Operator Manual

Our energy working for you.™

Power Generation

Transfer Switch
40–1000 Amps

OTPCSE

English 4-2009 962–0135 (Issue 2)

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

⚠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.

Whenever closed transition is used, approval to parallel with the local electric utility must be obtained.

UTILITY-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.

⚠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. With the breaker in the Off position, the line side lugs are still energized.***

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.

1. Introduction

OPERATOR'S MANUAL

This manual covers models produced under the Cummins® and Cummins Power Generation (CPG) brand names.

This operator's manual provides information necessary for operation of an OTPCSE automatic transfer switch (ATS). This is an open transition service entrance transfer switch and it is equipped with PowerCommand® Control and it is capable of executing Open Transition with Sync Check, and Programmed Transition transfer modes.

An **Open Transition (OT) with Sync Check** executes an OT when both sources of power are within specified tolerances of frequency, voltage, and relative phase difference. If both sources meet the tolerances, a fast transfer occurs.

A **Programmed Transition** executes an OT by disconnecting the load from the source of power, pausing in the neutral position of the transfer switch (between switched positions) to allow transient currents from the load to diminish, and then the load is switched to the other source.

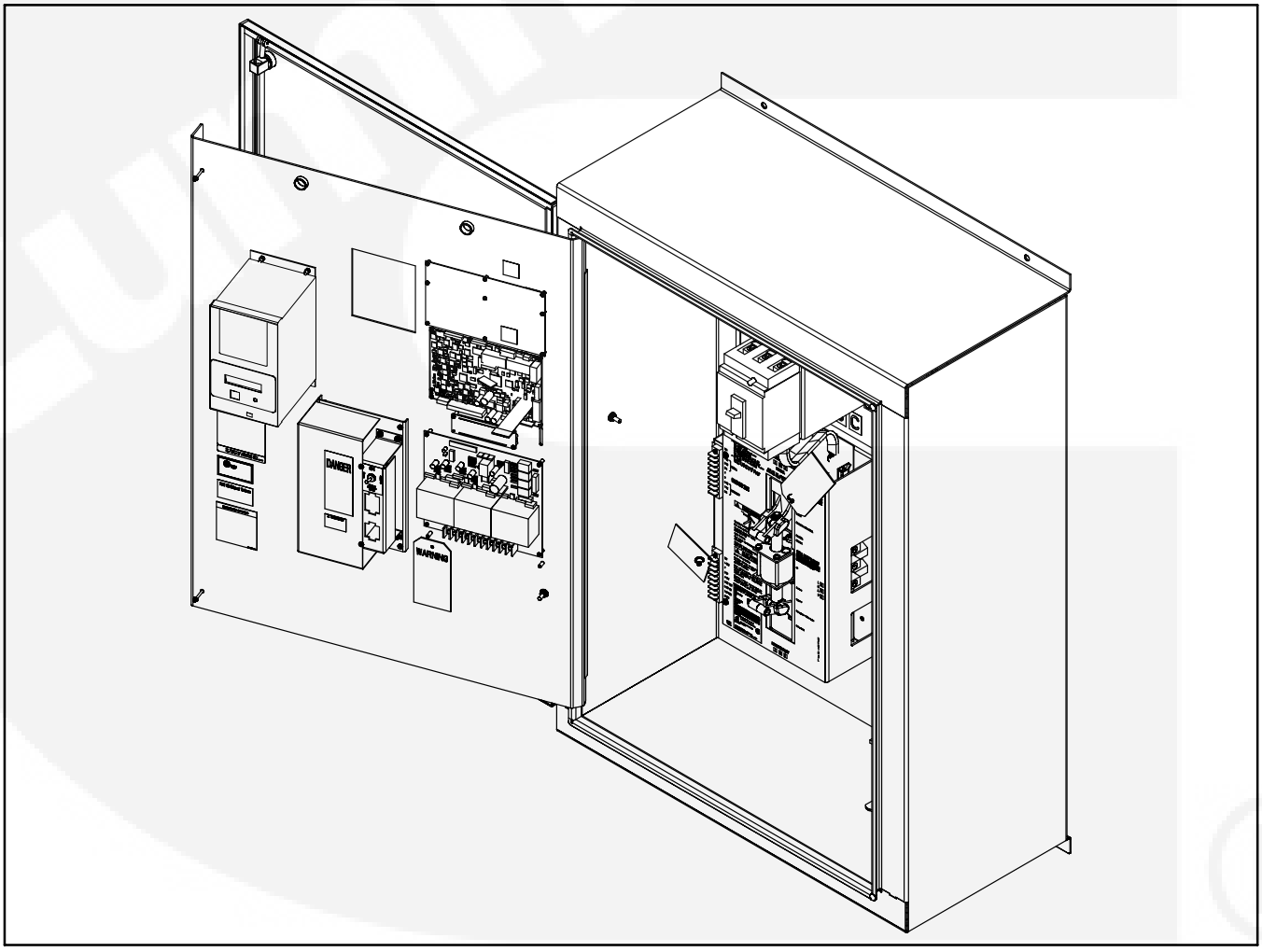


FIGURE 1-1. OTPC SERVICE ENTRANCE TRANSFER SWITCH (40–125 AMP, TYPE 3R AND 12 CABINET SHOWN)

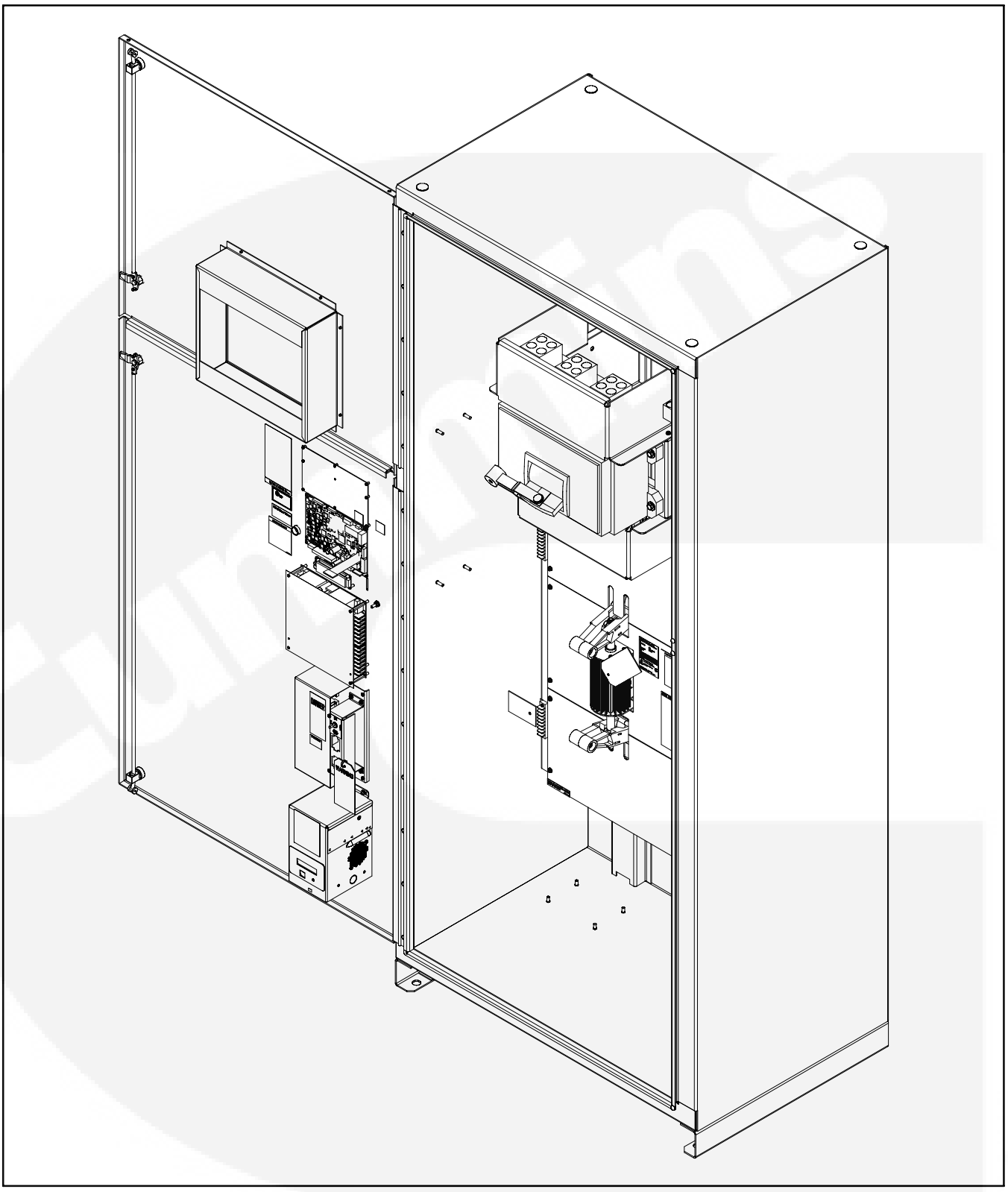


FIGURE 1-2. OTPCSE TRANSFER SWITCH (800 AMP, 4 POLE, TYPE 1 CABINET SHOWN)

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 (see Figure 1-3). 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.

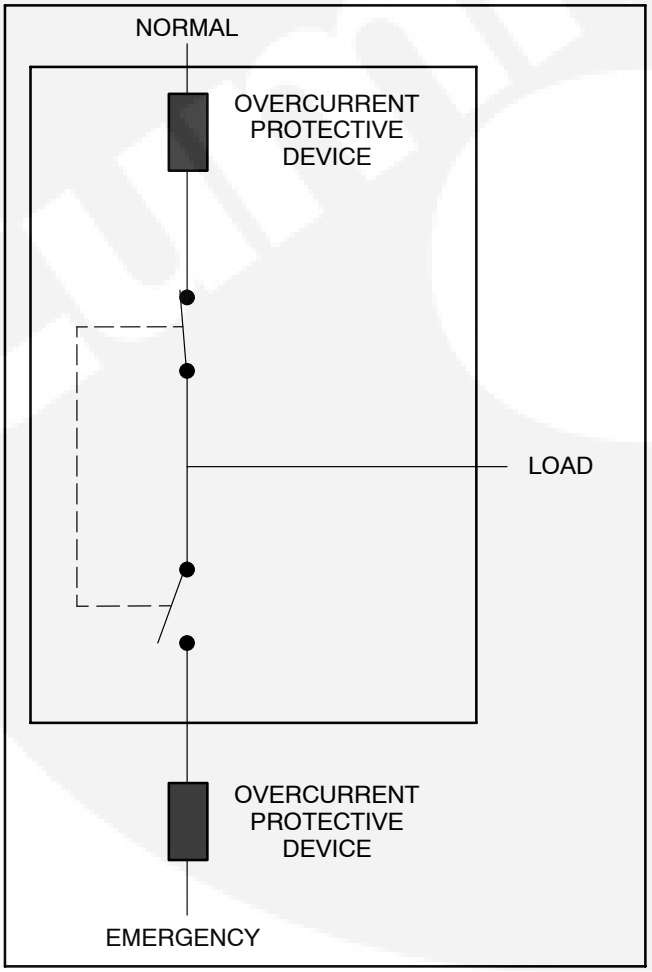


FIGURE 1-3. LOAD TRANSFER SWITCH (TYPICAL FUNCTION)

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

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 below lists the applications that are available with each control.

AVAILABLE CONTROL LEVELS

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

The control board level can be viewed, using the digital display (see Figure 1-4). This menu is included in the About submenus (see Figure 4-19).

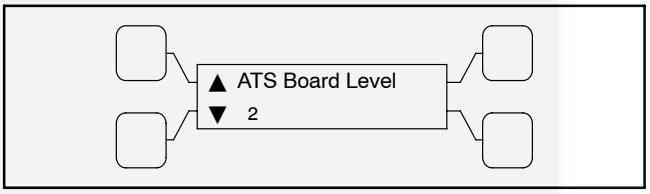


FIGURE 1-4. CONTROL LEVEL SUBMENU

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:

OTPCSEA0000000 Spec.A
1 2 3 4

1. OTPCSE - PowerCommand® Control Service Entrance transfer switch model.

2. Ampere Rating:
   A = 40, 70, 125
   B = 150, 225, 250
   C = 300, 400, 600
   D = 800, 1000

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 1-763-528-7290.

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

2. Description

The OTPCSE 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 general-purpose, indoor cabinet. Type 3R (outdoor, rainproof) and Type 12 (indoor, dust tight and waterproof) cabinets are also available. Figure 2-1 shows the control with optional features.

