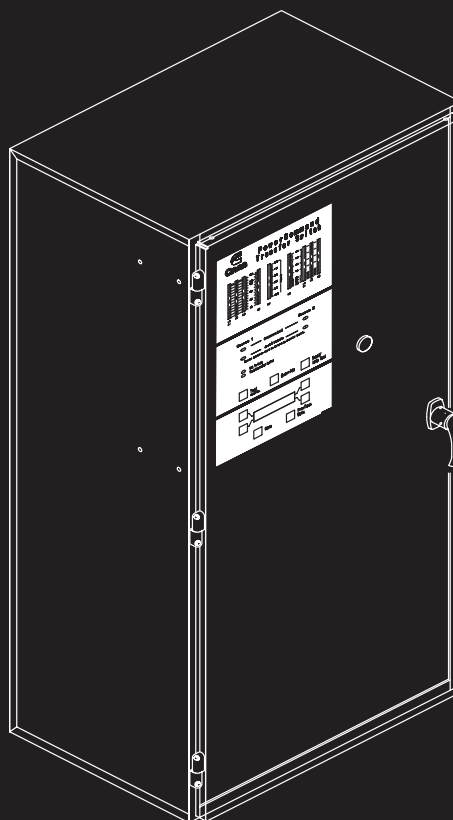


# Operator's Manual

**OTPC**  
**Transfer Switch**  
**40 to 3000 Amperes**









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**⚠WARNING**

**INCORRECT SERVICE OR REPLACEMENT OF PARTS CAN RESULT IN DEATH, SEVERE PERSONAL INJURY, AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE.**



# Safety Precautions

---

This manual includes the following symbols to indicate potentially dangerous conditions. Read the manual carefully and know when these conditions exist. Then take the necessary steps to protect personnel and the equipment.

**⚠ DANGER** *This symbol warns of immediate hazards that will result in severe personal injury or death.*

**⚠ WARNING** *This symbol refers to a hazard or unsafe practice that can result in severe personal injury or death.*

**⚠ CAUTION** *This symbol refers to a hazard or unsafe practice that can result in personal injury or product or property damage.*

## ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

High voltage in transfer switch components presents serious shock hazards that can result in severe personal injury or death. Read and follow these suggestions.

Keep the transfer switch cabinet closed and locked. Make sure only authorized personnel have the cabinet and operational keys.

Due to the serious shock hazard from high voltages within the cabinet, all service and adjustments to the transfer switch must be performed only by an electrician or authorized service representative.

## UTILITY-TO-GENSET OR GENSET TO GENSET APPLICATIONS

If the cabinet must be opened for any reason:

1. Move the operation selector switch on the generator set to Stop.
2. Disconnect the battery charger.
3. Disconnect the starting batteries of the generator set or sets (remove the ground [–] lead first).
4. Remove AC power to the automatic transfer switch. If the instructions require otherwise, use extreme caution due to the danger of shock hazard.

## UTILITY-TO-UTILITY APPLICATIONS

If the cabinet must be opened for any reason, remove AC power to the automatic transfer switch. If the instructions require otherwise, use extreme caution due to the danger of shock hazard.

## GENERAL PRECAUTIONS

Place rubber insulative mats on dry wood platforms over metal or concrete floors when working on any electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling any electrical equipment.

Jewelry is a good conductor of electricity and should be removed when working on the electrical equipment.

Wear safety glasses whenever servicing the transfer switch and do not smoke near the batteries.

Do not work on this equipment when mentally or physically fatigued, or after consuming alcohol or any drug that makes the operation of equipment unsafe.

### **⚠ WARNING**

**INCORRECT SERVICE OR REPLACEMENT OF PARTS CAN RESULT IN DEATH, SEVERE PERSONAL INJURY, AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE.**



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# 1. Introduction

## OPERATOR'S MANUAL

This manual covers models produced under the Cummins®/Onan® and Cummins Power Generation brand names.

This operator's manual provides information necessary for operation of an OTPC transfer switch. This is an open transition (OT) transfer switch with PowerCommand® Control (PC). With an open transition switch there is never a time when both sources are supplying power to the load.

Programmed transition switches pause in the neutral position of the transfer switch, between switched positions, so that transient currents from the load can diminish before the load is switched to the other source.

## TRANSFER SWITCH APPLICATION

Transfer switches are an essential part of a building's standby or emergency power system. Power Source 1 (Normal), commonly the utility line, is backed up by Power Source 2 (Emergency), often a generator set. The transfer switch automatically switches the electrical load from one source to the other.

The load is connected to the common of the transfer switch (Figure 1-1). Under normal conditions, the load is supplied with power from Source 1 (as illustrated). If Source 1 is interrupted, the load is transferred to Source 2. When Source 1 returns, the load is retransferred to Source 1. The transfer and retransfer of the load are the two most basic functions of a transfer switch.

Automatic transfer switches, capable of automatic operation without operator intervention, perform the following basic functions:

## UTILITY-TO-GENSET OPERATION

In utility-to-genset applications, the transfer switch performs the following functions:

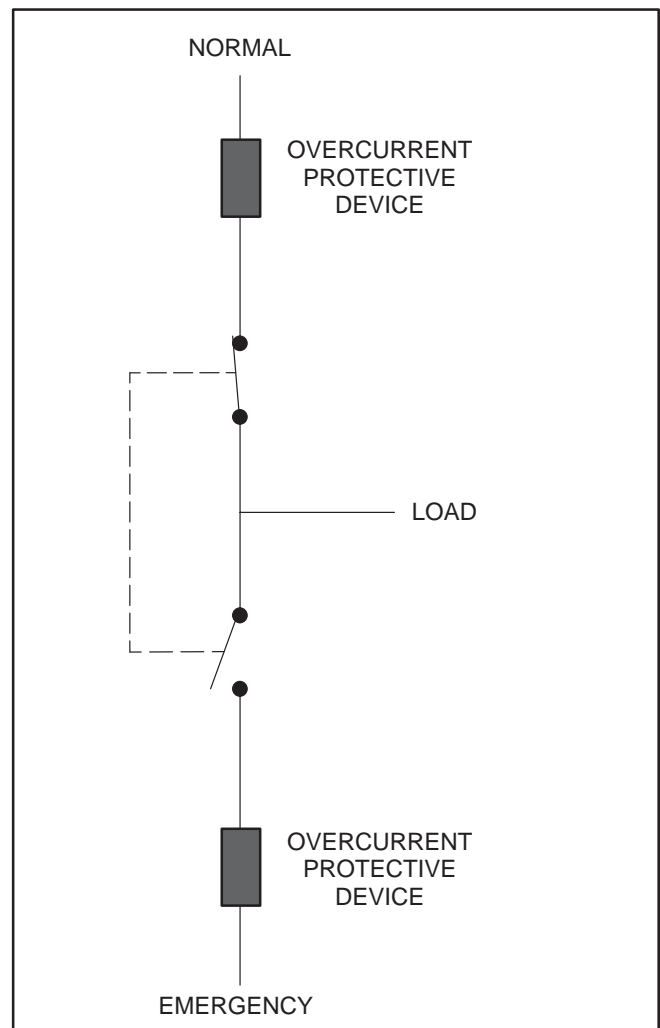
1. Senses the interruption of the Source 1 power.
2. Sends a start signal to the generator set (Source 2).

3. Transfers the load to the Source 2.
4. Senses the return of Source 1.
5. Retransfers the load to Source 1.
6. Sends a stop signal to the generator set.

## UTILITY-TO-UTILITY OPERATION

In utility-to-utility applications, the transfer switch performs the following functions:

1. Senses the interruption of the Source 1 power.
2. Transfers the load to the Source 2.
3. Senses the return of Source 1.
4. Retransfers the load to Source 1.



**FIGURE 1-1. LOAD TRANSFER SWITCH (TYPICAL FUNCTION)**



## GENERATOR-TO-GENERATOR CONTROL

The genset-to-genset control can be set up for two types of applications:

- Prime Power – Two gensets provide all of the power (utility power is not available)
- Dual Standby – Two gensets are used to back up utility power

**Note:** The Test/Exercise function and Load Shed feature are not available in this configuration.

If one genset fails to operate within the specified range of voltage and frequency, the transfer switch automatically starts and connects the other genset.

### Preferred Source Selection

With both prime power and dual standby applications, either genset can be set up to be the preferred source. If the preferred source is changed while one of the gensets is running, the control starts the second genset and transfers the load to it, when it becomes available.

### Time Delays

All the time delays are factory set and are adjustable through the front panel display. The factory settings are:

TDNE	10 SEC
TDEN	600 SEC
TDESa	3 SEC
TDECa	600 SEC
TDESb	3 SEC
TDECb	600 SEC

**Note:** TDESa and TDECa are for the Source 2 genset and TDESb and TDECb are for the Source 1 genset.

Use the Time Delay sub-menus under Setup or the PC Service tool to change the settings.

### Prime Power (Plant to Plant) Operation

In prime power applications, utility power is not available. The system includes one transfer switch and two gensets. One genset is always running and supplying power to the load while the other genset

is the backup genset. An external power supply is not needed in this application.

**Preferred Source Selection** – Under normal operation, one genset is designated as the preferred source and supplies power to the load. The second genset is the backup power source. If the preferred genset fails, the backup genset starts and the transfer switch transfers the load to the backup genset.

At any time, the PC Service tool or the Test sub-menu can be used to designate either genset (Source 1 or Source 2) as the preferred genset. If the preferred genset is changed and the backup genset becomes the preferred genset, the transfer switch transfers the load to the new preferred genset when it becomes available. The unit that is carrying the load is always considered the preferred source.

**Automatic Changeover** – The transfer switch can be set up to change the preferred source automatically by enabling the changeover timer. The Time Delay sub-menus under Setup or the PC Service tool can be used to enable the changeover timer and specify a changeover delay time period.

The automatic changeover timer automatically changes the preferred source and transfers the load to the new preferred genset after a TDEN time delay. After the transfer is complete, the control initiates a cool-down period (TDEC) on the old preferred genset before shutting it down. The old preferred genset is now the new backup genset. The changeover timer is now timing for the next changeover and the cycle continues as long as the changeover timer is enabled.

### Dual Stand-By Operation

In dual stand-by applications, utility power is available. The system includes two transfer switches and two gensets. Utility power supplies power to the load and both gensets are backup gensets.

Under normal operation, the utility is supplying power to the load through the lead transfer switch. The lead transfer switch is a utility-to-genset switch. The two gensets are connected to the genset-to-genset transfer switch. The load side of this switch is connected to the genset side of the lead transfer switch.

Upon loss of utility power to the lead transfer switch, a signal is sent to the genset-to-genset transfer switch to start the preferred genset. When the lead



transfer switch senses generator voltage, it transfers the load to that genset. If the preferred genset fails to start, a signal is sent to the backup genset to start. The PC Service tool or the Test sub-menu on the genset-to-genset transfer switch can be used to set the preferred source.

If the Stand-By Start is inactive, upon initial power-up (or reset), or during software initialization, the transfer switch control will not start either genset. When a Stand-By Start command is received from a Master ATS (or other device), the preferred genset immediately starts. If the preferred genset does not start, a time delay engine start (TDES) is initiated and the control starts the backup genset. The load is connected to the genset when it becomes available.

If the preferred genset becomes available while the backup genset is active, a time delay retransfer (TDEN) period is initiated and the load is retransferred back to the preferred genset. A time delay cool-down (TDEC) period is initiated before turning off the backup genset. When the Stand-By Start becomes deactivated, a TDEC period is initiated and the active generator is turned off.

***Preferred Source Selection*** – Under normal operation, one genset is designated as the preferred source and the second genset is designated as the backup power source. If the both the utility power

and the preferred genset fails, the backup genset starts and the genset-to-genset transfer switch transfers the load to the backup genset.

At any time, the PC Service tool or the Test sub-menu on the genset-to-genset transfer switch can be used to designate either genset (Source 1 or Source 2) as the preferred genset. If the preferred genset is changed and the backup genset becomes the preferred genset, the transfer switch transfers the load to the new preferred genset if it is needed and when it becomes available.

***Alternating Preferred Source*** – In an attempt to keep the running time equally distributed between both gensets, the control can be set to alternate between the gensets when utility power fails. The selected preferred genset starts with the first power outage. The second power outage starts the backup genset, which now becomes the preferred genset. Upon subsequent outages, the preferred genset alternates.

Only utility outages and tests or exercises initiated at the lead transfer switch result in the gensets being alternated. The designated preferred genset will not change if it fails and the backup genset takes over the load. This alternating preferred source can only be enabled with the PC Service tool. When enabled, a genset can be designated as the preferred source for a maximum of two weeks. Time adjustments can be made in one-hour increments.



## CONTROL LEVEL 1 AND LEVEL 2

Two controls are available. The type of power source switched and the desired features determine the control levels available. See the Description section for details. The table lists the applications that are available with each control.

**TABLE 1-1. AVAILABLE CONTROL LEVELS**

Power Sources	Level 1	Level 2
Genset-to-Utility	X	X
Genset-to-Genset		X
Utility-to-Utility		X

## MODEL IDENTIFICATION

Identify your model by referring to the Model and Specification number as shown on the nameplate. Electrical characteristics are shown on the lower portion of the nameplate, which is located on the cabinet door.

If it is necessary to contact a distributor regarding the transfer switch, always give the complete Model, Specification, and Serial number. This information is necessary to properly identify your unit among the many types manufactured.

The model number is made up of code segments that designate various features or options:

**OTPCA 00000 Spec.A**

1	2	3	4

1. OTPC - Open Transition PowerCommand® Control.
2. Ampere Rating:  
A = 40, 70, 125  
B = 150, 225, 260  
C = 300, 400, 600  
D = 800, 1000

E = 1200  
F = 1600  
G = 2000  
H = 3000

3. Assigned spec number - issued for each specific combination of accessories, voltages, frequency and standards codes. This number is only repeated for standard product.
4. Specification letter - advances with production modification.

## HOW TO OBTAIN SERVICE

When the transfer switch requires servicing, contact your nearest Cummins Power Generation distributor. Factory-trained Parts and Service representatives are ready to handle all your service needs.

To contact your local Cummins Power Generation distributor in the United States or Canada, call 1-800-888-6626 (this automated service utilizes touch-tone phones only). By selecting Option 1 (press 1), you will be automatically connected to the distributor nearest you.

If you are unable to contact a distributor using the automated service, consult the Yellow Pages. Typically, our distributors are listed under:

Generators-Electric,  
Engines-Gasoline or Engines-Diesel, or  
Recreational Vehicles-Equipment,  
Parts and Service.

For outside North America, call Cummins Power Generation, 1-763-574-5000, 7:30 AM to 4:00 PM, Central Standard Time, Monday through Friday. Or, send a fax to Cummins Power Generation using the fax number 1-763-574-8087.

When contacting your distributor, always supply the complete Model, Specification, and Serial Number as shown on the generator set nameplate.



## 2. Description

The OTPC transfer switch is available in two control package options: Level 1 and Level 2. Level 1 has the standard feature set and Level 2 has an extended set of features and applications. This section describes the standard and optional control features.

### CABINET

The standard cabinet meets the requirements for a UL Type 1 cabinet. This type is designated as a general-purpose, indoor cabinet. Figure 2-1 shows the control with optional features.

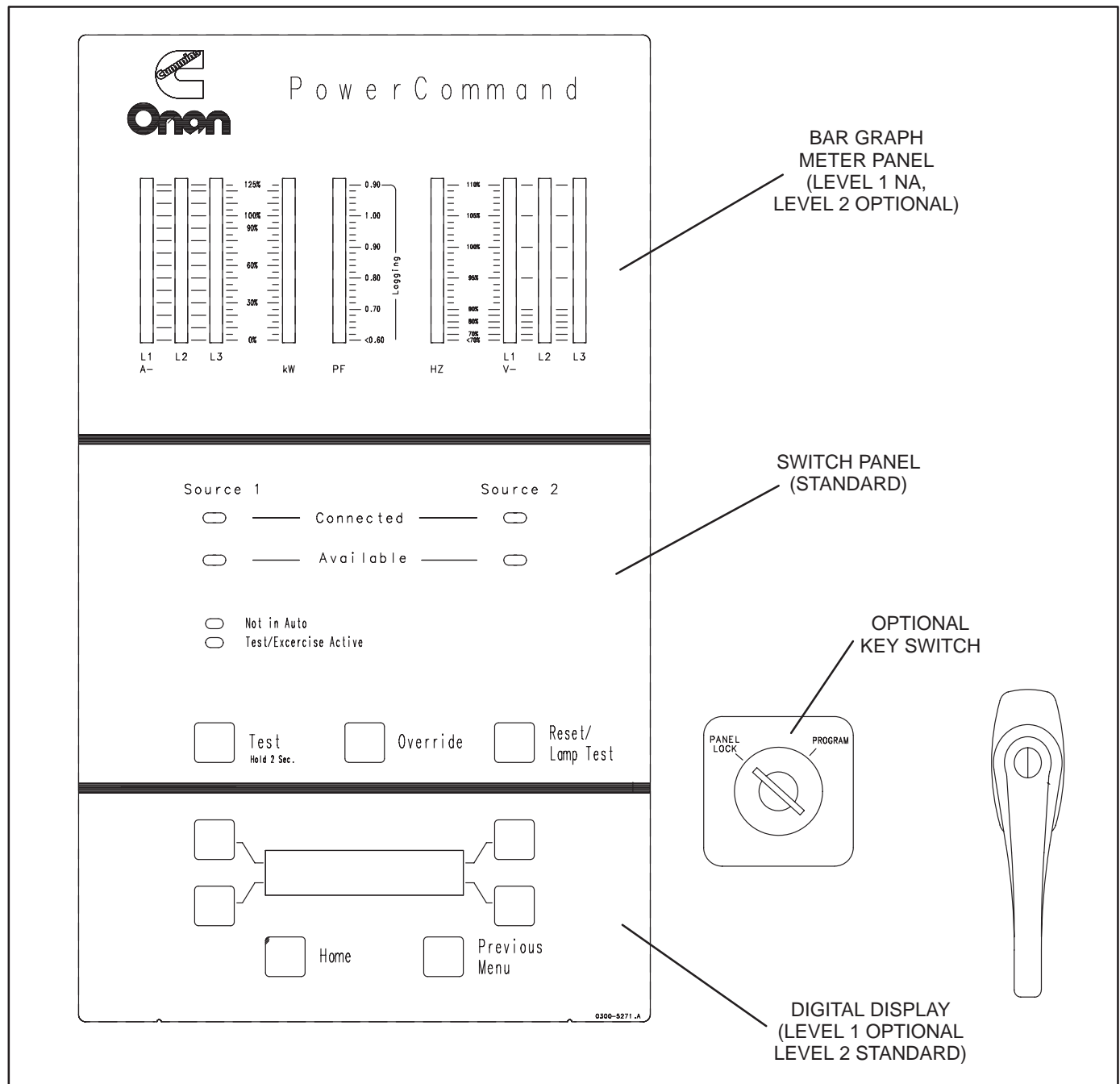


FIGURE 2-1. CABINET WITH OPTIONS



## CONTROL PANEL

The control features are divided into three groups: Bar Graph Meters, Switch Panel, and Digital Display. The Switch Panel is standard on all transfer switches. The Digital Display is standard on Level 2 controls and is optional on Level 1 controls. The Bar Graph Display is not available on Level 1 and is optional on Level 2 controls.

### Switch Panel

The switch panel (See Figure 2-1) is a standard feature on all OTPC transfer switches. It contains six indicator lamps and three membrane switches.

**Source 1 Available and Source 2 Available:** These indicators are lit when the corresponding sources have acceptable output voltage and/or frequency. These indicators can be lit simultaneously.

**Source 1 Connected:** This indicator is lit when the transfer switch is in the normal position and Source 1 is supplying power to the load.

**Source 2 Connected:** This indicator is lit when the transfer switch is in the emergency position and Source 2 is supplying power to the load.

**Not in Auto:** For all configurations, the Not in Auto indicator lights when the transfer switch is not in Auto.

The transfer switch is not in auto when any of the following signals are active:

1. Motor Disconnect Switch
2. Transfer Inhibit
3. Retransfer Inhibit
4. Load Shed

**Test/Exercise Active:** The Test/Exercise Active indicator is lit when the transfer switch has a test or exercise in progress.

**Test:** For utility-to-genset applications, the Test switch sends a start signal to the generator set designated Source 2 and blinks the Test/Exercise Active indicator. After the start and transfer time delays, Source 2 starts and assumes the load provided that the With Load option is selected. Press the Test switch again to end the test; the Test/Exer-

cise Active indicator goes out and Source 1 resumes as the source of power.

For genset-to-genset applications, there is no test function.

**Override:** The Override switch terminates most system time delays. The Program Transition, Elevator signal and Engine Cool Down are not affected by this switch. If you press this switch while the Transfer Inhibit input is active, the switch immediately transfers the load. If you press this switch while the Retransfer Inhibit input is active, the switch immediately retransfers the load.

**Reset/Lamp Test:** The Reset/Lamp Test switch turns on all control panel indicators. This switch also acknowledges events (refer to the Events section).

### Security Key Switch Option

The optional security key switch is located on the front panel between the handle and the Control Panel. When it is in the Panel Lock position, it disables the front panel input switches, Test and Override. It also prevents changes to the Digital Display from the setup menus; however, the current values are displayed. Changes can be made when the switch is in the Program position.

### Digital Display

The Digital Display is standard on Level 2 controls and optional on Level 1 controls. It contains a 2-line by 20-character digital display module and 6 momentary contact membrane switches. The module displays the menu system. The switches are used to navigate through the menu system.

Each menu indicates the function of the four switches at the sides of the display module. Not all switches are active for each menu. See the Digital Display Menu System section for complete digital display menu details.

### Bar Graph Meter Panel

The Bar Graph Meter Panel is not available on Level 1 controls and is optional on Level 2 controls. This feature includes a three phase AC ammeter, a power meter, a power factor meter, a frequency meter, and a three phase AC voltmeter.

**AC Ammeter:** The ammeter displays percent of full load currents in amperes (1–125%).



**Power Meter:** The power meter displays the real power in percent of full load in kilowatts (0–125%).

**Power Factor Meter:** The power factor meter displays the real power delivered to the load (1.0 – 0.6 lagging) and (1.0 – 0.9 leading).

**Frequency Meter:** This meter displays the output frequency (percent of nominal frequency), of the power source connected to the load (70–110%).

**AC Voltmeter:** The voltmeter displays percent of line to neutral voltages of the power source connected to the load (70–110%).

## ELECTRONIC CONTROL SYSTEM

This section describes the standard and optional components of the electronic control system.

**⚠WARNING** *Improper calibration or adjustment of electronic control modules can cause death, severe personal injury, and equipment or property damage. Calibration and adjustment of these components must be performed by technically qualified personnel only.*

All calibration and adjustment procedures are described in the Installation manual (which is shipped with the transfer switch) and in the Service manual (which is available through your distributor).

**⚠WARNING** *Accidental actuation of the linear motor could cause severe personal injury. Before making any adjustments, place the Motor Disconnect Switch (Figure 1-7) in the Off position. Return the switch to the Auto position after adjustments are completed.*

**⚠WARNING** *AC power within the cabinet and the rear side of the cabinet door presents a shock hazard that can cause severe personal injury or death. When the cabinet door is open, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothes, hair, etc.*

**Start Time Delay (TDES-A, and TDES-B):** This delay is adjustable from 0 to 15 seconds in 1 second increments on Level 1 controls and from 0 to 120 seconds in 1 second increments on Level 2 controls. The default value is 3 seconds for both. This brief time delay prevents the generator set from starting during short power interruptions. Timing starts at the Source 1 power interruption. If the duration of interruption exceeds the delay time, the

control system starts the generator. The value is set with the PC service tool or the digital display when it is available.

For genset-to-genset applications, TDES-A is the start time delay to start Source 2 genset and TDES-B is the start time delay to start Source 1 genset.

