? (ENTER)	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	N-ONE PH. SENSE?	Normal source sensing changed to single-phase.

Normal source pickup and dropout setpoint settings.

Dropout setpoints have priority over pickup setpoints. If a dropout setpoint is entered that is within 2% of a pickup setpoint, the pickup setpoint is adjusted to be within 2% of the dropout setpoint. The controller briefly displays *PICK-UP ADJUSTED* when the adjustment occurs.

Press MENU → at each dropout and pickup setpoint to see the setpoint in actual voltage or frequency.

Displays and permits changes to the normal source overvoltage pickup and dropout setpoints.

The following setpoints are available only when voltage and frequency monitoring (accessory KD-34-J) is enabled.

MENU ↓	N-OV DRO % 115→			Normal overvoltage dropout setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED			System confirms the entry.
	N-OV DRO % 120→	MENU →	N-OV DRO V 576→	Normal overvoltage dropout setpoint and voltage changed.
MENU ↓	N-OV PKU % 110→			Normal overvoltage pickup setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED			System confirms the entry.
	N-OV PKU % 115→	MENU →	N-OV PKU V 552→	Normal overvoltage pickup setpoint and voltage changed.

Index 6—Normal Source Voltage and Frequency Settings, continued

Key Entry	Display	Description

Displays and permits changes to the normal source undervoltage pickup and dropout setpoints.

MENU ↓	N-UV PKU % 90→	Normal undervoltage pickup setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.			
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.			
	N-UV PKU % 85→		MENU →	N-UV PKU V 408→	Normal undervoltage pickup setpoint and voltage changed.
MENU ↓	N-UV DRO % 85→	Normal undervoltage dropout setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.			
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.			
	N-UV DRO % 80→		MENU →	N-UV DRO V 384→	Normal undervoltage dropout setpoint and voltage changed.

Displays and permits changes to the normal source overfrequency pickup and dropout setpoints.

The following setpoints are available only when voltage and frequency monitoring (accessory KD-34-J) is enabled.

MENU ↓	N-OF DRO % 115→	Normal overfrequency dropout setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.			
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.			
	N-OF DRO % 120→		MENU →	NOF DRO HZ 72.0→	Normal overfrequency dropout setpoint and frequency in Hz changed.
MENU ↓	N-OF PKU % 110→	Normal overfrequency pickup setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.			
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.			
	N-OF PKU % 115→		MENU →	NOF PKU HZ 69.0→	Normal overfrequency pickup setpoint and frequency in Hz changed.

Index 6—Normal Source Voltage and Frequency Settings, continued

Key Entry	Display	Description

Displays the normal source underfrequency pickup and dropout setpoints.

The following setpoints are available only when voltage and frequency monitoring (accessory KD-34-J) is enabled.

MENU ▼	N-UF PKU % 90→			Normal underfrequency pickup setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED			System confirms the entry.
	N-UF PKU % 95→	MENU ▶	NUF PKU HZ 57.0→	Normal underfrequency pickup setpoint and frequency in Hz changed.
MENU ▼	N-UF DRO % 85→			Normal underfrequency dropout setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED			System confirms the entry.
	N-UF DRO % 90→	MENU ▶	NUF DRO HZ 54.0→	Normal underfrequency dropout setpoint and frequency in Hz changed.

RESET MENU + ENTER ↵	STORE SET-POINTS	Press the RESET MENU and then the ENTER↵ key to store setpoints to ensure that changes are retained after controller power interruption.
	ENTER INDEX 1-13	Return to the main menu allows access to another index.

2.12.7 Index 7—Emergency Source Voltage and Frequency Settings

Index 7 displays and permits changes to emergency source voltage and frequency system settings and pickup and dropout setpoints.

NOTE

The controller displays and accepts pickup and dropout setpoint settings as percentages of nominal system voltage or frequency. A pickup setpoint must be at least 2% within the dropout setpoint. The setpoints shown are default setpoints for a transfer switch with a 480-volt system voltage and a 60-hertz system frequency.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
7 YES	INDEX NUMBER 7	Press 7 to access the Emergency Source Voltage and Frequency Settings menu. Press the MENU ↓ key to access menu layers.
MENU ↓	EMERGENCY SYSTEM	Displays the top of the Emergency Source Voltage and Frequency Settings menu.
Displays and permits changes to system settings for the emergency source.		
MENU ↓	EMER VOLTS 208	Nominal system voltage for setpoint reference. Use the numeric keys to enter a new voltage. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	EMER VOLTS 480	Nominal system voltage changed.
MENU ↓	EMER HERTZ 50.0	Nominal system frequency for setpoint reference. Use the numeric keys to enter a new frequency. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	EMER HERTZ 60.0	Nominal system frequency for setpoint reference.
MENU ↓	E-ONE PH. SENSE?	Emergency source sensing is single-phase. To change to three-phase press the NO key.
8 NO	E-3 PHASE SENSE?	Then press the YES key.
7 YES	3 PHASE? (ENTER)	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	E-3 PHASE SENSE?	Emergency source sensing changed to three-phase.

Key Entry	Display	Description
	OR	
MENU ↓	E-3 PHASE SENSE?	Emergency source sensing is three-phase. To change to single-phase press the NO key.
8 NO	E-ONE PH. SENSE?	Then press the YES key.
7 YES	1 PHASE? (ENTER)	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	E-ONE PH. SENSE?	Emergency source sensing changed to single-phase.

Emergency source pickup and dropout setpoint settings.

Dropout setpoints have priority over pickup setpoints. If a dropout setpoint is entered that is within 2% of a pickup setpoint, the pickup setpoint is adjusted to be within 2% of the dropout setpoint. The controller briefly displays *PICK-UP ADJUSTED* when the adjustment occurs.

Pressing MENU → at each dropout and pickup setpoint displays the setpoint in actual voltage or frequency.

Displays and permits changes to the emergency source overvoltage pickup and dropout setpoints.

The following setpoints are available only when voltage and frequency monitoring (accessory KD-34-J) is enabled.

MENU ↓	E-OV DRO % 115→			Emergency overvoltage dropout setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED			System confirms the entry.
	E-OV DRO % 120→	MENU →	E-OV DRO V 576→	Emergency overvoltage dropout setpoint and voltage changed.
MENU ↓	E-OV PKU % 110→			Emergency overvoltage pickup setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED			System confirms the entry.
	E-OV PKU % 115→	MENU →	E-OV PKU V 552→	Emergency overvoltage pickup setpoint and voltage changed.

Index 7—Emergency Source Voltage and Frequency Settings, continued

Key Entry	Display	Description

Displays and permits changes to the emergency source undervoltage pickup and dropout setpoints

MENU ▼	E-UV PKU % 90→	Emergency undervoltage pickup setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.			
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.			
	E-UV PKU % 85→		MENU ▶	E-UV PKU V 408→	Emergency undervoltage pickup setpoint and voltage changed.
MENU ▼	E-UV DRO % 85→	Emergency undervoltage dropout setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.			
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.			
	E-UV DRO % 80→		MENU ▶	E-UV DRO V 384→	Emergency undervoltage dropout setpoint and voltage changed.

Displays and permits changes to the emergency source overfrequency pickup and dropout setpoints.

The following setpoints are available only when voltage and frequency monitoring (accessory KD-34-J) is enabled.

MENU ▼	E-OF DRO % 115→	Emergency overfrequency dropout setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.			
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.			
	E-OF DRO % 120→		MENU ▶	EOF DRO HZ 72.0→	Emergency overfrequency dropout setpoint and frequency in Hz changed.
MENU ▼	E-OF PKU % 115→	Emergency overfrequency pickup setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.			
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.			
	E-OF PKU % 110→		MENU ▶	EOF PKU HZ 69.0→	Emergency overfrequency pickup setpoint and frequency in Hz changed.

Index 7—Emergency Source Voltage and Frequency Settings, continued

Key Entry	Display	Description
Displays and permits changes to the emergency source underfrequency pickup and dropout setpoints.		
MENU ▼	E-UF PKU % 90→	Emergency underfrequency pickup setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	E-UF PKU % 95→	
MENU ▶	EUF PKU HZ 57.0→	Emergency underfrequency pickup setpoint and frequency in Hz changed.
MENU ▼	E-UF DRO % 85→	Emergency underfrequency dropout setpoint. Enter a new setpoint using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	E-UF DRO % 90→	
MENU ▶	EUF DRO HZ 54.0→	Emergency underfrequency dropout setpoint and frequency in Hz changed.
RESET MENU + ENTER ↵	STORE SET-POINTS	Press the RESET MENU and then the ENTER↵ key to store setpoints to ensure that changes are retained after controller power interruption.
	ENTER INDEX 1-13	Return to the main menu allows access to another index.

2.12.8 Index 8—Plant Exerciser

Index 8 displays and permits changes to plant exerciser settings when the plant exerciser (accessory KD-23) is enabled. The plant exerciser helps to ensure that the generator starts and runs when the emergency power source is needed by starting the engine and running the generator periodically. Three automatic plant exerciser modes (schedules) are available: calendar, 7-day or 14-day. A provision for manual engine start with programmable run time is also available.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
8 NO	INDEX NUMBER 8	Press 8 to access the Plant Exerciser menu if the plant exerciser (accessory KD-23) is enabled. Press the MENU ↓ key to access menu layers. The controller displays DISABLED if the Plant Exerciser is disabled.
MENU ↓	PLANT EXERCISER	Displays the top of the Plant Exerciser menu.

Plant Exerciser Modes:

Calendar Mode shows up to 5 events, with each event having 1 or 2 exercise occurrences. The controller automatically sets the calendar date for each occurrence according to the date setting entered in the Time of Day. This mode uses a true calendar, where the controller calculates the number of occurrences of a day in any month. Figure 2-14 illustrates relationships of calendar days and dates to occurrence days. The shaded columns show occurrence numbers for days in a typical month.

SUN	MON	TUE	WED	THU	FRI	SAT
		1 **1**	2 **1**	3 **1**	4 **1**	5 **1**
6 **1**	7 **1**	8 **2**	9 **2**	10 **2**	11 **2**	12 **2**
13 **2**	14 **2**	15 **3**	16 **3**	17 **3**	18 **3**	19 **3**
20 **3**	21 **3**	22 **4**	23 **4**	24 **4**	25 **4**	26 **4**
27 **4**	28 **4**	29 **5**	30 **5**	31 **5**		

Figure 2-14. Typical Calendar

Figure 2-15 shows a screen from the Monitor software that displays the relationship among exercise events, start times, selected days for each exercise run, occurrence numbers, the time that the generator set (emergency source) is to run, and whether the transfer switch is to transfer the load to the emergency source.

Exercise event 1 is enabled. The first exercise run starts at 7:30 AM on the second SATurday of the month; the second exercise run starts at 7:30 AM on the fourth SATurday. The generator set is to run for 45 minutes, and the load will not be transferred during the exercise runs. Events 2 to 5 show default settings.

Kohler Monitor **Calendar Mode Summary** <M340+> *Designation*

ESC exit. **F1** Help. **F9** Print. **F10** Main Menu.

EXERCISE EVENT	START TIME	DAY OF WEEK	OCCURRENCE # 1ST	OCCURRENCE # 2ND	RUN TIME HR:MN	LOAD TRANSFER
#1 ENABLED	07:30 AM	SAT	2	4	00:45	NO
#2 ENABLED	09:00 AM	TUE	1	1	00:00	NO
#3 ENABLED	09:00 AM	TUE	1	1	00:00	NO
#4 ENABLED	09:00 AM	TUE	1	1	00:00	NO
#5 ENABLED	09:00 AM	TUE	1	1	00:00	NO

Time **8:00 AM** Day **Sunday** Date **07/14/1996** Day Occurs # **2**

Figure 2-15. Calendar Mode Summary Screen

Index 8—Plant Exerciser, continued

14-day Mode allows up to 5 events of 1 or 2 exercise runs each in a 14-day (Sunday to Saturday) period. Each exercise run may be scheduled for a particular day of week 1 or week 2 in the 14-day period. When the 14-day mode is selected, the current week will show in Index 4.

Figure 2-16 shows a screen from the Monitor software that displays the relationship among exercise events, start times, selected days for each exercise run, week of the 14-day period, the time that the generator set (emergency source) is to run, and whether the transfer switch is to transfer the load to the emergency source.

Exercise event 1 is enabled. Exercise runs will start at 7:30 a.m. The first exercise run will occur on WEDnesday of week 2; the second exercise run will occur on SATurday of week 2. The generator set is to run for 45 minutes. The load will not be transferred during the exercise runs. Events 2 to 5 show default settings.

Kohler Monitor **14 Day Mode Summary** <M340+> *Designation*

ESC exit. **F1** Help. **F9** Print. **F10** Main Menu.

EXERCISE EVENT	START TIME	DAY OF WEEK 1ST	DAY OF WEEK 2ND	WEEK 1 or 2	RUN TIME HR:MN	LOAD TRANSFER
#1 ENABLED	**07:30 AM**	**WED**	**SAT**	**2**	**00:45**	**NO**
#2 ENABLED	**09:00 AM**	**TUE**	**TUE**	**1**	**00:00**	**NO**
#3 ENABLED	**09:00 AM**	**TUE**	**TUE**	**1**	**00:00**	**NO**
#4 ENABLED	**09:00 AM**	**TUE**	**TUE**	**1**	**00:00**	**NO**
#5 ENABLED	**09:00 AM**	**TUE**	**TUE**	**1**	**00:00**	**NO**

Time **8:00 AM** Day **Sunday** Date **07/14/1996** Week **2**

Figure 2-16. 14-Day Mode Summary Screen

7-day Mode allows up to 5 events with 1 or 2 exercise runs each in a 7-day period.

Figure 2-17 shows a screen from the Monitor software that displays the relationship among exercise events, start times, selected days for each exercise run, the time that the generator set (emergency source) is to run, and whether the transfer switch is to transfer the load to the emergency source.

Exercise event 1 is enabled. Exercise runs will start at 7:30 a.m. The first exercise run will occur on WEDnesday. The second exercise run will occur on SATurday. The generator set is to run for 45 minutes. The load will not be transferred during the exercise runs. Events 2 to 5 show default settings.

Kohler Monitor **7 Day Mode Summary** <M340+> *Designation*

ESC exit. **F1** Help. **F9** Print. **F10** Main Menu.

EXERCISE EVENT	START TIME	DAY OF WEEK 1ST	DAY OF WEEK 2ND	RUN TIME HR:MN	LOAD TRANSFER
#1 ENABLED	**07:30 AM**	**WED**	**SAT**	**00:45**	**NO**
#2 ENABLED	**09:00 AM**	**TUE**	**TUE**	**00:00**	**NO**
#3 ENABLED	**09:00 AM**	**TUE**	**TUE**	**00:00**	**NO**
#4 ENABLED	**09:00 AM**	**TUE**	**TUE**	**00:00**	**NO**
#5 ENABLED	**09:00 AM**	**TUE**	**TUE**	**00:00**	**NO**

Time **8:00 AM** Day **Sunday** Date **07/14/1996** Day Occurs # **2**

Figure 2-17. 7-Day Mode Summary Screen

Index 8—Plant Exerciser, continued

Key Entry	Display	Description

Displays the plant exerciser mode, either Calendar, 14-day, or 7-day.