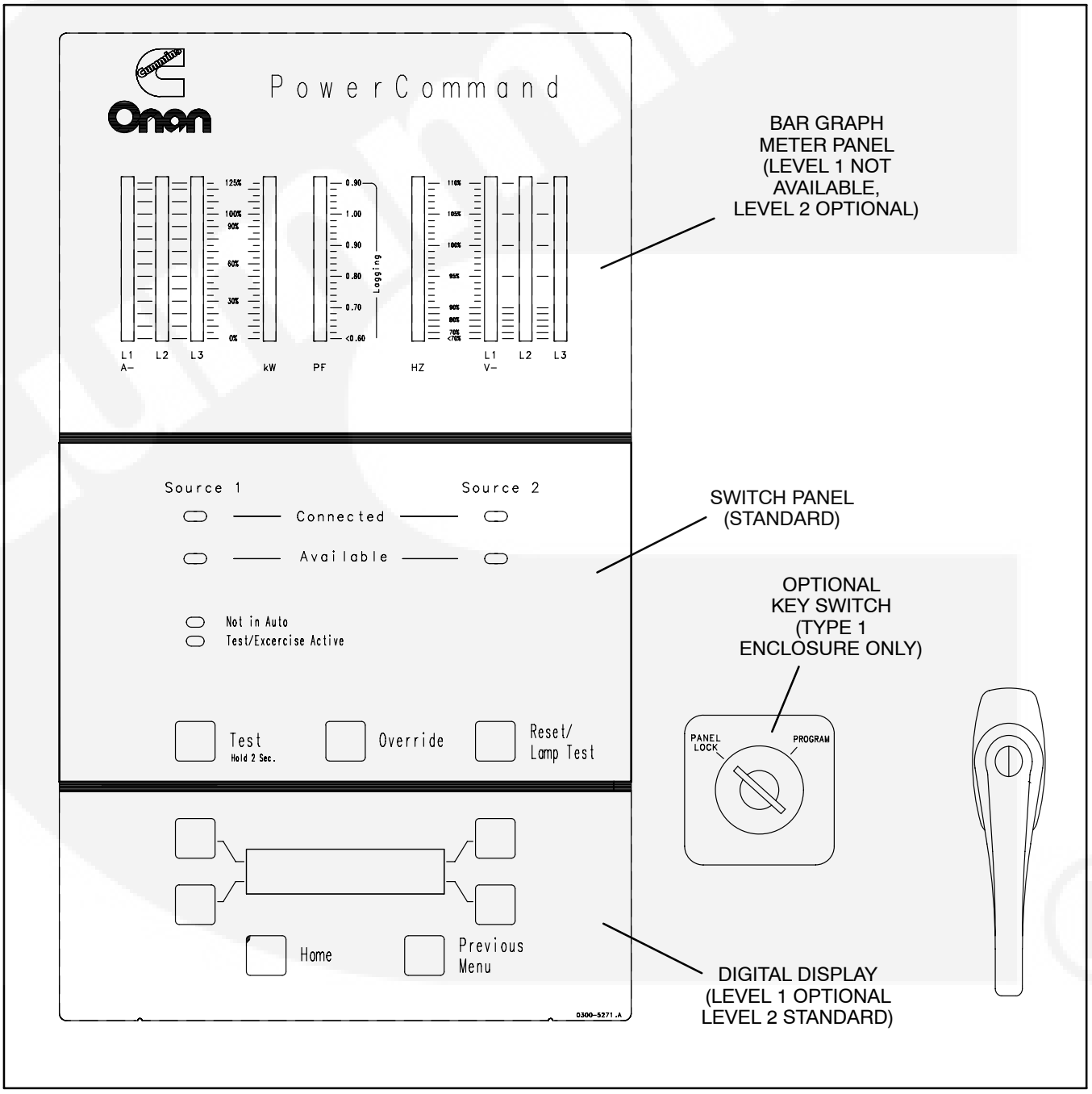


FIGURE 2-1. CABINET WITH OPTIONS

CONTROL PANEL FEATURES

The control features are divided into three groups: Bar Graph Meter Panel, 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.

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%).

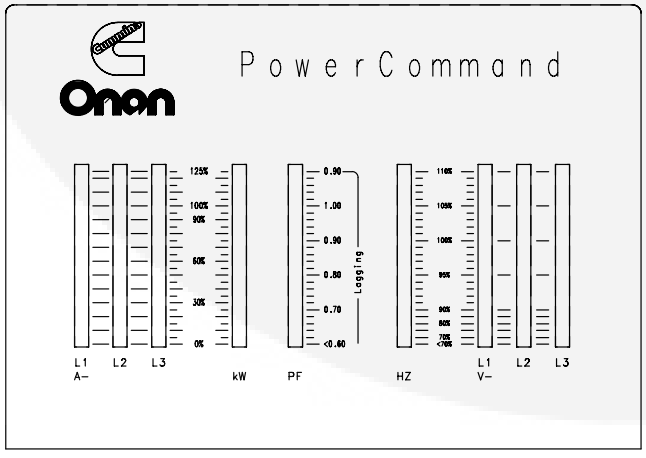


FIGURE 2-2. BAR GRAPH METER PANEL

Switch Panel

The switch panel (See Figure 2-3) is a standard feature on all OTPCSE transfer switches. It contains six indicator lamps and three membrane switches.

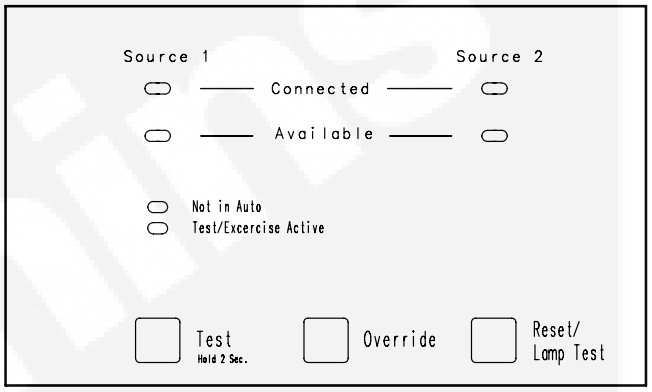


FIGURE 2-3. SWITCH PANEL

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:

- Motor Disconnect Switch is set to Off
- Fail-to-Disconnect event is active
- Control is locked out
- Wiring harness is disconnected from J12 on the Power Module
- Controller is set to Offline

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 or source synchronization, 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/Exercise Active indicator goes out and Source 1 resumes as the source of power.

For a more detailed explanation, refer to the “Electronic Control System” subsection on page 2-4.

Override

The Override switch terminates most system time delays. The Program Transition (TDPT), Elevator signal (TDEL) and Engine Cool Down (TDEC) are not affected by this switch. If you press this switch while the Transfer Inhibit input is active, the switch proceeds to transfer the load. If you press this switch while the Retransfer Inhibit input is active, the switch proceeds to retransfer the load.

Reset/Lamp Test

The Reset/Lamp Test switch turns on all control panel indicators. This switch also acknowledges events (refer Section 5 “Events”).

Security Key Switch Option

The optional security key switch (see Figure 2-4) is only available on OTPCSE transfer switches with a Type 1 enclosure. It 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 Test and Override input switches. It also prevents changes to the digital display from the setup menus; however, the current values can still be viewed. Changes can only be made when the switch is in the **Program** position.

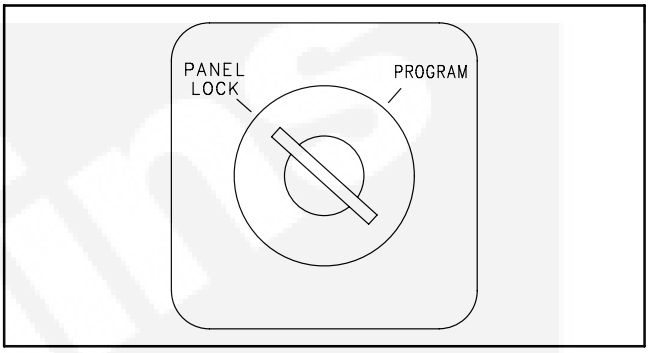


FIGURE 2-4. KEY SWITCH

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 six 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.

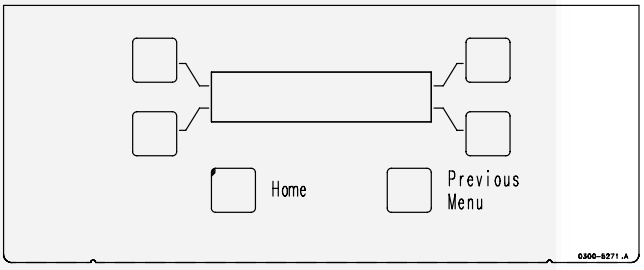


FIGURE 2-5. DIGITAL DISPLAY

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 (962−0621, shipped with the transfer switch) and in the Service Manual (962−0523, 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 2-6) in the Off position. Return the switch to the Auto position after adjustments are completed.***

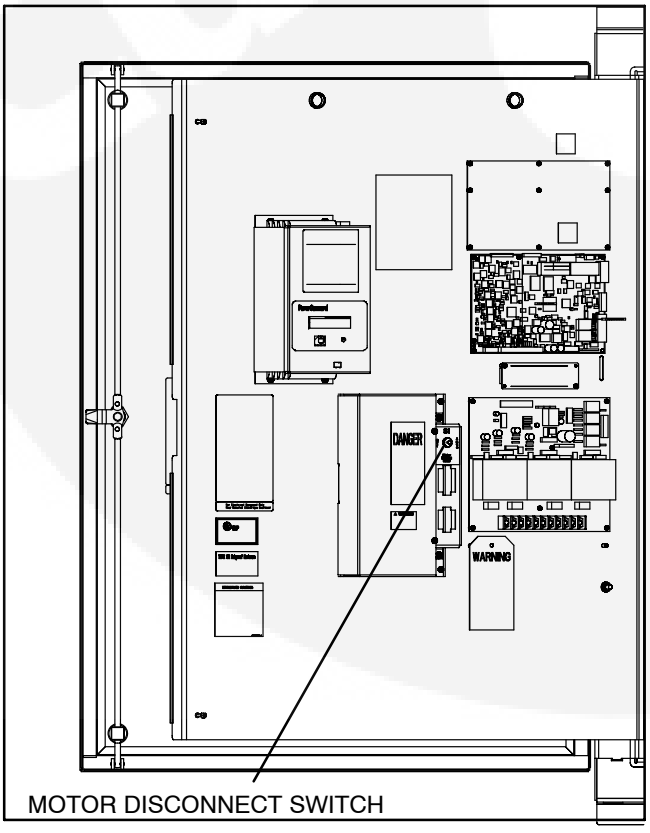


FIGURE 2-6. MOTOR DISCONNECT SWITCH

⚠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.***

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
TDEL	0 SEC
TDPT	0 SEC

NOTE: TDESa and TDECa are for the Source 2 generator set.

Use the Time Delay submenus under Setup or the PC service tool to change the settings.

Time Delay Engine Start (TDESa)

This start time delay is adjustable from 0 to 15 seconds in 1 second increments on Level 1 controls. This start time delay is adjustable from 0 to 120 seconds on Level 2 controls. Values up to 20 seconds are adjustable in 1 second increments; values over 20 seconds are adjustable in 5 second increments. The default value is 3 seconds for both. For long engine start time delays (over 15 seconds) a remote battery source should be used.

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. Figure 2-7 shows the TDES submenus available with the digital display. See Figure 4-12 for information on how to adjust this value.

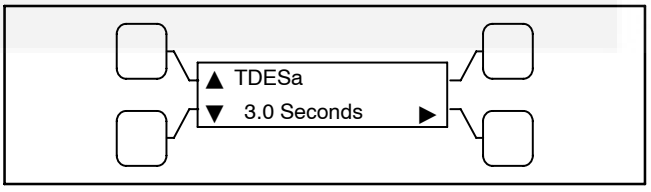


FIGURE 2-7. TDESa SUBMENU

Time Delay Engine Cooldown (TDECa)

This stop time delay is adjustable from 0 to 30 minutes in 1 minute increments. The default value is 10 minutes.

For utility-to-genset applications, 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. Figure 2-8 shows the TDEC submenus available with the digital display. See Figure 4-12 for information on how to adjust this value.

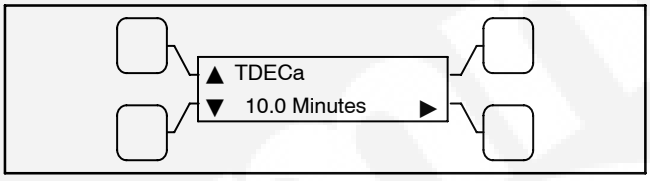


FIGURE 2-8. TDECa SUBMENU

Time Delay Normal to Emergency (TDNE)

This transfer time 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. Figure 2-9 shows the TDNE submenu available with the digital display. See Figure 4-12 for information on how to adjust this value.

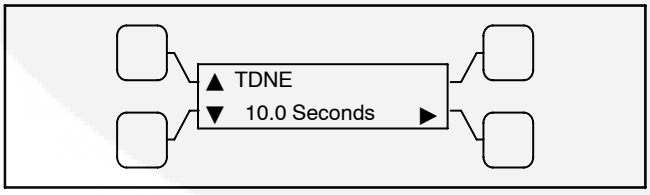


FIGURE 2-9. TDNE SUBMENU

Time Delay Emergency to Normal (TDEN)

This retransfer time 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. Figure 2-10 shows the TDEN submenu available with the digital display. See Figure 4-12 for information on how to adjust this value.