For utility-to-utility applications, TDES-A and TDES-B are not available.

**Stop Time Delay (TDEC-A, and TDEC-B):** This delay is adjustable from 0 to 30 minutes in 1 minute increments. The default value is 10 minutes. It begins timing when the load is retransferred to Source 1. At the end of the delay, the stop signal is sent to the generator set. During this time delay, the generator set cools down at no load before stopping. The value is set with the PC service tool or the digital display when it is available.

For genset-to-genset applications, TDEC-A is the stop time delay to stop Source 2 genset and TDEC-B is the stop time delay to stop Source 1 genset.

For utility-to-utility applications, TDEC-A and TDEC-B are not available.

**Transfer Time Delay (TDNE):** This delay begins when Source 2 (typically the generator) voltage and frequency reach the settings of the control. After the delay, the transfer switch transfers the load to Source 2. This brief time delay allows the generator set to stabilize before the load is applied. It has an adjustable range of 0 to 120 seconds in 1 second increments. The default value is 10 seconds. The value is set with the PC service tool or the digital display when it is available.

TDNE is the delay from preferred source to backup source in utility-to-utility applications.

**Retransfer Time Delay (TDEN):** This delay begins the moment Source 1 line voltage and frequency return to specified values. After the delay, the transfer switch can retransfer the load to Source 1. The delay allows the Source 1 to stabilize before retransfer. It has an adjustable range of 0 to 30 minutes in 1 minute increments. The default value is 10 minutes. The value is set with PC service tool or the digital display when it is available.

TDEN is the delay from backup source to preferred source in utility-to-utility applications.



**Under-Voltage Sensing**

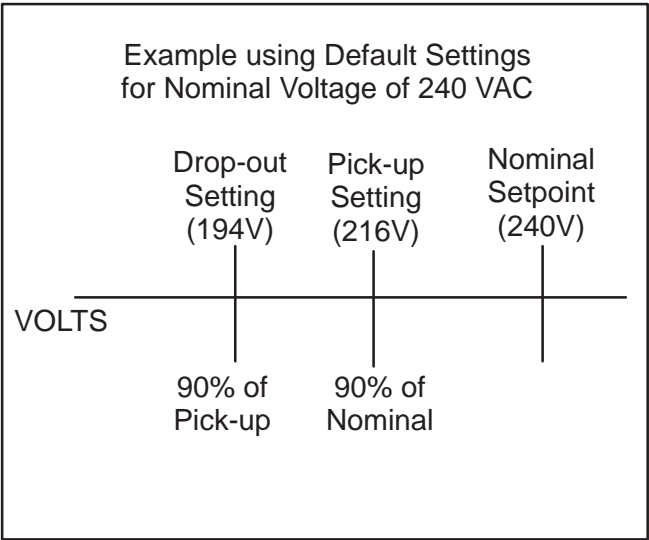
All controls include under-voltage sensors for Source 1 and Source 2. When a sensor detects a low voltage condition over a specified time period, it initiates a transfer. When the source voltage returns to an acceptable value again, the sensor initiates a retransfer.

These parameters are adjustable. The under-voltage sensing range for a falling voltage (drop-out) is 75 to 98% of the pick-up voltage setting. The default value is 90%. The pick-up range for a rising voltage is 85 to 100% of the nominal voltage setpoint. The default value is 90%. The adjustable range for the time delay period is 0.1 to 1.0 seconds in 0.1 second increments. The default delay time is 0.5 second. These values are set with the PC service tool or the digital display. See Figure 2-2 for an example using the default values.

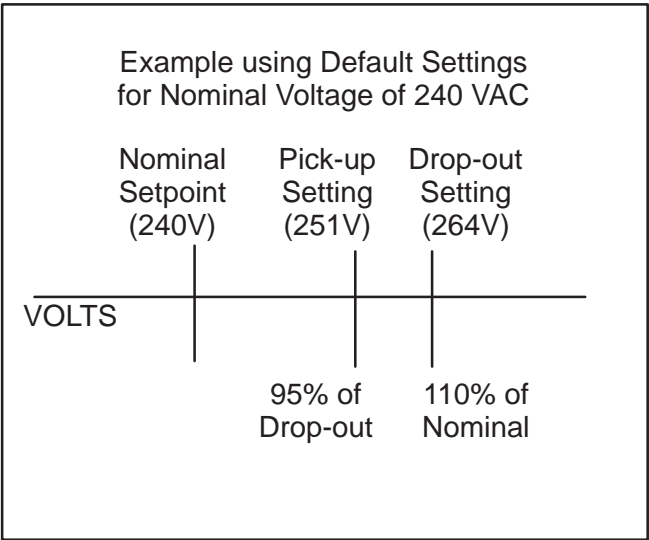
**Over-Voltage Sensing**

All controls include over-voltage sensors for Source 1 and Source 2 that can be disabled and not used. When a sensor detects a high voltage condition over a specified time period (delay), it initiates a transfer. When the source voltage falls to an acceptable value again, the sensor initiates a retransfer.

There parameters are adjustable. The over-voltage sensing range (drop-out) for a rising voltage is 105 to 135% of the nominal voltage setpoint. The default value is 110%. The pick-up range for a falling voltage is 95 to 100% of the drop-out setting. The default value is 95%. The adjustable range for the delay time period is 0.5 to 120.0 seconds in 1 second intervals. The default delay time is 3.0 seconds. The over-voltage sensing feature is enabled by default. These values are set with the PC service tool or the digital display. See Figure 2-3 for an example using the default values. This feature can also be disabled.



**FIGURE 2-2. UNDER-VOLTAGE SENSING**



**FIGURE 2-3. OVER-VOLTAGE SENSING**



## Frequency Sensing

All controls include frequency sensors for Source 1 and Source 2 that can be disabled and not used. When a sensor detects a high or low frequency condition over a specified delay time period, it initiates a transfer. When the frequency returns to an acceptable value again, the sensor initiates a retransfer.

These parameters are adjustable. The nominal frequency can be set between 45.0 and 60.0 Hz in 0.1 Hz increments. The default frequency is 60 Hz. The acceptable frequency bandwidth (pick-up) is  $\pm 5$  to  $\pm 20\%$  of the nominal frequency setpoint. The default value is 10%. The drop-out frequency is 1 to 5% beyond the pick-up. The default value is 1%. The range for the delay time period is 0.1 to 15 seconds. The default delay time is 1.0 second. The frequency sensing feature is enabled by default. These values are set with the PC service tool or the digital display. See Figure 2-4 for an example using the default values. This feature can also be disabled.

## Two-Wire Starting

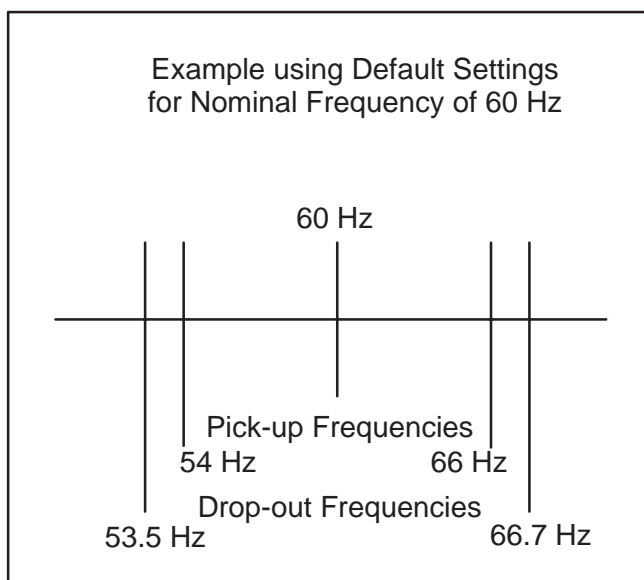
The starting circuit is a basic supervisory function of the electronic control. Water-cooled generator sets use a two-wire start control.

Although the logic is more involved, the two-wire starting circuit can be thought of as a single pole, single throw switch. A closed switch starts the generator set. An open switch stops the generator.

**Three-wire starting is not available on OTPC transfer switches.**

## Remote Test Transfer

The transfer switch may be wired with a remote test switch. Closure of a set of contacts across the remote test transfer inputs causes the transfer switch to sense a (simulated) utility power failure and send a start/run signal to the generator set. The load is transferred to Source 2 when Source 2 becomes available. (Refer to the Installation manual.)



**FIGURE 2-4. FREQUENCY SETTING**

## Programmed Transition

Program Transition introduces a delay (TDPT) during transition of the switch. Programmed transition stops the switch in the neutral position for an adjustable interval of time. In this position, the load is not connected to either Source 1 or 2. This delay allows residual current from inductive loads to decay to an acceptable level before transfer is completed.

The parameters are adjustable. The length of time that the transfer switch is in the neutral position can be adjusted from 0 to 60 seconds in 1 second increments. The default value is 0 seconds. The proper adjustment is a function of the load. This feature is enabled by default. The values are set with PC service tool or the digital display.

## Transfer Times

The controller senses and records the time it takes for the transfer switch to break from one source and reconnect to the other source. (Transfer times are not recorded if Programmed Transition delay is in use.)



## Test With or Without Load

The operator can test the transfer switch, generator, and power system automatically. The operator can transfer the load during the test or only test the generator. Both hardware means (switch input) and software means (PowerCommand network) input can activate an automatic test sequence.

## Programmable Generator Exerciser

Programmable generator exercises and exercise exceptions are generally programmed to be recurring. They can be programmed from the PC service tool or the digital display when it is available.

Level 1 controllers include two programmable generator exercises and two programmable exercise exceptions. While all events can be set using the PC service tool, only one exercise and one exercise exception can be set with the digital display.

Level 2 controllers include eight programmable generator exercises and eight programmable exercise exceptions. While all events can be set using the PC service tool, only two exercises and two exercise exceptions can be set with the digital display.

All controllers have a push-button switch on the digital module that enables and disables the exerciser clock. See the Digital Display Menu System section for details on setting the clock. The Real-Time clock must be set before exercise programs are entered.

For utility-to-genset configurations, the exerciser clock initiates genset start and run cycles at specified intervals for specified durations. The exerciser is not used in utility-to-utility or genset-to-genset configurations (see Generator-to-Generator Control Mode).

## Real-Time Clock

All controllers have a real-time clock that keeps track of the time and date. This clock is year 2000 compliant. The controller uses the real-time clock to time and date stamp all events.

**The clock is not set at the factory. To set the clock, use the digital display or PC Service tool.**

## Voltage Imbalance Sensor

Three phase Level 2 controllers include a voltage imbalance sensor for both Source 1 and Source 2.

This feature informs the operator when there is significant voltage imbalance between the phases of Source 1 or Source 2. This feature is used for equipment protection.

A voltage imbalance is typically caused by severe single phase loading. The sensor indicates a failure when the maximum deviation from the average voltage is greater than a user-specified value between 2 and 10% (drop-out) of the average voltage in 1% increments. The pickup value is fixed at 10% of the drop-out. The time delay for the imbalance sensor drop-out is adjustable (2–20 seconds).

This sensor can be enabled using the PC Service tool or the digital display Setup sub-menus. This sensor is inactive for single phase systems and indicates no failures. To prevent nuisance faults, the setting can be increased up to 10% of the nominal voltage.

## Phase Rotation Sensor

Three phase Level 2 controllers include a phase rotation sensor. This feature monitors the phase rotation of the source opposite from the connected source. When the alternate source is out of phase rotation with the connected source, transfer is inhibited. This generally occurs on new installations or after storm damage or generator rewiring. This feature protects against equipment damage by preventing transfer to a source that is out of phase. This feature is required in fire pump applications.

**⚠ CAUTION** *Level 1 controls do not support three-phase sensing on Source 2. Do not select the three-phase option for the Source 2 Sensing adjustment with Level 1 controls, even if the system is three phase. This setting will prevent Source 2 from becoming available.*

Both voltage sources have to be applied in order to check phase rotation. Generally, a power source may become out of phase rotation in new installations, after a storm, or when there is generator rewiring.

This feature is enabled by default. It can be disabled using the PC Service tool or the digital display Setup sub-menus.

## Loss of Single Phase Sensor

Three phase Level 2 controllers include a loss of single phase sensor. This feature initiates a transfer



from a source that has lost a single phase and prevents a transfer to a source that has lost a single phase. This is generally caused by a single phase to line ground or open. The controller indicates a fault when the relative phase angle between any line-to-line phase angle drops to less than 90 degrees. This feature is mainly used to protect three phase devices, such as motors.

This sensor can be enabled using the PC Service tool or the digital display Setup sub-menus. This sensor is inactive for single phase systems and indicates no failures.

### **Generator-to-Generator Control Mode**

Level 2 controllers can control a two-generator configuration for either dual standby or prime power. One generator is designated the preferred source. The default preferred source is Source 1 but it can be changed to Source 2 through the front panel display or PC service tool. The control automatically transfers the load between the two generators and detects generator alarm conditions. This configuration requires the optional Battery Kit when used in dual standby mode.

A separate changeover timer automatically transfers loads between the two generators. The changeover timer is set from the digital display or the PC Service tool. The exerciser clock is not available in this configuration.

### **Utility-to-Utility Control Mode**

Level 2 controllers can control a two-utility configuration for prime power. One utility is designated the preferred source. The default preferred source is Source 1 but it can be changed to Source 2 through the front panel display or PC service tool. The control automatically transfers the load between the two utilities and detects alarm conditions. The exerciser clock is not available in this configuration.

### **Sleep Mode**

After a period of screen inactivity (35 minutes), the digital display goes blank. Screen inactivity is when there is no user interaction with the menu system and when there are no events. The digital display is

reactivated when an event occurs or when an operator touches one of the menu buttons.

In order to conserve controller battery power, the loss of utility power also causes the digital display to go blank. The digital display is reactivated when a second power source becomes available.

## **TRANSFER SWITCH**

The transfer switch (Figures 2-5 and 2-6) opens and closes the contacts that transfer the load between Source 1 and Source 2. The switch is mechanically interlocked to prevent simultaneous closing to both power sources. The main parts of the switch discussed here are the contact assemblies, linear actuator, Motor Disconnect switch, and auxiliary contacts.

### **Contact Assemblies**

The automatic transfer switch has either three or four poles. Three pole transfer switches are provided with a neutral bar. The contact assemblies make and break the current flow. When closed to either Source 1 or Source 2, the contacts are mechanically held. A mechanical interlock prevents them from closing to both power sources at the same time.

### **Linear Actuator**

The linear actuator is a linear induction motor that moves the contact assemblies between the contacts of Source 1 and Source 2. Linear actuator operation is initiated automatically by the transfer switch. Manual operation of the switch is also possible. Refer to Manual Operation.

### **Motor Disconnect Switch**

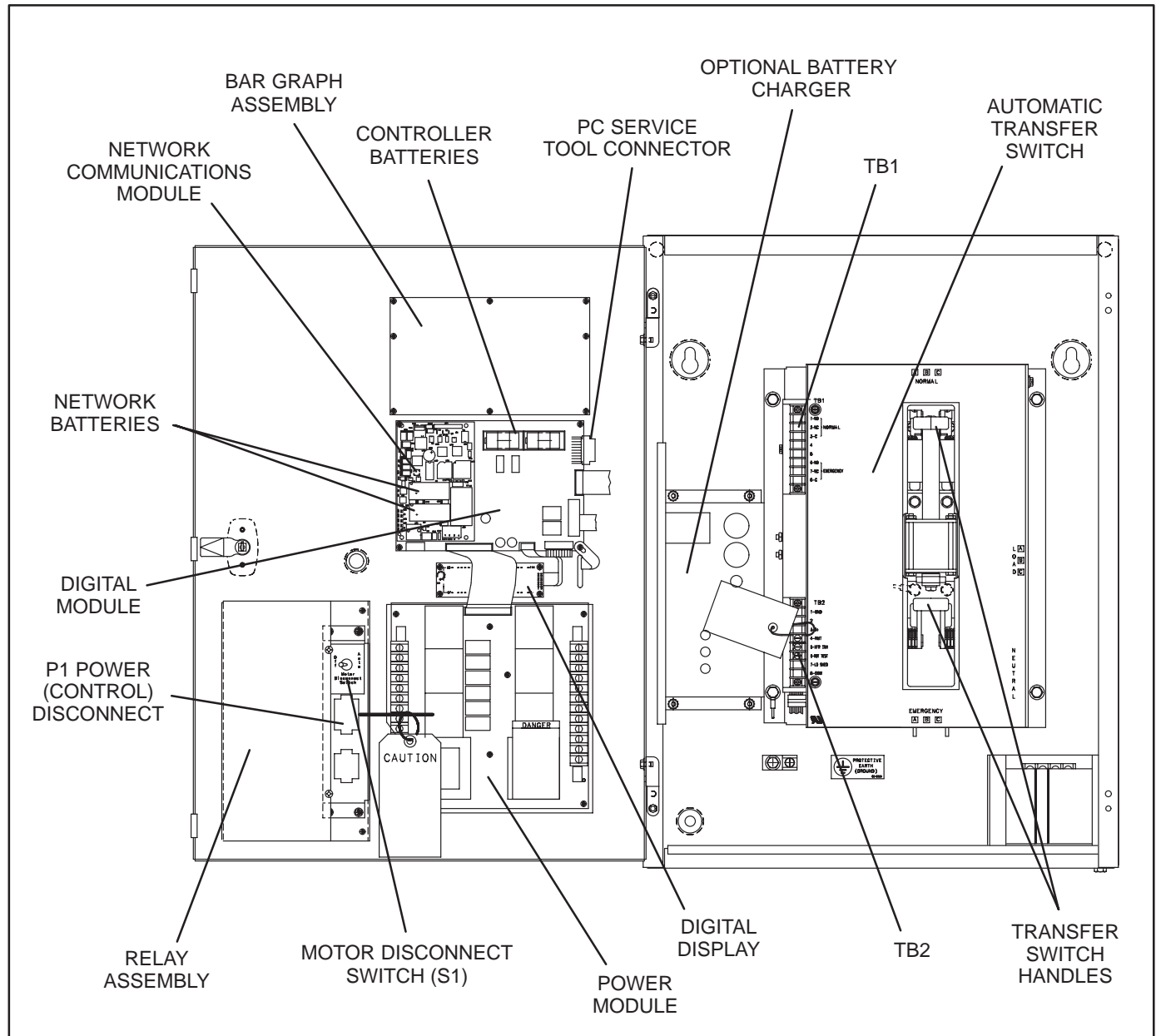
The Motor Disconnect toggle switch, on the Relay Assembly, enables and disables the linear actuator. This switch is only accessible from inside the enclosure. The Not In Auto LED on the front panel indicates the state of this switch. It is lit when the switch is in the Off position. Place the switch in the Auto position to enable the linear actuator. Place the switch in the Off position to disable the linear actuator.



## Auxiliary Contacts

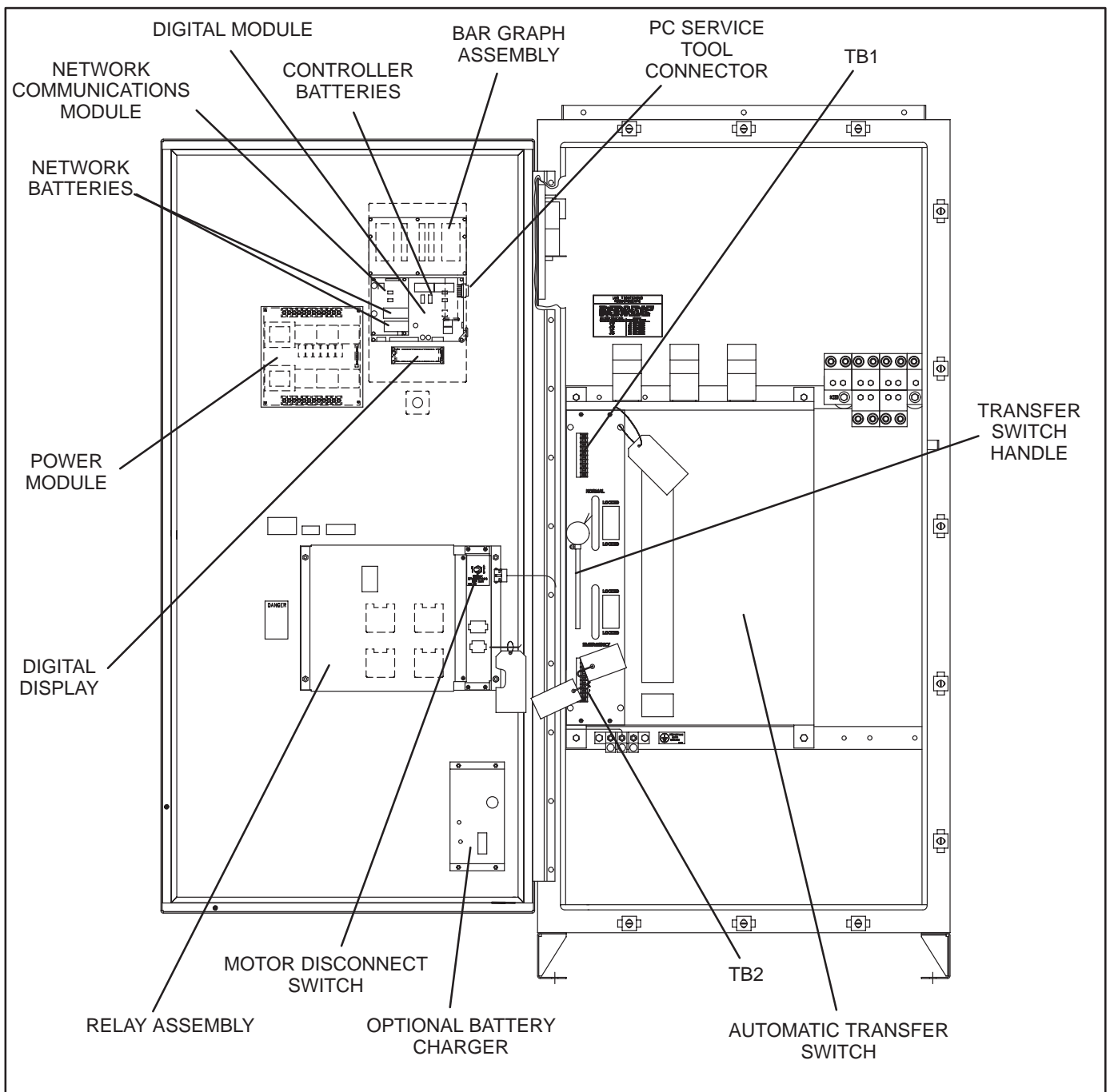
Auxiliary contacts are provided on the Source 1 and Source 2 sides of the transfer switch. They are actuated by operation of the transfer switch during transfer and retransfer. The Source 1 auxiliary con-

tact switch is actuated when the transfer switch is in the Source 1 position. The Source 2 auxiliary contact switch is actuated when the transfer switch is in the Source 2 position. The auxiliary contacts have current ratings of 10 amperes at 250 VAC. The contacts are wired to terminal block TB1.



**FIGURE 2-5. INTERIOR/COMPONENTS: 40-125 AMP SWITCH**





**FIGURE 2-6. INTERIOR/COMPONENTS: 1200 AMP SWITCH**



## OPTIONS

### Float Battery Charger Option

A float-charge battery charger (Figure 2-7) regulates its charge voltage to continuously charge without damage to the battery. As the battery approaches full charge, the charging current automatically tapers to zero amperes or to steady-state load on the battery.

Two chargers are available. One battery charger is rated for 10 amperes at 12 or 24 VDC. The other battery charger is rated for 2 amperes at 12 or 24 VDC.

The 2-ampere battery charger has an ammeter to indicate charging current and a fuse to protect the battery charger circuit.

The 10-ampere battery charger has three fuses (two on the AC input and one on the DC output), three fault display LEDs, and an ammeter for indication of charging current.