MENU ↓ → `CALENDAR MODE →`

OR

MENU ↓ → `14-DAY MODE →`

OR

MENU ↓ → `7-DAY MODE →`

Changing the plant exerciser mode.

Note: Changing the plant exerciser mode changes all settings to default values.

MENU →	`CALENDAR? NO→`	Calendar mode not selected (NO). Press the YES key to change to the calendar mode.
7 YES	`CALENDAR? YES→`	Press the ENTER ↵ key to confirm.
ENTER ↵	`ENTRY ACCEPTED`	System confirms the entry.
	`CALENDAR? YES→`	Calendar mode selected (YES).

OR

MENU →	`CALENDAR? YES→`	Calendar mode selected (YES).

MENU →	`14-DAY? NO→`	14-day mode not selected (NO). Press the YES key to change to the 14-day mode.
7 YES	`14-DAY? YES→`	Press the ENTER ↵ key to confirm.
ENTER ↵	`ENTRY ACCEPTED`	System confirms the entry.
	`14-DAY? YES→`	14-day mode selected (YES).

OR

MENU →	`14-DAY? YES→`	14-day mode selected (YES).

Index 8—Plant Exerciser, continued

Key Entry	Display	Description
MENU →	7-DAY? NO→	7-day mode not selected (NO). Press the YES key to change to the 7-day mode.
7 YES	7-DAY? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	7-DAY? YES→	7-day mode selected (YES).

OR

MENU →	7-DAY? YES→	7-day mode selected (YES).

Displays and permits changes to exerciser event #1 status.

MENU ↓	#1 ENABLED? NO→	Displays NO (default setting) when exerciser event #1 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key. Press the YES key to enable the event.
7 YES	#1 ENABLED? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	#1 ENABLED? YES→	Displays YES when exerciser event #1 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.

OR

MENU ↓	#1 ENABLED? YES→	Displays YES when exerciser event #1 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key. Press the NO key to disable the event.
8 NO	#1 ENABLED? NO→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	#1 ENABLED? NO→	Displays NO (default setting) when exerciser event #1 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.

Index 8—Plant Exerciser, continued

Key Entry	Display	Description

Displays and permits changes to exerciser event #1 settings.

Note: Settings descriptions assume that exerciser event #1 is enabled.

Key Entry	Display	Description
MENU →	STRT TM 9:00AM	Displays exerciser period start time for event #1. Default setting is 9:00 a.m. Enter a new time using the numeric keys. Press the ENTER o key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	STRT TM 7:30AM	Displays exerciser period start time for event #1 changed.

Calendar mode.

Key Entry	Display	Description
MENU →	DAY OF WEEK TUE→	Displays first day of event #1 when system is to exercise. Default setting is TUE (Tuesday). Enter a new day of the week using the keypad. Press the ENTER ↵ key to confirm.
2 SAT ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	DAY OF WEEK SAT→	Displays first day of event # when system is to exercise changed.
MENU →	1ST OCCUR # 1→	Displays occurrence number of day for first exercise run of event #. Default setting is 1 (first TUEsday of month). Enter a new occurrence number using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	1ST OCCUR # 4→	Displays occurrence number of day for first exercise run of event # changed.
MENU →	2ND OCCUR # 1→	Displays occurrence number of day for second exercise run of event #. Default setting is 1 (first TUEsday of month). Enter a new occurrence number using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	2ND OCCUR # 2→	Displays occurrence number of day for second exercise run of event # changed.

Key Entry	Display	Description
		OR
7- or 14-day modes.		
MENU ▶	1ST DAY TUE→	Displays day of week for first exercise run of event #1. Default setting is TUE (Tuesday). Enter a new day of the week using the keypad. Press the ENTER ↲ key to confirm.
5 WED, ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
	1ST DAY WED→	Displays day of week for first exercise run of event #1 changed.
MENU ▶	2ND DAY TUE→	Displays day of week for second exercise run of event #1. Default setting is TUE (Tuesday). Enter a new day of the week using the keypad. Press the ENTER ↲ key to confirm.
2 SAT, ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
MENU ▶	2ND DAY SAT→	Displays day of week for second exercise run of event #1 changed.
	WEEK 1 OR 2 1	**14-day mode only.** Displays week 1 or 2 of 14-day period for event #1. See Index 4 for current week of 14-day period. Default setting is week 1.
MENU ▶	RUN HR:MN :00→	Displays length of run time (default is zero) set for each exercise run in hours:minutes for event #1. Enter a new exercise run time using the numeric keys. Press the ENTER ↲ key to confirm.
ENTER ↲	ENTRY ACCEPTED	System confirms the entry.
	RUN HR:MN :45→	Displays length of run time (default is zero) set for each exercise run in hours:minutes for event #1 changed.
MENU ▶	LD TRANS NO→	Displays NO when the load is not transferred to the emergency source during the exercise run. Displayed when the transfer switch is equipped with accessory KD-23-C or accessory KD-23-G with the Load/No Load selector switch in the NO LOAD position.
		OR
MENU ▶	LD TRANS YES→	Displays YES when the load is transferred to an acceptable emergency source during the exercise run. Displayed when the transfer switch is equipped with accessory KD-23-D or accessory KD-23-G with the Load/No Load selector switch in the LOAD position.

Index 8—Plant Exerciser, continued

Key Entry	Display	Description

All plant exerciser modes have 5 independent exerciser events. Events #2-5 are enabled or disabled and the settings are viewed and changed in the same manner as event #1.

MENU ↓	#2 ENABLED? NO→	Displays NO (default setting) when exerciser event #2 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.
OR		
MENU ↓	#2 ENABLED? YES→	Displays YES when exerciser event #2 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.
MENU ↓	#3 ENABLED? NO→	Displays NO (default setting) when exerciser event #3 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.
OR		
MENU ↓	#3 ENABLED? YES→	Displays YES when exerciser event #3 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.
MENU ↓	#4 ENABLED? NO→	Displays NO (default setting) when exerciser event #4 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.
OR		
MENU ↓	#4 ENABLED? YES→	Displays YES when exerciser event #4 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.
MENU ↓	#5 ENABLED? NO→	Displays NO (default setting) when exerciser event #5 is disabled. The ATS does not exercise the generator set according to the settings visible by pressing the MENU → key.
OR		
MENU ↓	#5 ENABLED? YES→	Displays YES when exerciser event #5 is enabled. The ATS exercises the generator set according to the settings visible by pressing the MENU → key.

Key Entry	Display	Description

Manual One-time Plant Exerciser:

Displays and permits changes to the settings for and initiation of the manual one-time plant exerciser. The manual one-time plant exerciser starts and runs the generator set loaded or unloaded for a programmable time period regardless of the plant exerciser mode or schedule, plant exerciser accessory type, and/or the position of the optional Load/No Load selector switch. The manual one-time plant exerciser also provides a provision to bypass TDNE and TDEN time delays to allow the operator to shorten the duration of the exercise sequence without changing time delay settings.

Enabling the manual one-time plant exerciser.

Note: Change manual one-time plant exerciser settings before enabling the manual one-time plant exerciser run.

Note: Press the EXER STOP key to stop the exercise run. The ATS runs the generator set for TDEC before signaling the generator set to shut down.

Note: The one-time exerciser settings reset to :00/NO after a manual one-time plant exerciser sequence completes or the EXER STOP key is pressed.

Note: The Plant Exerciser LED lights when a manual one-time plant exerciser sequence starts and turns off after TDEC ends.

MENU ▼	ENG START? NO→	Displays NO when the one-time exerciser is disabled. The Plant Exerciser LED is off. Press the YES key to start the manual plant exerciser.
7 YES	ENG START? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	ENG START? YES→	Displays YES when the one-time exerciser is enabled. The Plant Exerciser LED lights.

OR

MENU ▼	ENG START? YES→	Displays YES when the one-time exerciser is enabled. The Plant Exerciser LED lights.

Displays and permits changes to one-time plant exerciser settings.

MENU ▶	RUN HR:MN :00→	Displays length of run time (default 0) for the one-time exerciser up to 72:00 hours:minutes exclusive of TDEC. Enter a new time using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	RUN HR:MN :20→	Displays length of run time for the one-time exerciser up to 72:00 hours:minutes changed.

Index 8—Plant Exerciser, continued

Key Entry	Display	Description
MENU ▶	LD TRANS NO→	Displays NO (default setting) when the controller does not transfer the load to the emergency source during the one-time exerciser. Press the YES key to transfer the load to the emergency source during the exerciser run period.
7 YES	LD TRANS YES→	Press the ENTER ↵ key to confirm.
	NO LOAD BP? NO→	If the ATS has plant exerciser accessory KD-23-D, this extra screen prompts to override the unloaded plant exerciser. Press YES to override the unloaded plant exerciser.
7 YES	LD TRANS YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	LD TRANS YES→	Displays YES when the controller transfers the load to an acceptable emergency source during the one-time exerciser.

OR

Key Entry	Display	Description
MENU ▶	LD TRANS YES→	Displays YES when the controller transfers the load to an acceptable emergency source during the one-time exerciser. Press the NO key to not transfer the load to the emergency source during the exerciser run period.
8 NO	LD TRANS NO→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	LD TRANS NO→	Displays NO when the controller does not transfer the load to the emergency source during the one-time exerciser.

Index 8—Plant Exciser, continued

Key Entry	Display	Description
MENU ▶	BP TDNE? NO→	Displays NO (default setting) when TDNE runs in the transfer sequence during the one-time exerciser. Press the YES key to bypass TDNE during the exerciser run period.
7 YES	BP TDNE? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	BP TDNE? YES→	Displays YES when TDNE is bypassed in the transfer sequence during the one-time exerciser.

OR

Key Entry	Display	Description
MENU ▶	BP TDNE? YES→	Displays YES when TDNE is bypassed in the transfer sequence during the one-time exerciser. Press the NO key to enable TDNE during the exerciser run period.
8 NO	BP TDNE? NO→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	BP TDNE? NO→	Displays NO (default setting) when TDNE runs in the transfer sequence during the one-time exerciser. Press the YES key to bypass TDEN during the exerciser run period.

Index 8—Plant Exerciser, continued

Key Entry	Display	Description
MENU →	BP TDEN? NO→	Displays NO (default setting) when TDEN runs in the transfer sequence during the one-time exerciser. Press the YES key to bypass TDEN during the exerciser run period.
7 YES	BP TDEN? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	BP TDEN? YES→	Displays YES when TDEN is bypassed in the transfer sequence during the one-time exerciser.

OR

MENU →	BP TDEN? YES→	Displays YES when TDEN is bypassed in the transfer sequence during the one-time exerciser. Press the NO key to enable TDEN during the exerciser run period.
8 NO	BP TDEN? NO→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	BP TDEN? NO→	Displays NO when TDEN runs in the transfer sequence during the one-time exerciser.
MENU ↓	COUNTDOWN :00	Displays the time remaining in the one-time exerciser in hours:minutes.
RESET MENU, ENTER ↵	STORE SET-POINTS	Press the RESET MENU and then the ENTER↵ key to store setpoints to ensure that changes are retained after controller power interruption.
	ENTER INDEX 1-13	Return to the main menu allows access to another index.

2.12.9 Index 9—Load Shed Settings

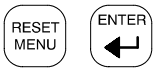
Index 9 displays and permits changes to load shed settings including the time delays before and after, normal-to-emergency and emergency-to-normal transfer. The sequence timing and number of loads to be shed and returned can be viewed and changed.

NOTE

Optional load shedding contacts (accessory KD-35-N) wired to control loads are required for load shed settings to be effective. The controller, however, sequences through all load shed setting time delays regardless of the presence of load shedding contacts on the switch.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
9 MON	INDEX NUMBER 9	Press 9 to access the Load Shed menu. Press the MENU ↓ key to access menu layers.
MENU ↓	LOAD SHED MN:SE	Displays the top of the Load Shed menu. Load shed times are shown in minutes:seconds before and after transfer. See Appendix D for standard and extended setting ranges.
Load shed settings for transfers from Normal to Emergency.		
MENU ↓	NORM - EMER →	Press the MENU → key to view load shed settings for normal-to-emergency transfers.
MENU →	BEFORE :00→	Displays time that all 9 load blocks are shed in minutes:seconds after TDNE ends before the start of the transfer to emergency. Enter a new time using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	BEFORE :20→	Displays time that all 9 load blocks are shed in minutes:seconds after TDNE ends before the start of the transfer to emergency changed.
MENU →	AFTER :00→	Displays time, in minutes:seconds, after transfer to emergency that all 9 load blocks remain shed. Enter a new time using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	AFTER :20→	Displays time, in minutes:seconds, after transfer to emergency that all 9 load blocks remain shed changed.
MENU →	SEQUENCE :00→	Displays the sequence time in minutes:seconds between reconnection of load blocks from block 1 to a maximum number (see next screen). If the sequence time is :00, the load blocks are reconnected immediately. Enter a new time using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	SEQUENCE :20→	Displays the sequence time in minutes:seconds between reconnection of load blocks from block 1 to a maximum number (see next screen) changed.
MENU →	LOADS RETURN 9→	Displays the maximum number of loads up to 9 reconnected in a timed sequence. Load blocks above this number remain shed when the switch is in the emergency position. Enter a new number of loads to return using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.

Index 9—Load Shed Settings, continued

Key Entry	Display	Description
Load shed settings for transfers from normal to emergency, continued		
	LOADS RETURN 5→	Displays the maximum number of loads up to 9 reconnected in a timed sequence. changed. Load blocks 6-9 remain shed when the switch is in the emergency position. Load blocks 1-5 connect to the emergency source 20 seconds apart in sequence.
Load shed settings for transfers from Emergency to Normal.		
	EMER - NORM →	Press the MENU → key to view load shed settings for emergency-to-normal transfers.
	BEFORE :00→	Displays time that all 9 load blocks are shed in minutes:seconds after TDEN ends before the start of the transfer to normal. Enter a new time using the numeric keys. Press the ENTER ↲ key to confirm.
	ENTRY ACCEPTED	System confirms the entry.
	BEFORE :20→	Displays time that all 9 load blocks are shed in minutes:seconds after TDEN ends before the start of the transfer to normal changed.
	AFTER :00→	Displays time, in minutes:seconds, after transfer to normal that all 9 load blocks remain shed. Enter a new time using the numeric keys. Press the ENTER ↲ key to confirm.
	ENTRY ACCEPTED	System confirms the entry.
	AFTER :05→	Displays time, in minutes:seconds, after transfer to normal that all 9 load blocks remain shed changed.
	SEQUENCE :00→	Displays the sequence time in minutes:seconds between reconnection of load blocks from block 1 to a maximum number (see next screen). If the sequence time is :00, the load blocks are reconnected immediately. Enter a new time using the numeric keys. Press the ENTER ↲ key to confirm.
	ENTRY ACCEPTED	System confirms the entry.
	SEQUENCE :05→	Displays the sequence time in minutes:seconds between reconnection of load blocks from block 1 to a maximum number (see next screen) changed.
	LOADS RETURN 9→	Displays the maximum number of loads up to 9 reconnected in a timed sequence. Load blocks above this number remain shed when the switch is in the normal position. Enter a new number of loads to return using the numeric keys. Press the ENTER ↲ key to confirm.
	ENTRY ACCEPTED	System confirms the entry.
	LOADS RETURN 7→	Displays the maximum number of loads up to 9 reconnected in a timed sequence changed. Load blocks 8-9 remain shed when the switch is in the normal position. Load blocks 1-7 connect to the normal source 5 seconds apart in sequence.
	STORE SET-POINTS	Press the RESET MENU and then the ENTER↲ key to store setpoints to ensure that changes are retained after controller power interruption.
	ENTER INDEX 1-13	Return to the main menu allows access to another index.