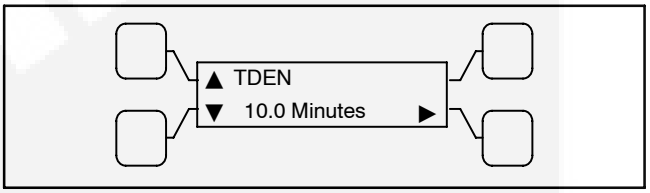


FIGURE 2-10. TDEN SUBMENU

Elevator Time Delay (TDEL)

Used in elevator applications, this delay sets a time to wait for an elevator pre-transfer signal. This signal allows the elevator to come to a complete stop before the switch transfers. The adjustable range is 0 to 60 seconds. The time delay begins when a transfer or retransfer signal has been sent to the relays. The default value is 0. The value can be set using the PC service tool or the digital display. Figure 2-11 shows the TDEL submenu available with the digital display. See Figure 4-12 for information on how to adjust this value.

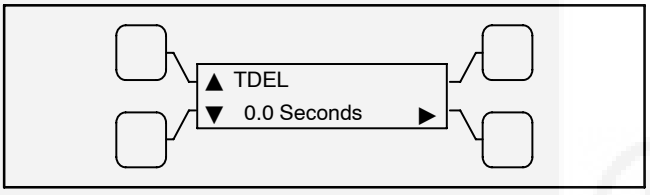


FIGURE 2-11. TDEL SUBMENU

Time Delay Programmed Transition (TDPT)

Programmed 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 voltage from inductive loads to decay to an acceptable level before transfer is completed.

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. Figure 2-12 shows the TDPT submenu available with the digital display. See Figure 4-12 for information on how to adjust this value.

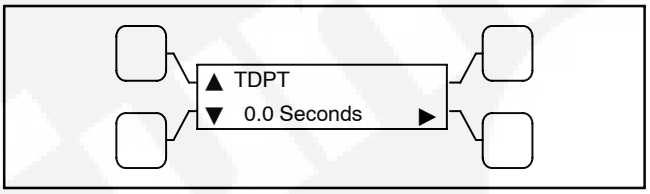


FIGURE 2-12. TDPT SUBMENU

Sensors

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 2-13 for an example using the default values. Figure 2-14 shows the under-voltage sensing submenus available with the digital display. See Figure 4-10 for information on how to adjust these values.

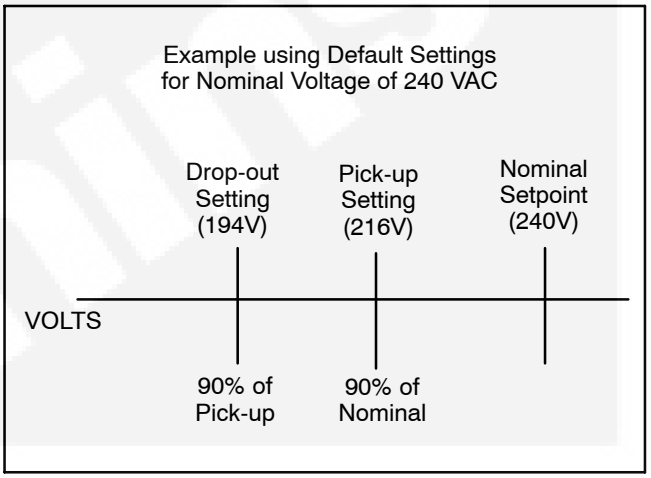


FIGURE 2-13. UNDER-VOLTAGE SENSING

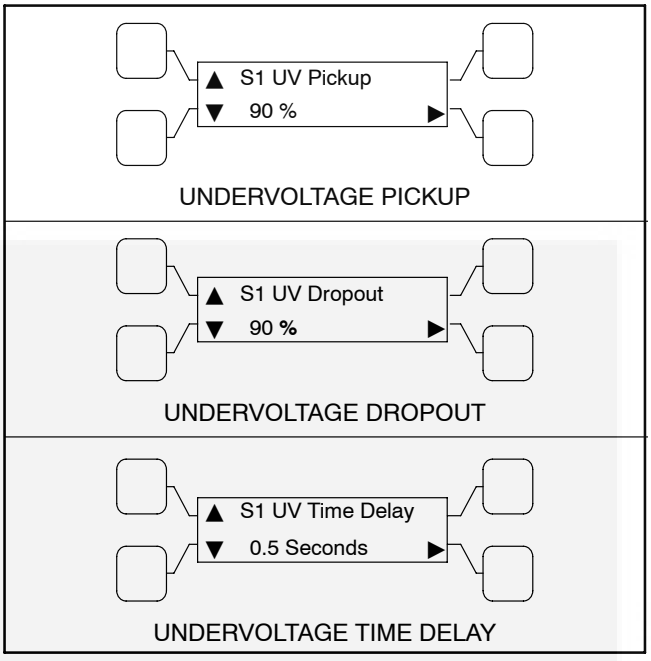


FIGURE 2-14. UNDER-VOLTAGE SENSING SUBMENUS

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 re-transfer.

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. This feature can also be disabled. See Figure 2-15 for an example using the default values. Figure 2-16 shows the over-voltage sensing submenus available with the digital display. See Figure 4-10 for information on how to adjust these values.

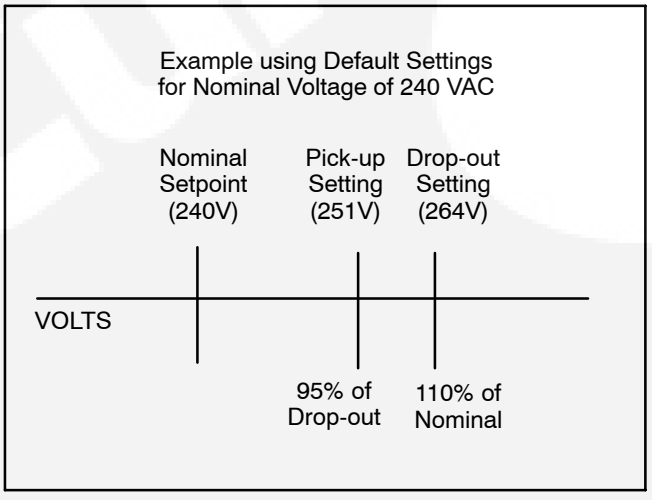


FIGURE 2-15. OVER-VOLTAGE SENSING

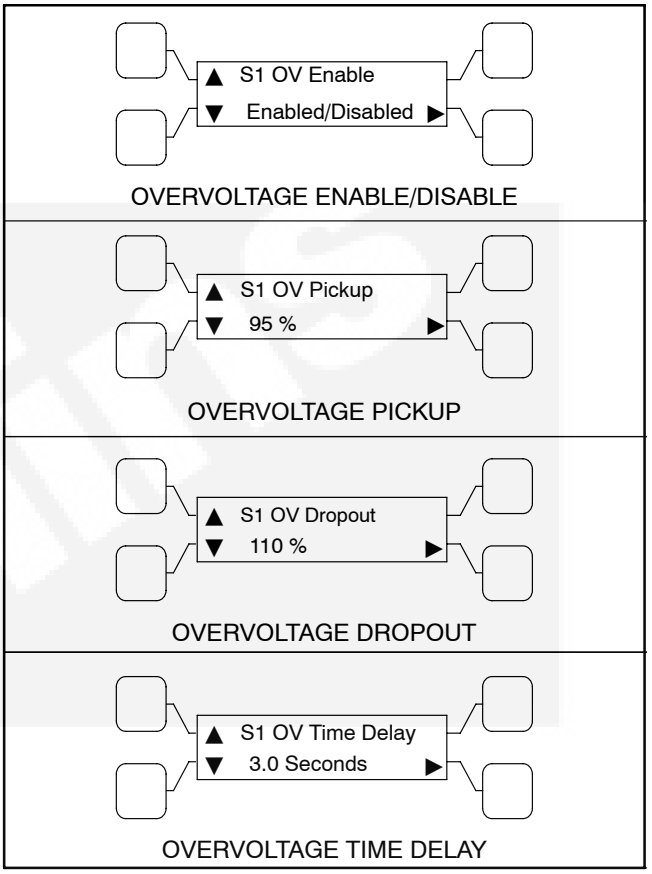


FIGURE 2-16. OVER-VOLTAGE SENSING SUBMENUS

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 ±5 to ±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. This feature can also be disabled. See Figure 2-17 for an example using the default values. Figure 2-18 shows the frequency submenus available with the digital display. See Figure 4-10 for information on how to adjust frequency sensor values.

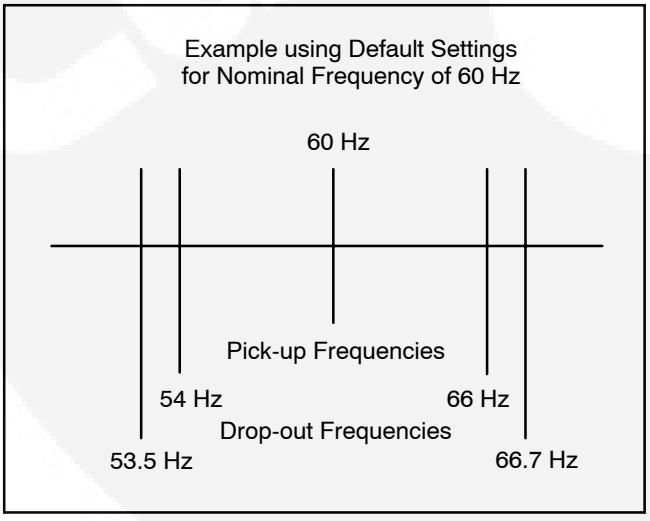


FIGURE 2-17. FREQUENCY SETTING

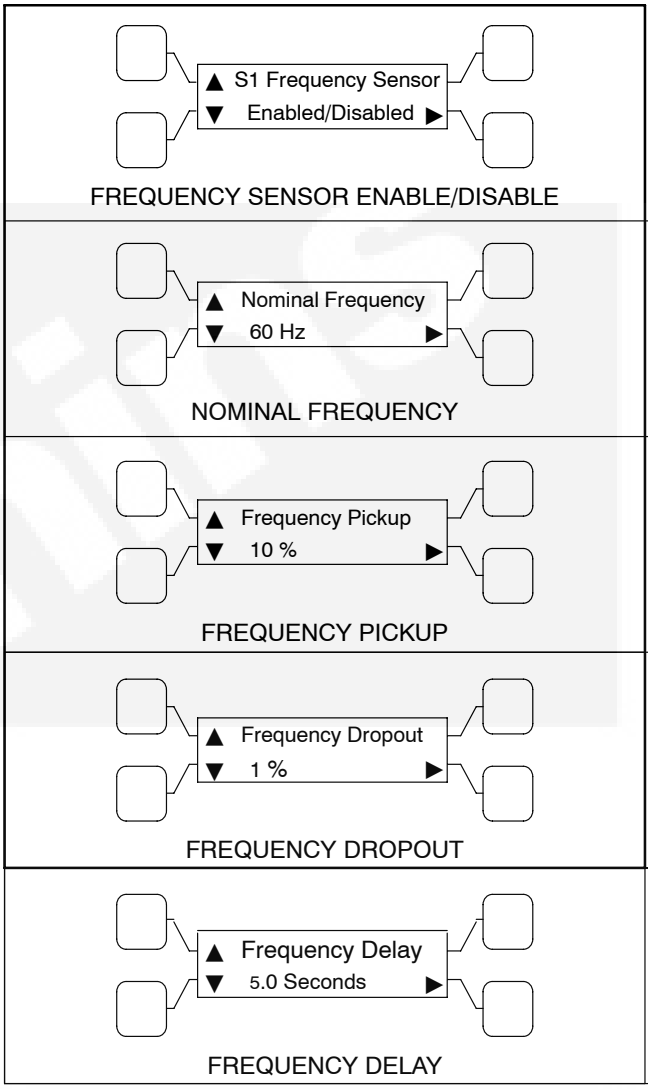


FIGURE 2-18. FREQUENCY SUBMENUS

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% (dropout) of the average voltage in 1% increments. The pickup value is fixed at 10% of the dropout. The time delay for the imbalance sensor drop-out is adjustable (2–20 seconds).

This sensor can be enabled using the the PC service tool or the digital display Setup submenus. 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. Figure 2-19 shows the voltage imbalance submenus available with the digital display. See Figure 4-10 for information on how to adjust voltage imbalance sensor values.