On the 10-ampere charger, three sets of (form C) alarm contacts (corresponding to the three fault LEDs) are also available. Using an optional alarm contact harness, these contacts can be wired by the installer to activate other audible or visual alarms.

Under normal operating conditions, the Low Bat and AC Fail relays are energized and the High Bat relay is de-energized. In response to a Low Bat or AC Fail condition, the appropriate normally energized relay (Low Bat or AC Fail) drops out. In response to a High Bat condition, the normally de-energized High Bat relay is energized.

### Auxiliary Relay Option

Optional DC auxiliary relays provide contacts for energizing external alarms, remote indicators, and control equipment such as louver motors and water pumps.

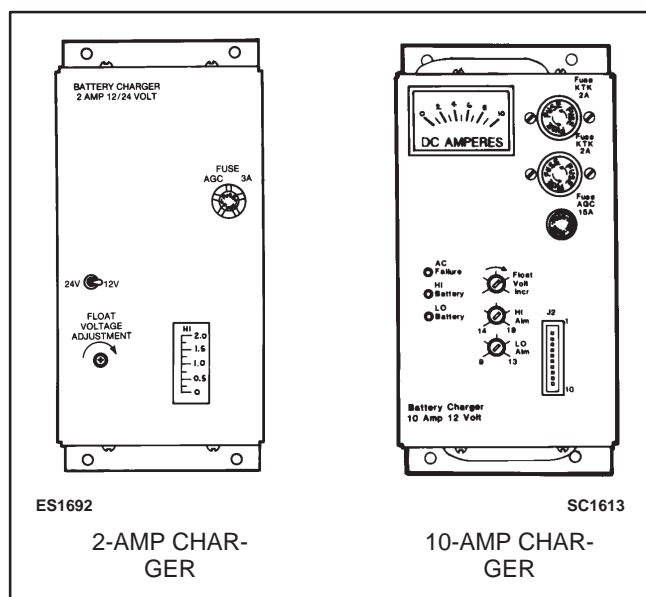


FIGURE 2-7. BATTERY CHARGER

### Relay Signal Module Option

The Relay Signal Module includes 11 Form-C relay contacts. The module includes the Elevator Pre-Transfer Delay Signal. The relay contacts may be used with other applications.

TABLE 2-1. RELAY SIGNAL MODULE

Relay Signal	Level 1 & 2
Source 1 Connected	X
Source 1 Available	X
Source 2 Connected	X
Source 2 Available	X
Test Active	X
Transfer Switch Not In Auto	X
Elevator Pre-Transfer	X
Load Shed Active	X
Fail to Close	Not Used

The Elevator Pre-Transfer Delay Signal delays transfer (or retransfer) for a specified time to give warning to an elevator control that a transfer (or retransfer) is about to occur.

This time delay is adjustable over a range of 0 to 60 seconds. The default value is 0 seconds. The value is set with the PC service tool or the digital display when it is available.



## **Load Shed Option**

The optional Load Shed function is used to disconnect the load from an available Power Source 2 in order to reduce the power consumed from that source. When the load shed function is initiated, the transfer switch is moved to the neutral position and the Not In Auto indicator lights.

When load shedding is active and Power Source 1 returns, the control immediately retransfers to Power Source 1.

If the load shed signal is removed before Power Source 1 returns, the switch transfers back to Power Source 2.

Load Shed is enabled or disabled from the PC Service Tool or the digital display when it is available.

## **Load Sequencing Option**

Controllers can include up to eight timed network variables to use for turning on loads in sequence after a transfer, a retransfer, or both. The Network Communications Module (NCM) must be installed. Each variable can be delayed up to 60 seconds af-

ter the preceding variable. The network variables are intended to activate relays on the Network Digital Input/Output Module (DIM). The DIM is located remotely from the transfer switch.

## **Load Current and Power Sensor Option**

Three-phase Level 2 controllers can include a load current and power sensor (Current Module). The control senses the four load currents (three line currents and the neutral current), three load voltages, and three power factor angles. The control calculates the real load power and the apparent load power.

The load current sensing feature is active on Level 2 controllers when the Current Module is installed and connected to the Digital Module.

The control issues a warning when the neutral current exceeds a user specified value between 100 and 150% of the rated current during a specified time period between 10 and 60 seconds.

The warning threshold (100 – 150%) and time delay (10 – 60 sec) are only set with the PC Service tool.



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# 3. Operation

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## AUTOMATIC OPERATION

Place control switches in the positions given below.

- **Motor Disconnect switch:** Auto position.

For utility-to-genset and genset-to-genset configurations, the generator set control must also be set for automatic (Auto) operation.

For transfer switches equipped with the Digital Display, read through the Digital Display Menu System section and become familiar with its use.

## MANUAL OPERATION OF 40 TO 1000 AMP TRANSFER SWITCHES

The transfer switch has operator handles for manually transferring the load. Manual operation must be performed by qualified personnel under **NO-LOAD CONDITIONS ONLY**. Use the following procedure:

**⚠WARNING** *Manual operation of the transfer switch under load presents a shock hazard that can cause severe personal injury or death. Do not attempt to operate switch manually when it is under load. Follow the “Safety Related Work Practices” listed in NFPA 70E.*

1. Open the cabinet door of the automatic transfer switch.
2. Move the Motor Disconnect switch to the Off position.
3. **Transfer - from Source 1 (Normal) to Source 2 (Emergency):**
  - A. Pull the upper manual operator handle down.
  - B. Push the lower manual operator handle down.

## Retransfer - from Source 2 to Source 1:

- C. Pull the lower manual operator handle up.
  - D. Push the upper manual operator handle up.
4. Before moving the Motor Disconnect switch back to the Auto position, remember the transfer switch transfers the load to the active power source. (If both power sources are available, it transfers the load to the Source 1.)

**⚠WARNING** *Automatic transfer switch operation results in rapid movement of the manual operator handles and presents a hazard of severe personal injury. Keep hands clear of handles when switching back to automatic operation.*

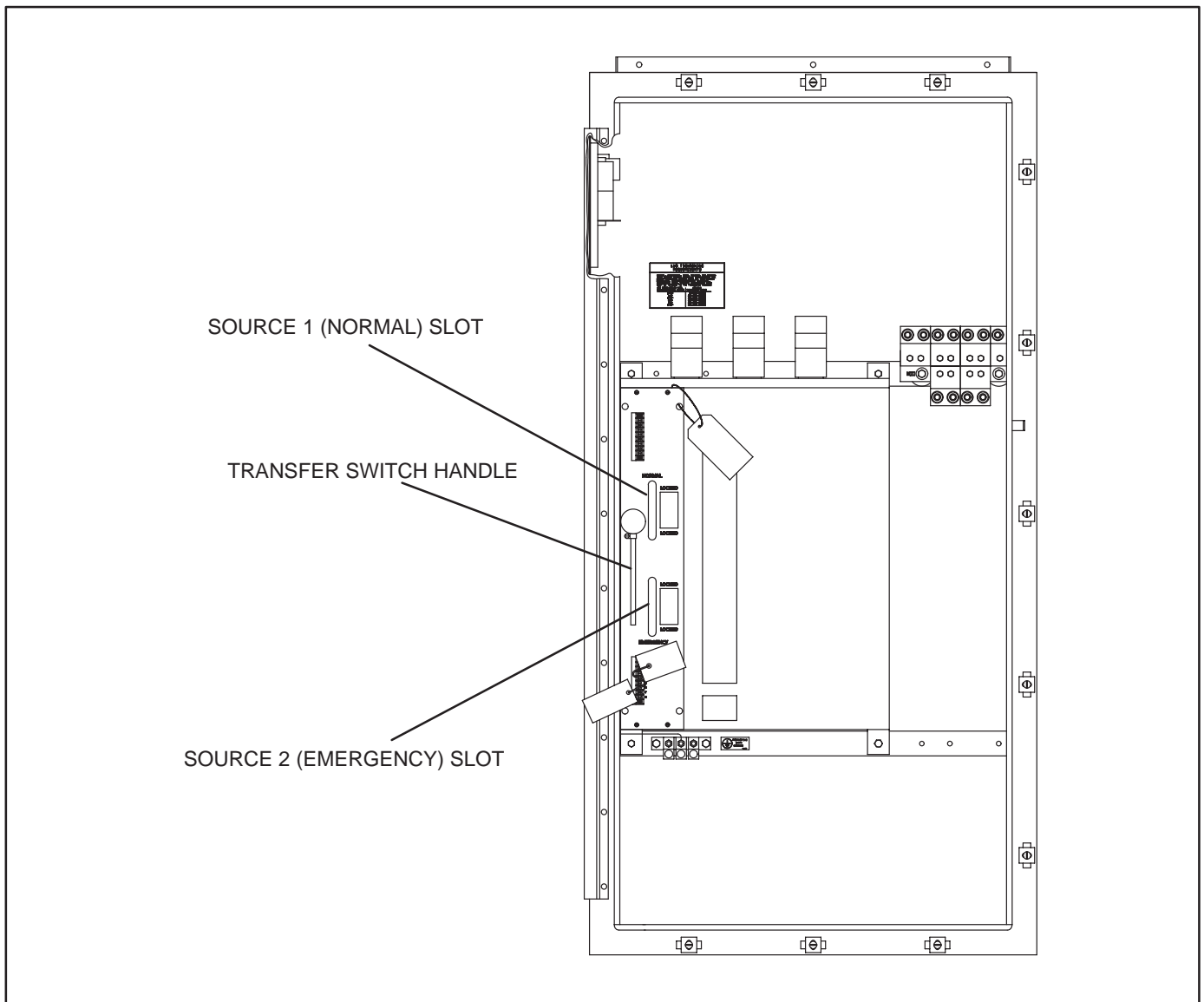
5. Move the Motor Disconnect switch to the Auto position.
6. Close the cabinet door.

## MANUAL OPERATION OF 1200 TO 3000 AMP TRANSFER SWITCHES

The transfer switch has operator handles that are intended for maintenance use only. Manual operation must be performed by qualified personnel under **NO-LOAD CONDITIONS ONLY**. Use the following procedure:

**⚠WARNING** *Manual operation of the transfer switch under load presents a shock hazard that can cause severe personal injury or death. Do not attempt to operate switch manually when it is under load. Follow the “Safety Related Work Practices” listed in NFPA 70E.*





**FIGURE 3-1. MANUAL OPERATION, 1200-3000 AMP SWITCHES**

## Manual Transfer to Source 2

If you determine that Source 2 is available but the transfer switch does not automatically transfer (refer to the *Troubleshooting* section), perform this procedure to manually transfer to Source 2.

1. Open the disconnect switches or breakers that feed the transfer switch. If there is no Source 2 disconnect, turn off the generator set.
2. When you are certain that neither power source is supplying power to the transfer switch, open the transfer switch cabinet door and turn the Motor Disconnect switch to Off.

**⚠ WARNING** *Manual operation of the transfer switch under load presents a shock hazard that can cause severe personal injury or death. Do not attempt to operate switch manually when it is under load.*

3. A manual operating handle is provided with the transfer switch. The handle is a steel rod or tube, with a knob or hand grip on one end. On standard transfer switches (Figure 3-1), there are two manual operator slots—one for the contacts of each power source.

First, insert the handle in the slot for the Source 1 (Normal) contacts and open the Source 1 contacts. Then, insert the handle in the slot for the Source 2 (Emergency) contacts



and close the Source 2 contacts. Be certain to push the handle all the way to the LOCK position. A distinct over-center locking action can be felt. Return the handle to its storage position.

**⚠WARNING** *Automatic transfer switch operation results in rapid movement of the manual operator mechanism and presents a hazard of severe personal injury if the operator handle is engaged in the mechanism. Remove the handle and place it in its storage position.*

4. After the switch has been transferred to Source 2 and the operator handle has been removed from the mechanism, close and lock the cabinet door.
5. Close the disconnect switches or breakers that feed the transfer switch. Start the generator set if it was previously turned off.
6. If the transfer switch is not functioning correctly, call your dealer or distributor immediately.

## Manual Transfer to Source 1

If you determine that Source 1 is available but the transfer switch does not automatically retransfer (refer to the Troubleshooting section), perform this procedure to manually retransfer to Source 1.

1. Open the Source 2 and Source 1 disconnect switches or breakers that feed the transfer switch. If there is no Source 2 side disconnect, turn off the generator set.
2. When you are certain that neither source is supplying power to the transfer switch, open the transfer switch cabinet door and turn the Motor Disconnect switch to Off.

**⚠WARNING** *Manual operation of the transfer switch under load presents a shock hazard that can cause severe personal injury or death. Do not attempt to operate switch manually when it is under load.*

3. A manual operating handle is provided with the transfer switch. The handle is a steel rod or tube, with a knob or hand grip on one end. On standard transfer switches (Figure 3-1), there are two manual operator slots—one for the Source 1 contacts and one for the Source 2 contacts.

First, insert the handle into the slot for the Source 2 (Emergency) contacts and open the Source 2 contacts. Then, insert the handle into the slot for the Source 1 (Normal) contacts and close the Source 1 contacts. Be certain to push the handle all the way to the LOCK position. A distinct over-center locking action can be felt. Return the handle to its storage position.

**⚠WARNING** *Automatic transfer switch operation results in rapid movement of the manual operator mechanism and presents a hazard of severe personal injury if the operator handle is engaged in the mechanism. Remove the handle and place it in its storage position.*

4. After the switch has been transferred to Source 1 and the operator handle has been removed from the mechanism, close and lock the cabinet door.
5. Open the Source 2 and Source 1 disconnect switches or breakers that feed the transfer switch. Start the generator set if it was previously turned off.
6. If the transfer switch is not functioning correctly, call your dealer or distributor immediately.



## GENERATOR SET EXERCISE

Run the generator for at least 30 minutes once each week with at least 50 percent load (if possible). If you do not want to use the exerciser, use the Test switch, as described below, to test the generator set each week.

The exerciser can be programmed for specified exercise periods and is used to exercise the generator set automatically with or without load. If Source 1 has an interruption while the generator set is exercising without load, the automatic transfer switch transfers the load to the generator set. The PC service tool is required to set the exercise parameters on transfer switches without the Digital Display. The Digital Display can set parameters for two exercise periods and two exceptions and the PC Service Tool can set parameters for eight exercise periods and eight exceptions.

## GENERATOR SET START TEST

This test is used with utility-to-genset applications only.

1. Set the Test With/Without Load variable to the Without Load value (refer to the Digital Display Menu System section or the PC Service Tool for details).

2. Press and hold the Test switch for two seconds. The generator set starts and runs after the start time delay.
3. At the end of the test period, press the Test switch again. The generator stops.
4. Reset the Test With/Without Load variable to the desired value for regularly scheduled genset exercising.

## WITH-LOAD STANDBY SYSTEM TEST

1. Set the Test With/Without Load variable to the With Load value (refer to the Digital Display Menu System section or the PC Service Tool for details).

**The Test With/Without Load variable must be set to the With Load value in order to test with load.**

2. Press and hold the Test switch for two seconds. The generator set starts and assumes the load after the start time delay.
3. At the end of the test period, press the Test switch again. To bypass the retransfer time delay and cause immediate load retransfer, press the Override switch. The generator stops after the stop time delay.
4. Reset the Test With/Without Load variable to the desired value for regularly scheduled genset exercising.



## PLANNED MAINTENANCE

Performing the annual planned maintenance procedures increases reliability of the transfer switch.

The following procedures must only be done by technically qualified personnel, according to procedures in the Service manual (40-1000 Amp Switches: 962-0516 and 1200-3000 Amp Switches: 962-0517). If repair or component replacement is necessary, call your dealer or distributor.

**⚠WARNING** *AC power within the cabinet and the rear side of the cabinet door presents a shock hazard that can cause severe personal injury or death. Incorrect installation, service, or parts replacement can result in severe personal injury, death, and/or equipment damage. All corrective service procedures must be done only by technically qualified personnel, according to procedures in the Service manual (40-1000 Amp Switches: 962-0516 and 1200-3000 Amp Switches: 962-0517).*

**⚠WARNING** *The transfer switch presents a shock hazard that can cause severe personal injury or death unless all AC power is removed. Be sure to set the genset operation selector switch to Stop, disconnect AC line power, disconnect the battery charger from its AC power source, and disconnect the starting battery (negative [–] lead first) before servicing.*

**⚠WARNING** *Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.*

### 1. Disconnect All Sources of AC Power:

- A. Disconnect both AC power sources from the transfer switch before continuing. Turn the generator set operation selector switch to Stop. (The selector switch is located on the generator set control panel.)
- B. ***If there is an external battery charger, disconnect it from its AC power source.*** Then disconnect the set starting battery (negative [–] lead first).

### 2. Clean

- A. Thoroughly dust and vacuum all controls, meters, switching mechanism components, interior buswork, and connecting lugs.
- B. Close the cabinet door and wash **exterior** surfaces with a damp sponge (mild detergent and water). ***Do not allow water to enter the cabinet, especially at meters, lamps, and switches.***

### 3. Inspect

- A. Check buswork and supporting hardware for carbon tracking, cracks, corrosion, or any other types of deterioration. If replacement is necessary, call your dealer or distributor.
- B. Check stationary and movable contacts. If contact replacement is necessary, the procedures are described in the Service manual (for 40-1000 Amp switches: 962-0516 and for 1200-3000 Amp switches: 962-0517).
- C. Check system hardware for loose connections. Tighten as indicated in step 4.
- D. Check all control wiring and power cables (especially wiring between or near hinged door) for signs of wear or deterioration.
- E. Check all control wiring and power cables for loose connections. Tighten as indicated in step 4.
- F. Check the cabinet interior for loose hardware. Tighten as indicated in step 4.



#### **4. Perform Routine Maintenance**

- A. Tighten buswork, control wiring, power cables, and system hardware, as necessary. Hardware torque values are given in section 4 of the Service manual (for 40-1000 Amp switches: 962-0516 and for 1200-3000 Amp switches: 962-0517). Retorque all cable lug connections. Lug torque requirements are listed in section 1 of the Service manual.
- B. Replace the batteries (3V lithium) in the Digital Module and the Network Module (if applicable) every two years. See Figures 2-5 and 2-6.

#### **5. Connect AC Power and Check Operation**

- A. Connect the set starting battery (negative [–] lead last). Connect the normal AC power source, enable the backup power source. If applicable, connect power to the battery charger.
- B. Verify proper operation of the battery charger.
- C. Test system operation as described in this section. Close and lock the cabinet door.



# 4. Digital Display Menu System

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This section describes the Digital Display Menu System and navigation through the menus. The menu display status information, events, and setup menus. Setup menus contain parameters with adjustable values. The descriptions in this section include ranges for the parameters and default values. The Digital Display is an option with Level 1 controls and is standard with Level 2 controls. See Figures 2-5 and 2-6. The system menus can also be accessed with the InPower Service Tool.

The Digital Display Menu System is a 2-line by 20-character graphical display screen and six buttons. The screen or menu displays status information, parameters, events and messages. The buttons change screens and parameters. Two buttons have names: Home and Previous Menu. These buttons are used for navigation. Messages include navigational indicators for the other four buttons.

## MAIN MENUS

The main menu system consists of three top-level

menus that list vertical menus (or sub-menus). The sub-menus display status information. This information cannot be changed in the main menus. The main menus contain eight sub-menus including the Setup Menu.

## SETUP MENUS

Before you can navigate and change setup parameters, you must enter a password; however, you can bypass the password and examine but not change parameters. When parameters are changed in any setup menu, you are prompted to either save the changes or restore the old values. Setting and navigating through the password menu is described in Figure 4-7.

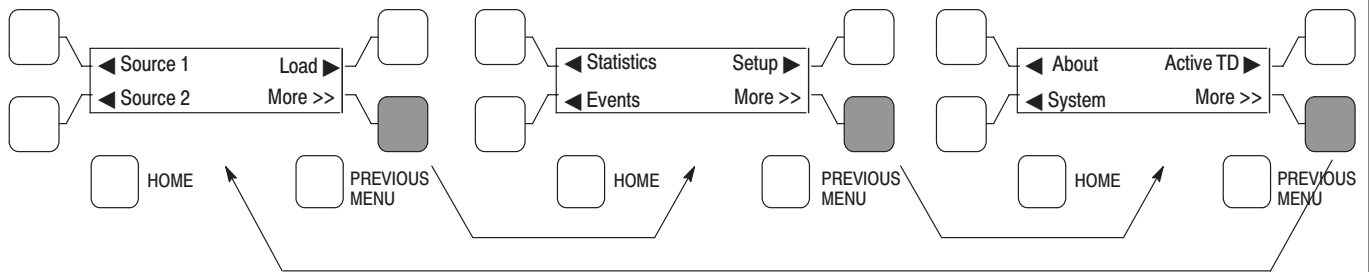
## NAVIGATION

Refer to Figures 4-28 through 4-30 at the end of this section for an overview of menu navigation. These illustrations can also be used to locate a submenu and determine how to access it.

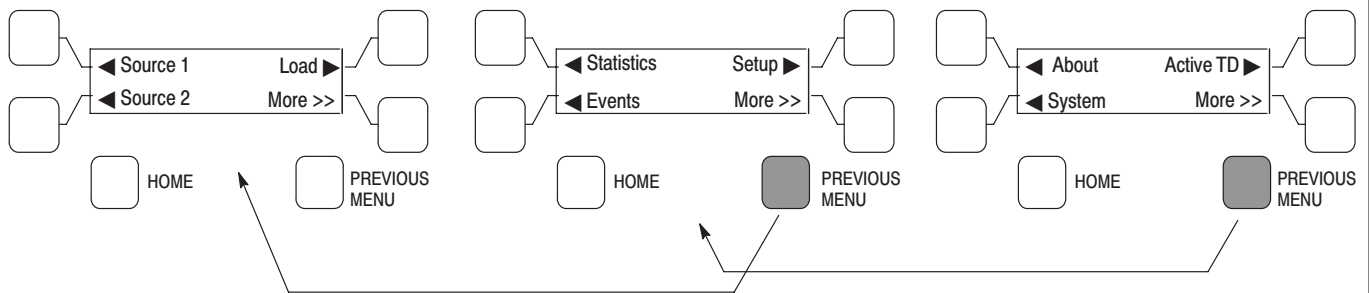


## MAIN MENU NAVIGATION

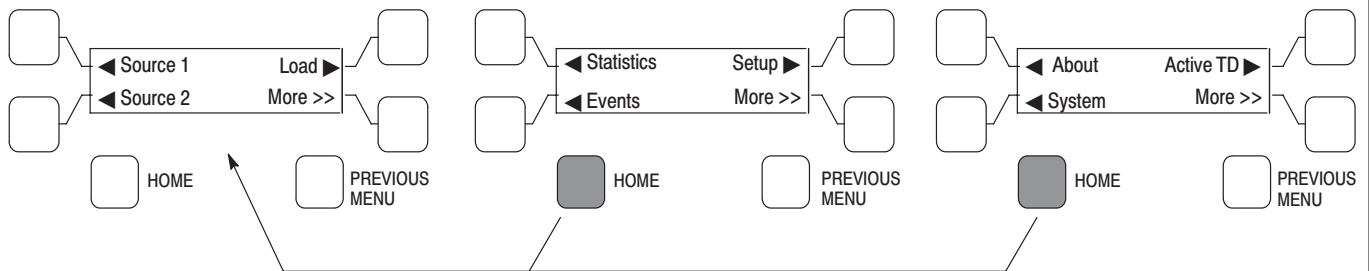
### Using the MORE button



### Using the PREVIOUS MENU button



### Using the HOME button



**NOTE:** The Active TD feature was not available in early versions of software.

**FIGURE 4-1. NAVIGATION**

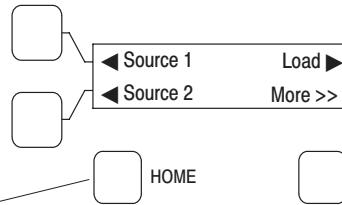


## MAIN MENU DESCRIPTIONS

### FIRST MAIN MENU

These buttons move between sub-menus that monitor aspects of both power sources:  
Line-to-Line Voltage  
Source Connected  
Frequency  
Running Time

The HOME key returns to this display within any of the Source 1 or 2 or Load sub-menus



The LOAD key moves through sub-menus to display information on the Load connected source:

Voltage Output  
Power Factor and Output  
Amps and Frequency

The MORE button advances to the Second Main Menu (below)

The PREVIOUS MENU key is not active at this level

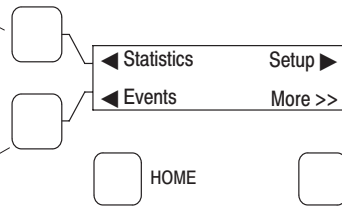
### SECOND MAIN MENU

The STATISTICS button displays information about either source

Run Time  
Avg. Transfer time  
Total Number of transfers  
Total Number of failures  
Battery & (optional) Charger status  
Current ON time

The EVENTS button displays the last 50 events or fault codes recorded on the controller.