2.12.10 Index 10—Source History

Index 10 displays the source, type, and date of the four most recent source failures. A manual test at the transfer switch records as a normal source failure. There are no alterable data or settings in this menu.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
1 FRI, 0	INDEX NUMBER 10	Press 10 to access the Source History menu. Press the MENU ↓ key to access menu layers.
MENU ↓	SOURCE HISTORY	Displays the top of the Source History menu.
MENU ↓	RECORD #1→	Press the MENU → key to view a description of the most recent failure.
MENU →	EMER UNDER FREQ	Displays a message indicating the type of source failure. See Appendix B for a list of source failure messages. This example shows an EMERgency UNDER FREQuency shutdown.
MENU →	DATE 7-15-98→	Month, date, and year of failure.
MENU →	TIME 1:00PM	Time of day of failure.
MENU ↓	RECORD #2→	Press the MENU → key to view a description of the second-most-recent failure.
MENU ↓	RECORD #3→	Press the MENU → key to view a description of the third-most-recent failure.
MENU ↓	RECORD #4→	Press the MENU → key to view a description of the fourth-most-recent failure.
MENU ↓	OUTAGE #1 00:00	Displays time elapsed during most recent source outage or fault (hours:minutes for record #1 only). Resets to zero after 24 hours.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.12.11 Index 11—Control Options Status

Index 11 displays shunt/jumper-controlled accessories status. There are no alterable data or settings in this menu. See Section 3.2 for more information on shunt/jumper-controlled accessories.

NOTE

Shunt/jumper-controlled accessories are enabled by hardware shunt/jumpers and cannot be enabled or disabled from the keypad.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
1 FRI, 1 FRI	INDEX NUMBER 11	Press 11 to access the Control Options Status menu. Press the MENU ↓ key to access menu layers.
MENU ↓	CONTROL OPTIONS	Displays the top of the Control Options Status menu.
MENU ↓	INPHASE MON NO	Displays YES when the inphase monitor (accessory KD-34-A) is disabled.
OR		
MENU ↓	INPHASE MON YES	Displays NO when the inphase monitor (accessory KD-34-A) is enabled.
MENU ↓	PHA SEQ/LOSS NO	Displays NO when phase sequence and loss monitoring (accessory KD-34-Z) is disabled.
OR		
MENU ↓	PHA SEQ/LOSS YES	Displays YES when phase sequence and loss monitoring (accessory KD-34-Z) is enabled.
MENU ↓	NORM & EMER NO	Displays NO when voltage and frequency monitoring (accessory KD-34-J) is disabled.
OR		
MENU ↓	NORM & EMER YES	Displays YES when voltage and frequency monitoring (accessory KD-34-J) is enabled.
MENU ↓	PLANT EXERC NO	Displays NO when the plant exerciser (accessory KD-23) is disabled.
OR		
MENU ↓	PLANT EXERC YES	Displays YES when the plant exerciser (accessory KD-23) is enabled.
MENU ↓	TD EXTENDED NO	Displays NO when extended time delays (accessory KD-100-B) is disabled.
OR		
MENU ↓	TD EXTENDED YES	Displays YES when extended time delays (accessory KD-100-B) is enabled.

Index 11—Control Options Status, continued

Key Entry	Display	Description
MENU ▼	MAN OVERRIDE NO	Displays NO when the manual override (accessory KD-29) is disabled.
OR		
MENU ▼	MAN OVERRIDE YES	Displays YES when the manual override (accessory KD-29) is enabled.
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to return to the main menu and access another index.

2.12.12 Index 12—Voltage Calibration

Index 12 and the local programming mode is used to calibrate the voltage-sensing circuits on the controller. The transfer switch is factory calibrated to its rated system voltage and requires no user calibration. Calibrate should only be necessary after some types of servicing, when applying the transfer switch at a different system voltage, or when the controller displays readings that differ from those obtained by equipment calibrated to accepted electrical industry standards by an amount exceeding specifications.

NOTE

Have trained and qualified personnel from a local distributor/dealer perform calibration.

2.12.13 Index 13—Remote Control

Index 13 displays and permits changes to remote monitoring and control parameters for online PC connections.

If a PC connection is not used for monitoring and control, enter NO for *ON-LINE*? Refer to the operation and installation manual for the Remote Monitoring and Control Communication Software for details on remote monitoring and control. See List of Related Materials in the Introduction section in this manual.

NOTE

There are four remote monitoring and control connection types: local single, local area network, remote single, and remote area network. Enabling the setting for one type by entering YES disables the other three.

Key Entry	Display	Description
RESET MENU	ENTER INDEX 1-13	Press the RESET MENU key to access the main menu.
1 FRI, 3 SUN	INDEX NUMBER 13	Enter 13 to access the Remote Control menu. Press the MENU ↓ key to access menu layers.
MENU ↓	REMOTE CONTROL	Displays the top of the Remote Control menu.

Displays and permits changes to online status (enable to use a PC connection).

MENU ↓	ON-LINE? NO	Monitoring and control by a PC connection disabled. Press the YES key to enable monitoring and control by a PC connection.
7 YES	ON-LINE? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	ON-LINE? YES	Monitoring and control by a PC connection enabled.

OR

MENU ↓	ON-LINE? YES	Monitoring and control by a PC connection disabled. Press the NO key to disable monitoring and control by a PC connection.
8 NO	ONLINE? NO	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	ON-LINE? NO	Monitoring and control by a PC connection disabled. The remaining items on this menu are irrelevant.

Index 13—Remote Control, continued

Key Entry	Display	Description

Displays and permits changes to local single connection status and settings (enable to connect a PC directly to the ATS.)

MENU ↓	LOCAL? NO	Monitoring and control by a local (direct) PC connection to a single device disabled. Press the YES key to enable this type of connection.
7 YES	LOCAL? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	ON-LINE? YES	Monitoring and control by a local (direct) PC connection to a single device enabled.

OR

MENU ↓	LOCAL? YES	Monitoring and control by a local (direct) PC connection to a single device already enabled.

Displays and permits changes to local area network connection status and settings (enable to connect a PC to a network of devices including the ATS).

MENU ↓	LAN? NO→	Monitoring and control by a local (direct) PC connection to a local area network (LAN) of devices disabled. Press the YES key to enable this type of connection.
7 YES	LAN? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	LAN? YES	Monitoring and control by a local (direct) PC connection to a local area network (LAN) of devices enabled. Other PC connection types are disabled (see NOTE).

OR

MENU ↓	LAN? YES→	Monitoring and control by a local (direct) PC connection to a local area network (LAN) of devices already enabled.

Displays and permits changes to the Address of the device on the local area network.

MENU →	ADDRESS 1→	Displays the Address of the device on the local area network (LAN). Each device must have a unique Address. Enter a new Address using numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	ADDRESS 2→	New LAN address entered.

Key Entry	Display	Description

Displays and permits changes to remote single connection status and settings (enable to connect a PC to the ATS over modems).

Key Entry	Display	Description
MENU ↓	REMOTE? NO→	Control by a remote (via modem) PC connection to a single device disabled. Press the YES key to enable this type of connection.
7 YES	REMOTE? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	REMOTE? YES	Monitoring and control by a remote (via modem) PC connection to a single device enabled. Other PC connection types are disabled (see NOTE).

OR

Key Entry	Display	Description
MENU ↓	REMOTE? YES→	Monitoring and control by a remote (via modem) PC connection to a single device already enabled.

Displays and permits changes to the System ID for the remote single connection.

Key Entry	Display	Description
MENU →	SYS. ID 0	Displays the System ID, a password for remote (via modem) PC connection.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	SYS. ID 1234	New system ID number entered.

Displays and permits changes to remote area network connection status and settings (enable to connect a PC to a network of devices including the ATS over modems).

Key Entry	Display	Description
MENU ↓	REMLAN? NO→	Monitoring and control by a remote (via modem) PC connection to a local area network (LAN) of devices disabled. Press the YES key to enable this type of connection.
7 YES	REMLAN? YES→	Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	REMLAN? YES	Monitoring and control by a remote (via modem) PC connection to a local area network (LAN) of devices enabled. Other PC connections are disabled (see NOTE).

OR

Key Entry	Display	Description
MENU ↓	REMLAN? YES→	Monitoring and control by a remote (via modem) PC connection to a local area network (LAN) of devices enabled.

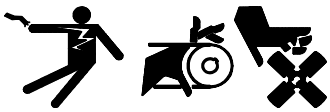
Index 13—Remote Control, continued

Key Entry	Display	Description
Displays and permits changes to the System ID for the remote area network connection.		
MENU ▶	SYS. ID 0	Displays the System ID, a password for remote (via modem) PC connections. Use the same System ID for all devices on the same local area network. Enter a new System ID using the numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	SYS. ID 4567	New System ID number entered.
Displays and permits changes to the Address of the device on the remote area network.		
MENU ▶	ADDRESS 1→	Displays the Address of the device on the local area network. Each device must have a unique address on the same network. Enter a new Address using numeric keys. Press the ENTER ↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	ADDRESS 2→	New LAN address entered.
Displays and permits changes to the baud rate.		
MENU ▼	BAUD RATE 2400	Displays the baud rate. Standard baud rates are 2400, 4800, and 9600. Enter a new baud rate using the numeric keys. Press the ENTER↵ key to confirm.
ENTER ↵	ENTRY ACCEPTED	System confirms the entry.
	BAUD RATE 9600	Baud rate changed.
RESET MENU, ENTER ↵	STORE SET-POINTS	Press the RESET MENU and then the ENTER↵ key to store setpoints to ensure that changes are retained after controller power interruption.
	ENTER INDEX 1-13	Return to the main menu allows access to another index.

Section 3. Accessories

Determine factory-installed accessories by examining the transfer switch nameplate. This section describes optional accessories available on Model GLS automatic transfer switch (ATS) with the M340 controller. All accessories are UL 1008 listed.

⚠ 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.

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(under 600 volt)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(600 volt and above)

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

Installing the battery charger. Hazardous voltage can cause severe injury or death. An ungrounded battery charger may cause electrical shock. Connect the battery charger enclosure to the ground of a permanent wiring system. As an alternative, install an equipment grounding conductor with circuit conductors and connect it to the equipment grounding terminal or the lead on the battery charger. Install the battery charger as prescribed in the equipment manual. Install the battery charger in compliance with local codes and ordinances.

Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Installing accessories to the transformer assembly. Hazardous voltage can cause severe injury or death. To prevent electrical shock disconnect the harness plug before installing accessories that will be connected to the transformer assembly primary terminals on microprocessor logic models. Terminals are at line voltage.

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.

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

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

(under 600 volt)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

(600 volt and above)

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 wristwatch, rings, and jewelry before servicing the equipment.

Servicing the transfer switch. Hazardous voltage can cause severe injury or death. Deenergize all power sources before servicing. Open 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.

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.

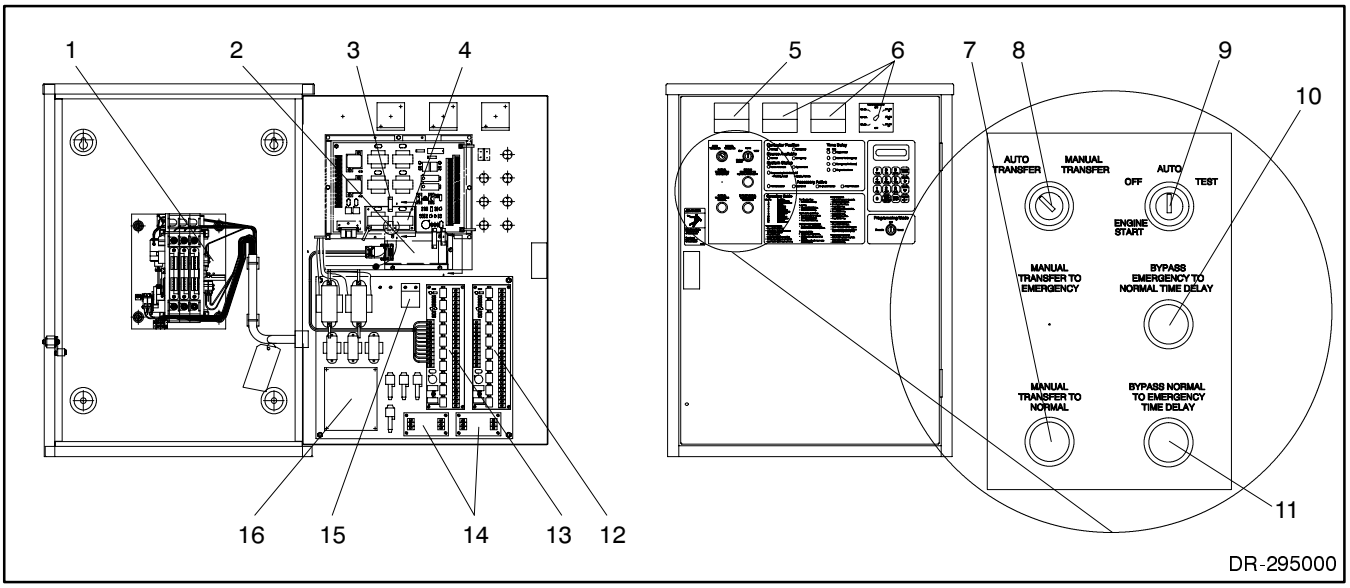
NOTICE

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.

3.1 Typical Mounting Locations

See Figure 3-1 for the typical mounting locations for accessories. The mounting locations of accessories may vary when the transfer switch has multiple accessories.

The following sections describe the operation of each accessory. The operation of some accessories is interdependent when certain combinations of accessories are installed.



1. KD-15-N—Main shaft auxiliary contacts
2. KD-51-A, B—Communication module
3. KD-5, 23, 29, 34 and 100 (shunt/jumper socket JP1)
4. KD-5-K—Emergency source three-phase sensing circuit board
5. KD-18-G—Frequency meter
6. KD-18-J—Voltage and current meters and selector switch
7. KD-29-X—Manual Transfer to Normal pushbutton
8. KD-29-X—Automatic/Manual selector switch
9. KD-6, 7—Test switch
10. KD-8-C—Bypass TDEN pushbutton
11. KD-8-D—Bypass TDNE pushbutton
12. KD-14-G—Auxiliary relay contacts (10 sets)
13. KD-35-N—Load shedding contacts (9 sets)
14. KD-14-H through R—Auxiliary relay contacts (1 set)
15. KD-23-G—Plant exerciser Load/No Load selector switch
16. KD-24—Battery charger

Figure 3-1. Typical Accessory Mounting Locations

3.2 Shunt/Jumper-controlled Accessories

Shunt/jumper-controlled accessories are configured by jumpers installed on plug JP1 on the main logic board. See Figure 3-1, Figure 3-2, and Figure 3-3. The factory enables only the manual override function unless the function was ordered at the time of purchase.