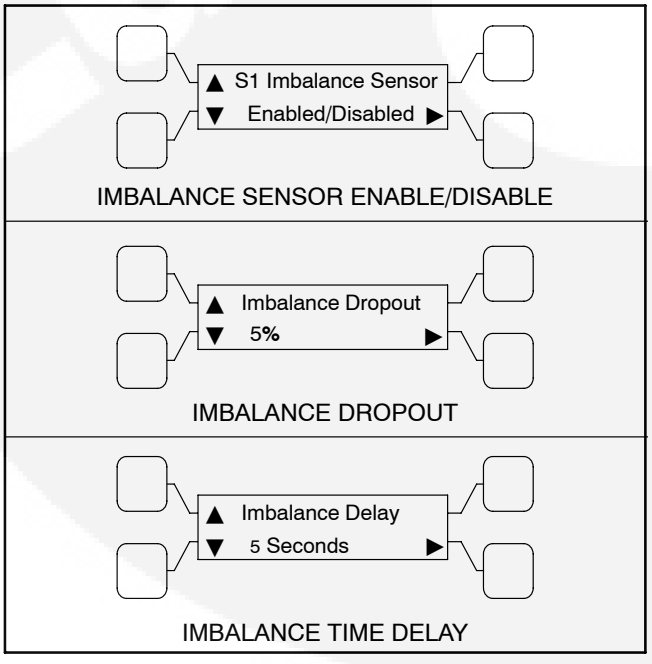


FIGURE 2-19. VOLTAGE IMBALANCE SENSOR SUBMENUS

Phase Rotation Sensing

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. The sensor can be disabled using the PC service tool or the digital display Setup submenus. Figure 2-20 shows the phase rotation sensing submenu available with the digital display. See Figure 4-10 for information on how to enable/disable this feature.

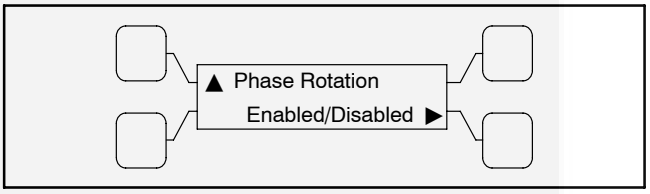


FIGURE 2-20. PHASE ROTATION SENSING SUBMENU

Loss of Single Phase Sensing

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 submenus. This sensor is inactive for single phase systems and indicates no failures. Figure 2-21 shows the loss of phase sensing submenu available with the digital display. See Figure 4-10 for information on how to enable/disable this feature.

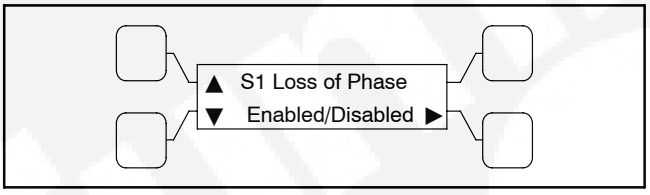


FIGURE 2-21. LOSS OF PHASE SENSING SUBMENU

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.

NOTE: Three-wire starting is not available on OTPCSE transfer switches.

Transfer Modes

A Transfer Mode can be selected from the front panel digital display. The available transfer modes are:

- Open Transition with Sync Check
- Programmed Transition

Since not all ATS are configured the same, some may not have access to all transition mode types. The transfer switch mode setting can be changed with the PC service tool or with the digital display. The Transfer Mode submenu available with the digital display is shown in Figure 2-22. For information on how to adjust this setting, see Figure 4-16.

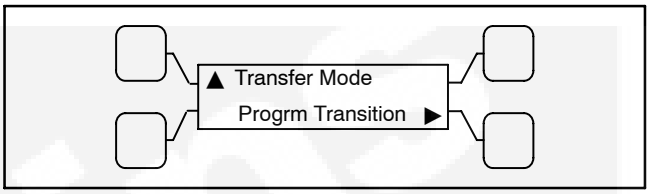


FIGURE 2-22. TRANSFER MODE SUBMENU

Open Transition with Sync Check

Open transition with sync check transfers the load from one source to the other when both sources are in phase. The controller uses the sync check sensor to monitor the voltage, frequency, and phase of Source 1 and Source 2 to guarantee their synchronicity in order to execute a load transfer.

The following describes the sequence of operation during a **normal (utility) power failure** for a transfer switch that is set up for open transition with sync check. Figure 2-23 illustrates the sequence of events.

Transfer from Source 1 to Source 2

This sequence includes begins with Source 1 supplying power to the load. The Source 1 Available and Source 1 Connected indicators are lit. The sequence ends with Source 2 (generator) assuming the load.

1. When Source 1 goes “out of spec,” the digital board starts a Time Delay to Engine Start (TDES) timer and the Source 1 Available indicator goes out.

2. If the TDES expires without a return to acceptable Source 2 power, the generator set receives a remote start signal. The engine starts and accelerates to rated speed.

3. When the alternator output reaches the “pick-up” level, the Source 2 Available indicator is lit. The transfer switch starts the Time Delay Normal to Emergency (TDNE) timer.

4. If there is a programmed transition delay, the transfer switch stops in the Neutral position for the Time Delay Programmed Transition (TDPT) and then completes its transition to the Source 2 position. The Source 2 Connected in-

dicator is lit and the Source 1 Connected indicator is off.

Transfer from Source 2 to Source 1

This sequence begins with Source 2 supplying power to the load. The Source 2 Available and Source 2 Connected indicators are lit. The sequence ends with Source 1 (utility) assuming the load.

1. When Source 1 returns to "in spec," the Source 1 Available indicator is lit and the digital board starts the Time Delay Emergency to Normal (TDEN) timer. When this time is complete, the controller starts monitoring both live sources looking for when they are in sync
2. When both sources are in sync, the switch transfers the load to Source 1. However, if the two sources fail to synchronize and the "Return PT Enabled" feature is active, the switch executes a programmed transition by stopping in the Neutral position and transferring the load to Source 1. If Source 2 goes offline while the controller is trying to synchronize the two sources, the controller executes a Programmed Transition and transfers the load to Source 1.
3. A Time Delay Engine Cool-down (TDEC) for the generator set is activated. When the engine cool-down delay expires, the generator set shuts down and the Source 2 Available indicator goes out.

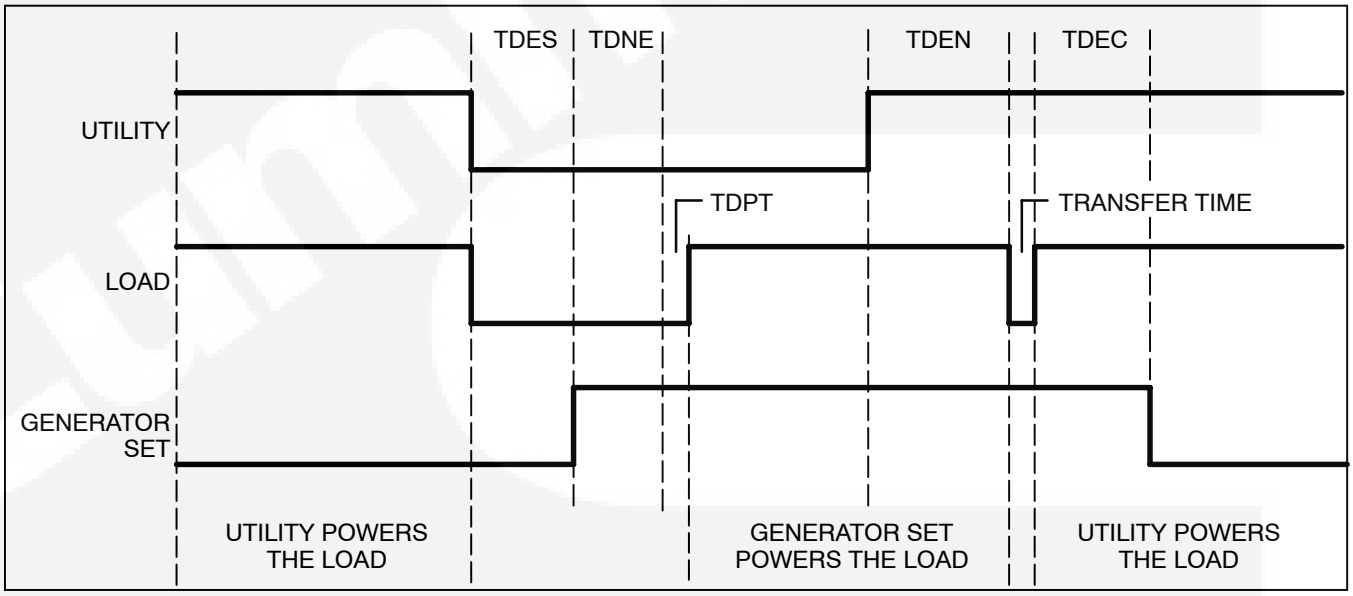


FIGURE 2-23. OPEN TRANSITION WITH SYNC CHECK

Return PT Enable

A feature included with controls that have a Sync Check sensor is Return to Programmed Transition. If the two sources fail to synchronize within two minutes, a Failed to Synchronize event occurs. If the Return to Programmed Transition feature is enabled, the control reverts to transferring the transfer switch to the programmed transition mode. This feature can be enabled with the PC service tool or with the digital display, if available. Figure 2-24 shows the Return to Program Transition Enable menu available with the digital display. For information on how to enable/disable this feature, see Figure 4-11.

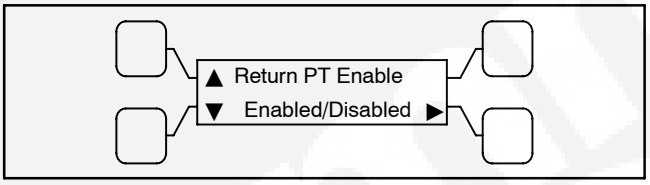


FIGURE 2-24. RETURN TO PROGRAMMED TRANSITION SUBMENU

Sync Check Sensor

If enabled, the Sync Check sensor overrides programmed transition whenever transferring between two live sources. If only one power source is available, programmed transition overrides the Sync Check sensor.

The transfer switch mode setting can be changed with the PC service tool or with the digital display, if available.

Sync Check is used to determine when both sources of power are within specified tolerances of frequency, voltage, and relative phase difference. If both sources are within this range, a fast or synchronized transfer occurs.

Synchronicity parameters are adjustable. The frequency bandwidth range is from 0.1 and 1.0 Hz. The default value is 1.0 Hz. The frequency difference between the sources must be equal to or less than the set value in order for transfer to occur. The voltage window is from 5 and 25 volts. The default value is 10 volts. The average voltage difference between the two sources must be equal to or less than the set value in order for transfer to occur. The manual offset range is from –25 to +25 milliseconds. The default value is 0 milliseconds. The transfer switch controller measures non-programmed transition transfer times from one source to another. It takes into account relay coils and solenoids energizing. These values can be set with the PC service tool or with the digital display, if available. The sync check sensor menus available with the digital display are shown in Figure 2-25. See Figure 4-11 for information on how to adjust sync check sensor values.

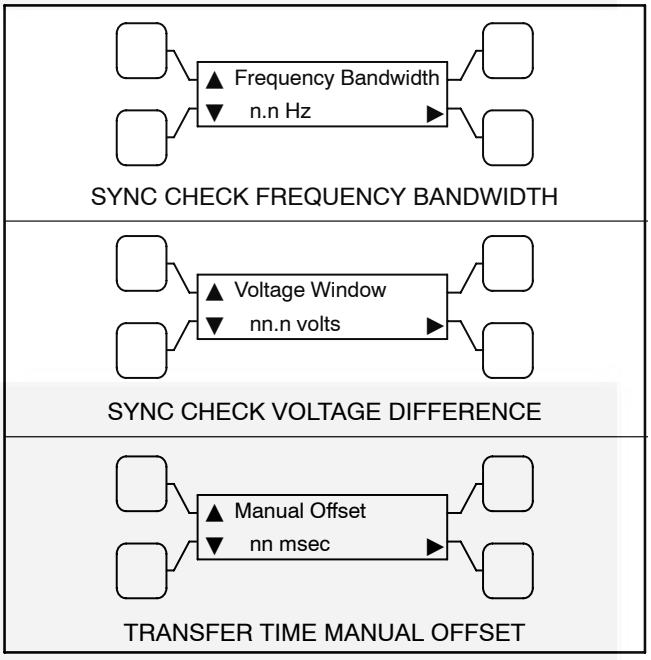


FIGURE 2-25. SYNCHRONICITY PARAMETER SUBMENUS

Active Sync Feature

If a PowerCommand transfer switch and a PowerCommand paralleling generator set are used together, the transfer switch control can send a Sync Enable command to the generator set to synchronize with the utility. This command is activated just before the Sync Check sensor is activated. When the generator set control receives a Sync Enable command and detects the Source 1 bus voltages, the generator set control automatically synchronizes its speed and phase to match the Source 1 bus. The Sync Check sensor monitors both sources. When they are synchronized, a transfer or retransfer command is initiated. **The generator set must be capable of reacting to a Sync Enable command.**

To use the Active Sync feature, it must first be enabled. The Active Sync feature can be enabled with the PC service tool or the digital display, if available.