From this display, the HOME button returns to the First Main Menu



The SETUP button enters the Password protected adjustment program:

Adjust Sensors  
Set Time Delays  
Test and Exercise  
Transition Mode Trim  
Load Sequencer Enable

The MORE button advances to the Third Main Menu (below)

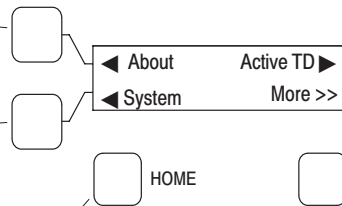
From this display, the PREVIOUS MENU button returns to the First Main Menu

### THIRD MAIN MENU

The ABOUT program displays general information about the transfer switch and controller.

The SYSTEM program provides access to data from surrounding devices communicating through a LonWorks network. If the optional network card is not included with the transfer switch, the SYSTEM program is not displayed.

From this display, the HOME button returns to the First Main Menu



The ACTIVE TD button displays all active time delays.

The MORE button returns the display to the First Main Menu

The PREVIOUS MENU button returns to the Second Main Menu (above)

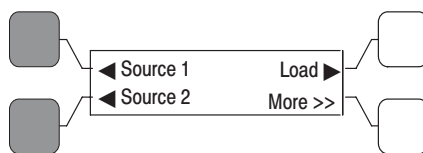
**NOTE:** The Active TD feature was not available in early versions of software.

FIGURE 4-2. MAIN MENUS



## FIRST MAIN MENU – Source 1 and Source 2 Sub-Menus

Press either one of these buttons to obtain read-only information on the power sources

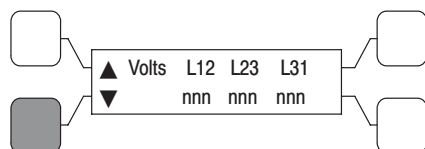


Pressing the HOME button in the sub-menus below returns the program to the First Main Menu

PREVIOUS MENU

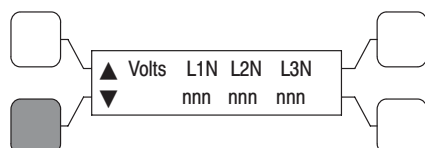
The PREVIOUS MENU button is not active at this level

Use the ▲▼ buttons on left to navigate through these screens



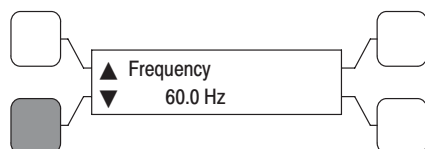
Line-to-Line Voltage

This screen displays line-to-line voltages for either Source 1 or Source 2 for three phase, two phase or single phase configurations. If the voltage is measured at 10 volts or less, the display reads 0. On Level 1 Controllers, only one voltage will be displayed at L12. On Level 2 Controllers, if the Source is two phase, the display will read voltages at L12 and L31.



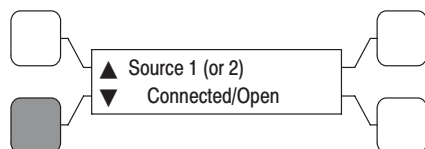
Line-to-Neutral Voltage

This screen displays Line to Neutral voltage measurements for three phase, two phase or single phase configurations. (Numbers do not display if system has no neutral) This screen does not display with Level 1 controllers.



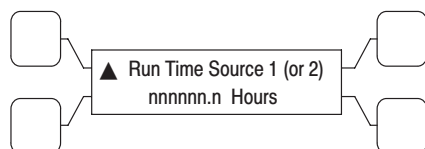
Sensed line frequency

This screen displays the sensed line frequency for Source 1 or 2.



Position of contactors

This screen displays the position of contactors for either Source 1 or 2.



Total connection time

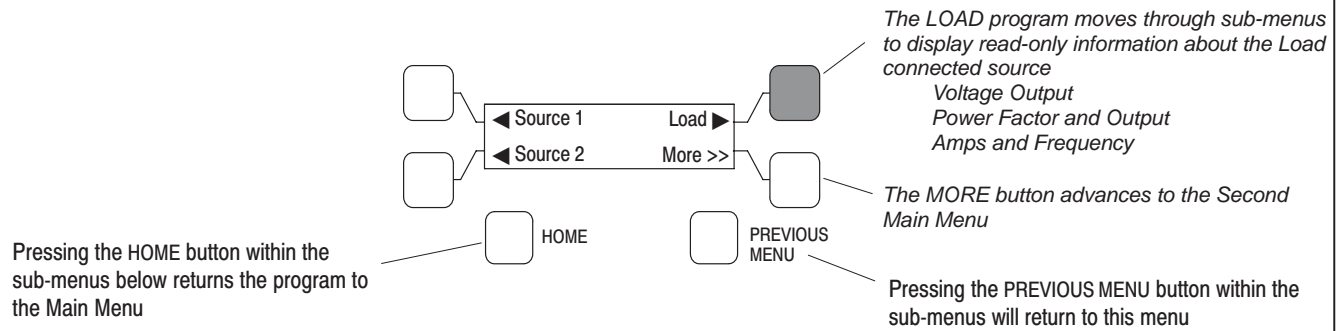
This screen displays the total time the transfer switch has been connected to either Source 1 or 2.

FIGURE 4-3. SOURCE 1 AND 2 SUB-MENUS



## FIRST MAIN MENU – Load Sub-Menus

This subset is not available on Level 1 Control  
and is optional on Level 2 Control



Use the ▲▼ buttons on left to navigate through these screens

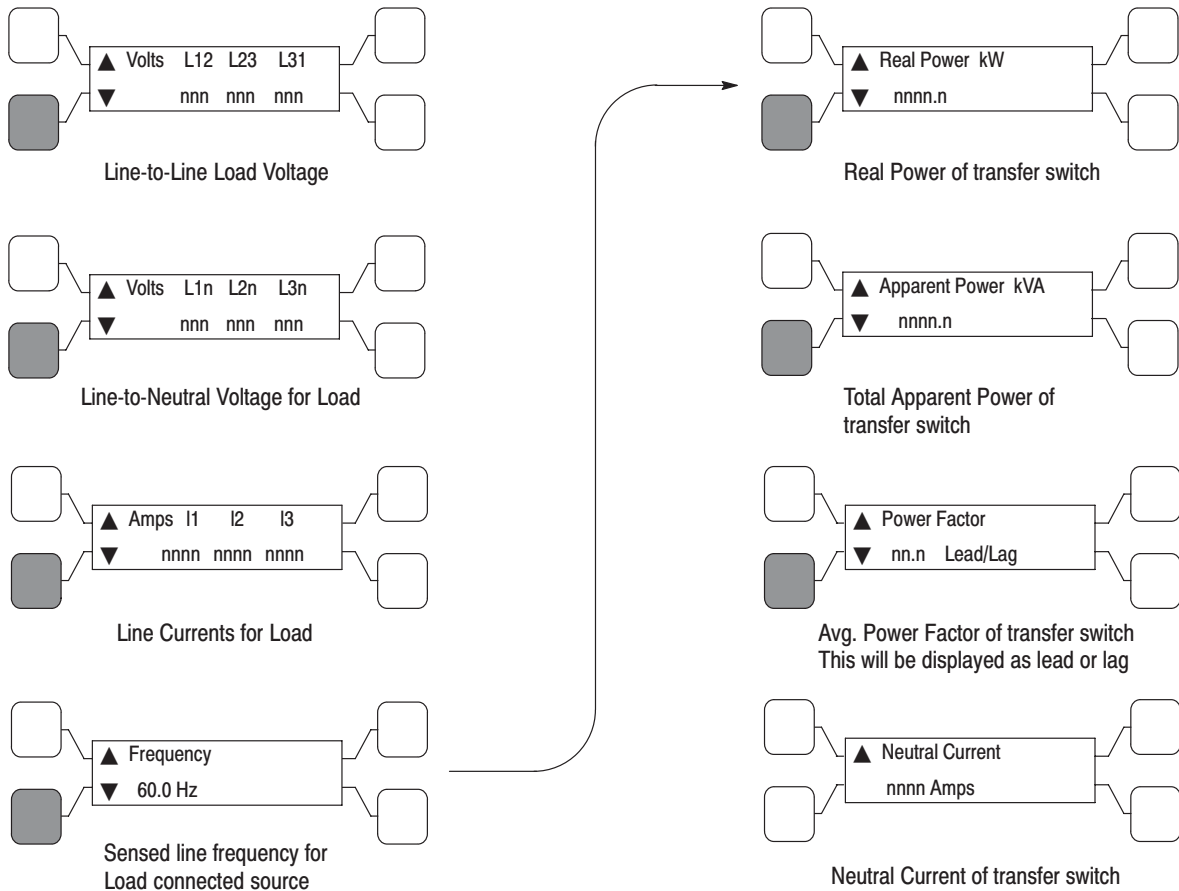


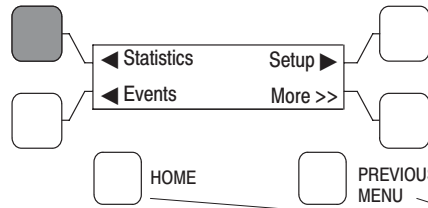
FIGURE 4-4. LOAD SUB-MENUS



## SECOND MAIN MENU – Statistics Sub-Menus

The STATISTICS program displays read-only information about either source:

Run Time  
Avg. Transfer time  
Total Number of transfers  
Total Number of failures  
Battery & (optional) Charger status  
Current ON time



From this display, the PREVIOUS MENU and HOME buttons return the program to the First Main Menu

Use the ▲▼ buttons on left to navigate through these screens

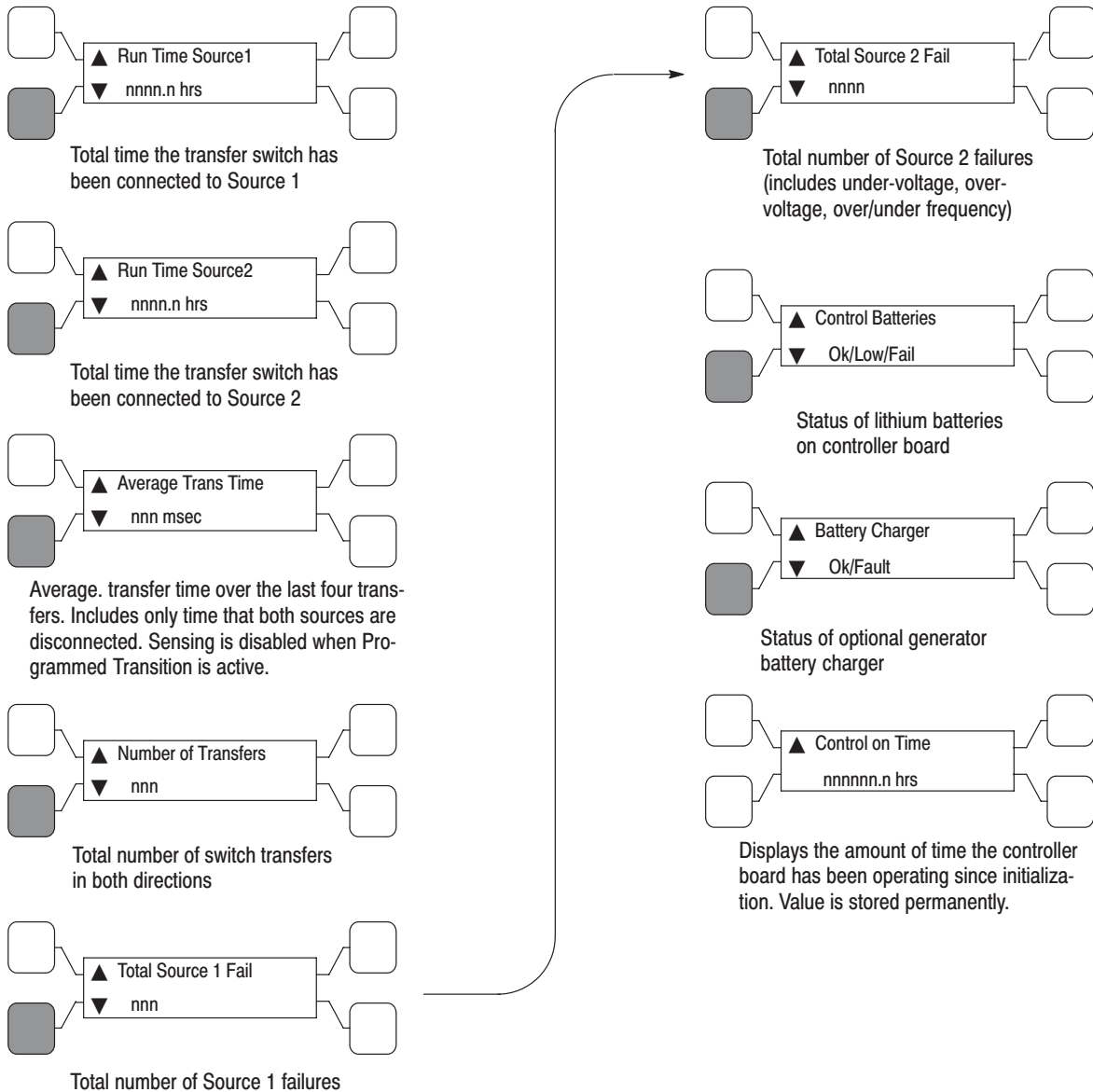


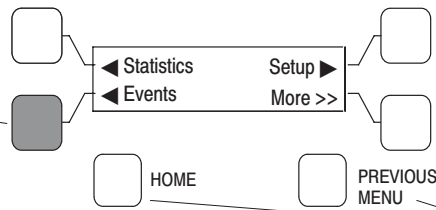
FIGURE 4-5. STATISTICS SUB-MENUS



## SECOND MAIN MENU – Events Sub-Menus

The **EVENTS** program displays information about either source. The controller stores and records the last fifty “events” in chronological order, beginning with the most recent event. The date and time are listed with each event.

The Events program include Fault codes, active time delays or significant power system changes.



From this display, the **PREVIOUS MENU** button and **HOME** button returns program to the First Main Menu.

Within the sub-menus, press the **PREVIOUS MENU** button anytime to return to this menu.

Use the ▲ ▼ buttons on left to navigate through these screens

### Sample Events

\* Indicates Event is currently active

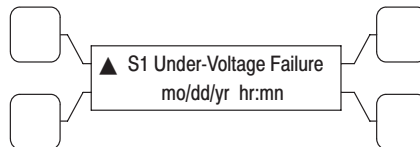
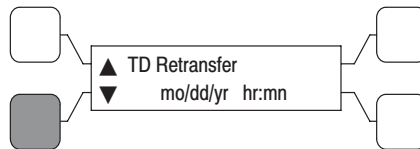
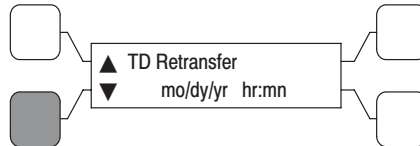
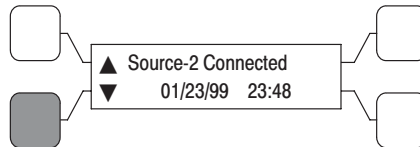
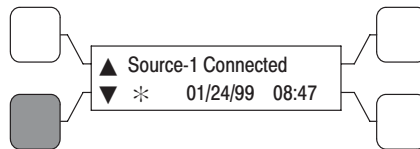
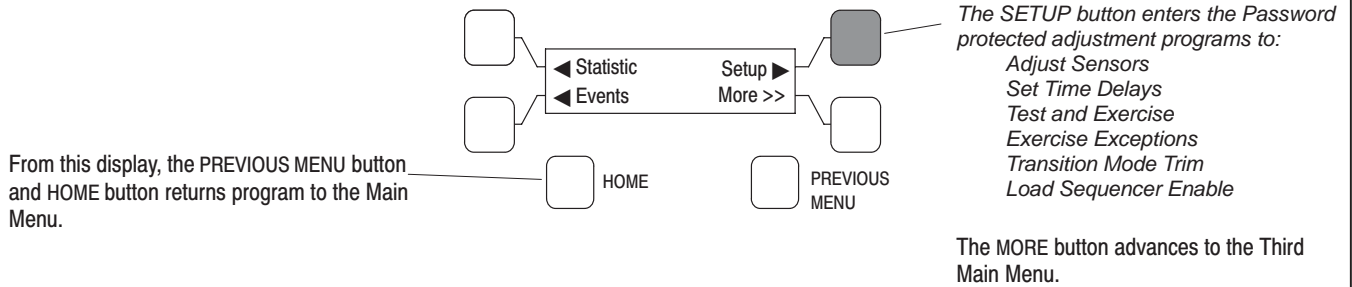


FIGURE 4-6. EVENTS SUB-MENUS



## SECOND MAIN MENU – Setup Sub-Menus

### Password



### Entering the Password Program

Press the Setup button to access the setup password menu.

The password is 574.

Use the + and – buttons to select numbers.

Use the → button to move the cursor to the next field.

**Note:** Entering the password is required to change setup parameters. The setup menus can be viewed (**read-only**) by pressing the → button three times without pressing either the + or – buttons to select numbers.

When the password is set, press the ► button to enter the setup program.

The Setup program is now accessed.  
This is the first Setup Menu screen.

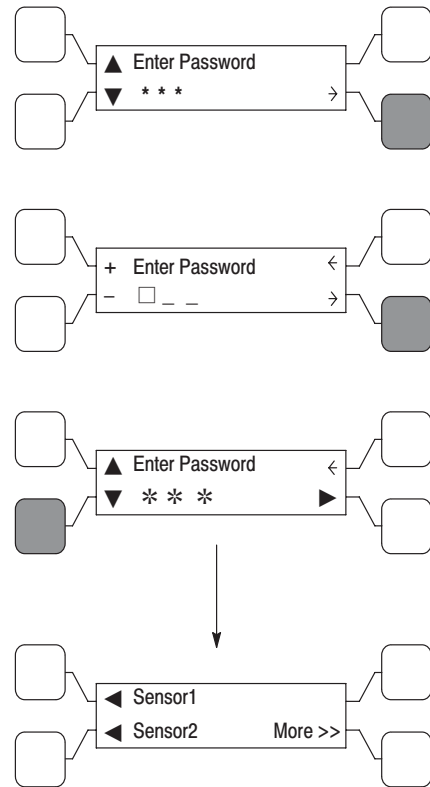
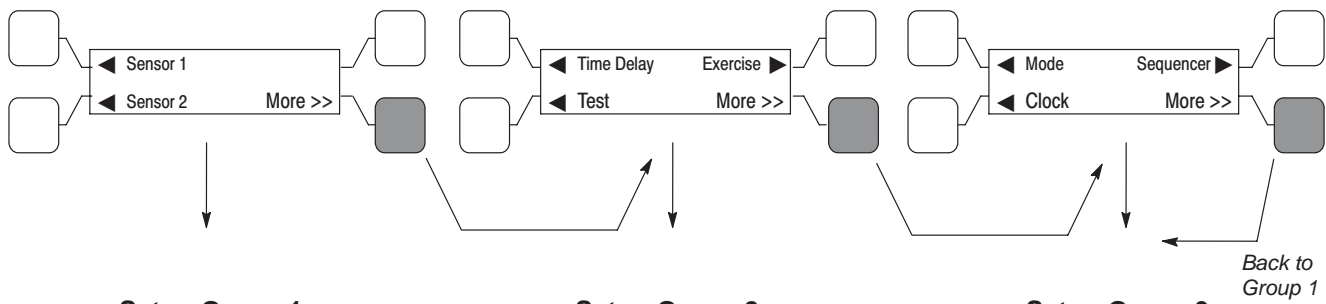


FIGURE 4-7. PASSWORD SUB-MENUS



## Setup Menu Navigation and Description



### Setup Group 1

This group allows programming the operational parameters of the switch for Source 1 and Source 2.

The *Sensor Sub-Menus* are used for setting the:

- Phase Type
- Nominal Voltage
- Undervoltage Settings
- Overvoltage Settings
- Time Delays
- Frequency Settings
- Imbalance Settings
- Phase Loss
- Phase Rotation

See Figures 4-10 and 4-11 for Sensor Sub-menus.

### Setup Group 2

The *Time Delay* sub-menus allow programming time for the:

- Engine Start
- Power Source 1 to Source 2
- Power Source 2 to Source 1
- Engine Cooldown
- Programmed Transition
- Elevator Pre-Transfer
- Genset to Genset Engine Controls

Refer to Figure 4-12 for Time Delay sub-menus.

*Test* sub-menus allow programming the front panel test switch to test the source with or without a load. If the configuration is genset to genset, Source 1 or 2 is selectable. See Figure 4-14.

*Exerciser* sub-menus allow programming an exercise routine for Power Source 2 and are available only on utility-to-genset controls. If Level 2 control is installed, a second exercise program can be setup. See Figure 4-15 or 4-17 for Exercise sub-menus.

*Exercise* sub-menus also allow for adding and deleting exercise exceptions. See Figure 4-19 for Exercise Exceptions sub-menus. Up to 8 routines and exceptions can be programmed using the PC service tool.

**NOTE:** Exercise Exceptions sub-menus were not available on early versions of software.

### Setup Group 3

The *Mode* sub-menu allows programming the type of transition the switch uses. See Figure 4-21.

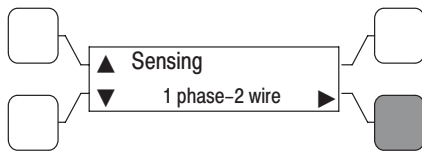
The *Clock* sub-menus program the time and date, as well as daylight savings time. See Figure 4-22.

Load *Sequencer* is a software feature, available only with LonWorks NetWork Communication Module. This program allows the user to send a predetermined sequence of event announcements in a timed, sequential order to turn the load off and on. See Figure 4-23.

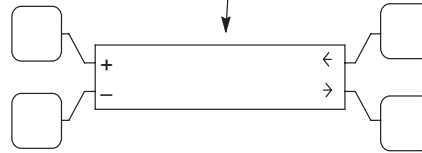
FIGURE 4-8. SETUP DESCRIPTION



## Changing Setup Parameters



When this button is pressed within any sub-menu, a cursor appears in the location of the editable field. In most cases, there is only one field to edit.



Use the + and – buttons to select numerical values or to toggle through a list of selections.

Default values are shown in parenthesis.

Use the → button to move the cursor to the next field.

When entering numerical values, the – button lowers the value to its lowest range, then begins again at the top end of the range. The + button increases the value to its highest range, then begins again at the low end of the range.

If changes are made, press the → button to enter the new value and return to the previous menu.

Changing any data within the setup sub-menus will invoke a SAVE/RESTORE screen when exiting the Setup Sub-menu Groups.