NOTE

Accessory KD-5-K emergency source three-phase sensing, if included, has a sensing circuit board mounted over the access hole in the metal shield to JP1 on the main controller circuit board.

Accessory KD-	Name
29	Manual Override
100-B	Extended Time Delays
23	Plant Exerciser
34-J	Voltage and Frequency Monitoring
34-Z or 5-K	Phase Sequence and Loss Monitoring
34-A	Inphase Monitor

Figure 3-2. Shunt/Jumper-controlled Accessories

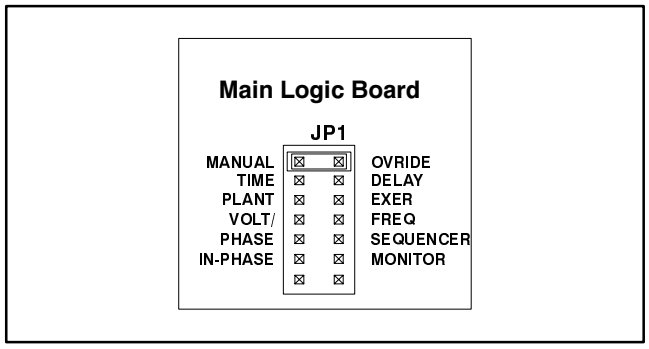


Figure 3-3. Shunt/Jumper Plug JP1

Descriptions of the shunt/jumper-controlled accessories as the jumpers appear on the main logic circuit board follow.

- **Manual Override** This accessory causes the transfer switch to automatically transfer to an available source when the source that is powering the load fails. Transfer time delays are bypassed. All ATSs have the MANUAL OVRIDE jumper installed on JP1 by the factory to enable this accessory. *DO NOT REMOVE THIS JUMPER!*
- **Extended Time Delays** This accessory extends the time delay to 99 minutes for TDNE, TDES, TDEN, TDEC, and load shed settings Time Before Transfer, Time After Transfer, and Sequence Time. The controller requires power from a DC power source such as a battery, when TDES is set for longer than 6 seconds. Install the TIME DELAY jumper on JP1 to enable extended time delays. See Appendix D.
- **Plant Exerciser** This accessory, which allows starting and running the generator set, provides a choice of 7-day, 14-day, or calendar-based automatic or manual one-time exerciser modes and an override function that allows the user to terminate the exerciser at any time. Whether the transfer switch transfers to the emergency source during an automatic exercise mode run depends on the plant exerciser accessory installed. See Section 3.9. Install the PLANT EXER jumper on JP1 to enable the plant exerciser.
- **Voltage and Frequency Monitoring** This accessory provides overvoltage sensing on all normal source phases, over- and underfrequency sensing on one phase of the normal source, and overvoltage and overfrequency sensing on one phase of the emergency source. Install the VOLT/FREQ jumper on JP1 to enable normal and emergency source sensing.
- **Phase Sequence and Loss Monitoring** This accessory provides source monitoring of the normal and emergency sources. Source monitoring includes phase rotation and phase loss, including anti-single-phase protection. Use this accessory in conjunction with KD-5-K to provide source monitoring on the emergency source. Enable this accessory only for 3-phase applications. Power conductors on contactor lugs A, B, and C must have a phase rotation of A-B-C, respectively, for this accessory to function correctly. Install the PHASE SEQUENCER jumper on JP1 to enable phase sequence and loss monitoring.
- **Inphase Monitor** Abnormal inrush current caused by switching between live power sources can damage motors and related equipment. The monitor minimizes inrush currents to equipment connected to a new power source. The monitor samples a single phase of one source and compares it to a single phase of any other source. The monitor signals the transfer switch to operate when the two voltages are within the desired phase angle and approaching a zero phase angle difference. The monitor is available only on contactor-type, nonprogrammed transition switches. The inphase monitor is bypassed when a connected source fails completely (voltages or frequency on all phases are outside of acceptable ranges). Install the IN-PHASE MONITOR jumper on JP1 to enable the monitor.

3.3 KD-5—Emergency Source Three-phase Sensing

Accessory KD-5-K emergency source three-phase sensing enables the controller to sense all three phases of the emergency source for over- and undervoltage and phase sequencing and loss conditions. The ATS is configured with a circuit board containing two additional transformers and shunt/jumper-controlled accessory KD-34-Z (phase sequence and loss monitoring) when this accessory is installed.

3.4 KD-6, 7—Test Switches

The standard test switch and accessory KD-6-F are two-position test switches mounted on the front panel that select one of two operation modes. Both switches have a maintained AUTO (automatic) position and a momentary TEST position. Accessory KD-6-F is key-operated.

Two-position Switch (Standard and KD-6-F)

- **Automatic** Transfer switch works automatically as described in Section 2.6—Automatic Operation.
- **Test** Simulates a normal source failure. The ATS operates as described in Section 2.6—Automatic Operation when Normal fails.

Accessories KD-6-N and P, three-position test switches mounted on the front panel, select one of three operation modes. Both switches have maintained AUTO (automatic) and ENGINE START positions and a momentary TEST position. Accessory KD-6-P is key-operated.

Three-position Switch (KD-6-N and P)

- **Automatic** Transfer switch works automatically as described in Section 2.6—Automatic Operation.
- **Test** Simulates a normal source failure. The ATS operates as described in Section 2.6—Automatic Operation when Normal fails.
- **Engine Start** Signals the generator set to start and run unloaded.

Accessories KD-7-D and F, four-position test switches mounted on the front panel, select one of four operation modes. The Not In Automatic LED lights when the switch is not in the automatic mode. The switches have a momentary TEST and maintained AUTO (automatic), OFF, and ENGINE START positions. Accessory KD-7-F is key-operated.

Four-position Switch (KD-7-D and F)

- **Engine Start** Signals the generator set to start and run unloaded.
- **Off** Prevents automatic transfer switch operation by inhibiting control circuits and opening the engine start circuit. The transfer switch will not start the generator nor will it transfer to an available source if the connected source fails.
- **Automatic** Transfer switch works automatically as described in Section 2.6—Automatic Operation.
- **Test** Tests transfer switch by simulating a normal source failure. The ATS operates as described in Section 2.6—Automatic Operation when Normal fails.

3.5 KD-8—Bypass Time Delay Pushbuttons

Accessories KD-8-C and D time delay override pushbuttons allow manual bypass of the TDEN (Time Delay Emergency to Normal) or TDNE (Time Delay Normal to Emergency) timers.

Accessory KD-8-C Press pushbutton to bypass the TDEN timer and instantly transfer the load to the normal source.

Accessory KD-8-D Press pushbutton to bypass the TDNE timer and instantly transfer the load to the emergency source.

3.6 KD-14—Auxiliary Relay Contacts

Auxiliary relay contacts are isolated SPDT form C relay contacts for remote indication that operate from the controller's power source and can energize whenever the controller is powered. Each relay contact is rated for 10 amps maximum @ 120 vac resistive or 10 amps maximum @ 28 vdc and 0.01 amps minimum @ 28 vdc.

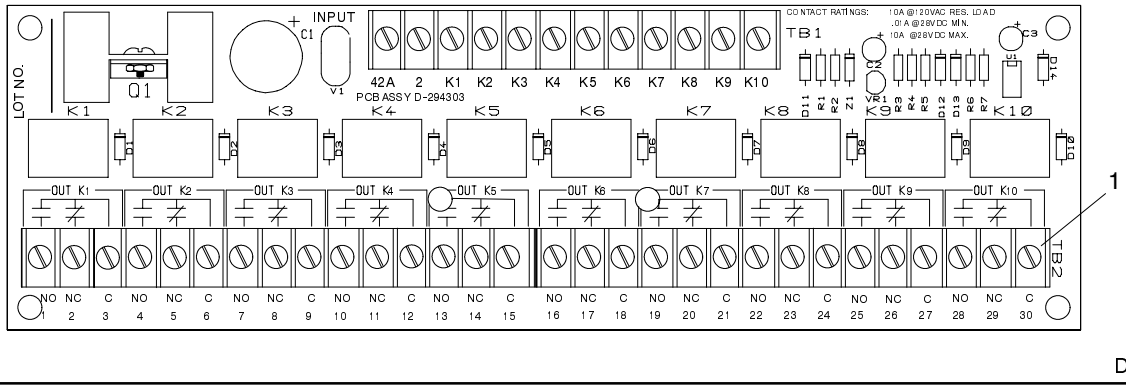
NOTE

The ATS can have a maximum of one KD-14-G (10 relay kit) and a maximum of two KD-14-H through KD-14-R (single relay kit).

Accessory KD-14-G has ten relays (ten sets of contacts). See Figure 3-4 for descriptions of conditions when each relay is energized. See Figure 3-5 for connections.

Relay	Description
K1	Normal source available (acceptable)
K2	Normal source available (acceptable)
K3	Emergency source available (acceptable)
K4	Emergency source available (acceptable)
K5	Contactor in normal position
K6	Contactor in emergency position
K7	System alert
K8	System alert
K9	Programming Mode switch not in the Off position
K10	ATS not in automatic mode

Figure 3-4. Accessory KD-14-G Relay Descriptions



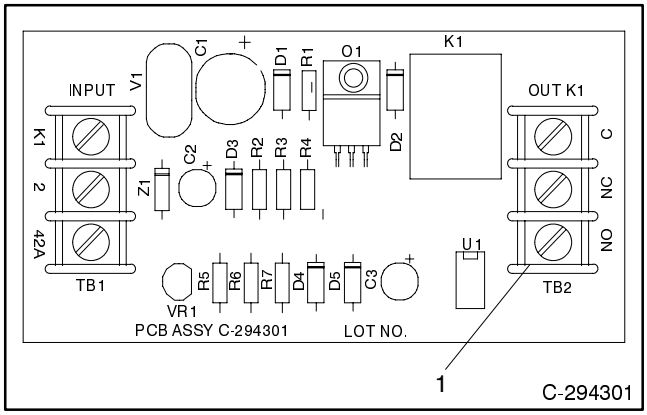
1. Customer connections terminal strip TB2

Figure 3-5. Accessory KD-14-G Connections

Accessories KD-14-H through KD-14-R are single relays (one set of contacts each). See Figure 3-6 for a summary of conditions when the relay is energized for each kit. See Figure 3-7 for connections.

Accessory KD-14-	Description
H	Contactor in normal position
J	Contactor in emergency position
K	Normal source available (acceptable)
L	Emergency source available (acceptable)
M	ATS not in automatic mode
N	Programming Mode switch not in the Off position
P	System alert
R	Load bank control—on when the plant exerciser is set to No Load and is active

Figure 3-6. KD-14-H through KD-14-R Relay Descriptions



1. Customer connections terminal strip TB2

Figure 3-7. KD-14-H through KD-14-R Connections

3.7 KD-15—Main Shaft Auxiliary Contacts

All main shaft auxiliary contacts are mounted on the power switching device and operate with the transfer switch main contacts to provide a positive indication of switch position. See the power switching device operation and installation manual for details. See List of Related Materials in the Introduction section in this manual.

Accessory KD-15-N provides one additional isolated contact closed when the load is connected to the normal source and one additional isolated contact closed when the load is connected to the emergency source.

3.8 KD-18—Meters

Analog meters are mounted on the enclosure door above the front panel.

Accessory KD-18-G is an analog frequency meter that displays the emergency power source frequency in hertz.

Accessory KD-18-J is an analog AC rms average voltage and current meter with a selector switch that allows display of each load line current in amperes or each phase voltage of Normal or Emergency.

3.9 KD-23—Plant Exercisers

A plant exerciser can periodically exercise the emergency power source generator set. All plant exerciser accessories provide a choice of 7-day, 14-day, or calendar-based automatic or manual one-time exercise modes and an override function that allows the user to terminate the exercise at any time.

Exercisers are available that exercise the generator set in one of two modes, loaded or unloaded.

Exerciser Modes

- **Unloaded** Automatic ATS operation is bypassed by closing the engine start contacts. The ATS only transfers to the emergency source if the normal source fails during the exercise period.
- **Loaded** Simulates a normal source failure and the ATS initiates an automatic sequence of operations that closes the engine start contacts and transfers the load to the emergency source during the exercise period. An override function transfers the load back to the normal source if the emergency source fails during the exercise period.

Figure 3-8 summarizes the exerciser mode for each exerciser accessory. The manual one-time plant exerciser allows the user to exercise the generator set loaded or unloaded regardless of the accessory type or the position of the Load/No Load selector switch.

Accessory KD-23-	Exercises The Generator Set
C	Unloaded
D	Loaded
G	Loaded or unloaded set by the position of the Load/No Load selector switch

Figure 3-8. Exerciser Summary

Exercise the generator set under load once a week for a minimum of 30 minutes to maximize the reliability of the emergency power system.

Program and initiate the plant exerciser in Index 8—Plant Exerciser. See Section 2.12.8.

3.10 KD-24—Battery Charger

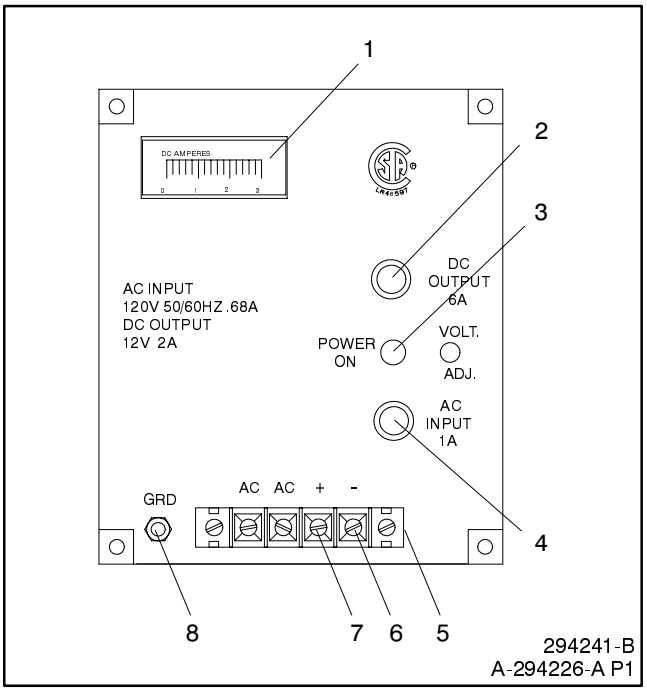
Automatic, adjustable-float battery chargers are mounted below the main circuit board on the inner panel of the enclosure door. See Figure 3-9 for component identification.

KD-24-xxA 12-volt Charger
KD-24-xxB 24-volt Charger

Where xx refers to the line voltage and is coded to match the transfer switch model number voltage code.

3.10.1 Specifications

The automatic battery charger automatically charges and maintains the charge on lead-acid automotive-type batteries. Circuits on the control circuit board regulate and limit the output of the battery charger to provide current-limiting, AC line compensation, reverse-polarity protection, ambient-temperature compensation, and a constant-voltage charging mode. The control circuit board continuously monitors the battery and load conditions to maintain the battery's proper state of charge. The charger is factory adjusted to maintain the battery at the proper float voltages. The 12-volt charger maintains a 6-cell lead-acid battery and requires no user adjustment. The 24-volt charger maintains a 12-cell lead-acid battery and requires no user adjustment.