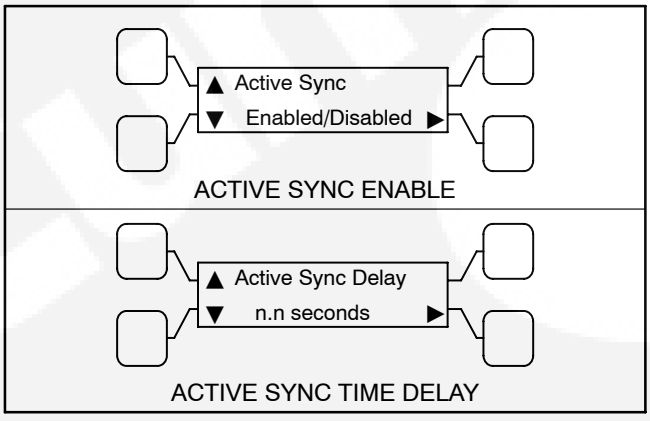


FIGURE 2-26. ACTIVE SYNC SUBMENUS

When the Active Sync feature is enabled, the control runs an Active Sync Time Delay (if greater than 0) and sends the Sync Enable command to the generator set. The Active Sync Time Delay is used to check the stability of the system before transferring to the other source. The two sources must remain synchronized for this period of time period before a transfer command is given. The Active Sync Time Delay is adjustable from 0 to 5 seconds in 0.1 second increments (default = 0.5 seconds). The Active Sync Delay timer can be set with the PC service tool or the digital display. **The Active Sync Delay should not be used unless the generator set is actively synchronized to the utility (for example, a paralleling generator set). Contact your dealer or distributor for more information.** The active sync menus available with the digital display are shown in Figure 2-26. See Figure 4-11 for information on how to adjust active sync values.

Speed Adjust

If a PowerCommand transfer switch and a non-paralleling generator set are networked together, the transfer switch control can send a Speed Adjust command to the generator set to increase its speed just enough to increase its frequency by 0.5 Hz. The command is activated just before the Sync Check sensor is activated. It is used when the generator set takes a long time to drift in sync with the utility. This increases the number of “in-phase” opportunities to satisfy the Sync Check sensor. Speed Adjust is always enabled unless Active Sync is enabled. **The generator set must be capable of reacting to a Speed Adjust command. This feature is only available if a PowerCommand network is installed.**

Programmed Transition

Programmed 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 voltage 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 (TDPT) 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 can be set with the PC service tool or the digital display.

The following describes the sequence of operation during a **normal (utility) power failure** for a transfer switch that is set up for programmed transition. Figure 2-27 illustrates the sequence of events.

Transfer from Source 1 to Source 2

This sequence includes a programmed transition and begins with Source 1 supplying power to the load. The Source 1 Available and Source 1 Connected indicators are lit. The sequence ends with Source 2 (generator) assuming the load.

1. When source 1 goes “out of spec,” the digital board starts a Time Delay to Start (TDES) timer and the Source 1 Available indicator goes out.

2. If the TDES expires without a return to acceptable Source 1 power, the generator set receives a remote start signal. The engine starts and accelerates to rated speed.

3. When the alternator output reaches the “pick-up” level, the Source 2 Available indicator lights. The transfer switch starts the Time Delay Normal to Emergency (TDNE) timer. When this time is complete, the switch moves to the Neutral position. The Source 1 Connected indicator goes out.

4. If there is a programmed transition delay, the transfer switch stops in the Neutral position for the Time Delay Programmed Transition (TDPT) and then completes its transition to the Source 2 position. The Source 2 Connected indicator lights.

Transfer from Source 2 to Source 1

This sequence begins with Source 2 supplying power to the load. The Source 2 Available and Source 2 Connected indicators are lit. The sequence ends with Source 1 (utility) assuming the load.

1. When Source 1 returns to “in spec,” the Source 1 Available indicator lights and the digital board starts the Time Delay Emergency to Normal (TDEN) timer. When this time is complete, the switch moves to the neutral position and the Source 2 Connected indicator goes out.

2. If there is a program transition time delay, the transfer switch stops in the neutral position for the time delay and then completes its transition to the Source 1 position and the Source 1 Connected indicator lights.

3. A Time Delay Engine Cool-down (TDEC) for the generator set is activated. When the engine cool-down delay expires, the generator set shuts down and the Source 2 Available indicator goes out.

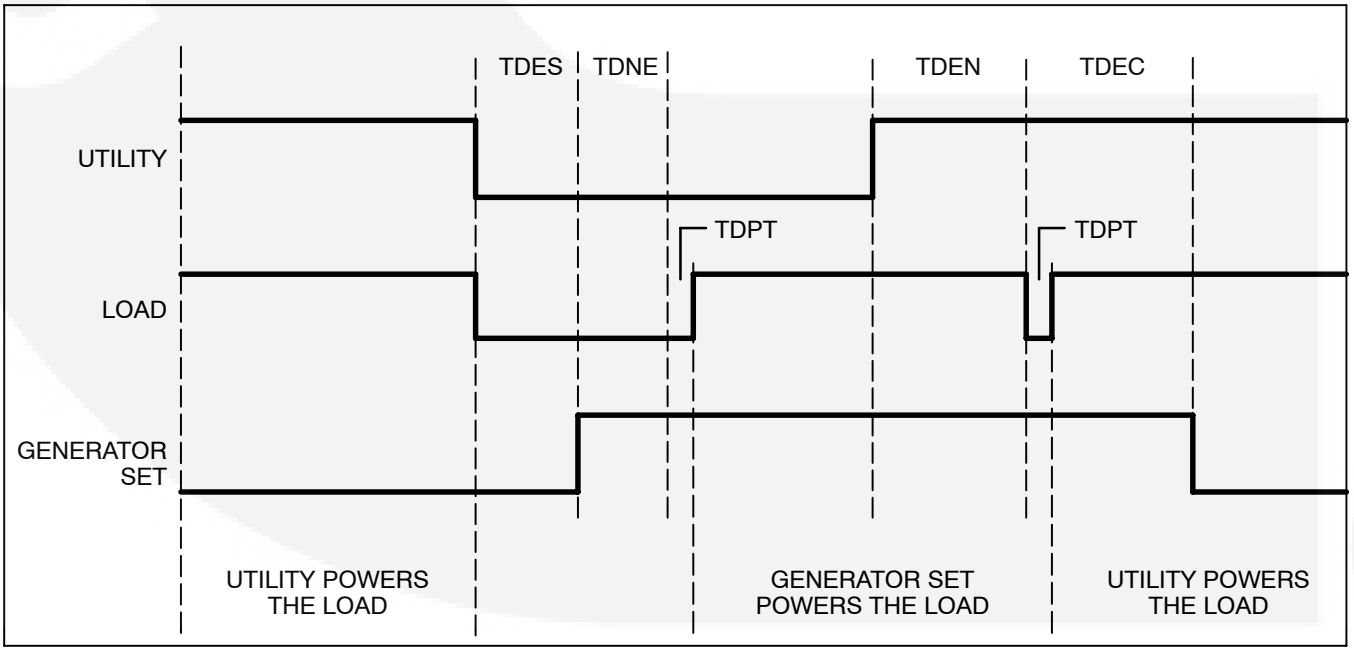


FIGURE 2-27. PROGRAMMED TRANSITION SEQUENCE OF OPERATION

Test

If the test button is pushed on the Front Panel, then the controller simulates a Source 1 (or preferred Source) failure and proceeds to transfer the load to Source 2 (or non-preferred source). The sequence of events is described below and is illustrated in Figure 2-28.

Transfer from Source 1 to Source 2

This sequence begins with Source 1 supplying power to the load continuously. The Source 1 Available and Source 1 Connected indicators are lit. The sequence ends with Source 2 (generator) assuming the load.

1. When the operator holds the Test button on the front panel for at least two seconds, the digital board starts a Time Delay to Engine Start (TDES) timer.
2. When the TDES timer expires, the generator set receives a remote start signal. The engine starts and accelerates to rated speed.
3. When the alternator output reaches the ”pick-up” level, the Source 2 Available indicator lights. The transfer switch starts the Time Delay Normal to Emergency (TDNE) timer. When this time is complete, the controller proceeds to transfer the load in accordance with how it is configured.

   - If the controller is configured for OT with Sync Check, it monitors the two sources until they are in phase and transfers the load to Source 2. The Source 2 Connected indicator lights.

   - If the controller is configured for Programmed Transition and there is a programmed transition delay, the transfer switch stops in the Neutral position for the Time Delay Programmed Transition (TDPT) and then completes its transition to the Source 2 position. The Source 2 Connected indicator lights.

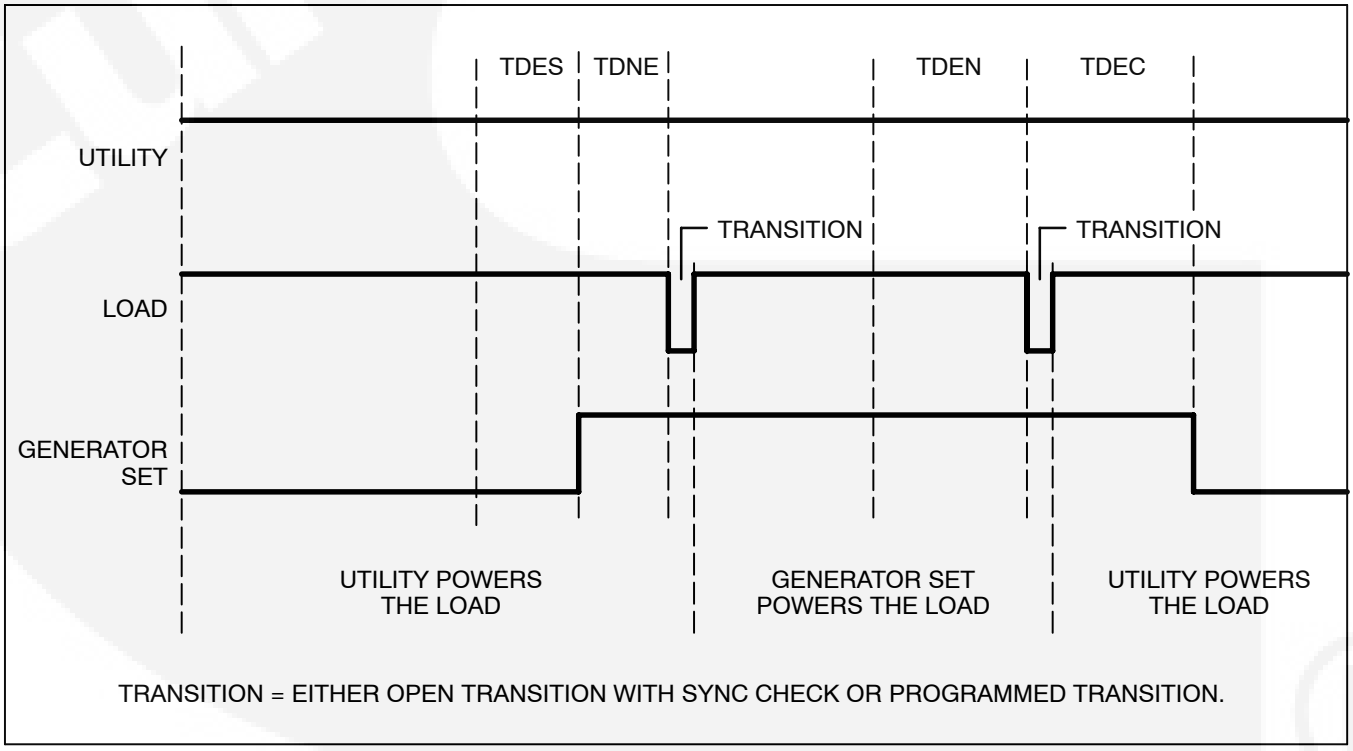


FIGURE 2-28. FRONT PANEL TEST SEQUENCE OF OPERATION

Transfer from Source 2 to Source 1

This sequence begins with Source 2 supplying power to the load. The Source 2 Available and Source 2 Connected indicators are lit. The sequence ends with Source 1 (utility) assuming the load.

1. When the operator pushes the Test button on the Front Panel, the digital board starts the Time Delay Emergency to Normal (TDEN) timer.

2. When the TDEN is complete, the controller proceeds to transfer the load in accordance with how it is configured.

   - If the controller is configured for open transition with sync check, it monitors the two sources until they are in phase and transfers the load to Source 1. The Source 1 Connected indicator lights.

   - If the controller is configured for Programmed Transition and there is a programmed transition delay, the transfer switch stops in the Neutral position for the Time Delay Programmed Transition (TDPT) and then completes its transition to the Source 1 position. The Source 1 Connected indicator lights.

3. A Time Delay Engine Cool-down (TDEC) for the generator set is activated. When the engine cool–down delay expires, the generator set shuts down and the Source 2 Available indicator goes out.

Test With or Without Load

The operator can test the transfer switch, generator, and power system locally. The operator can choose to transfer the load during the test or only test the generator. A test sequence can be activated either through the switch panel push button or through the PowerCommand network. The Test With/Without Load menu available is through the digital display (see Figure 2-29). See Figure 4-13 for information on how to adjust this setting.

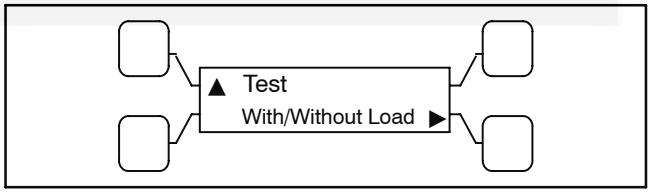


FIGURE 2-29. TEST WITH OR WITHOUT LOAD SUBMENU

Remote Test Switch

The transfer switch can be wired with a remote test switch.