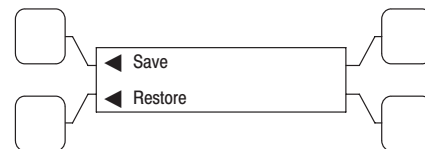
If the PREVIOUS MENU button is pressed during an editing session, the data will not be changed.

If the HOME button is pressed during an editing session, the SAVE/RESTORE screen is invoked.

## Saving or Restoring Setup Parameters

Changing any parameters within the Setup sub-menus invokes this screen when exiting the Setup sub-menu groups.

Use the Restore button to delete any setup parameter changes that were made during the current session. The program reverts to data from the previous session and does not save any changes.



**FIGURE 4-9. CHANGING SETUP PARAMETERS**

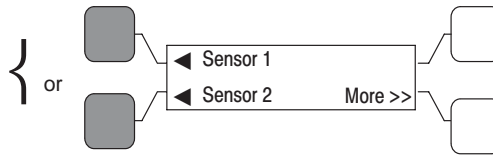


## Setup – Group 1

### Sensor 1 & Sensor 2 Sub-Menus

Sensor 1 and Sensor 2 sub-menus are identical except:

S1 refers to Source 1  
S2 refers to Source 2

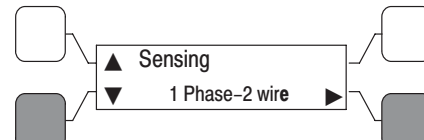


For 2-wire system, select:

1 phase–2 wire

For a single phase - 3 wire system, select: 1 phase–3 wire

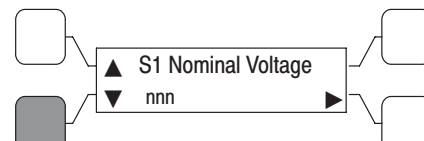
For a 3 phase system, select: 3 phase



System Voltage for Source 1 or 2

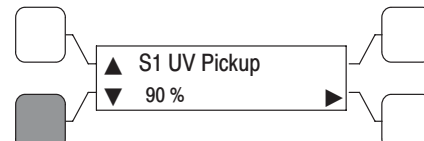
Enter the system voltage between 110 and 600 VAC

**Note:** Level 1 Controls are Line-to-Line Voltages and Level 2 Controls are Line-to-Neutral Voltages.



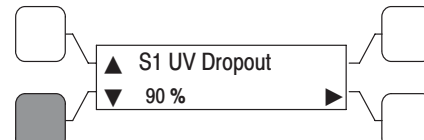
Under-Voltage Sensor Pick-Up

Enter a number between 85 and 100% of the nominal voltage (90%)



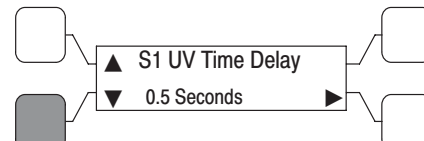
Under-Voltage Sensor Drop-Out Voltage

Enter a number between 75 and 98% of the under-voltage pick-up percentage (90%)



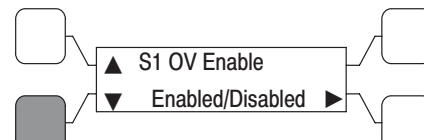
Under-Voltage Drop-Out Time Delay

Enter a time between 0.0 and 1.0 seconds (0.5)



Over-Voltage Sensing Enable

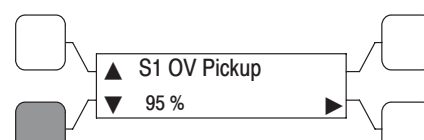
Choose Enabled or Disabled (Enabled)



Over-Voltage Pick-Up

This adjusts the over-voltage pick-up as a percentage of the over-voltage drop-out

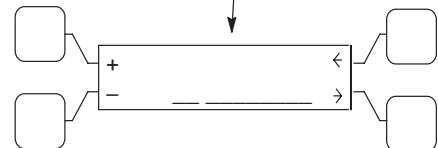
Enter a number between 95 and 99% (95%)



**Note:** Default values are in parenthesis.

Continued on next page

When this button is pressed in any sub-menu, a cursor appears in the location of the editable field. In most cases, there is only one field to edit.



Use the + and – buttons to select numerical values or to toggle through a list of selections.

Default values are shown in parenthesis)

When entering numerical values, the – button lowers the value to its lowest range, then begins again at the top end of the range. The + button increases the value to its highest range, then begins again at the low end of the range.

Use the → button to move the cursor to the next field.

If changes are made, press the → button to enter the new value and return to the previous menu.

Changing any data within the setup sub-menus will invoke a SAVE/RESTORE screen when exiting the Setup Sub-menu Groups.

If the PREVIOUS MENU button is pressed during an editing session, the data will not be changed.

If the HOME button is pressed during an editing session, the SAVE/RESTORE screen is invoked.

FIGURE 4-10. SETUP GROUP 1 – SENSOR SUB-MENUS

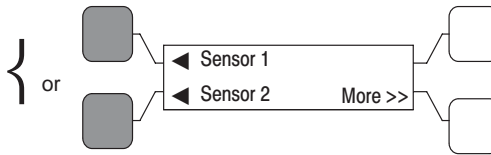


## Setup – Group 1

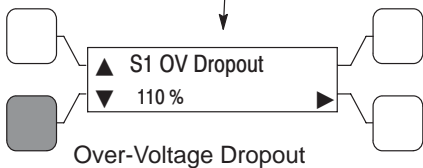
### Sensor 1 & Sensor 2 Sub-Menus (Continued)

Sensor 1 and Sensor 2 sub-menus are the same except:

S1 refers to Source 1  
S2 refers to Source 2

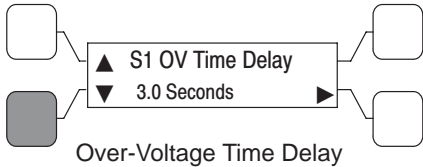


Continued from previous page



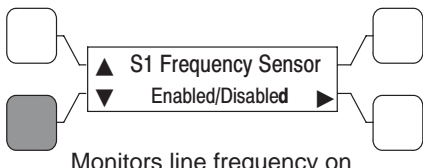
Over-Voltage Dropout

Enter a percentage between 105 and 135% of the nominal voltage (110%)

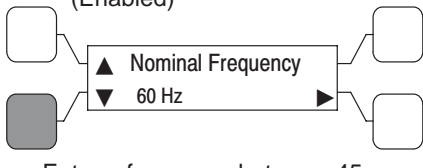


Over-Voltage Time Delay

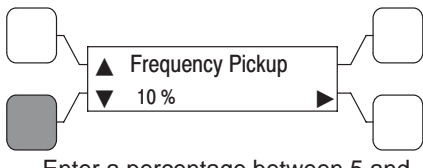
Enter a range between 0.5 and 120 seconds (3 Seconds)



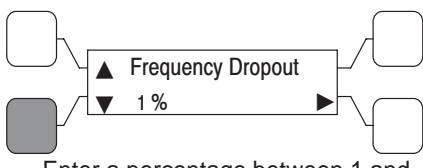
Monitors line frequency on A-Phases of both sources (Enabled)



Enter a frequency between 45 and 65 Hz (60 Hz)

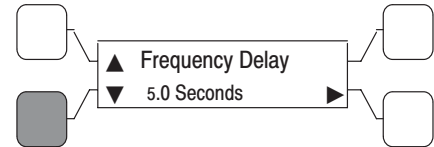


Enter a percentage between 5 and 20% of the nominal frequency (10%)



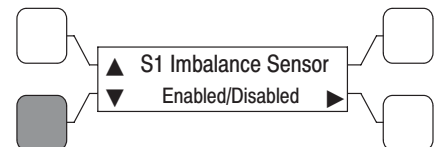
Enter a percentage between 1 and 5% of the frequency pickup (1%)

**Note:** Default values are in parenthesis.

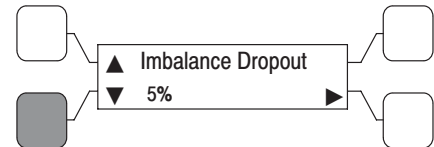


Enter a time between 0.1 and 15.0 seconds (5 Seconds)

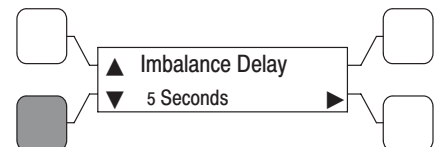
#### Level 2 Controllers Only



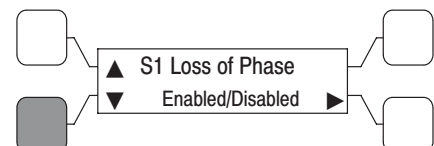
Detects unbalanced voltages on 3-phase sources (Disabled)



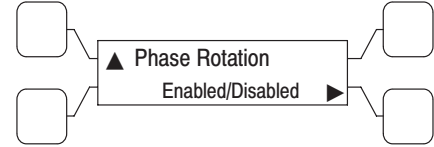
Enter a percentage between 2 and 10% (5%)



Enter a time between 2 and 20 seconds (5 Seconds)



The loss of single phase sensing can be enabled or disabled (Disabled)



The phase rotation sensing can be enabled or disabled (Enabled)

**FIGURE 4-11. SETUP GROUP 1 – SENSOR SUB-MENUS (Continued)**



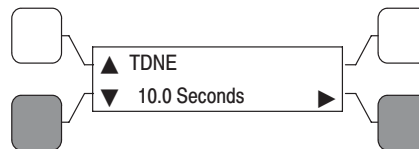
## Setup – Group 2

### Time Delay Sub-Menus



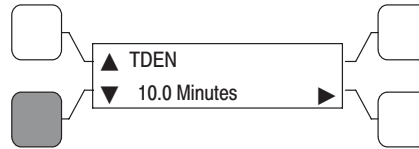
In a Normal to Emergency transfer this function allows Source 2 to stabilize before the load is applied.

Enter a time from 0 to 120 seconds (10 seconds). See Note 2.



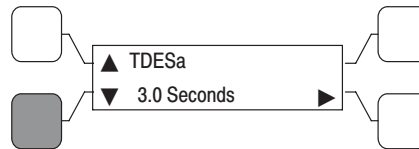
In a Emergency to Normal transfer this allows Source 1 to stabilize before re-transfer.

Enter a time from 0 to 30 minutes (10 minutes). See Note 2.



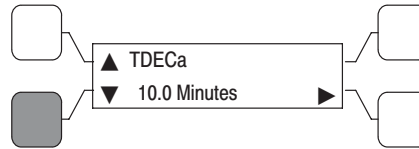
Sets the time delay for Engine Start on genset (a) used in a utility-generator and generator-generator mode. Prevents nuisance genset starting during brief power interruptions. This menu does not appear in utility-to-utility installations.

Enter a range from 0 to 120 seconds (3.0 seconds). See Note 2.



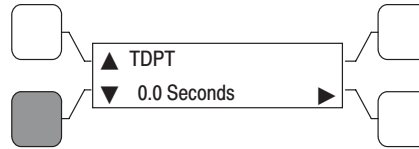
Sets the time delay for Engine Cool-down following a re-transfer. This menu does not appear in utility-to-utility installations.

Enter a time from 0 to 30 minutes (10 minutes).



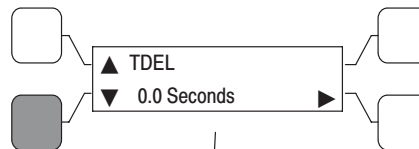
Sets the time delay for Programmed Transition setting of 0.0 disables the program.

Enter a time from 0 to 60 seconds (0 seconds).



Sets the time delay to wait for an elevator pre-transfer signal.

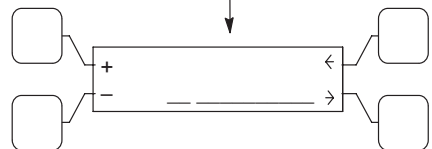
Enter a time from 0 to 60 seconds (0 seconds).



**Note:** Default values are in parenthesis.

**Note 2:** On early versions of software, the sequence of the first three menus were as follows: TDESa, TDNE, and TDEN.

When this button is pressed in any sub-menu, a cursor appears in the location of the editable field. In most cases, there is only one field to edit.



Use the + and – buttons to select numerical values or to toggle through a list of selections.

Default values are shown in parenthesis.

Use the → button to move the cursor to the next field.

When entering numerical values, the – button lowers the value to its lowest range, then begins again at the top end of the range. The + button increases the value to its highest range, then begins again at the low end of the range.

If changes are made, press the → button to enter the new value and return to the previous menu.

Changing any data within the setup sub-menus will invoke a SAVE/RESTORE screen when exiting the Setup Sub-menu Groups.

If the PREVIOUS MENU button is pressed during an editing session, the data will not be changed.

If the HOME button is pressed during an editing session, the SAVE/RESTORE screen is invoked.

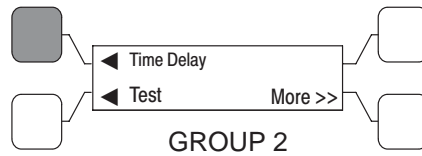
*Continued on next page*

**FIGURE 4-12. SETUP GROUP 2 – TIME DELAY SUB-MENUS**



## Setup – Group 2

### Time Delay Sub-Menus (Continued)



***This group is used only in Genset to Genset applications***

*Continued from previous page*

Sets the Engine Start time delay to for genset (b).

Enter a time from 0 to 120 seconds (3 seconds)

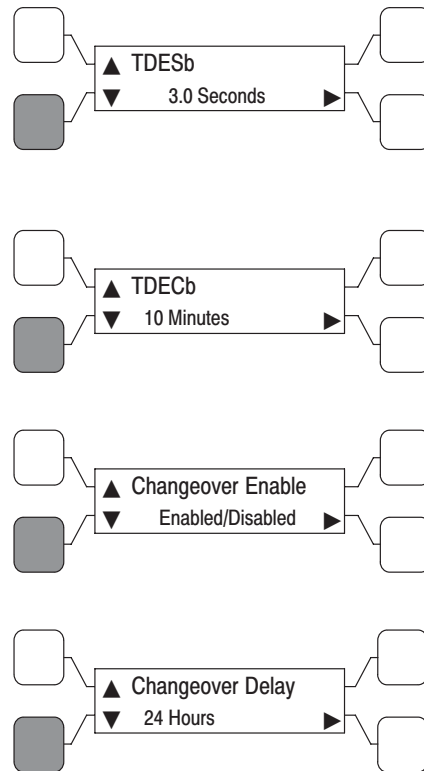
Sets the time delay for Engine Cooldown to begin.

Enter a time of 0 to 30 minutes (10 minutes)

If Changeover Enabled is enabled, this menu sets the amount of time a single generator can be run before switching to the other generator.

Enter a time from 1 to 336.0 hours (24 hrs)

*Level 2 Controller Only*



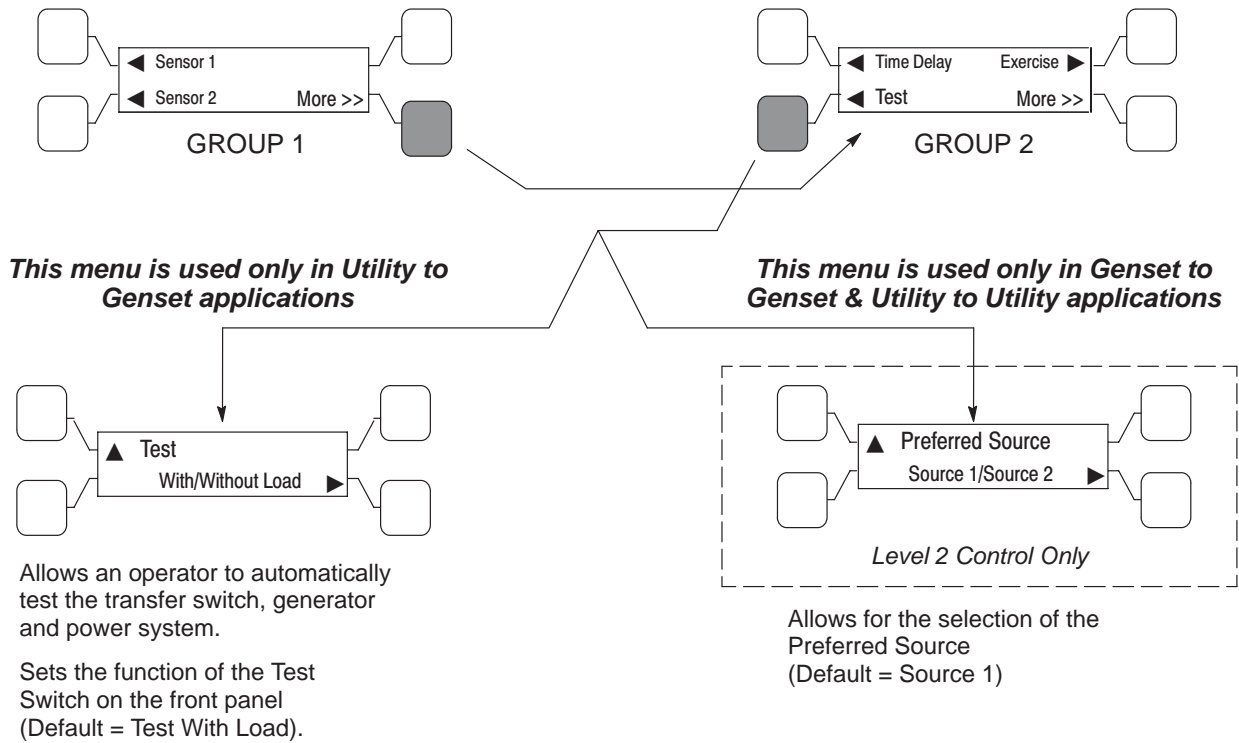
**Note:** Default values are in parenthesis.

**FIGURE 4-13. SETUP GROUP 2 – TIME DELAY SUB-MENUS (Continued)**



## Setup – Group 2

### Test Sub-Menus



**Note:** Default values are in parenthesis.

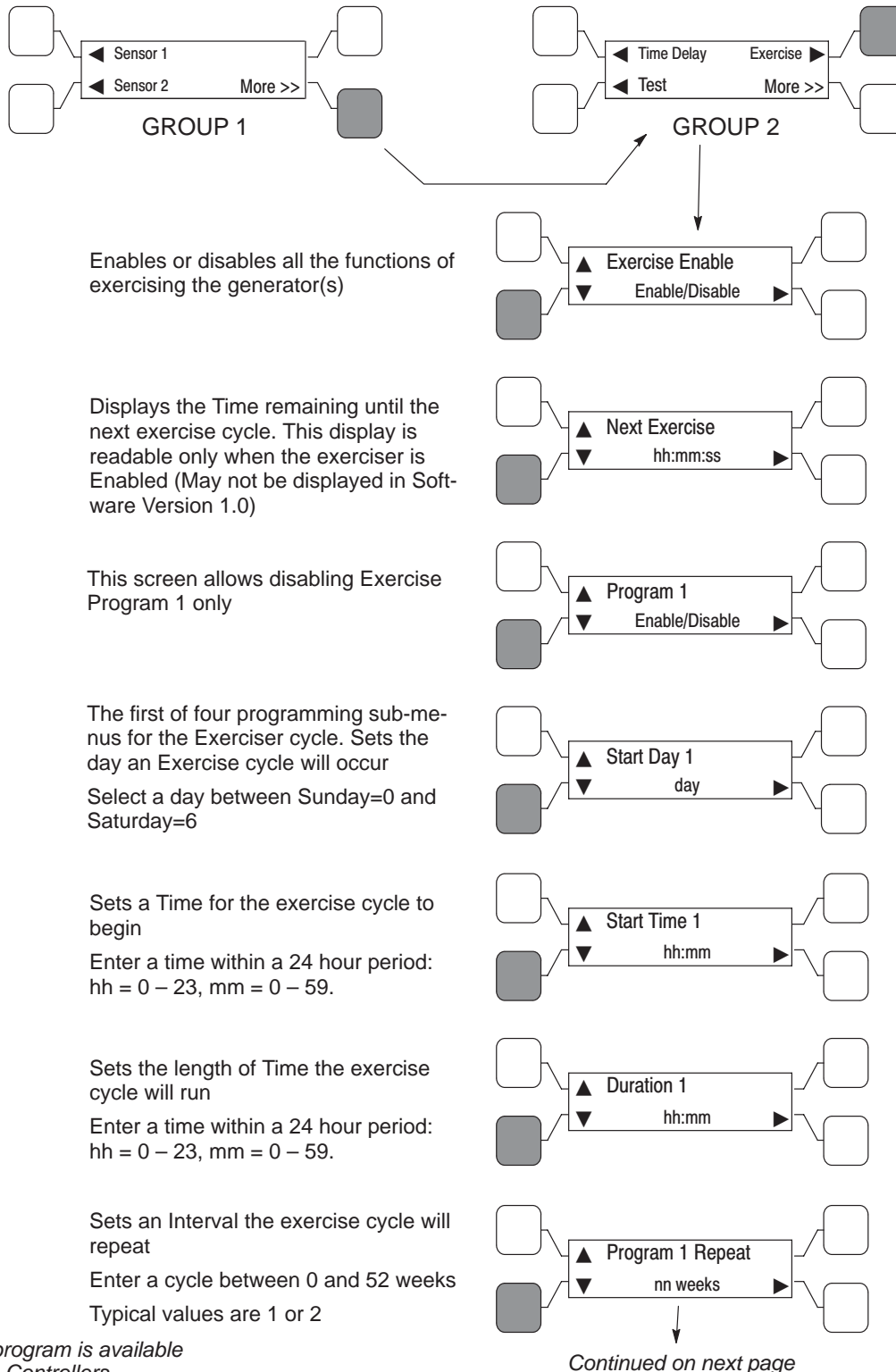
**FIGURE 4-14. SETUP GROUP 2 – TEST SUB-MENUS**



## Setup – Group 2

### Exerciser Sub-Menus – Software Versions Prior to 1.5.190

*These sub-menus are available only in Utility-to-Genset applications.*

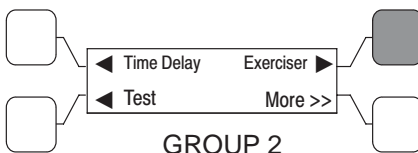


**FIGURE 4-15. SETUP GROUP 2 – EXERCISER SUB-MENUS (SOFTWARE VERSIONS PRIOR TO 1.5.190)**



## Setup – Group 2

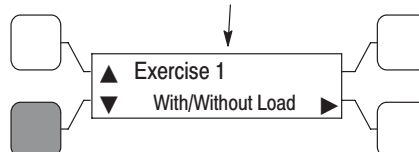
### Exerciser Sub-Menus – Software Versions Prior to 1.5.190 (Continued)



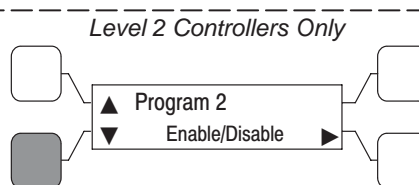
Level 2 Controllers allow for two exercise programs to be setup from the Setup menu screen. Six additional programs and eight exceptions can be setup using the PC Service Tool.

Enables or disables exercising the generator(s) with or without a load

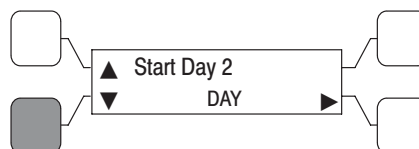
*Continued from previous page*



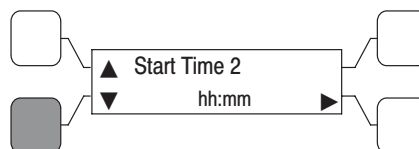
This screen allows disabling Exercise Program 2 only



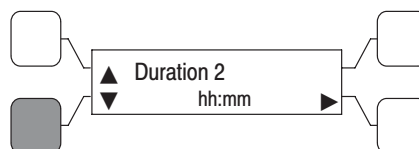
Sets the day of the second exercise cycle.  
Enter a day between Sunday = 0 and Saturday = 6.