1. Ammeter
2. DC output fuse
3. POWER ON lamp
4. AC input fuse
5. Terminal block
6. DC negative (–) output terminal
7. DC positive (+) output terminal
8. Ground terminal

Figure 3-9. Typical Battery Charger Components

NOTE

The battery chargers included in the transfer switch covered by this manual are designed strictly for use in the transfer switch and conform with UL and CSA listing requirements where specified. Read instructions before using battery charger.

3.10.2 Installation Connections

NOTE

Charger Damage! Connect battery charger only to a battery with the same DC voltage as the battery charger output rating.

Wire Type Use #10 AWG stranded copper wire, 600 V, 105°C vinyl plastic insulation UL style 1015, CSA type TEW for the DC output leads from the battery charger to the battery.

Wire Length See Figure 3-10 for the maximum distance of leads from the battery charger to the battery. Greater distances may result in excessive voltage drop, particularly when a battery ages and requires more current to maintain a float charge. Excessive voltage drop results in an undercharging condition that can lead to battery damage and/or failure of the generator to start.

Battery Voltage	Maximum Distance *, Ft. (m)
12	150 (45)
24	300 (90)

* Based on #10 AWG stranded copper wire, 0.1/0.2 volt maximum voltage drop on each lead to the battery on 12/24 volt systems, output current 0.5 amps maximum, and ambient temperature 167°F (75°C) maximum.

Figure 3-10. Maximum Distance from Battery Charger to Battery

Grounding Ensure that the metal frame or ground terminal of the battery charger is connected to a grounded, metal, permanent wiring system or an equipment-grounding conductor. Ensure that all battery charger connections comply with all applicable electrical codes and standards.

Charger Installation Connection Procedure

1. Prevent the generator set, which provides the emergency power source to the transfer switch, from starting by moving the generator set master switch to the OFF position and disconnecting all generator engine start batteries, negative (–) leads first.
2. Disconnect *BOTH* the normal and emergency power sources to the transfer switch by opening upstream circuit breakers or switches. The POWER ON lamp on the battery charger should turn off.
3. Battery leads are not provided due to the variety of generator installations. Install, prepare, and connect leads as follows.
   a. Install a red wire for the positive (+) lead and a black wire for the negative (–) lead from the battery charger to the battery. Do not exceed the maximum distance given in Figure 3-10.
   b. Strip the insulation from both ends of both leads.

c. Install a ring terminal on one end of the positive (+) lead and connect to the generator set at a location that is connected to the positive (+) terminal of the battery, typically at the engine starter solenoid (direct connection to the battery terminal can lead to corrosion problems.) Connect the other end of the red lead to the DC positive (+) terminal on the battery charger's terminal block and secure by tightening the lock screw.

d. Install a ring terminal on one end of the negative (–) lead and connect to the generator set in a location that is connected to the negative (–) terminal of the battery, typically the engine block. Connect the other end of the black lead to the DC negative (–) terminal on the battery charger's terminal block and secure by tightening the lock screw.

e. Reinstall the barrier on the battery charger's terminal strip.

4. Reconnect power supplies to the transfer switch. The POWER ON lamp on the battery charger should light.

NOTE

When initially applying power to the transfer switch, the engine start contacts remain closed signaling the generator to run until the ATS's Time Delay Engine Cooldown (TDEC), if equipped, ends.

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5. Reconnect generator engine start battery cables, negative (–) leads last; reconnect power to the generator engine start battery charger, if installed; and move the generator set master switch to the AUTO (automatic) position. The generator may start and run for a while.

3.10.3 Disconnecting the Charger Before Replacing or Servicing the Battery

Charger Disconnection Procedure

1. Prevent the generator set, which provides the emergency power source to the transfer switch, from starting by moving the generator set master switch to the OFF position and disconnecting all generator engine start batteries, negative (–) leads first.

2. Disconnect *BOTH* the normal and emergency power sources to the transfer switch by opening upstream circuit breakers or switches. The POWER ON lamp on the battery charger should turn off.

3. Remove lead leads from the battery charger terminal block, black lead from the negative (–) terminal first and wrap each of the charger connection leads with electrically-insulating tape.

4. Reconnect power supplies to the transfer switch. The POWER ON lamp on the battery charger should light.

NOTE

When initially applying power to the transfer switch, the engine start contacts remain closed signaling the generator to run until the ATS's Time Delay Engine Cooldown (TDEC), if equipped, ends.

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5. Reconnect generator engine start battery cables, negative (–) leads last; reconnect power to the generator engine start battery charger, if installed; and move the generator set master switch to the AUTO (automatic) position. The generator may start and run for a while.

3.10.4 Reconnecting the Charger After Replacing or Servicing the Battery

Charger Reconnection Procedure

1. Prevent the generator set, which provides the emergency power source to the transfer switch, from starting by moving the generator set master switch to the OFF position and disconnecting all generator engine start batteries, negative (–) leads first.

2. Disconnect *BOTH* the normal and emergency power sources to the transfer switch by opening upstream circuit breakers or switches. The POWER ON lamp on the battery charger should turn off.

3. Reconnect the lead wires to the battery charger terminal block, black lead to the negative (–) terminal last.

4. Reconnect the power supplies to the transfer switch. The POWER ON lamp on the battery charger should light.

NOTE

When initially applying power to the transfer switch, the engine start contacts remain closed signaling the generator to run until the ATS's Time Delay Engine Cooldown (TDEC), if equipped, ends.

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5. Reconnect generator engine start battery cables, negative (–) leads last; reconnect power to the generator engine start battery charger, if installed; and move the generator set master switch to the AUTO (automatic) position. The generator may start and run for a while.

3.10.5 Charging Lead-acid Batteries

Charge 6- or 12-cell (12- or 24-volt) lead-acid batteries according to the following procedure.

Battery Charging Procedure

1. Inspect the battery for defective cables, loose posts, and loose terminals. Ensure that the battery terminals and battery charger connectors are tight and clean of all corrosion for efficient charging.
2. If the battery is not sealed check the fluid level in each cell. If the fluid level is low, add distilled water to bring the fluid level up to the battery manufacturer's recommended level.
3. An automatic charger does not operate properly on dry-charge batteries not given a conditioning charge. Give a dry-charge battery a conditioning charge immediately after adding electrolyte fluid. *This battery charger cannot provide the voltage and current required to provide a conditioning charge.* Follow the battery manufacturer's recommendations for length of the conditioning charge and required charger specifications.
4. Reconnect the power supplies to the transfer switch. The POWER ON lamp on the battery charger should light.
5. The ammeter indicates the charge current the charger delivers to the battery. The charger control circuit limits the maximum charging current to 2 amps. A generator set does not require a cranking disconnect because the charger output is overload-protected. A battery in good condition is nearly fully charged when the following occurs.
   - **Charging current approaches zero** as a battery becomes charged and the battery voltage approaches the control voltage setting. The ammeter needle may fluctuate, indicating a continuous supply of pulsating current that automatically keeps the battery in a charged condition.
   - **The specific gravity of the battery electrolyte is between 1.250 and 1.285 corrected to a temperature of 80°F (26.7°C).** See the generator set or engine operation manual for the procedure to measure the specific gravity of battery electrolyte.
   - **Bubbles appear at the surface of the battery fluid.** Bubbles indicate a battery that is 80 to 85% charged. Vigorous bubbling occurs when the battery nears full charge.

3.10.6 Charging Nickel-cadmium Batteries

Charging recommendations vary between manufacturers of nickel-cadmium batteries. Contact the manufacturer of the nickel-cadmium battery for charging and maintenance instructions. If the voltage setting recommended by the battery manufacturer is different from the battery charger's factory setting, contact an authorized service center to adjust the battery charger.

3.10.7 Charger Voltage Adjustment

The battery charger's output settings are factory set and normally require no customer adjustment. If the battery charger requires adjustment, contact an authorized service center to adjust the battery charger. See Figure 3-11 for factory output settings.

Charger Voltage	Float Voltage	Current Limit (Amps)
12	13.2	2
24	26.4	2

Figure 3-11. Factory Output Settings

3.10.8 Charger and Battery Maintenance

See the operation manual for the generator set or engine for battery maintenance details. Include the following items when maintaining the system.

Important Charger and Battery Maintenance Items

- Check the battery terminals and charger connectors for clean contact surfaces. Clean corroded battery terminals and charger connectors with a mild baking soda/water solution.
- Check battery fluid level regularly and maintain battery fluid to battery manufacturer's recommended level by adding distilled water (nonsealed batteries only).

3.11 KD-29—Manual Operation Switches

Manual operation switches are located on the front panel. Unless the test switch is in the OFF position (see Section 3.4) or the manual override function has been disabled by removal of the MANUAL OVRIDE jumper (see Section 3.2) the controller overrides manual operation and seeks an acceptable source when the connected source fails.

Accessory KD-29-X allows manual transfer to the normal source. A key-operated Automatic/Manual selector switch selects the operation mode.

- **Automatic** Transfer switch works automatically as described in Section 2.6—Automatic Operation. No manual transfer is allowed.
- **Manual** Transfer switch is manually operable by pressing a pushbutton to transfer to Normal.

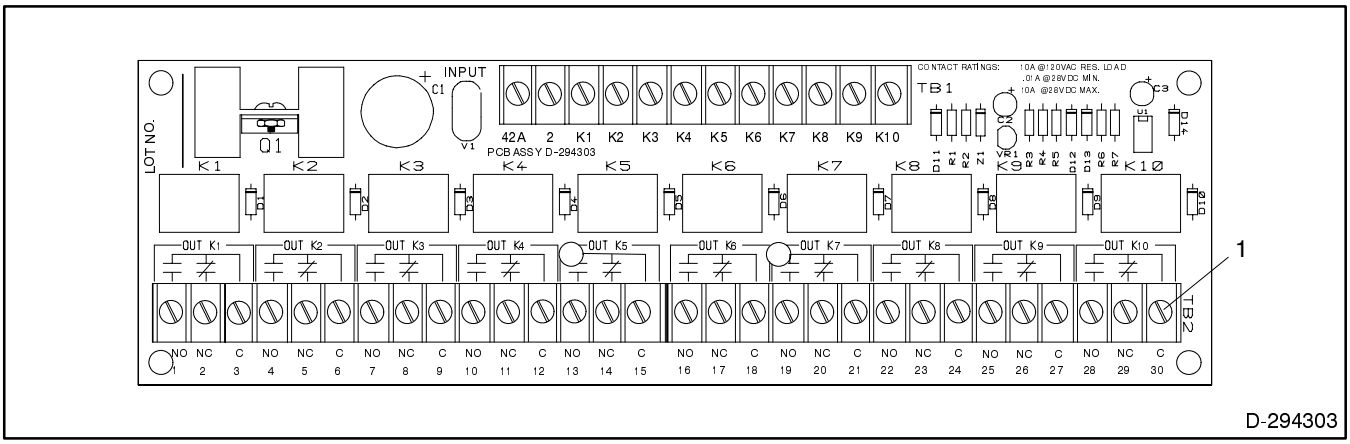
To manually operate the transfer switch, set the automatic/manual selector switch to MANUAL. When the normal source returns the Source Available, Normal LED lights. Then the TDEN On LED lights when the time delay begins timing. Next, the TDNE End LED lights when the time delay ends. When the time delay ends, the LCD display shows *MANUAL TRANSFER* and the System Alert LED flashes. Press the Manual Transfer to Normal pushbutton to transfer to the normal source. The transfer switch transfers the load to the normal source. The TDEC On LED lights when the time delay begins timing. The generator set is signalled to shut down when TDEC End LED lights. The Source Available, Emergency LED turns off when the generator set is signalled to shut down.

3.12 KD-34—Source Monitors

Source monitors are shunt/jumper-controlled accessories. See Section 3.2.

3.13 KD-35—Load Shedding Contacts

Accessory KD-35-N load shedding contacts allow the controller to disconnect load blocks prior to transfer and to reconnect designated load blocks as a group or in a programmed time sequence in either direction. Each load block is controlled by a relay. Each relay provides isolated SPDT form C contacts, each contact rated for 10 amps maximum @ 120 vac resistive or 10 amps maximum @ 28 vdc and 0.01 amps minimum @ 28 vdc. The time delays before transfer and the sequence interval time delay are adjustable. Loads are returned up to the number selected in load shed settings starting with relay K1 up to relay K9. Relay K10 is unused. See Figure 3-12 for connections. Program load shed settings in Index 9—Load Shed Settings. See Section 2.12.9.



1. Customer connections terminal strip TB2

Figure 3-12. Accessory KD-35-N Connections

3.14 KD-51—Communication Modules

The ATS requires a communication module to communicate with a PC for monitoring and control. A communication module has a ribbon cable that connects it to the main logic board and a port for connection to communication wiring. See Section 2.10 for information on PC communication connections.

Accessory KD-51-A provides RS-485 communication capability for the local area network and the remote area network connections.

Accessory KD-51-B provides RS-232 communication capability for the local single and the remote area network connections.

3.15 KD-100—Extended Time Delays

Extended time delays are shunt/jumper-controlled accessories. See Section 3.2.

Scheduled 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.

A local authorized distributor/dealer (authorized service center) can provide complete preventive maintenance and services to keep the transfer switch in top condition. Contact a local distributor/dealer for additional information. See the Service Assistance section in the Introduction for how to locate a local distributor/dealer.

Read this entire section carefully before attempting any maintenance or service. Unless otherwise specified, have maintenance or service performed by an authorized service center that has trained and qualified personnel who follow all applicable codes and standards.

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.

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(under 600 volt)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(600 volt and above)

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

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

(under 600 volt)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

(600 volt and above)

⚠ WARNING

Hazardous voltage. Moving rotor.
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. Open the main circuit breakers of all power sources before servicing the equipment. Configure the installation to electrically ground the generator set, transfer switch, and related equipment and electrical circuits to comply with applicable codes and standards. 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 wristwatch, rings, and jewelry before servicing the equipment.

Servicing the transfer switch. Hazardous voltage can cause severe injury or death. Deenergize all power sources before servicing. Open 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.

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.

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

When replacing hardware, do not substitute with inferior grade hardware. Screws and nuts are available in different hardness ratings. To indicate hardness, American Standard hardware uses a series of markings, and metric hardware uses a numeric system. Check the markings on the bolt heads and nuts for identification.

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.

4.1 Inspection and Service

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

4.1.1 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, noise, 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. *Do not use compressed air to clean the switch because it can cause debris to lodge in the components and cause damage.* Replace any worn, missing, or broken external components with manufacturer-recommended replacement parts. Contact a local authorized service center for specific part information and part ordering. Tighten loose external hardware.

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 service center to inspect and service the transfer switch if any of the following conditions are found inside the transfer switch.

- Accumulations of dirt or 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 power interruption required to perform an internal inspection is unacceptable in the application, have an internal inspection performed by an authorized service center.

4.1.2 Other Inspections and Service

Contact an authorized service center to perform scheduled maintenance, service, and any other maintenance that ensures the safe and reliable operation of the transfer switch. See Section 4.3—Service Schedule for the recommended maintenance items and service intervals.