For utility-to-genset applications, closure of a set of contacts across the remote test transfer input (TB2-5 and TB2-8, as shown on Figure 2-30) causes the transfer switch to sense a simulated utility power failure and sends a start/run signal to the generator set and transfers the load to the generator set when it becomes available.

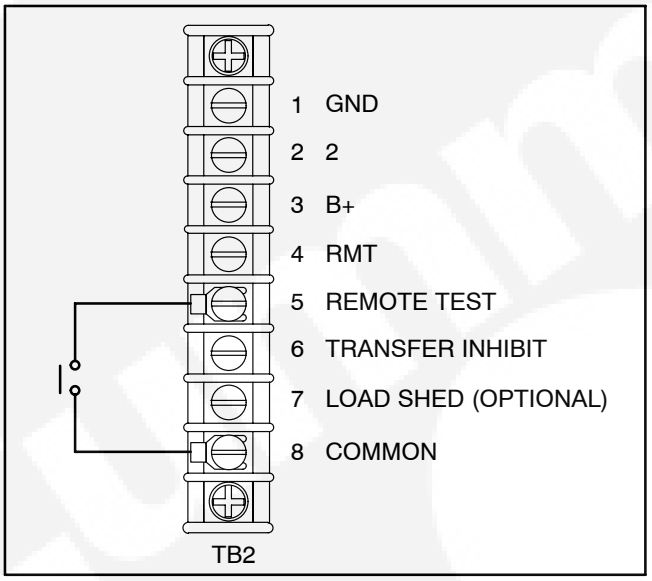


FIGURE 2-30. TB2 CONNECTIONS FOR REMOTE TEST TRANSFER

Opening a set of contacts across the remote test transfer input causes the transfer switch to sense that the primary source has been restored and transfers the load back to the primary source (Source 1).

Transfer Inhibit

This feature is used to control load transfer to generator sets. When activated, load transfer will not take place unless the Override button on the switch panel is pressed or the transfer inhibit input is disabled.

Transfer Inhibits are set up by connecting a remote contact between TB2-6 and TB2-8 (see Figure 2-31). Closing the contact enables the feature and opening the contact disables it. Transfer Inhibits are set up using the PC service tool and a remote switch inside the cabinet connected to TB2. When enabled, the event is displayed on the front panel. If Source 1 fails, transfer inhibit is ignored.

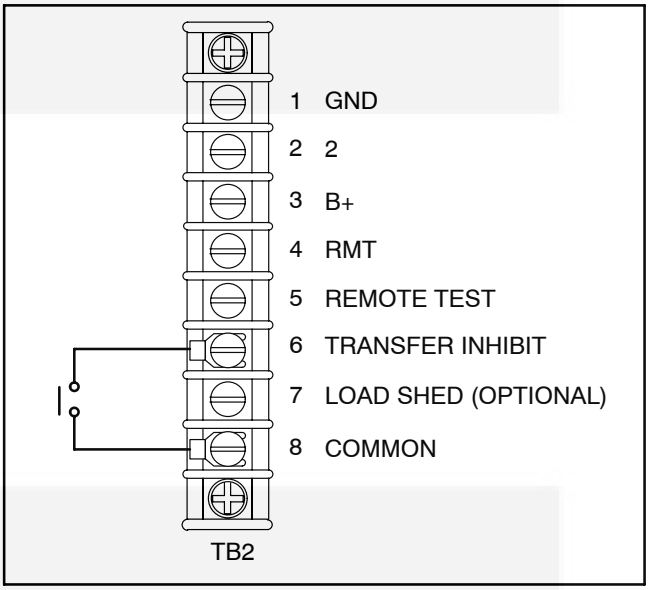


FIGURE 2-31. TB2 CONNECTIONS FOR TRANSFER INHIBIT

Retransfer Inhibit

This feature is used to prevent the ATS from automatically transferring the load back to Source 1. When activated, load transfer will not take place unless the Override button on the switch panel is pressed, the retransfer inhibit input is disabled, or Source 2 fails.

NOTE: If Source 2 fails, the Retransfer Inhibit is ignored.

Retransfer Inhibits are set up by connecting a remote contact between TB3-53 and TB3-54 (see Figure 2-32). Closing the contact enables the feature and opening the contact disables it. When enabled, the event is displayed on the front panel.

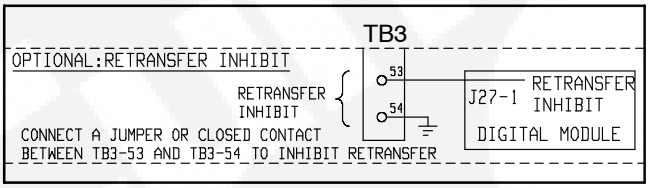


FIGURE 2-32. TB3 CONNECTIONS FOR RETRANSFER INHIBIT

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.

The controller keeps track of open transition transfer times and provides an average open transition transfer time. The controller records the transfer time if the transition mode is an open transition with Sync Check or when a Programmed Transition is used and the Programmed Transition time delay is zero.

The controller also shows closed transition transfer times, even though the function is not available. Figure 2-33 shows the Transfer submenus available through the digital display. See Figure 4-5 for information on how to view these menus.

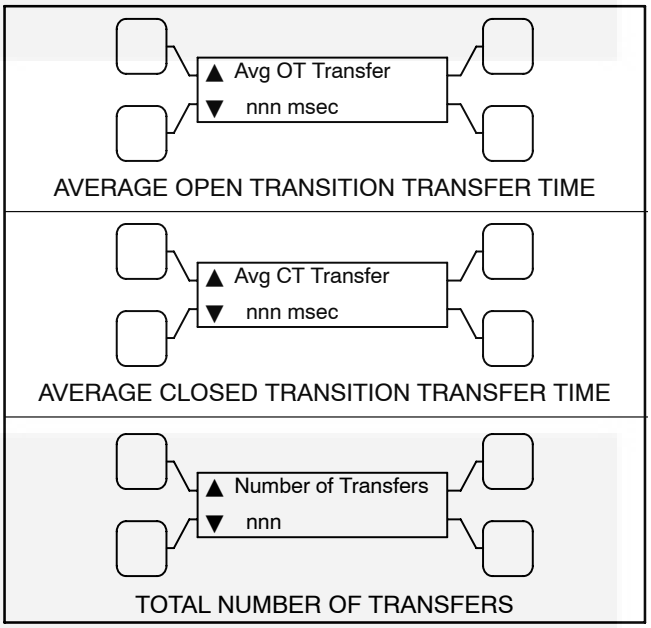


FIGURE 2-33. TRANSFER SUBMENUS

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, if available. Figure 2-34 shows some of the exercise submenus available with the current version of software used with the digital display. Figure 2-35 shows the current exercise exception submenus. For information on how to adjust the exercise values, see Figure 4-14. For information on how to adjust the exercise exception values, see Figure 4-15.

Level 1 controllers include two programmable generator exercises and two programmable exercise exceptions. All events can be set using the PC service tool or the digital display.

Level 2 controllers include eight programmable generator exercises and eight programmable exercise exceptions. All events can be set using the PC service tool or the digital display.

All controllers have a push-button switch on the digital module that enables and disables the exerciser clock, as shown in Figure 6-1. See the *Digital Display Menu System* section for details on setting the clock (Figure 4-17). The Real-Time clock must be set before exercise programs are entered.

For utility-to-genset configurations, the exerciser clock initiates generator set start and run cycles at specified intervals for specified durations.

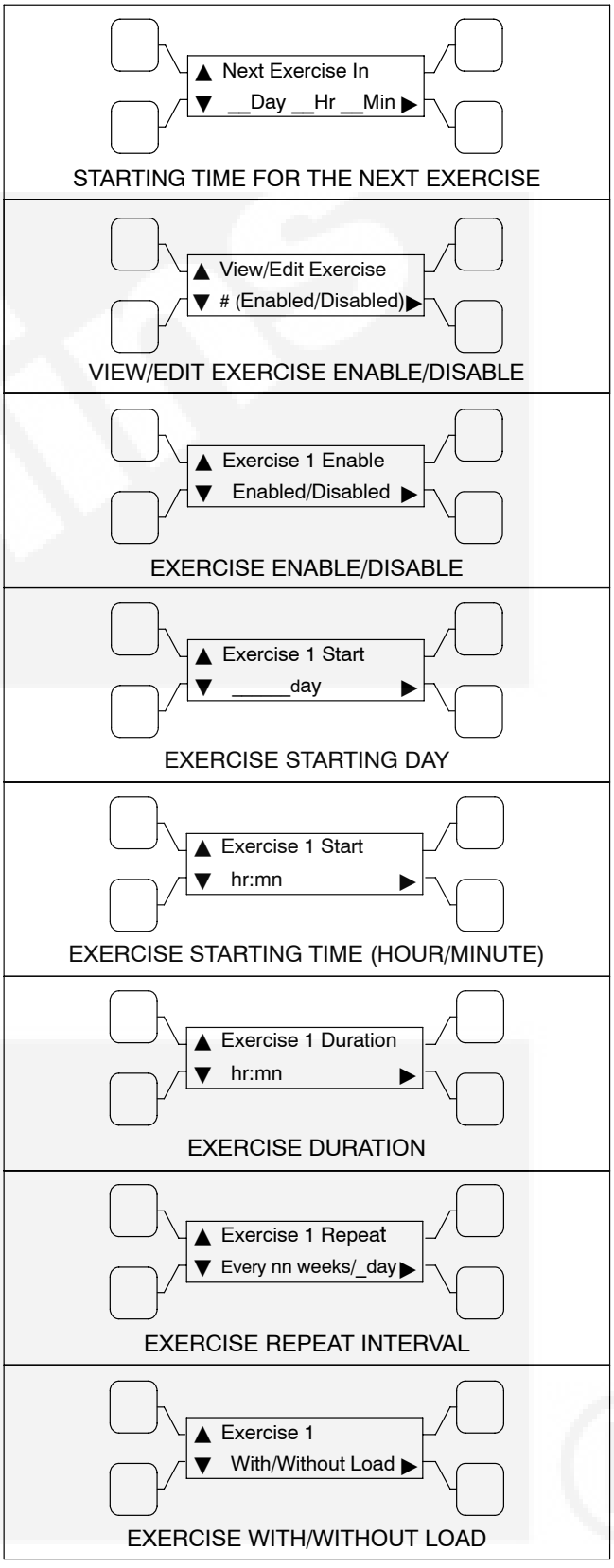


FIGURE 2-34. EXERCISE SUBMENUS

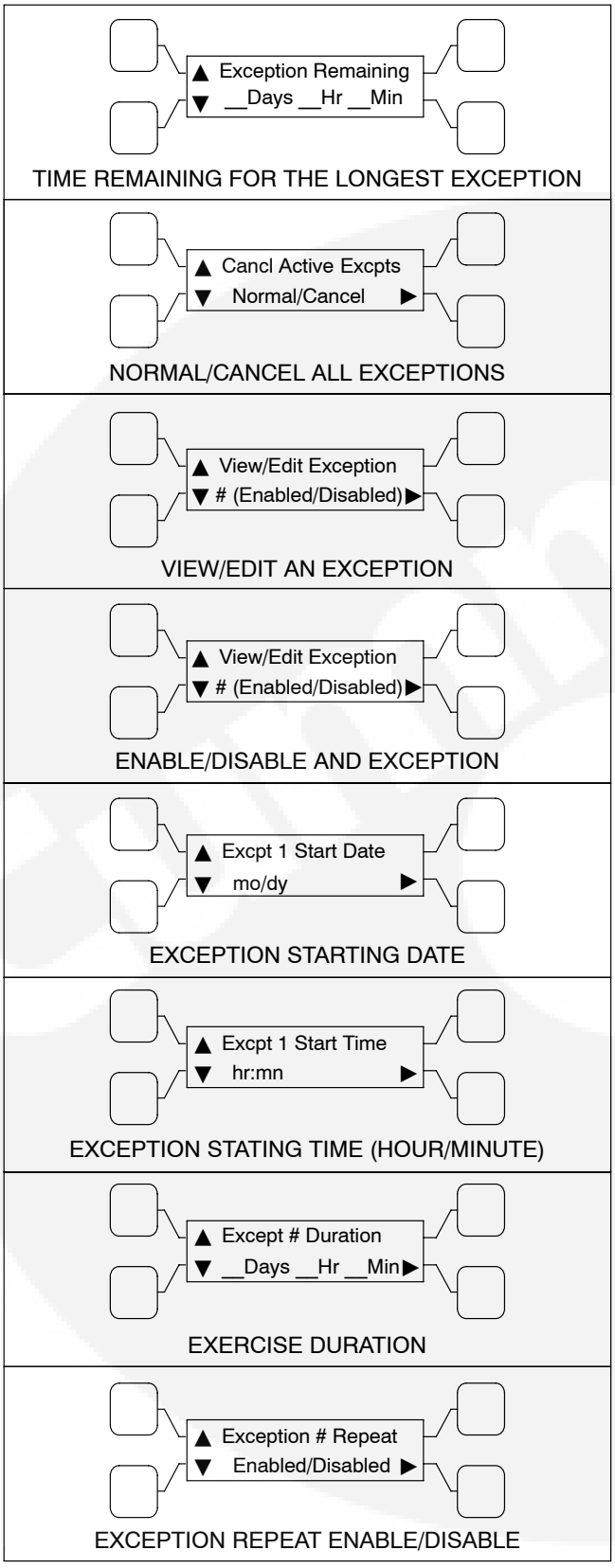


FIGURE 2-35. EXERCISE EXCEPTIONS SUBMENUS

Real-Time Clock

All controllers have a real-time clock that keeps track of the time and date. 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 PC service tool or the digital display.