Sets the time the second exercise cycle will begin  
Enter a time within a 24 hour period: hh = 0 – 23, mm = 0 – 59.



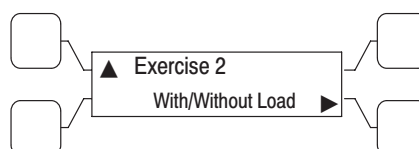
Sets a time limit the second exercise cycle will run  
Enter a time within a 24 hour period: hh = 0 – 23, mm = 0 – 59.



Sets an Interval the second exercise cycle will repeat  
Enter a range from 0 to 52 weeks. Typical values are 1 or 2.



Enables or disables the second exercise program to run the generator(s) with or without a load



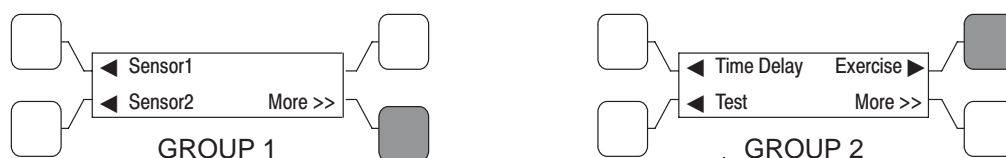
**FIGURE 4-16. SETUP GROUP 2 – EXERCISER SUB-MENUS (SOFTWARE VERSIONS PRIOR TO 1.5.190) (Continued)**



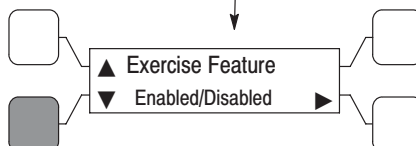
## Setup – Group 2

### Exerciser Sub-Menus – Starting with Software Version 1.5.190

*These sub-menus are available only in Utility-to-Genset applications.*

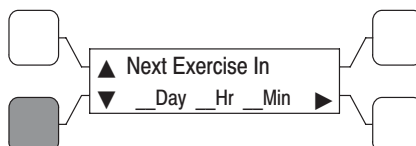


Enables or disables all the functions of exercising the generator(s). (Default = Disabled)

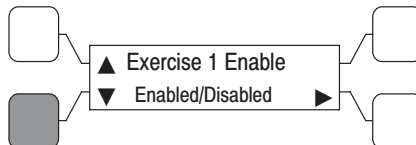


**Note:** Instead of “Exercise Feature,” this menu is titled “Exercise Enable” in some early versions of software. This menu is no longer included with current software.

Displays the Time remaining until the next exercise cycle. If no exercises are enabled, the message “No Next Exercise” is displayed.

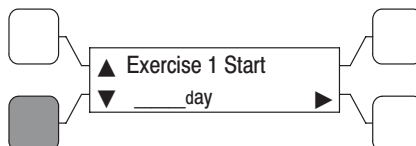


This screen allows disabling Exercise 1 only. (Default = Disabled)



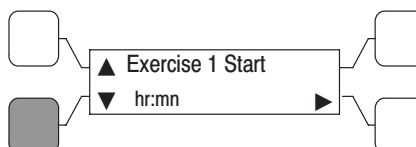
The first of four programming sub-menus for the Exercise cycle. Sets the day an Exercise cycle will occur

Select a day between Sunday and Saturday. (Default = Sunday)



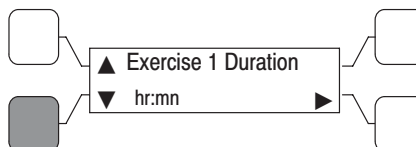
Sets a Time for the exercise cycle to begin.

Enter a time within a 24 hour period: hr = 0–23, mn = 0–59. (Default = 00:00)



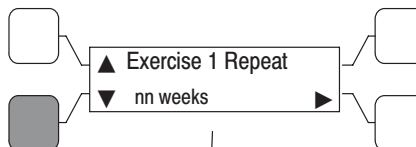
Sets the length of Time the exercise cycle will run.

Enter a time within a 24 hour period: hr = 0–23, mn = 0–59. (Default = 00:00)



Sets an Interval the exercise cycle will repeat.

Enter a cycle between 0 and 52 weeks. Typical values are 1 or 2. (Default = 0 weeks)



**Note:** Only one exercise is available for Level 1 Controllers

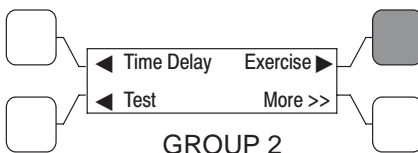
*Continued on next page*

**FIGURE 4-17. SETUP GROUP 2 – EXERCISE SUB-MENUS (STARTING WITH SOFTWARE VERSION 1.5.190)**



## Setup – Group 2

### Exercise Sub-Menus – Starting with Software Version 1.5.190 (Continued)



GROUP 2

Level 2 Controllers allow for two exercise programs to be setup from the Setup menu screen. Six additional programs and eight exceptions can be setup using the PC Service Tool.

Enables or disables the first exercise program to run the generator(s) with or without a load. (Default = Without Load)

This screen allows disabling Exercise 2 only. (Default = Disabled)

Sets the day of the second exercise cycle.  
Enter a day between Sunday and Saturday.  
(Default = Sunday)

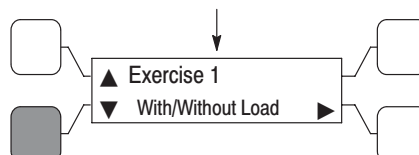
Sets the time the second exercise cycle will begin.  
Enter a time within a 24 hour period: hr = 0–23, mn = 0–59. (Default = 00:00)

Sets a time limit the second exercise cycle will run.  
Enter a time within a 24 hour period: hr = 0–23, mn = 0–59. (Default = 00:00)

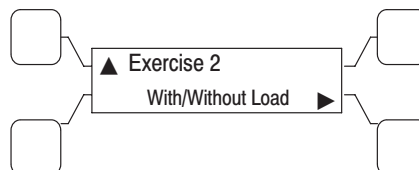
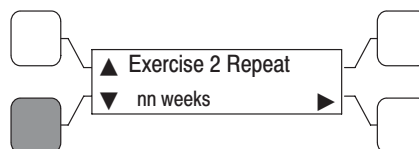
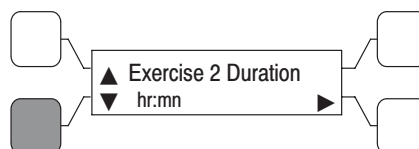
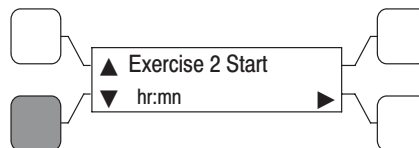
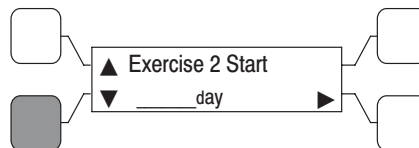
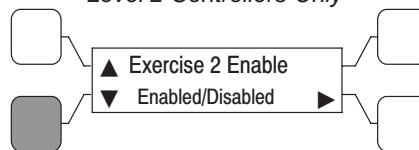
Sets an Interval the second exercise cycle will repeat.  
Enter a range from 0 to 52 weeks. Typical values are 1 or 2. (Default = 0 weeks)

Enables or disables the second exercise program to run the generator(s) with or without a load. (Default = Without Load)

Continued from previous page



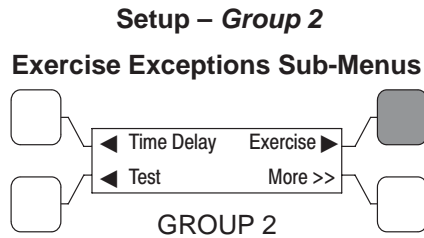
Level 2 Controllers Only



Add and Delete Exceptions  
(continued on next page)

**FIGURE 4-18. SETUP GROUP 2 – EXERCISE SUB-MENUS (STARTING WITH SOFTWARE VERSION 1.5.190) (Continued)**

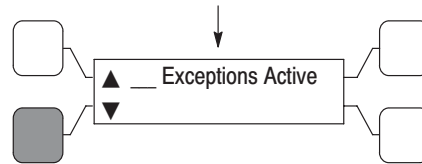




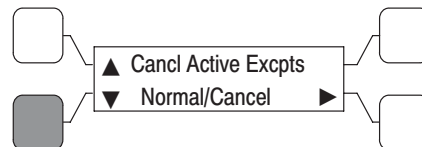
Level 2 Controllers allow for adding and deleting exceptions to the two exercise programs setup from the Setup menu screen.

Indicates the number of active exercise exceptions. If there are no active exceptions, the message “No Exceptions Active” is displayed.

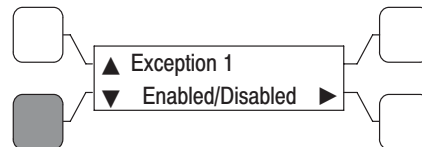
*Continued from previous page*



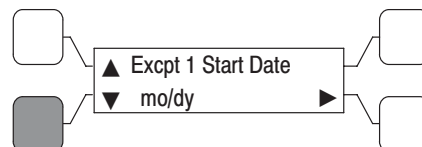
This screen allows canceling all exceptions. (Default = Normal)



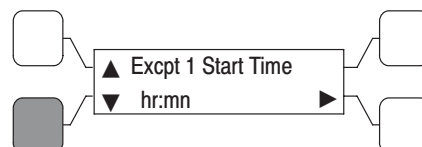
This screen allows enabling/disabling Exception 1 only. (Default = Disabled)



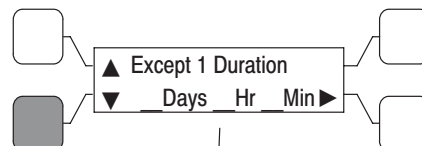
Sets the month and day for Exception 1.  
Enter a starting date that the exercise will not run: mo = 1–12, dy = 1–31.



Sets a time of day for Exception 1.  
Enter a starting time of day that the exercise will not run: hr = 0–23, mn = 0–59.



Sets the Time period that Exception 1 will override an Exercise.  
Enter a time: dy = 1–31, hr = 0–23, mn = 0–59.



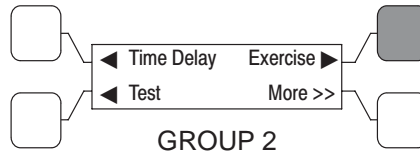
*Continued on next page*

**FIGURE 4-19. SETUP GROUP 2 – EXERCISE EXCEPTIONS SUB-MENUS**



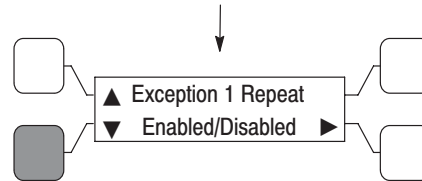
## Setup – Group 2

### Exercise Exceptions Sub-Menus (Continued)

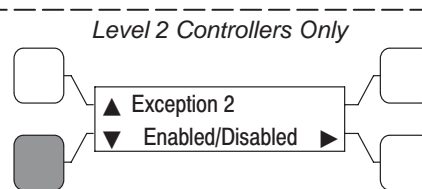


*Continued from previous page*

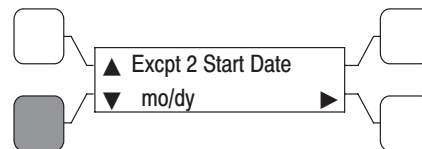
This screen allows enabling/disabling Exception 1 repeating. (Default = Disabled)



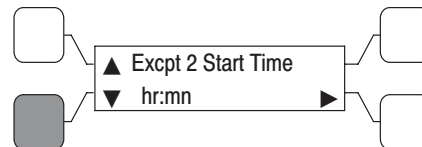
This screen allows enabling/disabling Exception 2 only. (Default = Disabled)



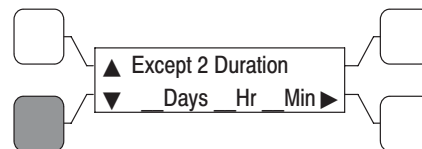
Sets the month and day for Exception 2.  
Enter a starting date that the exercise will not run: mo = 1–12, dy = 1–31.



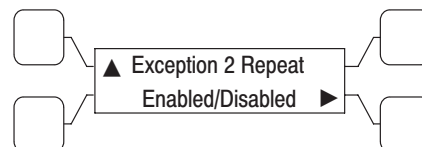
Sets a time of day for Exception 2.  
Enter a starting time of day that the exercise will not run: hr = 0–23, mn = 0–59.



Sets the Time period that Exception 2 will override an Exercise.  
Enter a time: dy = 1–31, hr = 0–23, mn = 0–59.

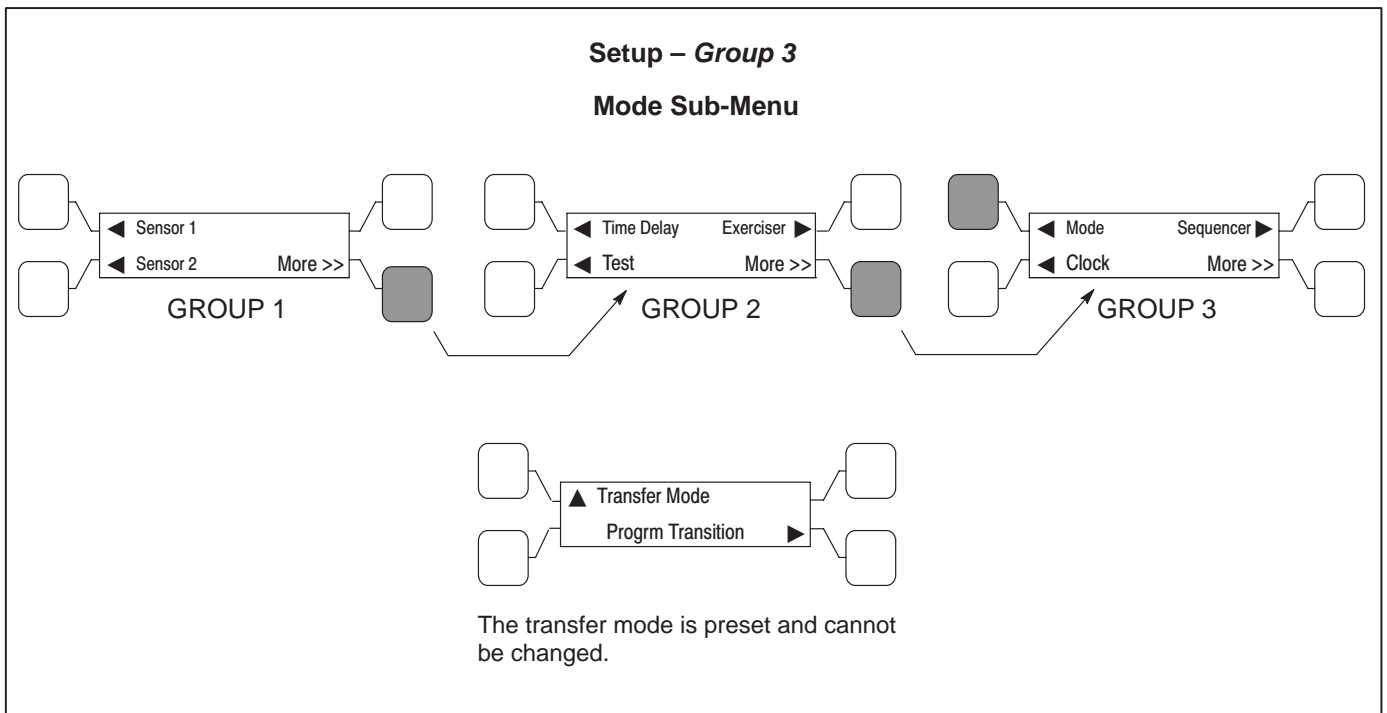


This screen allows enabling/disabling Exception 2 repeating. (Default = Disabled)



**FIGURE 4-20. SETUP GROUP 2 – EXERCISE EXCEPTIONS SUB-MENUS (Continued)**





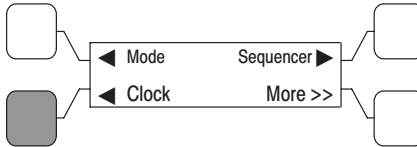
**FIGURE 4-21. SETUP GROUP 3 – MODE SUB-MENU**



### Setup – Group 3

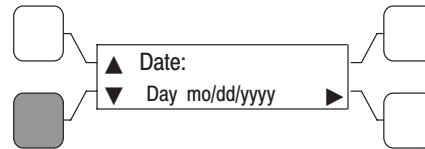
#### Clock Sub-Menus

The Clock sub-menus allow the user to set the actual date and-time, as well as select the Daylight Saving Time option.



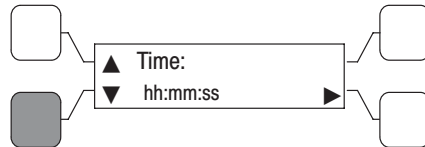
Sets the actual day and date.

Enter a month between Jan = 1 and Dec = 12, date between 1 and 31, and year between 1 and 9999.



Sets the actual time of day.

Enter the actual time within a 24 hour period  
Enter a time within a 24 hour period: hh = 0 – 23, mm = 0 – 59, ss = 0 – 59.



Activates the Daylight Savings time option.  
Selecting Enabled automatically updates the clock +/- one hour on the appropriate days.  
(Default = Disabled)



**Note:** The Daylight Savings Time program is set for North America. If you are anywhere outside of North America, the time should be changed manually.

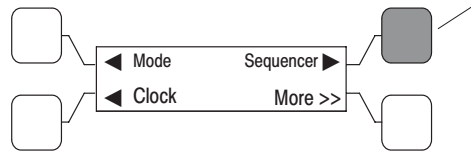
- The first Sunday in April – moves the time forward one hour.
- The last Sunday in October – moves the time back one hour.

**FIGURE 4-22. SETUP GROUP 3 – CLOCK SUB-MENUS**



### Setup – Group 3

#### Sequencer Sub-Menus



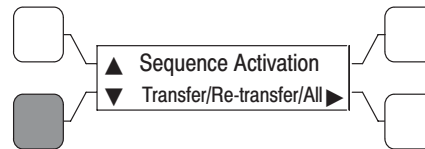
The Sequencer sub-menus are a software only feature allowing the user to send a predetermined sequence of network event announcements. The announcements are sent in a timed, sequential order and are used to turn ATS loads off and on.

Sequencer is available only with the Network Communication Module. The module must be installed and enabled before these screens are displayed.

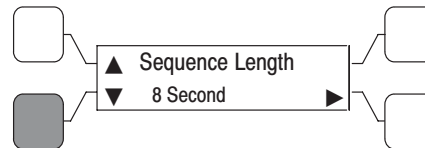
When Enabled, allows event announcements to be sent to the transfer switch.



Sets activation for certain operational modes.  
Choose Transfer, Re-transfer or All

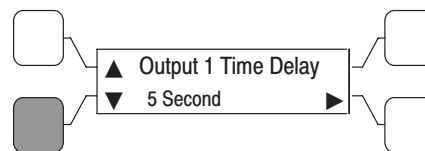


The control can activate a maximum of 8 relay output signals.  
Enter the number of relay output signals desired to activate: 1 thru 8



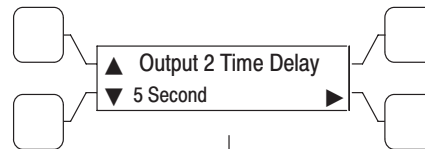
When Load Sequencer is triggered, the controller deactivates all remote relay output signals. Starting with Relay 1, the controller counts down the specified time delay, then activates Relay 1.

Enter a time from 0 to 60 seconds.



If the Sequence Length is greater than 1, the control counts down the specified Relay 2 time delay, then activates the Relay 2 signal.

Enter a time from 0 to 60 seconds.



The process repeats until all relay signals have been sequenced. The maximum time delay for all 8 signals is 8 minutes.

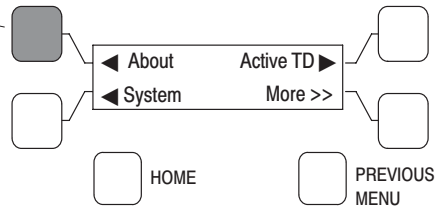
*Menus continue through Output 8, depending on the number of Sequence Lengths specified.*

FIGURE 4-23. SETUP GROUP 3 – SEQUENCER SUB-MENUS

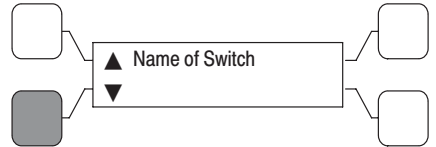


### THIRD MAIN MENU – About Sub-Menus

The About sub-menus contain read-only information about the transfer switch and controller.



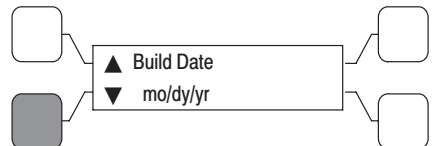
Displays the name of the switch as defined in the Event Handling Requirement.



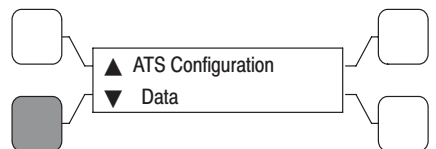
Displays the current firmware version of the controller.



Displays the manufacturing date of the controller.

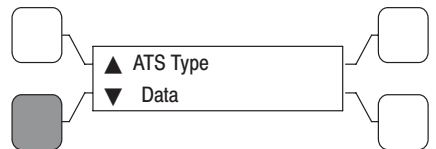


Displays the configuration of the controller. Changes are made by service personnel using the PC Service tool.



Data
Test Mode
Util-Gen
Utility-Utility
Genset-Genset
Unknown

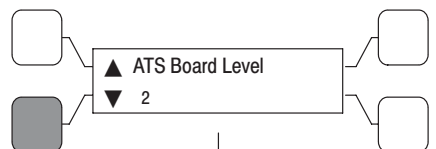
Displays the mode of operation the control is using. Adjustments can be made by service personnel using the PC Service Tool.



Data
OT = Open Transition
BT = Bypass Transition
Unknown

Displays the ATS board level (1 or 2).

**NOTE:** This menu was not included in early versions of software.

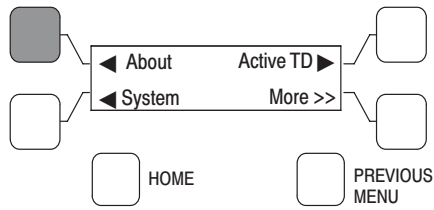


Continued on next page

FIGURE 4-24. THIRD MAIN MENU – ABOUT SUB-MENUS

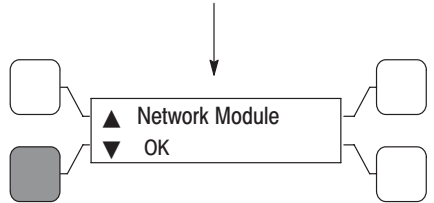


### THIRD MAIN MENU – About Sub-Menus *(continued)*



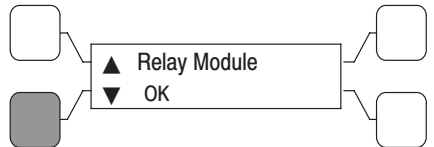
*Continued from previous page*

This screen indicates if a Network Communications Module is installed and enabled.



Hardware Detected	Software Enabled	Data
True	True	OK
False	True	Not Installed
True	False	Not Enabled
False	False	Not Available

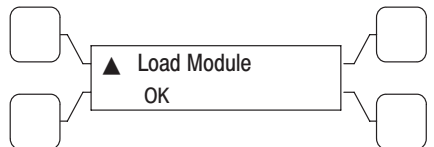
This screen indicates if the Relay Module hardware is installed.