Have an authorized service center repair or replace components inside the transfer switch enclosure with manufacturer-recommended replacement parts.

4.2 Testing

4.2.1 Weekly Generator Set Exercise

Use a plant exerciser or manual test to start and run the generator set under a load once a week to maximize the reliability of the emergency power system. See Sections 2.12.8 and 3.9 for plant exerciser information. See Section 3.4 for information on test switches.

4.2.2 Monthly Automatic Operation Test

Test the transfer switch's automatic control system monthly. See Section 5.5.2. Verify that the expected sequence of operations occurs as the switch transfers the load to the emergency source when a normal source failure occurs or is simulated. Observe the indicators (incandescent lamps and LEDs) included on the transfer switch to check their operation. When the switch transfers the load to the emergency source, end the test and verify that the expected sequence of operations occurs as the transfer switch retransfers to the available normal source and signals the generator set to shut down after a cooldown period.

4.3 Service Schedule

Follow the service schedule below for the recommended service intervals. Have all service performed by an authorized service center except for activities limited to the items designated by an X.

System Component or Procedure	See Section	Visually Inspect	Check	Change	Clean	Test	Frequency
ELECTRICAL SYSTEM							
Check for signs of overheating or loose connections: discoloration of metal, melted plastic, or a burning odor	4.1.1	X	X				M
Check the contactor's external operating mechanism for cleanliness and clean and relubricate if dirty *	4.1.1	X		D, R (lubricant)	D		M
Check wiring insulation for deterioration, cuts, or abrasion and repair or replace wiring to regain the properties of the original wiring	4.1.1	X		D, R (wiring)			M
	4.1.2	D	D				Q
Check the transfer switch's main power switching mechanisms' mechanical operation and integrity	4.1.2	D	D			D	Y
Tighten control and power wiring connections to specifications	4.1.2, P		D			D	Y
Check the transfer switch's main power switching contacts' condition and clean or replace the main contacts or replace the contactor assembly as necessary	4.1.2	D		D, R	D		Y
Perform a thermal scan or millivolt drop test to check for high contact resistances on power circuits. Tighten connections, clean main contacts, adjust or replace main contacts or contactor assembly to eliminate high contact resistances	4.1.2		D	D, R	D	D	Y
Test wire and cable insulation for electrical breakdown	4.1.2					D	Every 3 Years
Check calibration of voltage-sensing circuitry and setpoints, and recalibrate circuitry as necessary	4.1.2		D			D	Every 5 Years
CONTROL SYSTEM							
Exercise the generator set under load	4.2.1					X	W
Test the transfer switch's automatic control system	4.2.2	X				X	M
Test all indicators (incandescent lamps and LEDs) and all remote control systems for operation		D	D	D, R		D	Y
GENERAL EQUIPMENT CONDITION							
Inspect the outside of the transfer switch for any condition of vibration, leakage, noise, temperature, contamination, or deterioration to keep the transfer switch clean and in good condition *	4.1.1	X			X		W
Check that all external hardware is in place, tightened, and not badly worn	4.1.1	X	X	R			W
Inspect the inside of transfer switch for any condition of vibration, leakage, noise, temperature, contamination, or deterioration to keep the inside of the transfer switch clean, dry, and in good condition *	4.1.1	X	X		D		M
	4.1.2	D	D		D		Y
Check that all internal hardware is in place, tightened, and not badly worn	4.1.2	X	D				M

* Service more frequently if 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.

Change 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 service center.

L See the transfer switch logic controller operation and installation manual for more information.

P See the transfer switch power switching device operation and installation manual for more information.

D Have service performed by an authorized service center.

X Operator action.

R May require replacement of components.

W=Weekly
M=Monthly
Q=Quarterly
S=Six Months
Y=Yearly

Kohler® automatic transfer switches are shipped factory wired and tested, ready for installation. Installation of the switch consists of the following.

- Unpacking and inspecting the switch upon receipt.
- Protecting the switch against damage before and during installation.
- Wiring of normal source (utility), emergency source (generator), and load power circuits.
- Wiring of control connections such as generator engine start signals and accessories.
- Connecting and initializing the controller.
- Checking voltages and functions.

Use this section for controller installation details. Begin installation by following the installation section in the power switching device operation and installation manual packed with the transfer switch. The power switching device operation and installation manual contains information on mechanical installation, electrical ratings, power connection details, and other power switching device details. See List of Related Materials in the Introduction section in this manual.

5.1 Upon Receipt of Unit

5.1.1 Inspection

At time of delivery, inspect the transfer switch for signs of shipping damage. If damage and/or rough handling is evident, file a damage claim immediately with the transportation company and promptly notify the distributor/dealer.

5.1.2 Lifting

⚠ WARNING

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

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

The power switching device operation and installation manual lists the approximate weight of each transfer switch. Use a spreader bar to lift. Attach the bar only to the enclosure's mounting holes or lifting brackets; do not lift the unit at any other points. Replace, close, and latch the enclosure door before moving or mounting the unit.

5.1.3 Unpacking

Unpack the transfer switch immediately after receipt and inspect it for shipping damage. Failure to perform an immediate inspection impedes recovery of losses caused by shipping damage. Use care when unpacking to avoid damaging the transfer switch components. Remove all dirt and packing material that may have accumulated in the transfer switch or any of its components.

If the equipment has been stored at cold temperatures, allow equipment to warm to room temperature for 24 hours (minimum) before unpacking to prevent condensation on the electrical apparatus.

5.1.4 Storage

Store the transfer switch in its protective packing until ready for final installation. Protect the automatic transfer switch at all times from excessive moisture, construction grit, and metal chips. Avoid storage in low temperature and high humidity areas where condensation could occur on the unit.

5.2 Mechanical Installation

Check the System Voltage and Frequency Do not install the transfer switch if the system voltage and frequency shown on the transfer switch nameplate is different from the nominal normal (utility) source voltage and frequency and the nominal emergency source voltage and frequency shown on the generator set nameplate.

All enclosed switches have the logic controls mounted on the enclosure door. The transfer switch enclosure is either mounted on the wall or floor depending on the switch type and size. Refer to the power switching device operation and installation manual for mounting information.

5.3 Check Manual Operation

Follow the procedure in the power switching device operation and installation manual to manually operate the power switching device to verify that it operates smoothly without binding and prepare it for automatic operation. If the power switching device does not operate smoothly without binding, *STOP!* Call an authorized service center to service the power switching device before proceeding.

5.4 Electrical Wiring

The factory prewires all internal electrical connections. The only wiring necessary for installing the transfer switch is to connect the transfer switch to external devices and power sources.

Observe all applicable national, state, and local electrical codes during installation.

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

The power switching device operation and installation manual provides schematic diagrams and enclosure drawings.

⚠ 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.

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(under 600 volt)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

(600 volt and above)

⚠ WARNING

Hazardous voltage.
Can cause severe injury or death.

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

(under 600 volt)

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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

(600 volt and above)

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

Installing the battery charger. Hazardous voltage can cause severe injury or death. An ungrounded battery charger may cause electrical shock. Connect the battery charger enclosure to the ground of a permanent wiring system. As an alternative, install an equipment grounding conductor with circuit conductors and connect it to the equipment grounding terminal or the lead on the battery charger. Install the battery charger as prescribed in the equipment manual. Install the battery charger in compliance with local codes and ordinances.

Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Installing accessories to the transformer assembly. Hazardous voltage can cause severe injury or death. To prevent electrical shock disconnect the harness plug before installing accessories that will be connected to the transformer assembly primary terminals on microprocessor logic models. Terminals are at line voltage.

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.

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.

5.4.1 AC Power Connections

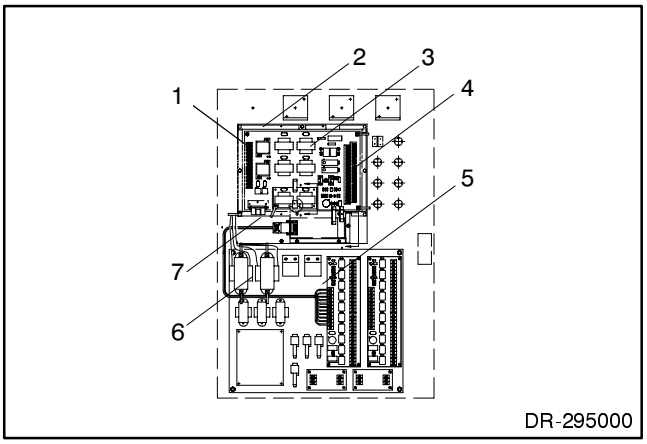
See the power switching device operation and installation manual for power connection information and ratings.

5.4.2 Controller Logic

The M340 electrical control system (logic controller) is mounted on the inside of the enclosure door. See Figure 5-1.

The power switching device and the logic controller each has its own wire harness that terminates with an inline disconnect plug. See Figure 5-1. The factory sends the transfer switch with the inline disconnect plugs disconnected.

Do not connect the controller to the power switching device until a voltage check is performed. See Section 5.5.1.



1. AC connection terminal strip TB-AC1
2. Main controller circuit board (behind metal shield)
3. Transformer circuit board
4. DC connection terminal strip TB-DC1 (terminals 1–34)
5. Accessory mounting area
6. Normal and emergency power transformers NT and ET
7. Inline disconnect plug P1

Figure 5-1. M340 Inner Panel Electrical Controls (shown with accessories)

The main controller circuit board contains the main microprocessor control circuits and is mounted inside a metal shield. The main controller circuit board connects to a transformer circuit board that has terminal strips and connectors that allows connection to other parts of the system.

Terminal strip TB-AC1 is used for connections from the interconnection circuit board to the normal and emergency power transformers and accessories. The power transformers transform line voltage into a lower voltage AC source that powers the controller.

Terminal strip TB-DC1 provides terminals for various DC input and output connections.

See Section 5.7 for terminal strip identification.

5.4.3 DC Power Connections

If the application requires accessory KD-100-B extended time delays, a 12–30 volt DC battery power supply is required to maintain controller power during an extended time delay. Connect the positive (+) terminal from the battery to Battery In (terminal 29) on terminal strip TB-DC1 on the transformer circuit board. Connect the negative (–) terminal from the battery to Controller Signal Ground (any of terminals 32 through 34) on TB-DC1 on the transformer circuit board. See Section 5.7.

5.4.4 Accessory and Control Connections

Make the generator start signal connections. See the power switching device operation and installation manual for details on generator engine start signal connections.

Note any optional accessories installed on the switch and make connections to accessories. See Section 3—Accessories.

If accessory KD-23-G plant exerciser is present, position the plant exerciser Load/No Load selector switch on the inner panel to select whether the generator runs loaded or unloaded during an automatic plant exercise period.

5.4.5 PC Communication

Install communication wiring to the communication module, if installed. See the installation instructions for the communication modules or the operation and installation manual for the Remote Monitoring and Control Communication software or Communication Kits for instructions and required products. See List of Related Materials in the Introduction section in this manual.

5.4.6 Area Protection Mode

An optional, customer-supplied, isolated remote contact can be used to cause the ATS to enter an area protection mode. In area protection mode the ATS starts the generator set and transfers the load to the emergency source when available in anticipation of a normal power source outage. To wire the area protection circuit, remove the wire grounding Area Protection (terminal 6) on terminal strip TB-DC1 and connect a circuit containing a normally closed contact between Area Protection (terminal 6) of TB-DC1 to Controller Signal Ground (any of terminals 32 through 34) on TB-DC1 on the transformer circuit board. See Section 5.7. When the contact opens, the ATS enters the area protection mode and follows the sequence of operation similar to a normal source failure by starting the generator and transferring to the emergency source when it is available (acceptable). The ATS remains in area protection mode until (1) the area protection contact closes or (2) the emergency source fails. In either case the ATS transfers back to the normal source if available (acceptable).

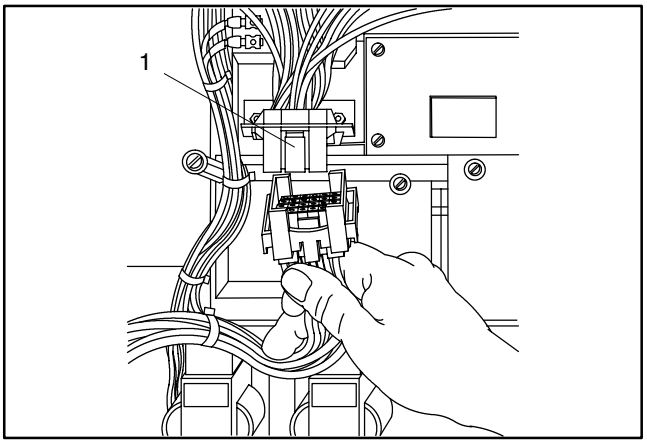
5.4.7 Remote Test Circuit

An optional, customer-supplied isolated remote contact can be used to test the transfer switch. To wire the remote test circuit, connect an isolated normally closed contact between K1 Test Relay Control (terminal 24) of TB–DC1 and Controller Signal Ground (any of terminals 32 through 34) on TB-DC1 on the transformer circuit board. When the contact opens, the ATS enters the test mode and operates the same as if the test switch selects the test mode.

5.5 Functional Tests

5.5.1 Voltage Check

Follow the instructions in the power switching device operation and installation manual for the voltage check procedure to complete installation of the power switching device. See Figure 5-1 and Figure 5-2 to locate and connect the controller's inline disconnect plug.



1. Inline Disconnect Plug P1

Figure 5-2. Inline Disconnect Plug

5.5.2 Automatic Operation Test

The following test verifies the transfer switch's electrical control system operation.

Start the test with all control switches in automatic, the normal power source available, load connected to the normal source, and normal and emergency source line circuit breakers or switches closed. Close circuit breaker or switches only when loads can be safely energized. Observe indicators and time delays during the sequences of operation and compare them to expected operation. See Section 2.6—Automatic Operation.

Automatic Operation Test Procedure

1. Move the generator set master switch on the generator set that provides the emergency power source to the transfer switch to the AUTO (automatic) position. The generator set may start.
2. If the generator set is still running, wait until it shuts down. After normal power is applied to the transfer switch the generator set should not run longer than the transfer switch TDEC and the generator set controller cooldown period.
3. Move or push the transfer switch test switch to select the test mode and hold it in that position if the test switch has a momentary test position. The generator set should start and run after TDES completes timing. The load should transfer to the emergency source after TDNE completes timing.
4. Move or release the transfer switch test switch to select the automatic mode. The transfer switch retransfers the load to the normal source after TDEN completes timing. TDEC allows the generator engine to continue running for an additional unloaded running time. The transfer switch TDEC completes timing before any cooldown function in the generator set controller begins timing.

This completes functional tests of the transfer switch. Leave the generator set master switch in the AUTO (automatic) position.