The clock menus available with the digital display are shown in Figure 2-36. For information on how adjust these settings, see Figure 4-17.

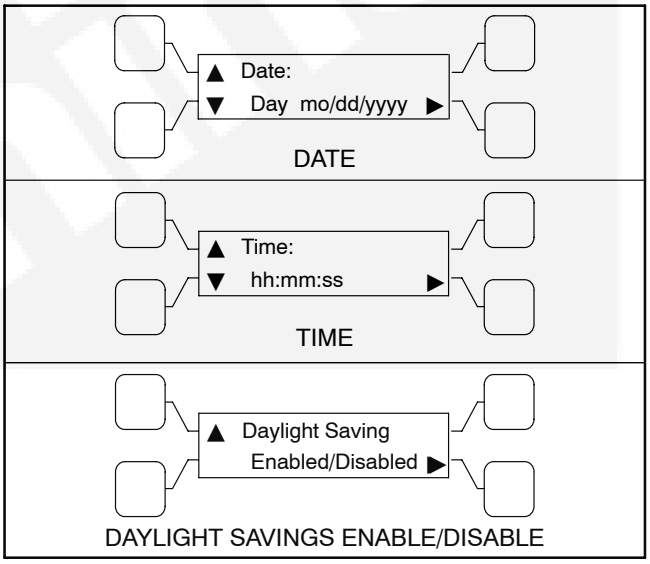


FIGURE 2-36. CLOCK SUBMENUS

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.

The status of the controller batteries can be viewed using the digital display (see Figure 2-37). The controller batteries status submenu is included in the Statistics submenus (see Figure 4-5).

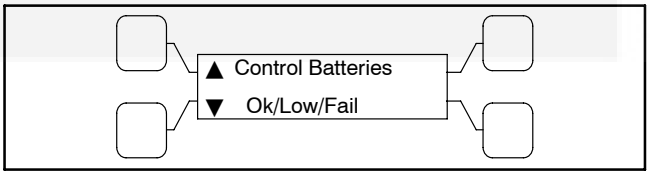


FIGURE 2-37. CONTROLLER BATTERIES STATUS SUBMENU

TRANSFER SWITCH ASSEMBLY

The transfer switch (see Figures 2-39 through 2-42) 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. 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” in *Section 3*.

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 contact 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 (see Figure 2-38).

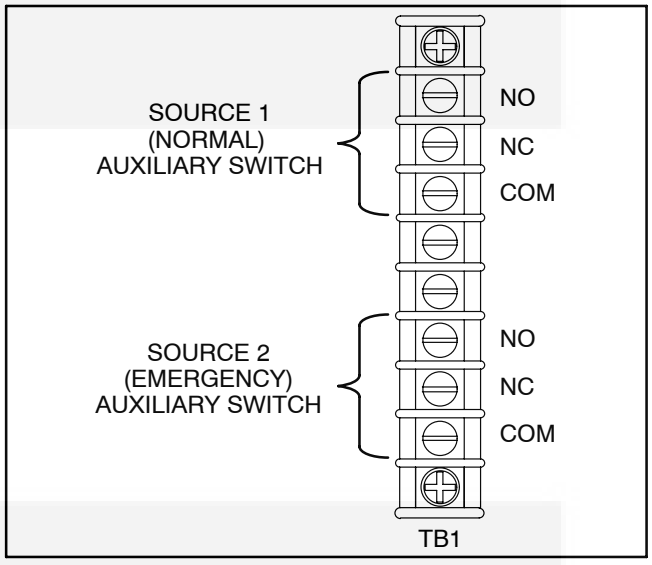


FIGURE 2-38. TERMINAL BLOCK TB1

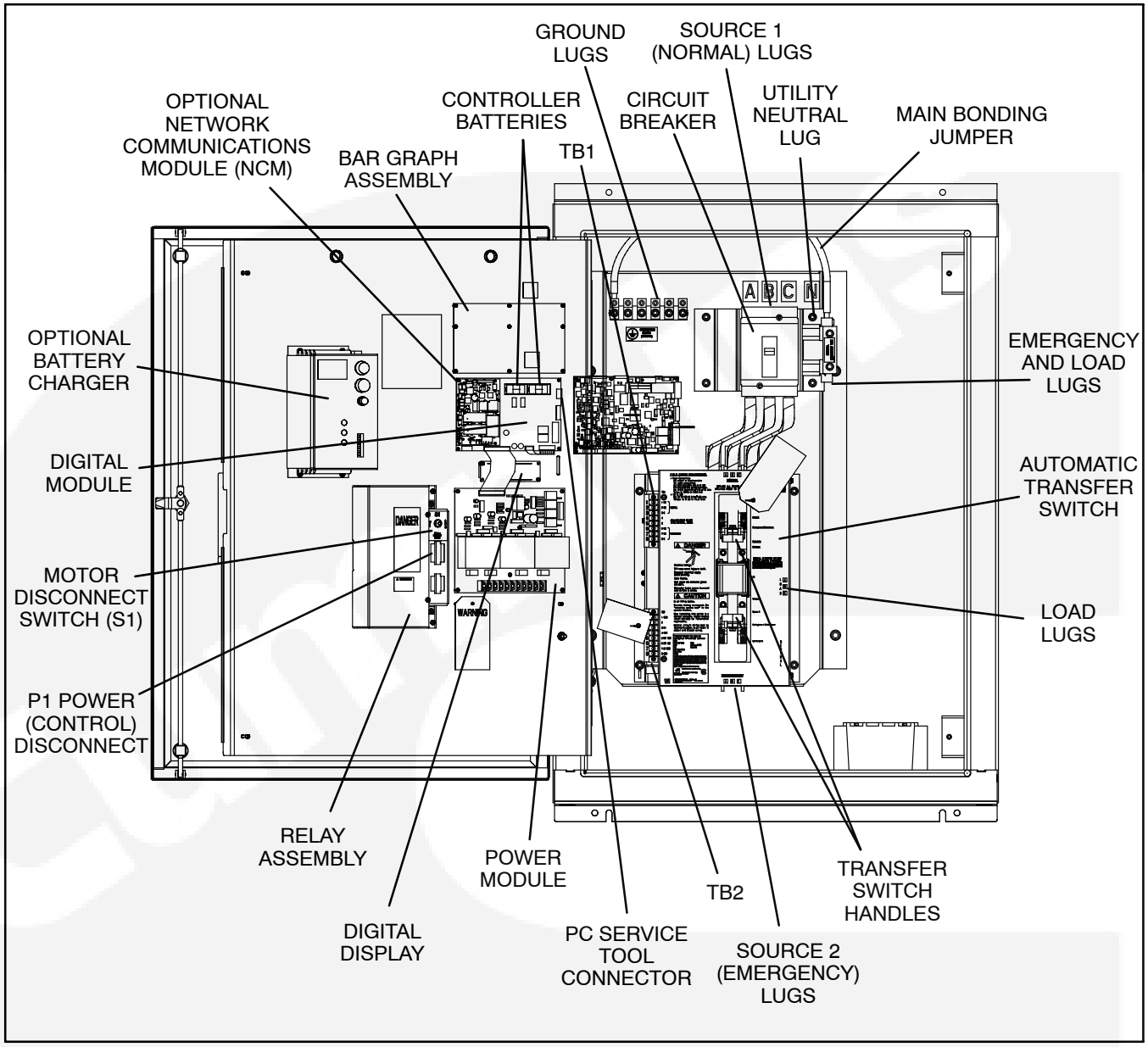


FIGURE 2-39. INTERIOR/COMPONENTS (40–125 AMP, 3 POLE, TYPE 3R AND 12 CABINET)

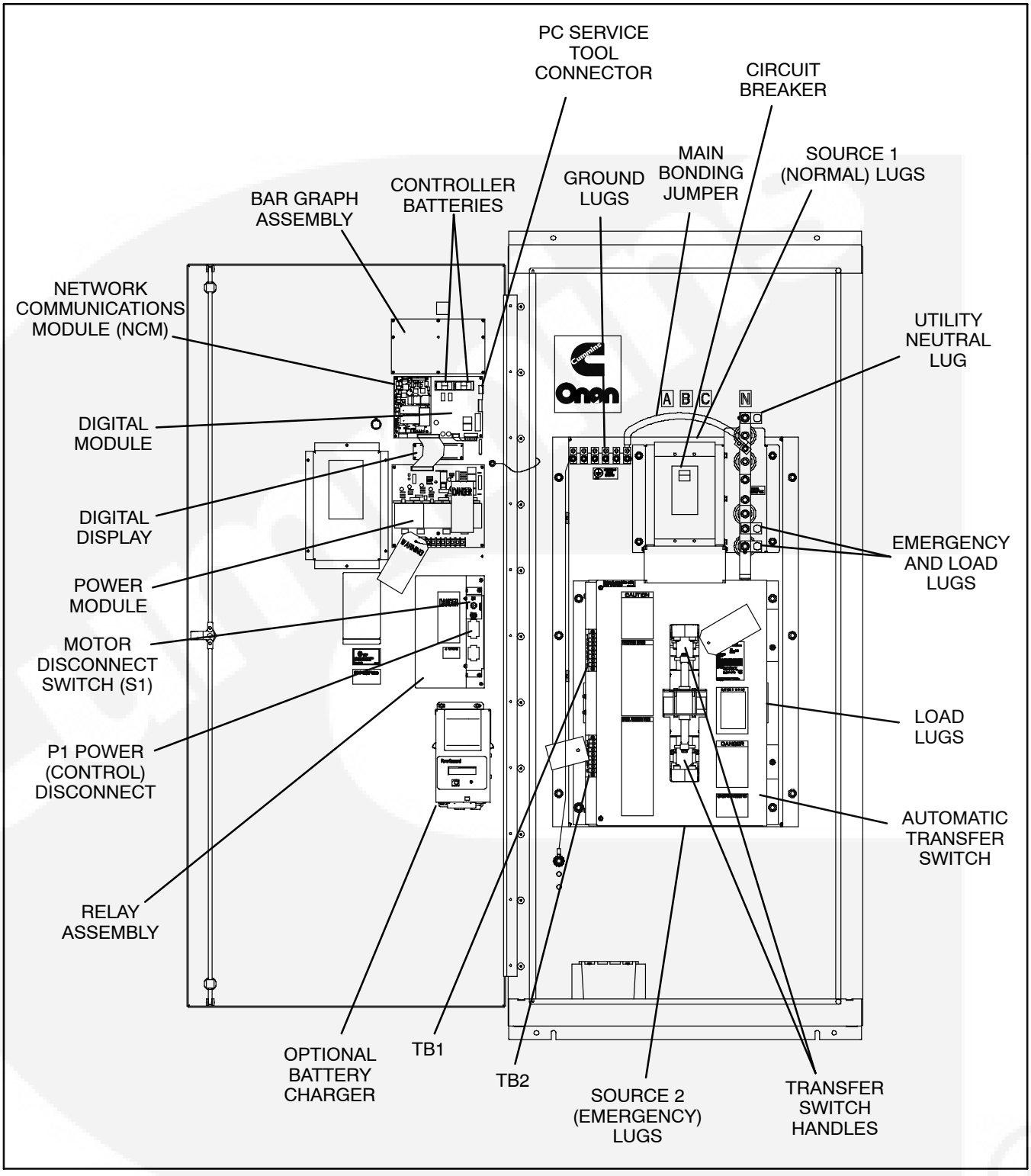


FIGURE 2-40. INTERIOR/COMPONENTS (150–250 AMP, 3 POLE, TYPE 1 CABINET)