Data
OK
Not Installed

This screen indicates if the Load Current Module hardware is installed.

This feature is not available on Level 1 controllers

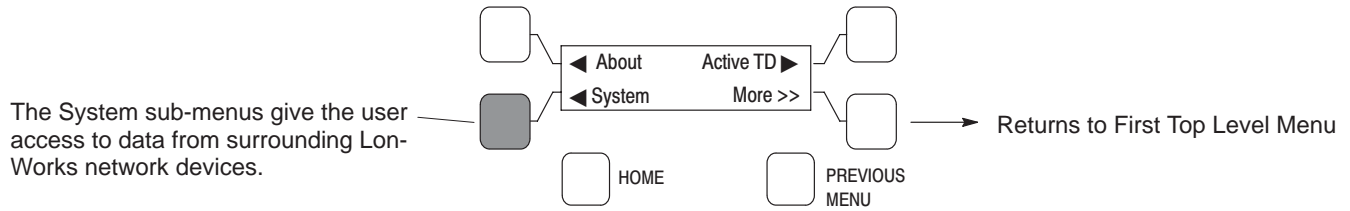


**FIGURE 4-25. THIRD MAIN MENU – ABOUT SUB-MENUS (Continued)**

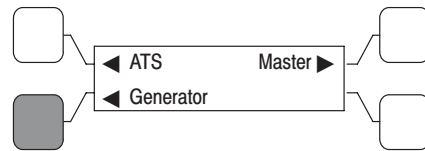
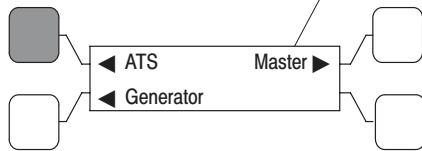


### THIRD MAIN MENU – System Sub-Menus

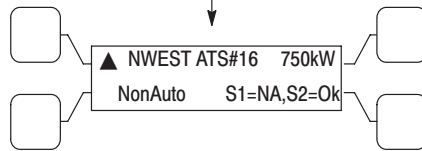
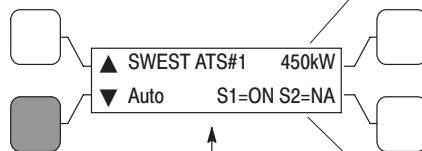
These sub-menus are available only with the Network Communication Module.  
The status of up to 32 devices can be viewed at the ATS.



Available only with networked transfer switches



EXAMPLES

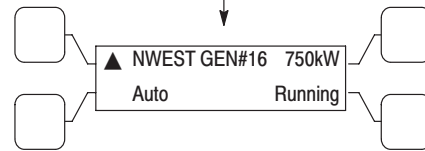
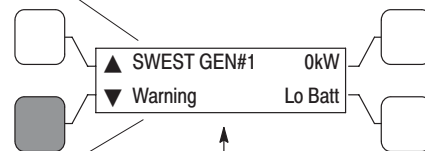


Load (kW)

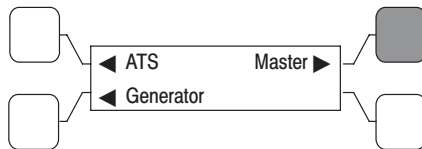
Name Tag (12 Char)

Operational State  
Status of Unit

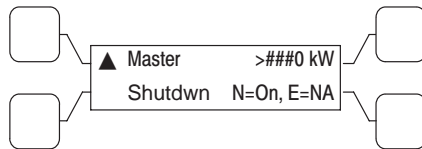
EXAMPLES



If no Generator Sets are connected to the system, the message "No GenSets Found" is displayed.



EXAMPLE



The Master Control menu displays information on:

1. Power (kW)
2. Master Control Status  
(Non Auto, Ready, Norm Fail, Test)
3. Voltage Source Status  
([N=Source1, E=Source2], On, OK, or NA).

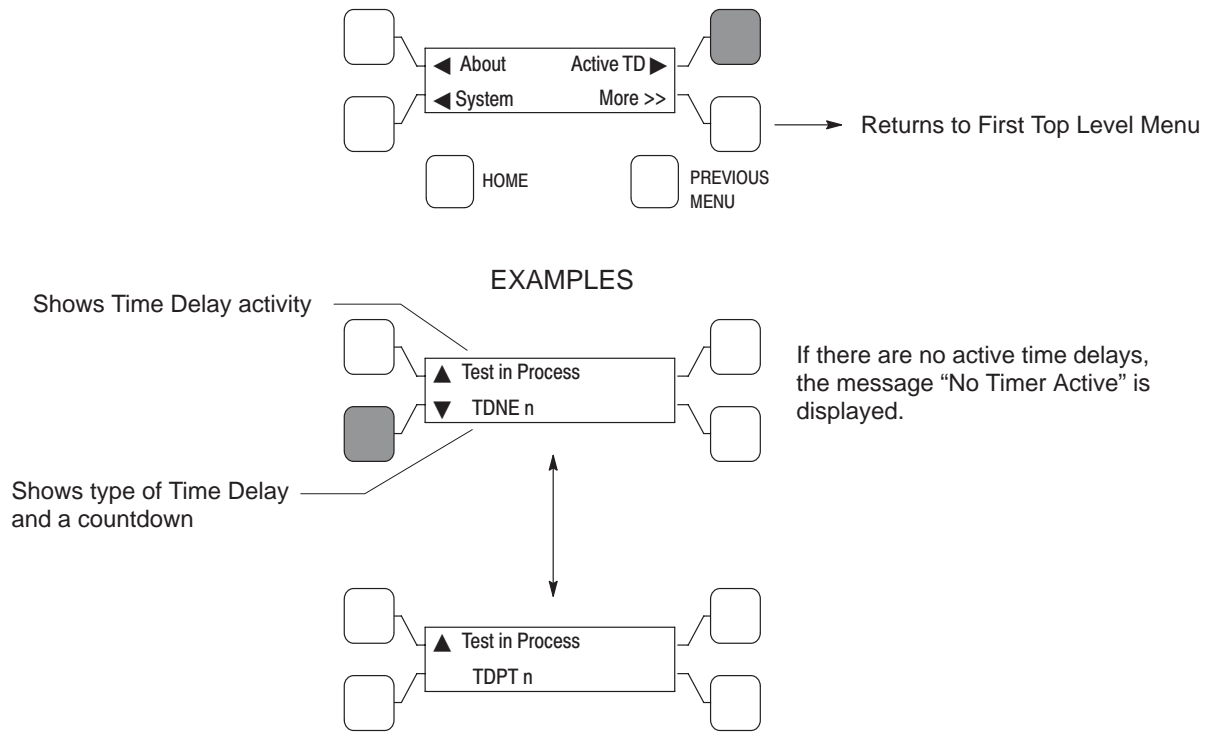
If a Master Control is not connected to the system, the message "No Master Control" is displayed.

**NOTE:** The Master Control menu is not available in early versions of software.

FIGURE 4-26. THIRD MAIN MENU – SYSTEM SUB-MENUS



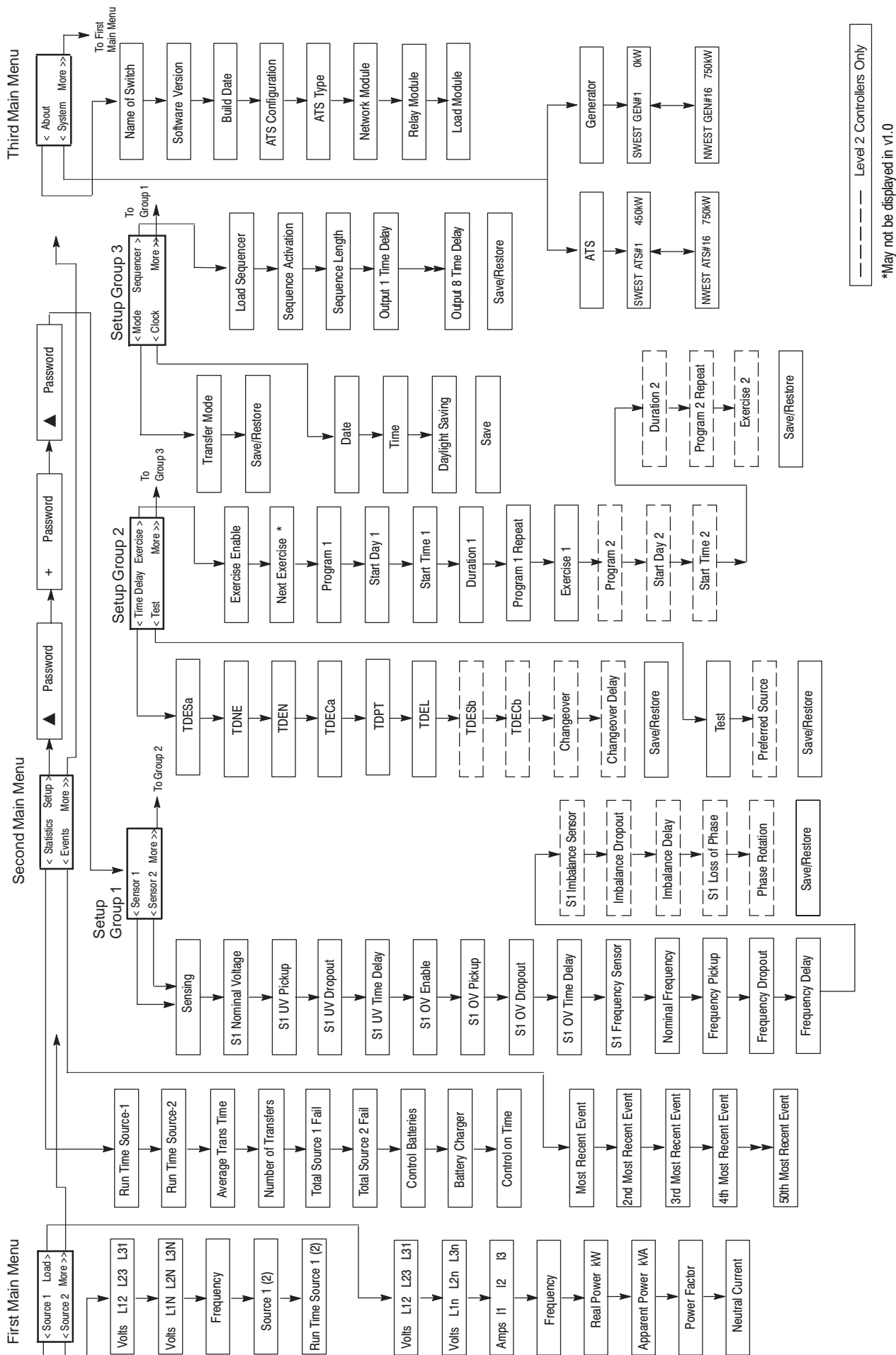
### THIRD MAIN MENU – Active TD Sub-Menus



**NOTE:** Active TD menus were not available on early versions of software.

**FIGURE 4-27. THIRD MAIN MENU – ACTIVE TD SUB-MENUS**





**FIGURE 4-28. MENU SYSTEM MAP – PRIOR TO SOFTWARE VERSION 1.5.190**



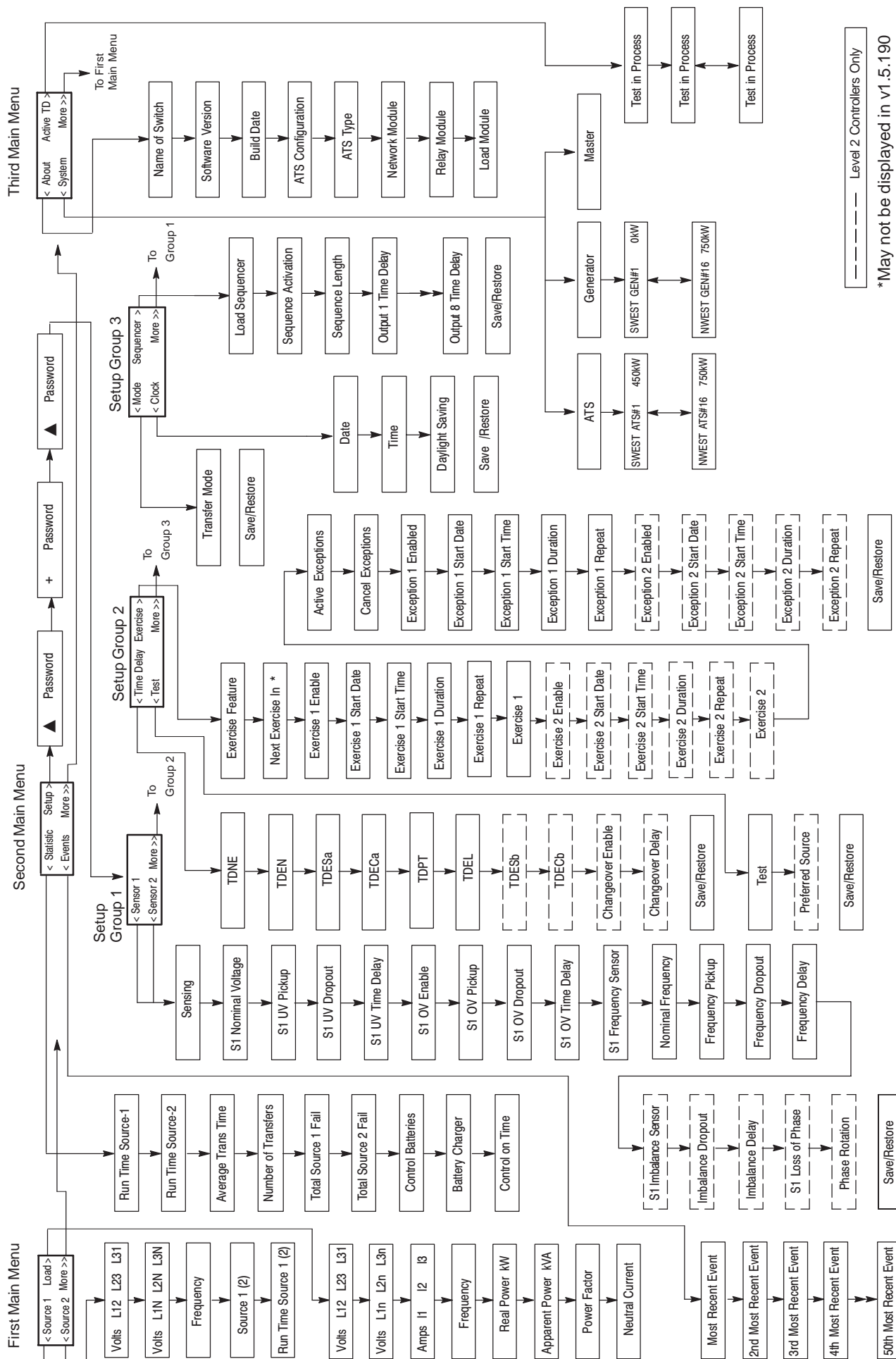


FIGURE 4-29. MENU SYSTEM MAP – STARTING WITH SOFTWARE VERSION 1.5.190







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# 5. Events

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This section describes the Events feature and contains a list of all non-fault events. Events can be displayed on the PC service tool and on transfer switches that are equipped with the Digital Display.

## EVENT TYPES

The controller has two types of events: fault events and non-fault events. All events have the same format within the control software.

A fault event is an alarm when the transfer switch or ATS controller is not operating correctly. These events are detected by the main control software subsystems. Fault events can be in either of two states: active or inactive. Fault events are used in troubleshooting transfer switch problems. See Troubleshooting, Section 6 for a list of the fault events.

A non-fault event is a power system fault or a situation in which the power system is not in the normal state. Non-fault events can be in either of two states: active or inactive. Non-fault events provide a chronological history of power system behavior.

Active events consist of a text message, a date/time stamp, and an asterisk. Pressing the Reset button on the control panel acknowledges all active events, clears the current event from the display and moves it to the history file. The asterisk indicator is part of an active event message until the event has been acknowledged.

## Event History

The controller displays the last event that occurred on the digital display, until it is acknowledged or another event occurs. If another event occurs before the displayed event is acknowledged, it is displayed and the previous event moves to the history file, unacknowledged. Unacknowledged events are acknowledged when the reset button is pressed.

The control records up to 50 events in the event history file. When the history file is full and a new event occurs, the control adds it to the history file and deletes the oldest event in the history file. The PC service tool and the digital display can display the

events. See the Digital Display Menu System section for how to display previous events.

**NOTE:** The controller automatically saves a record of events twice a day. If power is lost, the controller attempts to save a record of current events. If the controller batteries and power are removed, event history may be lost. To save a record of current events, use the digital display (Save button in the Setup sub-menus) or InPower (Save Adjustments) before removing power or the batteries from the transfer switch.

## NON-FAULT EVENTS

The events listed below describe the status of the power system or the ATS, but are not ATS faults. These events are meant to provide a historical log of the power system behavior over time.

**Press the Reset button on the control panel to acknowledge the event and clear the message from the display.**

### Source 1 Connected or Bypassed Source 1

This event is active whenever the Source 1 position input is active. There is an associated LED output on the front panel, a relay output on the Relay Module, and a Digital Display screen that also indicate Source 1 Connected.

### Source 2 Connected

This event is active whenever the Source 2 position input is active. There is an associated LED output on the front panel, a relay output on the Relay Module, and a Digital Display screen that also indicate Source 2 Connected.

### Source 1 Available

This event is active whenever the Source 1 sensors (over/under voltage, over/under frequency, phase rotation, loss of phase, voltage imbalance) indicate that Source 1 is within acceptable limits. There is an associated LED output on the front panel and a relay output on the Relay Module.

### Source 2 Available

This event is active whenever the Source 2 sensors (over/under voltage, over/under frequency, phase



rotation, loss of phase, voltage imbalance) indicate that Source 2 is within acceptable limits. There is an associated LED output on the front panel and a relay output on the Relay Module.

### **Emergency Start A**

This event is active whenever the controller requires the Source 2 genset to start at rated speed—otherwise known as an emergency start. There is also a discrete output called Emergency Start A.

### **Emergency Start B**

This event is active whenever the controller requires the Source 1 genset to start at rated speed. This event is only used in genset-genset control modes. There is also a discrete output called Emergency Start B.

### **Test Start A**

This event is active whenever the controller performs a Test sequence. The controller also activates the Emergency Start A output in order for the generator to interpret that a Test/Exercise start is called for.

There is also a discrete output called Test Start A that goes to the Start Type input on gensets with PowerCommand 3200 controls.

### **Time Delay Start A (TDES-A)**

This event is active whenever the Time Delay Start A timer is active. This event is inactive whenever the timer expires or is not active. The main control loop activates this output whenever the control requires generator set (A) to start.

The digital display shows this event when it becomes active, in addition, it displays an active countdown, in seconds, of the time delay.

### **Time Delay Start B (TDES-B)**

This event is active whenever the Time Delay Start B timer is active. This event is inactive whenever the timer expires or is not active. The control activates this output whenever the control requires generator set (B) to start. This event is only present for controllers configured for Genset-Genset control mode.

The digital display shows this event when it becomes active, in addition, it displays an active countdown, in seconds, of the time delay.

### **Time Delay Source 1 (N)-to-Source 2 (E) (TDNE)**

This event is active whenever the Time Delay Source 1 to Source 2 timer is active—also called the time delay transfer. This event is inactive whenever the timer expires or is not active. The control activates this output when the control is counting down to transfer the switch from Source 1 to Source 2.

The digital display displays this event when it becomes active, in addition, it displays an active countdown, in seconds, of the time delay.

### **Time Delay Source 2 (E) to Source 1 (N) (TDEN)**

This event is active whenever the Time Delay Source 2 to Source 1 timer is active—also called the time delay retransfer. This event is inactive whenever the timer expires or is not active. The control activates this output when the control is counting down to transfer the switch from Source 2 to Source 1.

The digital display shows this event when it becomes active, in addition, it displays an active countdown, in seconds, of the time delay.

### **Time Delay Engine Cool-Down (TDEC)**

This event is active whenever the Time Delay Engine Cool-down timer is active—also called the time delay stop. This event is inactive whenever the timer expires or is not active. The control activates this output whenever the control is cooling down the generator set.

The digital display shows this event when it becomes active, in addition, it displays an active countdown, in seconds, of the time delay.

### **Time Delay Programmed Transition (TDPT)**

This event is active whenever the programmed transition timer is active (whenever the control is delaying the transfer switch in the neutral position). This event is inactive whenever the timer expires or is not active.

The digital display shows this event when it becomes active, in addition, it displays an active countdown, in seconds, of the time delay.



## Transfer Pending (TDEL)

Whenever the Elevator Pretransfer output is active, the controller sets this event to active. The control activates this event whenever a transfer pending signal is needed in the power system—this is typically used as an early warning signal for elevator systems. When the timer expires, the event will go inactive.

The digital display shows this event when it becomes active, in addition, it displays an active countdown, in seconds, of the time delay.

## Test In Progress

This event is active whenever a test sequence is active. There is an associated LED output on the front panel and a relay output on the Relay Module.

## Exercise in Progress

This event is active whenever an exercise sequence is active. There is an associated LED output on the front panel and a relay output on the Relay Module.

## Source 1 Under-Voltage Failure

This event is active whenever Source 1 voltage is less than the acceptable limits, set in the controller.

## Source 1 Over-Voltage Failure

This event is active whenever Source 1 voltage is greater than the acceptable limits, set in the controller.

## Source 1 Over/Under Frequency Failure

This event is active whenever Source 1 frequency is outside acceptable limits, set in the controller.

## Source 1 Voltage Imbalance Failure

This event is active whenever Source 1 voltage is outside acceptable limits set in the controller.

## Source 1 Loss of Phase Failure

This event is active whenever Source 1 is missing one or more of its (three-phase) voltage sources.

## Source 2 Under-Voltage Failure

This event is active whenever Source 2 voltage is less than the acceptable limits set in the controller.

## Source 2 Over-Voltage Failure

This event is active whenever Source 2 voltage is greater than the acceptable limits set in the controller.

## Source 2 Over/Under Frequency Failure

This event is activate whenever Source 2 frequency is outside acceptable limits set in the controller.

## Source 2 Voltage Imbalance Failure

This event is active whenever Source 2 voltage is outside acceptable limits set in the controller

## Source 2 Loss of Phase Failure

This event is active whenever Source 2 is missing one or more of its (three-phase) voltage sources.

## Phase Rotation Failure

This event is active whenever Source 1 and Source 2 voltages have difference phase sequences.

## Not in Auto: ATS Motor Disconnected

This event is active whenever the ATS Motor Disconnect input is active. This input causes the controller to enter a non-automatic mode—it does not try to move the transfer switch mechanism.

## Not in Auto: Load Shed

This event is active whenever the Load Shed input is active, or the network *nviLoadShedCmd* input is active.

## Not in Auto: Transfer Inhibit

This event is active whenever the Transfer Inhibit input is active, or the network *nviTransferInhCmd* input is active.

## Not in Auto: Retransfer Inhibit

This event is active whenever the Transfer Inhibit input is active, or the network *nviReTransferInhCmd* input is active. Even though the Not-in-Auto light is lit, the transfer switch will function correctly.



## **Not in Auto: Common Output (Network Only)**

This event is used to support the multiple Not In Auto conditions. This output has the same value (or status) as the hardware LED output located on the ATS front panel and the Relay Module output.

Whenever any of the Not In Auto events are true—including, ATS Motor Disconnected, Load Shed, Transfer Inhibit, Retransfer Inhibit, Bypassed to Source 1, and Bypassed to Source 2—the control makes this event active.

The Network Annunciator uses this event to indicate the general status of the ATS Not In Auto output.

## **Service Tool Connected**

This event is active, whenever there is a PC service tool connected to the controller. The purpose for this event is to provide a chronological service history, which is stored at the ATS.