5.6 Controller Setup

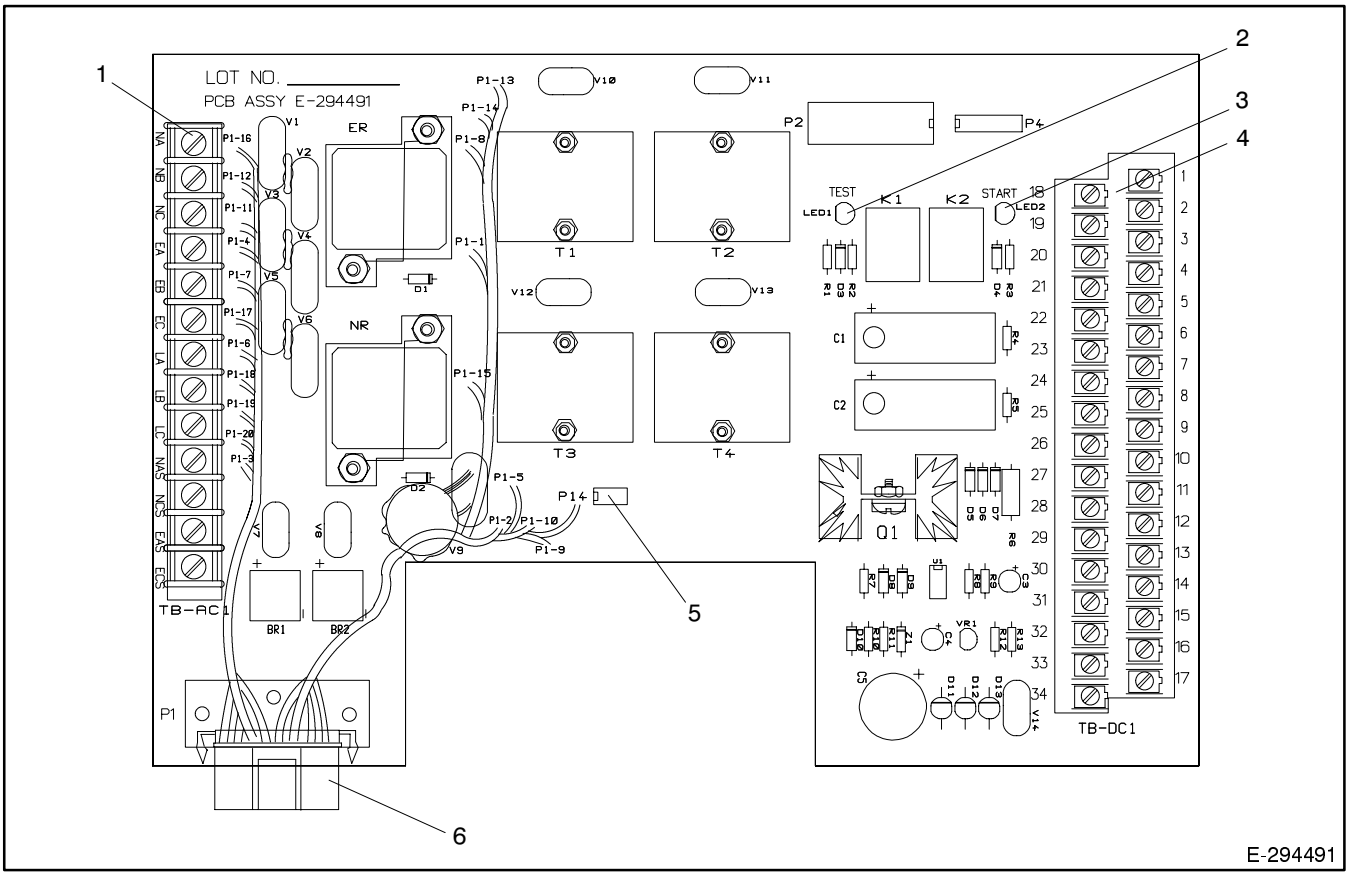
It is likely that the controller requires reprogramming of settings for the application. Read Sections 1, 2, and 3 to understand controller and accessory operation. Follow the controller initialization sequence shown in Figure 5-3. Use the worksheets in Appendix E to record the various settings. See Appendix D for setting ranges and factory default settings.

Step	Index	Section	Action
1	4	2.12.4	Set the time and date.
2	11	2.11.11	View accessories status.
3	5	2.12.5	View and change time delays.
4	6	2.12.6	View and change normal source system and setpoint settings.
5	7	2.12.7	View and change emergency source system and setpoint settings.
6	8	2.12.8	If Plant Exerciser accessory is enabled, choose the plant exerciser mode and program a plant exerciser schedule.
7	9	2.12.9	If the ATS is equipped with a load shedding contacts accessory, program the load shed settings.
8	1	2.12.1	View normal source voltages and frequency. All sensed phases appear.
9	—	2.12.2	Perform an automatic operation test to verify settings. See Section 5.5.2. Reprogram settings if operation sequence is not as expected.
10	13	2.9 and 2.12.13	Set applicable settings for online PC communication.
11	none	2.4.2	Place the Programming Mode switch in the Off or Remote position and store the key in a safe location.

Figure 5-3. Controller Initialization

5.7 Terminal Strip Identification

Refer to Figure 5-4 for the positions of the terminal strips TB-AC1 and TB-DC1 on the transformer circuit board.



1. AC connections terminal strip TB-AC1
2. Test LED lights when the ATS is in the test mode
3. Engine Start LED lights when engine start contacts are closed
4. DC connections terminal strip TB-DC1
5. Accessory ribbon cable connector
6. Inline disconnect plug P1

Figure 5-4. Transformer Circuit Board

5.7.1 TB-AC1 Terminal Strip—AC Inputs

TB-AC1 connects the controller to the normal, emergency, and load line voltages through the inline disconnect plug and to controller power supply transformers NT1 and ET1. There are no installation connections required on this terminal strip.

Label	Description
NA	**Normal Phase A** connects from the contactor to terminal NA through P1-12.
NB	**Normal Phase B** connects from the contactor to terminal NB through P1-11.
NC	**Normal Phase C** connects from the contactor to terminal NC through P1-4.
EA	**Emergency Phase A** voltage connects from the contactor to terminal EA through P1-7.
EB	**Emergency Phase B** voltage connects from the contactor to terminal EB through P1-17.
EC	**Emergency Phase C** voltage connects from the contactor to terminal EC through P1-13.
LA	**Load Phase A.** Contactor load voltage—Phase A from P1-18.
LB	not used
LC	**Load Phase C.** Contactor load voltage—Phase C from P1-20.
NAS	**Normal Transformer #1**. Input to DC power supply from NT1 transformer. Voltage between NAS and NCS about 19 vac.
NCS	**Normal Transformer #2**. Input to DC power supply from NT1 transformer. Voltage between NAS and NCS about 19 vac.
EAS	**Emergency Transformer #1**. Input to DC power supply from ET1 transformer. Voltage between EAS and ECS about 19 vac.
ECS	**Emergency Transformer #2.** Input to DC power supply from ET1 transformer. Voltage between EAS and ECS about 19 vac.

5.7.2 TB-DC1 Terminal Strip—DC and I/O Connections

Use TB-DC1 for DC connections of the controller to accessories and external circuits. To ground inputs connect to TB-DC1 terminals 32, 33, or 34 (Controller Signal Ground), *NOT TO A CHASSIS OR EARTH GROUND.* Output terminals internally connect to Controller Signal Ground when grounded, not necessarily to a chassis or earth ground. Descriptions assume that the controller is powered and functioning normally.

Terminal	(I)nput or (O)utput	Description
1	O *	**Programming Switch Not In Off RDO**. Grounded if the Programming Mode switch is not in the Off position.
2	I *	**Manual Transfer Emergency to Normal.** The ATS manually transfers to an available normal source when grounded if terminal 20 is also grounded.
3	I *	**Bypass Normal to Emergency Time Delay.** The controller bypasses TDNE when grounded.
4	I *	**Bypass Emergency to Normal Time Delay.** The controller bypasses TDEN when grounded.
5	O *	**Load Bank Control RDO.** Grounded if the plant exerciser is unloaded and active.
6	I *	**Area Protection.** The area protection mode is inhibited when grounded.
7	I *	**Manual Transfer Normal to Emergency.** The ATS manually transfers to an available normal source when grounded if Auto/Manual Select (terminal 20) is also grounded.
8	I *	**Fault #1.** *FAULT #1* message appears on the LCD when grounded.
9	I *	**Not In Automatic.** Grounding causes the Not in Automatic LED to flash.
10	I *	**Plant Exercise Load/No Load.** The automatic scheduled plant exerciser runs the generator set under load during the plant exercise run when grounded.
11	I *	**Fault #2.** *FAULT #2* message appears on the LCD when grounded.
12	—	**Reserved**
13	—	**Reserved**
14	O *	**Not In Automatic RDO.** Grounded when the ATS is in automatic mode.
15	—	**Reserved**
16	—	**Reserved**
17	—	**Reserved**
18	O *	**Emergency Source Available RDO.** Grounded if the emergency source is available (acceptable).
19	O *	**System Alert RDO.** Grounded during a system alert.
20	I *	**Auto/Manual Select.** The transfer switch is in manual mode and under control of the manual transfer inputs when grounded.
21	O	**Engine Start Terminal 3.** Connects to generator set engine start terminal 3.
22	O	**Remote Start/Stop Relay (Engine Start Disconnect #1).** Terminal 22 connects to K2, normally closed contact. Connects to engine start terminal 4.
23	O	**Unregulated DC Power.** Power source for auxiliary relay contact kits, KD-14.
24	I *	**K1 Test Relay Control.** Test relay energizes to simulate a normal source failure when grounded.
25	I	**Normal Relay/Emergency Relay.** Supplies 10 volts DC to the transfer control relays from terminal 30.
26	O *	**Normal Source Available RDO.** Grounded if the normal source is available (acceptable).
27	O *	**Emergency Position RDO.** Grounded when the contactor is in the emergency position.
28	O *	**Normal Position RDO.** Grounded when the contactor is in the normal position.
29	I	**DC Battery In.** Positive input for external 12-30 volt DC controller power supply.
30	O	**Regulated DC Power Supply.** Regulated +10 volts DC from the controller power supply.
31	O	**Engine Start Disconnect #2.** Connects to engine start terminal 4.
32	—	**Controller Signal Ground.** Common connection points for negative terminals and signal ground wires to controller input terminals.
33		
34		

* Inputs require isolated contacts or open collector/drain that connect to Controller Signal Ground (terminals 32–34) to activate, operating voltage 12 vdc maximum, operating current 10 mA DC minimum. Relay driver outputs (RDOs) connect to a maximum of three accessory KD-14 Auxiliary Relay Contact inputs for external annunciation to custom equipment.

Appendix A. Glossary of Abbreviations

Abbreviations are used throughout this manual. Normally in the text they will appear in complete form with the abbreviation following in parenthesis the first time they are used. After that they will appear in the abbreviated form. The commonly used abbreviations are shown below.

AC	alternating current
AISI	American Iron and Steel Institute
Amp	ampere
Amps	amperes
ANSI	American National Standard Institute
API	American Petroleum Institute
approx.	approximate, approximately
A/R	as required, as requested
A/S	as supplied, as stated, as suggested
ASA	American Standards Association
ASME	American Society of Mechanical Engineers
assy.	assembly
ASTM	American Society for Testing Materials
ATDC	after top dead center
aux.	auxiliary
AWG	American Wire Gauge
AWM	appliance wiring material
BBDC	before bottom dead center
BDC	before dead center
BHP	brake horsepower
bmep	brake mean effective pressure
Btu	British thermal unit
°C	Celsius degree
cc	cubic centimeter
CCA	cold cranking Amps.
CEC	Canadian Electrical Code
cfh	cubic feet per hour
cfm	cubic feet per minute
CID	cubic inch displacement
cm	centimeter, centimeters
cmm	cubic meters per minute
co.	company
cont'd.	continued
CSA	Canadian Standards Association
CT	current transformer
cu. in.	cubic inch, cubic inches
cyl.	cylinder
dB	decibel
dBA	decibels (A weighted)
DC	direct current
DCR	direct current resistance
deg.	degree
dept.	department
dia.	diameter
e.g.	example given
EIA	Electronic Industries Association
EMI	electromagnetic interference
EPA	Environmental Protection Agency
etc.	et cetera (and so forth)
ext.	external
°F	Fahrenheit degree
fl. oz.	fluid ounce, fluid ounces
FM	frequency modulation
ft.	foot, feet
ft. lbs.	foot pound, foot pounds
ga.	gauge (meters, wire size)
gal./ gals.	gallon, gallons
gph	gallons per hour
gpm	gallons per minute
gr.	grade
gnd.	ground
HCHT	high cylinder head temperature
HET	high exhaust (or engine) temperature
Hg	mercury (element)
H_2O	water
HP	horsepower
hr, hrs	hour
Hz	hertz (cycles per second)
ID	inside diameter
IEEE	Institute of Electrical and Electronic Engineers
in.	inch(es)
inc.	incorporated
in. lbs.	inch pounds
int.	internal
int.-ext.	internal-external
ISO	International Standards Organization
J	joule, joules
JIS	Japanese Industry Standard
kg	kilogram, kilograms
kg/cm^2	kilograms per square centimeter
kgm	kilogram meter(s)
kJ	kilojoules (btu cal)
km	kilometer, kilometers
kPa	kiloPascal, kiloPascals
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt amperes
kW	kilowatt, kilowatts
kWH	kilowatt hour
L	liter, liters
LxWxH	length x width x height
LED(s)	light emitting diode
lb., lbs.	pound, pounds
L/hr.	liter per hour, liters per hour
L/min.	liter(s) per minutes
LOP	low oil pressure
LP	liquefied petroleum
m	meter, meters
m^3	cubic meter, cubic meters
max.	maximum
MCM	one thousand circular mils.
meggar	megohmmeter
MHz	megahertz
mi.	mile, miles
mil	one one-thousandth of an inch
min.	minimum
mJ	millijoule, millijoules
MJ	mega joule, mega joules
mm	millimeter, millimeters
m^3/min	cubic meters per minute
MPa	megaPascal
mW	milliwatt, milliwatts
MW	megawatt, megawatts
N/A	not available or not applicable
NBS	National Bureau of Standards
N.C.	normally closed
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Nm	Newton meter, Newton meters
no., nos	number, numbers
NPT	National Standard taper pipe thread per general use
N/R	not required
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OS	overspeed, oversize
O/S	oversize
OSHA	Occupational Safety and Health Act
OV	overvoltage
oz.	ounce, ounces
PF	power factor
PMG	permanent magnet generator
pot.	potentiometer
ppm	parts per million
psi	pounds per square inch
pt., pts.	pint, pints
PVC	polyvinyl chloride
qt., qts.	quart, quarts
qty.	quantity
ref.	reference
RFI	radio frequency interference
r.h.m.	round-head machine (screw)
rms	root mean square
RPM	revolutions per minute
RTV	room temperature vulcanization
SAE	Society of Automotive Engineers
SCR	silicon-controlled rectifier
sec.	second, seconds
spec.	specs, specification
sq.	square
sq. cm	square centimeters
sq. in.	square inch, square inches
tach	tachometer
TDC	top dead center
tech. pub.	technical publications
temp.	temperature
TIF	telephone influence factor
TP, TPs	technical publications
turbo	turbocharger
UHF	ultrahigh frequency
UNC	Unified coarse thread (was NC)
UNF	Unified fine thread (was NF)
UL	Underwriter's Laboratories, Inc.
U/S	undersize
U.S.A.	United States of America
V	volt, volts
vac	volts alternating current
vdc	volts direct current
VHF	very high frequency
W	watt, watts