## **Load Sequencer Outputs (1-8)**

The Load Sequencer feature consists of eight programmable timers which can control eight different network devices in a timed sequence. Each Load Sequencer output is an independent Event Announcement. This is necessary for the Network Control Module (NCM) to receive and transmit event changes.

When these outputs are active, the transfer switch is typically inhibiting another transfer switch from loading the active source. This allows a gentle loading of a transfer switch when performing a transfer or retransfer sequence.

The Event Handler generates an Event Announcement whenever the Load Sequencer outputs (1-8) change state.

## **Network Wink**

The network wink event is active whenever the Network Control Module (NCM) performs a logical write command to the controller. Network wink events are used by network service technicians to identify a particular network device—the technician winks a device in order to identify it from other devices. The controller responds to an active network wink event

by placing a Network Wink message on the digital display.

## **Exercise Sequence**

This event is active whenever the controller performs an Exercise sequence. This event is identical to the Test Start-A and Test Start-B event descriptions. However, an exercise event is initiated by the controller itself rather than by an external switch input.

## **Generator A Common Alarm**

This event is active when the Generator A Common Alarm input is activated. This input is usually only used in genset-to-genset applications. When this input is active, it indicates that generator A is shut-down (and locked out).

## **Generator B Common Alarm**

This event is active when the Generator B Common Alarm input is activated. This input is usually only used in genset-to-genset applications. When this input is active, it indicates that generator B is shut-down (and locked out).

## **Neutral Current Warning**

This event is detected only on switches equipped with the Load Monitoring bargraph. This event is active when the neutral current (amps) exceeds the threshold for neutral current.

## **Preferred Source 1 (or 2)**

This event is active when the preferred source variable changes from either Source 2 to Source 1 or Source 1 to Source 2. The event is inactive when the preferred source is Source 1.

This event is used only in utility-to-utility control modes.

## **Controller Loss of Power**

The controller signals the network card and other devices that the ATS controller is going to shutdown due to a lack of power. This signal triggers a time-delay start or other sequences. After the sequences are complete the controller shuts itself off in order to conserve the back-up batteries. The network card responds by not communicating to the controller.



## 6. Troubleshooting

The following procedures describe preliminary troubleshooting checks. If the trouble persists, call your dealer or distributor.

Troubleshooting procedures are different when you have a transfer switch equipped with a digital display from when you do not have a digital display. You can display a fault message with the digital display, but without the digital display you must depend on ATS symptoms to diagnose the problem. Ten LED indicators and a small push-button switch lo-

cated on the Digital Module may help in troubleshooting the transfer switch.

### CONTROL MODULE LED INDICATORS AND SWITCH

The digital module located on the inside of the switch enclosure door contains ten LED indicators. The indicators provide some information about the current control status. These indicators may be helpful in troubleshooting the transfer switch when the Digital Display is not available. See Figure 6-1.

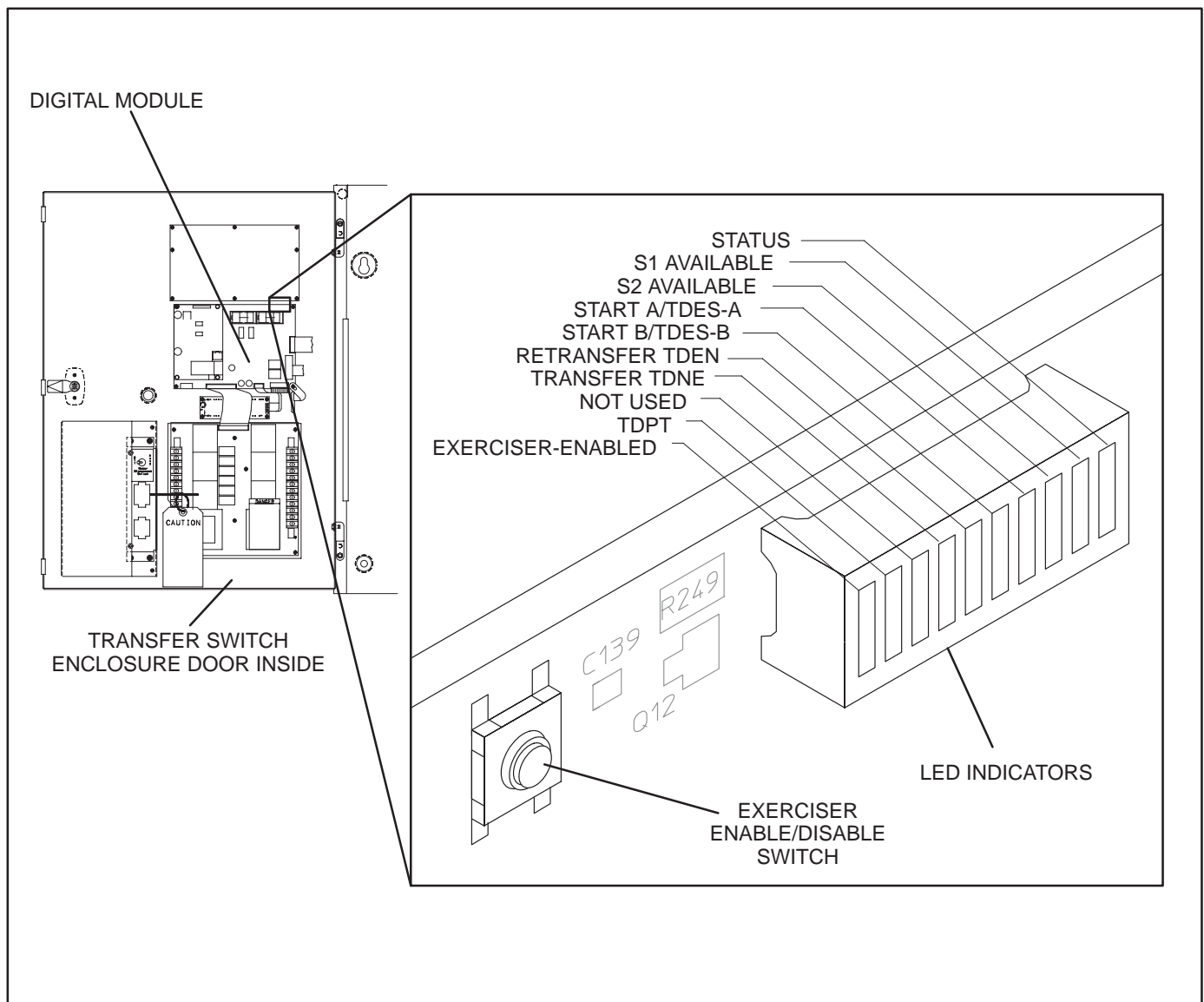


FIGURE 6-1. LED LOCATION ON DIGITAL MODULE (SHOWN ON THE 40 TO 125 AMP SWITCH)



**TABLE 6-1. DIGITAL MODULE LED INDICATORS**

Indicator	Definition
Status	Blinks at 1/2 Hz rate when the controller has power and the program is running without error. This indicator flashes the event code of an active event until the event is acknowledged with the Reset switch on the front panel. This indicator is sometimes referred to as the heart beat because it blinks constantly when the controller does not have an active event. (Refer to Table 6-2.)
S1 Available	Lights when Power Source 1 has acceptable voltage and frequency limits. This indicator lights when the Source 1 Available indicator on the control panel lights.
S2 Available	Lights when Power Source 2 has acceptable voltage and frequency limits. This indicator lights when the Source 2 Available indicator on the control panel lights.
Start A/TDES-A	<ol style="list-style-type: none"> <li>1. Lights constantly when the control has commanded Source 2 to start</li> <li>2. Blinks at 1/2 Hz rate during the time delay to engine start (TDESa)</li> </ol>
Start B/TDES-B	<p>This indicator is only used for genset-to-genset applications when Source 1 is a generator not a utility.</p> <ol style="list-style-type: none"> <li>1. Lights constantly when the control has commanded Source 1 to start</li> <li>2. Blinks at 1/2 Hz rate during the time delay to engine start (TDESb)</li> </ol>
Retransfer/TDEN	<ol style="list-style-type: none"> <li>1. Lights when the control energizes the Retransfer relay</li> <li>2. Blinks at 1/2 Hz rate during the time delay to retransfer (TDEN)</li> </ol>
Transfer/TDNE	<ol style="list-style-type: none"> <li>1. Lights when the control energizes the Transfer relay</li> <li>2. Blinks at 1/2 Hz rate during the time delay to transfer (TDNE)</li> </ol>
TDPT	<p>Time Delay Programmed Transition</p> <p>Blinks at 1/2 Hz rate during the programmed transition time delay</p>
Exerciser Enabled	Lights when the Exerciser clock is enabled and blinks during an exercise period. The small switch next to the indicator enables and disables the exerciser. The operator can also enable and disable the exerciser from the Digital Display when it is available.

## Fault Flash-Out

The control flashes an active fault code on the Digital Module Status indicator until it is acknowledged with the Reset switch on the front panel. See Figure 6-1 and Table 6-1. The control flashes each digit of the fault code with a pause between digits and a longer pause between repetitions.

The control moves acknowledged events to the event history file. This file can hold a maximum of 50 fault and non-fault events. The digital display and

the PC Service Tool can read the contents of the Event history file.

## Exerciser Enable/Disable Switch

The Exerciser Enable/Disable switch enables the control to exercise the genset during future scheduled exercise periods and lights the Exerciser Enabled indicator or disables the scheduled exercise period and turns the indicator off. This button is used by service personnel to disable unexpected transfers while servicing the switch.



## TROUBLESHOOTING TRANSFER SWITCH WITHOUT THE DIGITAL DISPLAY

**⚠WARNING** *Some ATS service procedures present hazards that can result in severe personal injury or death. Only qualified service personnel with knowledge of electricity and machinery hazards should perform service. See Safety Precautions.*

When the digital display is not available, diagnosis of problems involves observing system operation. If you cannot determine the problem, contact Cummins/Onan Service.

### Power Outage Occurs, But Generator Set Does Not Start

**⚠WARNING** *AC power within the cabinet and the rear side of the cabinet door presents a shock hazard that can cause severe personal injury or death. Use extreme caution to avoid touching electrical contacts whenever the cabinet door is open.*

1. The operation selector switch on the generator set control panel should be set at Remote. Check for fault indicators on the generator set control.
2. Start the generator set using its start-stop controls. If it does not crank, check the starting batteries. If it cranks but does not start, check the fuel supply. If the problem persists, call your dealer or distributor.

**⚠WARNING** *Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark or flame while servicing batteries.*

**⚠WARNING** *Ignition of fuel can cause severe personal injury or death by fire or explosion. Do not permit any flame, cigarette, spark, pilot light, arcing equipment, or other possible source of ignition near the fuel system.*

### Generator Set Starts During Normal Power Service

1. The operation selector switch on the generator set control panel should be set at Remote.

**⚠WARNING** *AC power within the cabinet and the rear side of the cabinet door presents a shock hazard that can cause severe personal injury or death. Use extreme caution to avoid touching electrical contacts whenever the cabinet door is open.*

2. Check the Test/Exerciser Active indicator to see whether it is in an exercise period.

**If the exercise period occurs at an unexpected time or for an excessive duration, refer to the exerciser clock programming procedure or call your dealer or distributor.**

3. Momentary voltage dips might cause voltage sensors to initiate generator set starting. Check the parameter settings in Setup menus.
4. If the problem persists, call your dealer or distributor.

### Generator Set Does Not Exercise

1. The operation selector switch on the generator set control panel should be set at Remote.

**⚠WARNING** *AC power within the cabinet and the rear side of the cabinet door presents a shock hazard that can cause severe personal injury or death. When the cabinet door is open, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothes, hair, etc.*

2. Check the Test/Exerciser Active indicator to see whether it is in an exercise period.
3. Start the generator set using its start-stop controls. If it does not crank, check the starting batteries. If it cranks but does not start, check the fuel supply. If the problem persists, call your dealer or distributor.

**⚠WARNING** *Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark or flame while servicing batteries.*

**⚠WARNING** *Ignition of fuel can cause severe personal injury or death by fire or explosion. Do not permit any flame, cigarette, spark, pilot light, arcing switch or equipment, or other possible source of ignition near the fuel system.*



## After A Power Failure, Generator Set Starts But Does Not Assume Load

1. Check the output voltage of the power source by observing the voltmeter on the generator set or the optional voltmeter on the automatic transfer switch.
2. Open the cabinet door and check to see whether the Motor Disconnect switch is in the Auto position.

**⚠WARNING** *AC power within the cabinet and the rear side of the cabinet door presents a shock hazard that can cause severe personal injury or death. When the cabinet door is open, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothes, hair, etc.*

3. Check the Source 2 Available lamp on the ATS Control Panel. Check the parameter settings in Setup.
4. Manually transfer the switch (see Operation). Call your dealer or distributor.

## After Power Returns, Transfer Switch Does Not Return To Normal Position

1. The retransfer time delay period may not have expired. Check the Retransfer Timing lamp on the Digital Module.
2. Open the cabinet door and check the Motor Disconnect switch position. For automatic operation, it must be in the Auto position.

**⚠WARNING** *AC power within the cabinet and the rear side of the cabinet door presents a shock hazard that can cause severe personal injury or death. When the cabinet door is open, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothes, hair, etc.*

3. Stop the generator set with the Start/Stop switch. When the generator set stops, the transfer switch transfers the load to Power Source 1 if power is acceptable.
4. If the switch still does not retransfer, manually return the switch to the Source 1 position (see Operation). Call your dealer or distributor.

## Generator Set Continues to Run After Retransfer of Load to Normal Power

The stop time delay function may not have expired. Stop the generator set with its Start/Stop switch, and call your dealer or distributor.

## Battery Charger Fails To Charge (If Equipped)

Check the battery charger fuse(s). Replace, if necessary, with fuses of the correct rating. Fuse ampere ratings are shown on the charger faceplate.

**⚠WARNING** *Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark or flame while servicing batteries.*

If the fuse is OK, call your dealer or distributor.

## Battery Loses Water

The battery charger float voltage could be too high (if equipped with battery charger). Adjust the float setting (optional 10-amp charger only). If the problem continues, call your dealer or distributor.

## Battery Loses Charge

Battery charger float voltage could be too low (if equipped with battery charger). Adjust the float setting (optional 10-amp charger only). If the problem continues, call your dealer or distributor.



## TROUBLESHOOTING TRANSFER SWITCH WITH THE DIGITAL DISPLAY

The Digital Display shows two types of events: fault events and non-fault events. The last 50 events, both fault and non-fault events, can be viewed with the Digital Display. You can also read all events in the event history file by using the PC Service Tool.

### Fault Events

Fault events should be considered alarms for the transfer switch operator. They indicate that the transfer switch is not operating correctly. Table 6-2 lists the fault codes and fault message and Table 6-3 gives corrective actions for each fault code.

TABLE 6-2. FAULT CODES AND MESSAGES

343	Controller Checksum Error
441	Low Controller Battery
1113	ATS Fail to Close: Transfer
1114	ATS Fail to Close: Retransfer
597	Battery Charger Malfunction
477	Network Battery Low
1468	Network Communications Error

The controller displays the fault message on the Digital Display and flashes the asterisk indicator. You must press the Reset button on the control panel to acknowledge a fault and clear the display.

TABLE 6-3. TROUBLESHOOTING

<b>⚠ WARNING</b> <i>Some ATS service procedures present hazards that can result in severe personal injury or death. Only qualified service personnel with knowledge of electricity and machinery hazards should perform service. See Safety Precautions.</i>	
<p style="text-align: center;"><b>CONTROLLER CHECKSUM ERROR (343)</b></p> <p>The checksum of the Flash EPROM does not match the checksum stored in the controller</p> <p><b>Corrective Action:</b></p> <ol style="list-style-type: none"> <li>1. Reset the control by removing power.</li> <li>2. Remove and re-install Digital Module batteries (see Figures 2-5 and 2-6).</li> <li>3. Contact Cummins/Onan Service if checksum error is repeated on power up.</li> <li>4. Reset real-time clock (see Figure 4-18).</li> </ol>	
<p style="text-align: center;"><b>LOW CONTROLLER BATTERY (441)</b></p> <p style="text-align: center;">Low Lithium battery voltage</p> <p><b>Corrective Action:</b></p> <ol style="list-style-type: none"> <li>1. Replace Digital Module batteries. (See Figures 2-5 and 2-6.)</li> <li>2. Press the Reset button on the front panel.</li> <li>3. Reset real-time clock (see Figure 4-18).</li> </ol>	
<p style="text-align: center;"><b>ATS FAIL TO CLOSE: TRANSFER (1113)</b></p> <p>A transfer between Source 1 and Neutral failed or the allotted transfer time was exceeded.</p> <p><b>Corrective Action:</b></p> <ol style="list-style-type: none"> <li>1. Press the Reset button on the front panel.</li> <li>2. Refer to the fault definitions following this table.</li> <li>3. Contact Cummins/Onan Service.</li> </ol>	



TABLE 6-3. TROUBLESHOOTING (CONTINUED)

**⚠ WARNING** *Some ATS service procedures present hazards that can result in severe personal injury or death. Only qualified service personnel with knowledge of electricity and machinery hazards should perform service. See Safety Precautions.*

### **ATS FAILED TO CLOSE: RETRANSFER (1114)**

A transfer between Source 2 and Neutral failed or the allotted transfer time was exceeded.

#### **Corrective Action:**

1. Press the Reset button on the front panel.
2. Refer to the fault definitions following this table.
3. Contact Cummins/Onan Service.

### **BATTERY CHARGER MALFUNCTION (597)**

The battery charger status signal indicates a fault condition.

#### **Corrective Action:**

1. Press the Reset button on the front panel.
2. Check the battery charger fuse(s). Replace, if necessary, with fuses of the correct rating. Fuse current ratings are shown on the charger faceplate.
3. Refer to the fault definitions following this table.
4. Contact Cummins/Onan Service.

### **NETWORK BATTERY LOW (477)**

The Network Control Module (NCM) indicates that the network battery voltage is low.

#### **Corrective Action:**

1. Press the Reset button on the front panel.
2. Replace the Network Module batteries.
3. Contact Cummins/Onan Service.

### **NETWORK COMMUNICATIONS ERROR (1468)**

The Network Control Module (NCM) indicates that a network communications error has occurred.

#### **Corrective Action:**

1. Press the Reset button on the front panel.
2. Contact Cummins/Onan Service.



## **FAULT EVENT DEFINITIONS**

### **Controller Checksum Error**

The controller checks the Flash EPROM checksum after each microprocessor reset. The checksum is stored in nonvolatile EEPROM. If a checksum error fault occurs, the controller still attempts a normal boot-up sequence.

The controller Fault Flash-out subsystem flashes this fault on the Status indicator until the fault is acknowledged (reset). Reset the control by removing power (including the batteries). If checksum error is repeated on power up, replace the Digital Module.

### **Low Controller Battery**

The controller monitors the voltage of the Lithium batteries that supply power to the controller. If the battery voltage drops to 5 Vdc, the controller sets the fault status to active.

The controller Fault Flash-out subsystem flashes this fault until the fault is acknowledged (reset).

### **ATS Fail to Close: Re-Transfer**

The controller first verifies that the transfer switch moved from Source 2 to Neutral within the time limit defined in the Fail to Close Time Delay. The controller also verifies that the transfer switch moved from Neutral to Source 1 within the time limit defined in the Fail to Close Time Delay.

If the Fail to Close time limit is exceeded, the controller changes the fault status to active. The fault remains active until the Reset button is pressed.

### **ATS Fail to Close: Transfer**

The controller first verifies that the transfer switch moved from Source 1 to Neutral within the time limit

defined in the Fail to Close Time Delay. The controller also verifies that the transfer switch moved from Neutral to Source 1 within the time limit defined in the Fail to Close Time Delay.

If the Fail to Close time limit is exceeded, the controller changes the fault status to active. The fault remains active until the Reset button is pressed.

### **Battery Charger Malfunction**

The controller monitors the status of the optional battery charger. If the Battery Charger Fault input is active, this event is active.

The controller Fault Flash-out subsystem flashes this fault until the fault is acknowledged (reset).

### **Network Battery Low**

This event is detected by the optional Network Communications Module (NCM) and is communicated to the controller. If the battery voltage drops, the controller sets the fault status to active.

The controller Fault Flash-out subsystem flashes this fault on the Status indicator until the fault is acknowledged (reset).

### **Network Communications Error**

This event is detected by the Network Communications Module (NCM) and is communicated to the transfer switch controller. This indicates that the device is no longer communicating with other devices on the network.

The controller Fault Flash-out subsystem flashes this fault until the fault is acknowledged (reset).



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## 7. Time Delay Glossary

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TIME DELAY	ABBREVIATION	DEFINITION
Start Time Delay	TDES	This delay is adjustable from 0 to 15 seconds in 1 second increments on Level-1 controls and from 0 to 120 seconds in 1 second increments on Level-2 controls. The default value is 3 seconds for both. This brief time delay prevents the generator set from starting during short power interruptions. Timing starts at the Source 1 power interruption. If the duration of interruption exceeds the delay time, the control system signals the generator set to start. The value is set with the PC service tool or the digital display when it is available.
	TDES-A and TDES-B	For genset-to-genset applications, TDES-A is the start time delay to start Source 2 genset and TDES-B is the start time delay to start Source 1 genset. For utility-to-utility applications, TDES-A and TDES-B are not available.
Stop Time Delay (Cool-down)	TDEC	This delay is adjustable from 0 to 30 minutes in 1 minute increments. The default value is 10 minutes. It begins timing when the load is retransferred to Source 1. At the end of the delay, the stop signal is sent to the generator set. During this time delay, the generator set cools down at no load before stopping. The value is set with the PC service tool or the digital display when it is available.
	TDEC-A and TDEC-B	For genset-to-genset applications, TDEC-A is the stop time delay to stop Source 2 genset and TDEC-B is the stop time delay to stop Source 1 genset. For utility-to-utility application, TDEC-A and TDEC-B are not available.
Transfer Time Delay	TDNE	This delay begins when Source 2 (typically the generator) voltage and frequency reach the settings of the control. After the delay, the transfer switch transfers the load to Source 2. This brief time delay allows the generator set to stabilize before the load is applied. It has an adjustable range of 0 to 120 seconds in 1 second increments. The default value is 10 seconds. The value is set with the PC service tool or the digital display when it is available.  TDNE is the delay from preferred source to backup source in utility-to-utility applications.
Retransfer Time Delay	TDEN	This delay begins the moment Source 1 line voltage and frequency return to specified values. After the delay, the transfer switch can retransfer the load to Source 1. The delay allows the Power Source 1 to stabilize before retransfer. It has an adjustable range of 0 to 30 minutes in 1 minute increments. The default value is 10 minutes. The value is set with PC service tool or the digital display when it is available.  TDEN is the delay from backup source to preferred source in utility-to-utility applications.



<b>TIME DELAY</b>	<b>ABBREVIATION</b>	<b>DEFINITION</b>
Programmed Transition Time Delay	TDPT	This delay is the time that the switch spends in the neutral position, when neither source is connected to the load, during a transfer or a retransfer. It begins when the switch moves to the neutral position and opens the contacts of the switch connected to the load. After the delay the control transfers the load. This time delay allows residual voltage of inductive loads to decay sufficiently before connecting it to another source. It is adjustable from 0 to 60 seconds in 1 second increments. The default value is 0 seconds. The proper adjustment is a function of the load. This feature is enabled by default. The value is set with the PC service tool or the digital display when it is available.
Elevator Pretransfer Time Delay	TDEL	The Elevator Pre-Transfer Delay Signal delays transfer (or retransfer) for a specified time to give warning to an elevator control that a transfer (or retransfer) is about to occur. It is adjustable from 0 to 60 seconds in 1 second increments. The default value is 0 seconds. This feature is enabled by default. The value is set with the PC service tool or the digital display when it is available.







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