Appendix B. Source History Message Summary

Source History Message Summary for Single-phase Sensing	
Display Message	**The Controller Has Detected the Following Condition**
NORM OVER VOLT	Normal source voltage greater than the dropout setting
NORM UNDER VOLT	Normal source voltage less than the dropout setting
NORM OVER FREQ	Normal source frequency greater than the dropout setting
NORM UNDER FREQ	Normal source frequency less than the dropout setting
EMER OVER VOLT	Emergency source voltage greater than the voltage dropout setting
EMER UNDER VOLT	Emergency source voltage less than the dropout setting
EMER OVER FREQ	Emergency source frequency greater than the dropout setting
EMER UNDER FREQ	Emergency source frequency less than the dropout setting

Source History Message Summary for Three-phase Sensing	
Display Message	**The Controller Has Detected the Following Condition**
N-OVVOLT PH A-B	Normal source voltage between phases A and B greater than the dropout setting
N-OVVOLT PH B-C	Normal source voltage between phases B and C greater than the dropout setting
N-OVVOLT PH A-C	Normal source voltage between phases A and C greater than the dropout setting
N-UNVOLT PH A-B	Normal source voltage between phases A and B less than the dropout setting
N-UNVOLT PH B-C	Normal source voltage between phases B and C less than the dropout setting
N-UNVOLT PH A-C	Normal source voltage between phases A and C less than the dropout setting
N-OVER FREQ	Normal source frequency greater than the dropout setting
N-UNDER FREQ	Normal source frequency less than the dropout setting
N-PHASE LOSS	One or more of the three phases of the normal source not energized
E-OVVOLT PH A-B	Emergency source voltage between phases A and B greater than the dropout setting
E-OVVOLT PH B-C	Emergency source voltage between phases B and C greater than the dropout setting
E-OVVOLT PH A-C	Emergency source voltage between phases A and C greater than the dropout setting
E-UNVOLT PH A-B	Emergency source voltage between phases A and B less than the dropout setting
E-UNVOLT PH B-C	Emergency source voltage between phases B and C less than the dropout setting
E-UNVOLT PH A-C	Emergency source voltage between phases A and C less than the dropout setting
E-OVER FREQ	Emergency source frequency greater than the dropout setting
E-UNDER FREQ	Emergency source frequency less than the dropout setting
E-PHASE LOSS	One or more of the three phases of the emergency source not energized

Appendix C. System Alert Message Summary

System Alert Message Summary	
Display Message	**The Controller Has Detected the Following Condition**
AUX-SWITCH FAULT	Contactor malfunction or limit switch fault
DBL AUX-SW FAULT	Contactor limit switch fault
TRANSFER HANG	Contactor transfer time too long or failure to transfer
POWER-DOWN ERROR	Possible failure to save settings during power loss. Check to see if settings were retained.
RAM ERROR	Internal controller fault. Call an authorized service center for repairs.
MEMORY ERROR	Internal controller fault. Call an authorized service center for repairs.
MANUAL TRANSFER	Ready to accept input from manual transfer pushbuttons (if equipped)
FAULT #1	Annunciation of fault signal #1 from a remote source, such as a customer-provided engine condition switch
FAULT #2	Annunciation of fault signal #2 from a remote source, such as a customer-provided engine condition switch

Appendix D. Setting Ranges and Factory Defaults

Setting	Standard Range	Maximum With Extended Time Delays	Factory Default
Time Delays (Minutes:Seconds) (Index 5)			
Engine Start (TDES)	0:00-0:06	99:00	0:05
Normal to Emergency (TDNE)	0:00-5:00	99:00	0:05
Emergency to Normal (TDEN)	0:00-30:00	99:00	5:00
Engine Cooldown (TDEC)	0:00-30:00	99:00	5:00
Normal System Voltage/Frequency Settings (Index 6)			
Normal Volts	105-600		same as coded by transfer switch model number
Normal Hz	48-62		
Normal Overvoltage Dropout	105-135%		115%
Normal Overvoltage Pickup	100-130%		110%
Normal Undervoltage Pickup	75-100%		90%
Normal Undervoltage Dropout	70-95%		85%
Normal Overfrequency Dropout	105-135%		115%
Normal Overfrequency Pickup	100-130%		110%
Normal Underfrequency Pickup	85-100%		90%
Normal Underfrequency Dropout	80-95%		85%
Emergency System Voltage/Frequency Settings (Index 7)			
Emergency Volts	105-600		same as coded by transfer switch model number
Emergency Hz	48-62		
Emergency Overvoltage Dropout	105-135%		115%
Emergency Overvoltage Pickup	100-130%		110%
Emergency Undervoltage Pickup	75-100%		90%
Emergency Undervoltage Dropout	70-95%		85%
Emergency Overfrequency Dropout	105-135%		115%
Emergency Overfrequency Pickup	100-130%		110%
Emergency Underfrequency Pickup	85-100%		90%
Emergency Underfrequency Dropout	80-95%		85%
Plant Exerciser (Index 8)			
(Run Time hours:minutes)			
7-day, 14-day, and Calendar Modes	0-4:00		0:00
Manual One-time Exerciser Mode	0-72:00		0:00
Load Shed (Index 9)			
Time Before Transfer (Minutes:Seconds)	0:00-1:00	99:00	0:00
Time After Transfer (Minutes:Seconds)	0:00-0:05	99:00	0:00
Loads Returned	1-9		9
Sequence Time (Minutes:Seconds)	0:00-0:05	99:00	0:00
Remote Control (Index 13)			
Address	1-128		1
System ID	0-999999		0
Baud Rate	2400, 4800, or 9600		2400

Appendix E. Controller Setup Worksheets

The following sections provide controller setup worksheets.

Control Options Status

Review the shunt/jumper-controlled accessories furnished with the transfer switch by accessing Index 11. Complete the worksheet below with the information obtained in Index 11. See Section 2.11.11.

Installed Control Options Worksheet		
Display Message	**Enabled? (YES or NO)**	**Accessory**
INPHASE MON	_____	Inphase monitor
PHA SEQ/LOSS	_____	Source phase sequence (3 phase applications only)
NORM & EMER	_____	Normal and emergency over- and under- voltage and frequency sensing
PLANT EXERC	_____	Programmed periodic generator set exerciser
TD EXTENDED	_____	Extended (to 99 minutes maximum) time delay
MAN OVERRIDE	YES	Automatic override of all possible manual functions to provide power to the load

Time Delays

Complete the worksheet below by entering the desired time delay settings in minutes:seconds. Program new settings in Index 5. See Section 2.12.5.

NOTE

Extended time delays allows TDES as long as 99 minutes, but the controller does not maintain control for longer than 6 seconds without an available power source. Power the controller with a DC voltage source from a battery to maintain the controller's power supply if setting TDES longer 6 seconds. If the objective is to increase the time delay before transferring to the emergency source, you may wish to increase TDNE instead of TDES. Then the generator set will be supplying power to the controller until TDNE ends.

Time Delay Settings Worksheet				
Setting (Minutes:Seconds)	**Standard Range**	**Maximum With Extended Time Delays**	**Factory Default**	**New Setting**
Engine Start (TDES)	0:00-0:06	99:00	0:05	____:____
Normal to Emergency (TDNE)	0:00-5:00	99:00	0:05	____:____
Emergency to Normal (TDEN)	0:00-30:00	99:00	5:00	____:____
Engine Cooldown (TDEC)	0:00-30:00	99:00	5:00	____:____

Normal and Emergency Source Settings

Determine normal and emergency pickup and dropout setpoints that provide load protection. Enter normal and emergency pickup and dropout setpoints in the worksheet below. Program the new setpoints for the normal source system in Index 6. See Section 2.12.6. Program the new setpoints for the emergency source system in Index 7. See Section 2.12.7.

Normal and Emergency Source System Setpoints Worksheet

Setting	Limits	Factory Defaults		New Setpoint	
		Normal	Emergency	Normal	Emergency
Overvoltage Dropout	105–135%	115%	115%	_____%	_____%
Overvoltage Pickup	100–130%	110%	110%	_____%	_____%
Undervoltage Pickup	75–100%	90%	90%	_____%	_____%
Undervoltage Dropout	70–95%	85%	85%	_____%	_____%
Overfrequency Dropout	105–135%	115%	115%	_____%	_____%
Overfrequency Pickup	100–130%	110%	110%	_____%	_____%
Underfrequency Pickup	85–100%	90%	90%	_____%	_____%
Underfrequency Dropout	80–95%	85%	85%	_____%	_____%

Plant Exerciser

There are three different automatic plant exerciser modes, 7-day, 14-day, and calendar.. Only one mode is selectable for use at any one time. All three automatic exerciser modes allow up to five independent exercise events each with two run periods. The manual one-time exerciser mode allows the user to start the generator set manually. Enter the desired exercise settings in the worksheets below for the exercise mode selected. Program the plant exerciser settings in Index 8. See Section 2.12.8.

The choice of automatically exercising the generator set either under load or unloaded is selectable only if accessory KD-23-G is installed. If this accessory is installed, position the Load/No Load selector switch to select whether the ATS will exercise the generator set loaded or unloaded. The Load/No Load selector switch is located on the inside of the transfer switch door.

NOTE

Changing the automatic exerciser mode causes automatic plant exerciser mode settings to revert back to default settings. Settings for the manual one-time exerciser revert back to default settings when the manual one-time exerciser period ends or after the EXER STOP key is pressed.

Plant Exerciser Settings Worksheet

Setting	Range	Factory Default	New Setting	Notes
CALENDAR?	YES or NO	NO	____	Enter YES to enable the Calendar Mode.
14-DAY?	YES or NO	NO	____	Enter YES to enable the 14-day Mode.
7-DAY?	YES or NO	YES	____	Enter YES to enable the 7-day Mode.
# 1-5 ENABLED?	YES or NO	NO	see worksheets below	Enter YES to enable exercise event #1-5.
STRT TM	12:00 AM to 12:00 PM	9:00 AM	see worksheets below	Start time of exerciser event. For all automatic exerciser modes.
1ST DAY, 2ND DAY, or DAY OF WEEK	MON-SUN	TUE	see worksheets below	Day of the week to start exercise event. For all automatic exerciser modes.
1ST OCCUR # or 2ND OCCUR #	1-5	1	see worksheets below	Occurrence number of day in month to start the exercise event. Calendar mode only.
WEEK 1 OR 2	1-2	1	see worksheets below	Week in two-week period to start the exercise event. 14-day mode only.
RUN HR:MN	0:00-4:00	0:00	see worksheets below	Maximum run time for the manual one-time exerciser is 72:00 hours:minutes with extended time delays for all exerciser modes.
LD TRANS?	YES or NO	NO	____	Choice of load or no-load exercise accessory regardless of exerciser accessory or setting of the Load/No Load selector switch. Manual one-time exerciser mode only.
BP TDNE?	YES or NO	NO	____	YES causes bypass of time delay when transferring to emergency. Manual one-time exerciser mode only.
ENGINE START?	YES or NO	NO	____	YES initiates the manual one-time exercise.

Plant Exerciser, continued

Calendar Mode Exerciser provides exercise events on any two times that the day of the week occurs in a month. The calendar exerciser is a true calendar type, and it calculates when a day of the week will occur in any given month once the date has been set in Index 4.

Calendar Mode Exerciser Worksheet								
Exercise Event #	Enabled? (YES or NO)	Start Time		Day of Week	Occurrence #		Week 1 or 2	Run Time HR:MN
		HR:MN	AM/PM		1st Day	2nd Day		
1	____	____:____	____		____	____	____	____:____
2	____	____:____	____		____	____	____	____:____
3	____	____:____	____		____	____	____	____:____
4	____	____:____	____		____	____	____	____:____
5	____	____:____	____		____	____	____	____:____

14-Day Mode Exerciser provides exercise events that occur at the same time, on the same day(s), and for the same duration every other week. Also programmable to provide weekly exercise events.

14-day Mode Exerciser Worksheet							
Exercise Event #	Enabled? (YES or NO)	Start Time		Day of Week		Week 1 or 2	Run Time HR:MN
		HR:MN	AM/PM	1st Day	2nd Day		
1	____	____:____	____	____	____	____	____:____
2	____	____:____	____	____	____	____	____:____
3	____	____:____	____	____	____	____	____:____
4	____	____:____	____	____	____	____	____:____
5	____	____:____	____	____	____	____	____:____

7-Day Mode Exerciser provides exercise events that occur at the same time, on the same day(s), and for the same duration every week.

7-day Mode Exerciser Worksheet						
Exercise Event #	Enabled? (YES or NO)	Start Time		Day of Week		Run Time HR:MN
		HR:MN	AM/PM	1st Day	2nd Day	
1	____	____:____	____	____	____	____:____
2	____	____:____	____	____	____	____:____
3	____	____:____	____	____	____	____:____
4	____	____:____	____	____	____	____:____
5	____	____:____	____	____	____	____:____

Load Shed Settings

Use this section only if accessory KD-35-N Load Shedding Contacts is installed in the transfer switch. Determine load shedding requirements for loads controlled by the load shedding contacts. Next, determine the times (in minutes and seconds) before and after transfer to either source to disconnect and reconnect load blocks. Determine the number of load blocks (1-9) to reconnect after transfer to either source. Determine the time (in minutes and seconds) that must elapse between load blocks returned in sequence after transfer to either source. Enter these load shed settings into the following worksheet. Program the settings in Index 9. See Section 2.12.9.

Load Shed Settings Worksheet

Setting	Standard Range	Maximum With Extended Time Delays	Factory Default	Transfer To	
				Normal	Emergency
Time Before	0:00-1:00	99:00	0:00	____:____	____:____
Time After	0:00-0:05	99:00	0:00	____:____	____:____
Time Sequence	0:00-0:05	99:00	0:00	____:____	____:____
Loads Returned	1-9	-	9	___	___

Remote Control

See Section 2.9 for an explanation of settings that enable or disable PC connections and set one of the communication connection types. Complete the worksheet below and program remote control settings in Index 13. See 2.12.13.

Remote Control Settings Worksheet

Setting	Range	Factory Default	New Setting	Notes
ON-LINE?	YES or NO	NO	____	Enter YES to enable a PC connection.
LOCAL?	YES or NO	-	____	Enter YES to enable a local single connection. Relevant only when ON-LINE is YES.
LAN?	YES or NO	-	____	Enter YES to enable a local area network connection. Relevant only when ON-LINE is YES.
REMOTE?	YES or NO	-	____	Enter YES to enable a remote single connection. Relevant only when ON-LINE is YES.
REMLAN?	YES or NO	-	____	Enter YES to enable a remote area network connection. Relevant only when ON-LINE is YES.
ADDRESS?	1-128	1	____	Address of controller on a local area network. Assign a unique address to each device on the network from 1 to the maximum number of devices on the network. Relevant only for local area network and remote area network connections.
SYS. ID?	0-999999	0	_____	System ID number works as a password to allow modem communication only with software that has the correct System ID number. Relevant only for remote single and remote area network connections.
BAUD RATE?	2400, 4800, or 9600	2400	_____	Baud rate in bits per second of serial communication between the controller and a personal computer's COM port.

Notes

Index

M

N

O

P

R

S

T

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POWER SYSTEMS

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