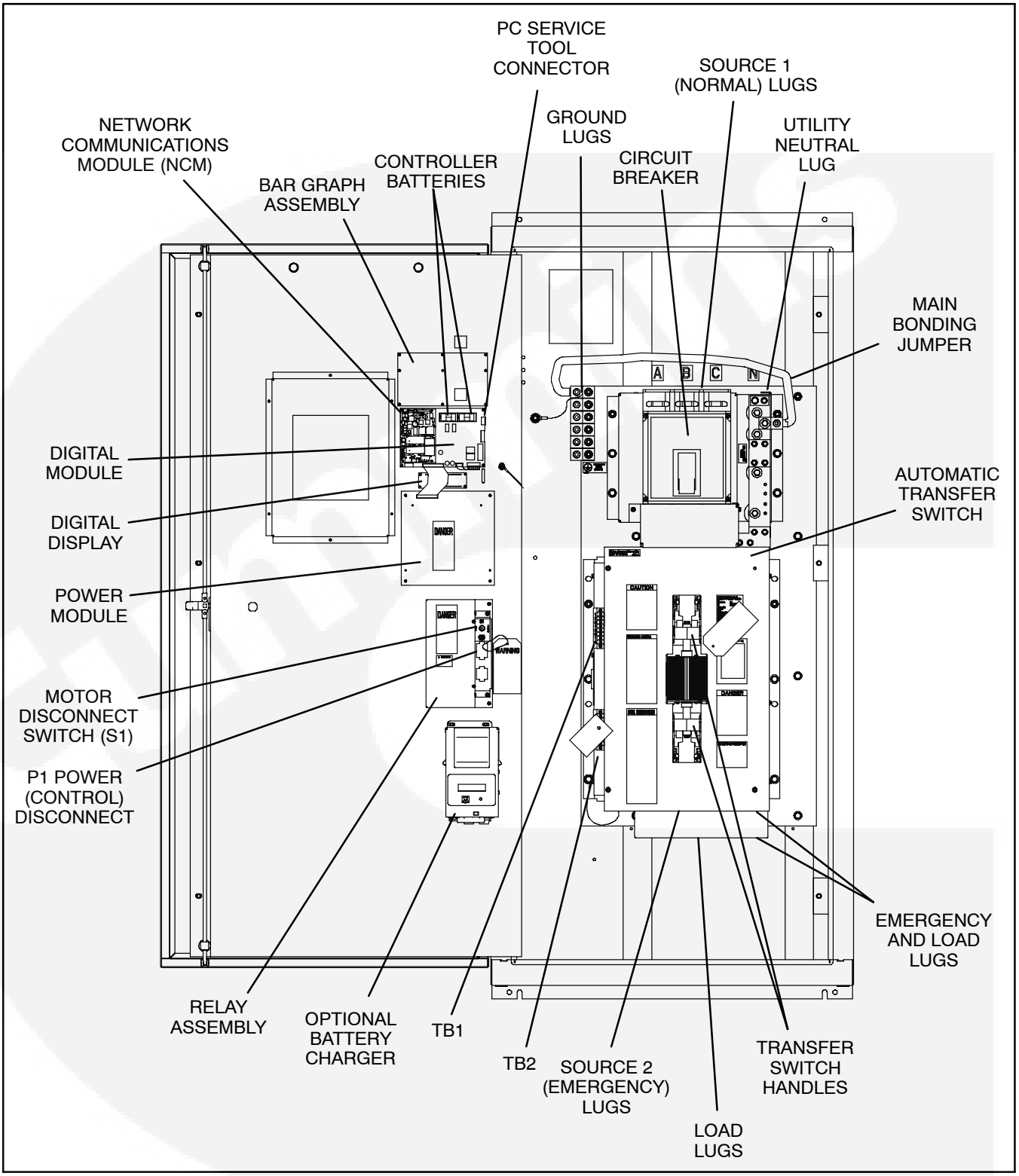


FIGURE 2-41. INTERIOR/COMPONENTS (300–600 AMP, 4 POLE, TYPE 3R AND 12 CABINET)

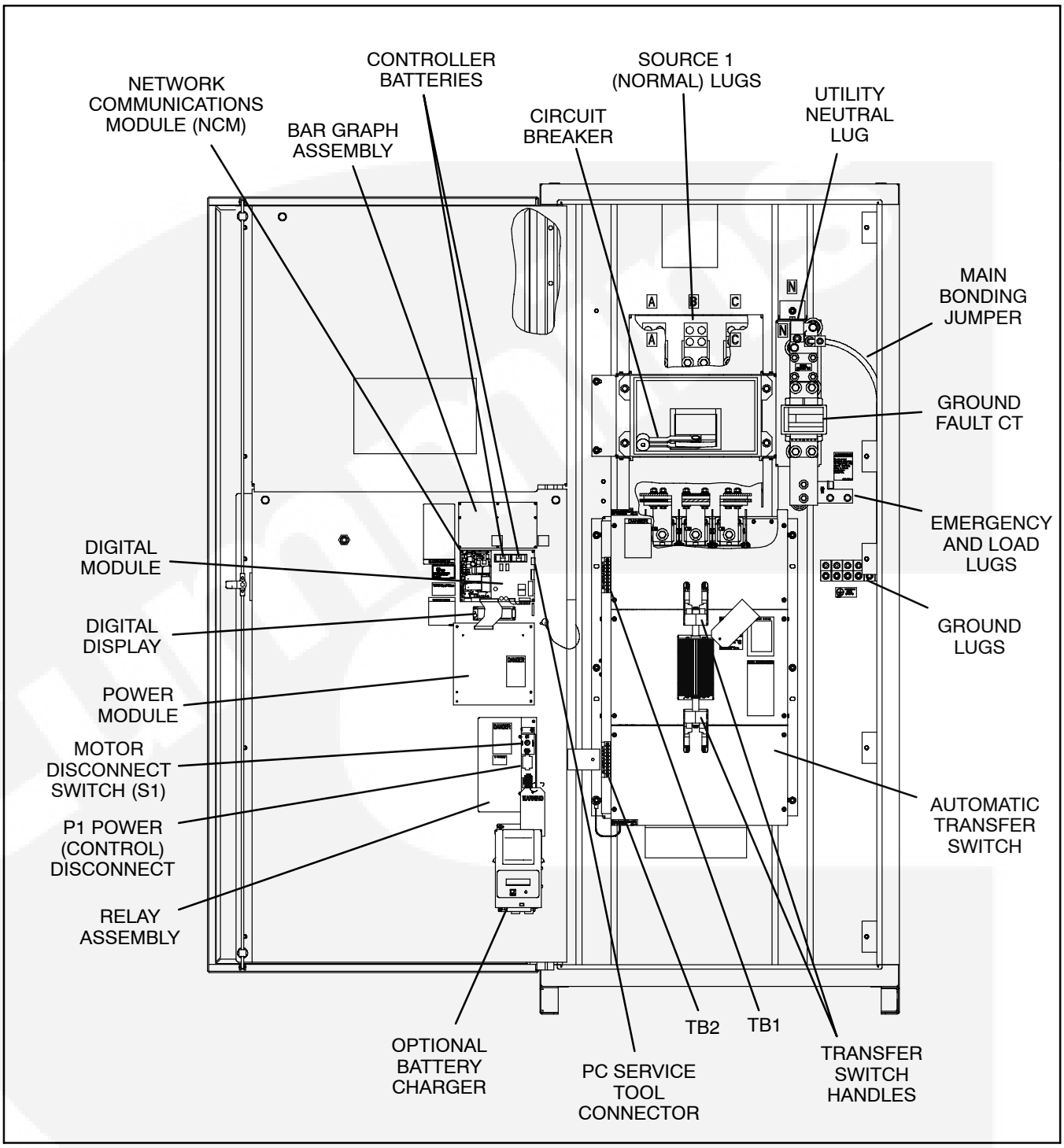


FIGURE 2-42. INTERIOR/COMPONENTS (1000 AMP, 4 POLE, TYPE 3R AND 12 CABINET)

CIRCUIT BREAKER TRIP UNITS

Each circuit breaker on an OTECSE transfer switch includes one of the following trip units. The following pages describe trip units used on 150–1000 amp service entrance transfer switches.

- STR23SP – Used with 150, 225, and 250 amp service entrance transfer switches
- Micrologic® 3.0 LI – Used with 300, 400, and 600 amp service entrance transfer switches
- Micrologic 6.0A LSIG – Used with 800 and 1000 amp service entrance transfer switches

The circuit breaker trip units are preset at the factory. The default settings are listed in the following tables.

Circuit Breaker STR23SP Trip Unit Settings

Rated Switch Amperage	Io	Ir	Im
150A	1	1	6
225A	0.9	1	6
250A	1	1	6

Circuit Breaker Micrologic 3.0 Trip Unit Settings

Rated Switch Amperage	Ir	tr	Ii
300A	0.5	0.5	1.5
400A	0.67	0.5	1.5
600A	1	0.5	1.5

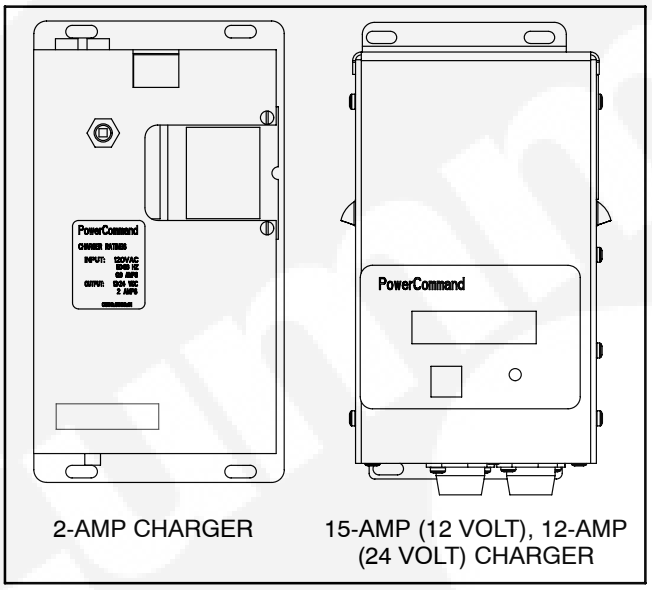
Circuit Breaker Micrologic 6.0 Trip Unit Settings

Rated Switch Amperage	Ir	tr	Isd	tsd	Ii	Ig	tg
800A	0.8	0.5	1.5	0 (Off)	2	A	0.1
1000A	1	0.5	1.5	0 (Off)	2	A	0.1

OPTIONS

Battery Charger Options

Two battery chargers (see Figure 2-43) are available for use with an OTPCSE transfer switch. One battery charger is rated for 2 amperes at 12 or 24 VDC. The other battery charger is rated for 15 amperes at 12 VDC or 12 amperes at 24 VDC.



2-AMP CHARGER

15-AMP (12 VOLT), 12-AMP (24 VOLT) CHARGER

FIGURE 2-43. CURRENT BATTERY CHARGERS

A float-charge battery charger 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.

When present, the status of the battery charger can be viewed using the digital display (see Figure 2-44). The battery charger status submenu is included in the Statistics submenus (see Figure 4-5).

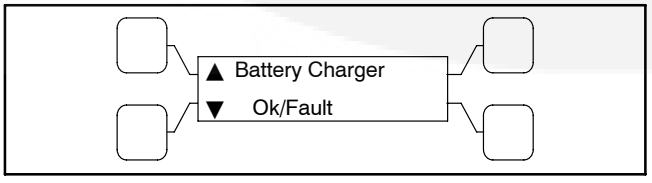


FIGURE 2-44. BATTERY CHARGER STATUS SUBMENU

2-Amp Battery Charger

The 2-ampere battery charger (see Figure 2-45) has a 5 amp DC output circuit breaker switch on the front of the battery charger. The charger also includes a 5 amp AC fuse to protect the battery charger circuit.

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.

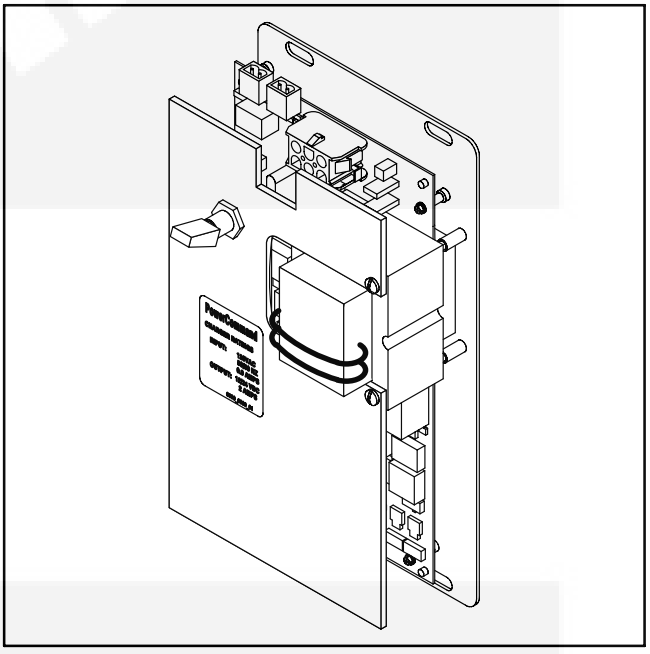


FIGURE 2-45. 2-AMP POWERCOMMAND BATTERY CHARGER

Control Panel

The 2-amp charger control panel includes a digital display, a RESET button, and an LED status indicator (see Figure 2-46).

- The 2-line x 16-character digital display displays menus and faults.
- The RESET button is used to select menu options and to clear fault messages.
- The status LED displays the appropriate color for the following conditions.
  - **Green** – On solid indicates unit is charging
  - **Red** – On solid indicates a fault condition. The fault number is shown on the digital display.

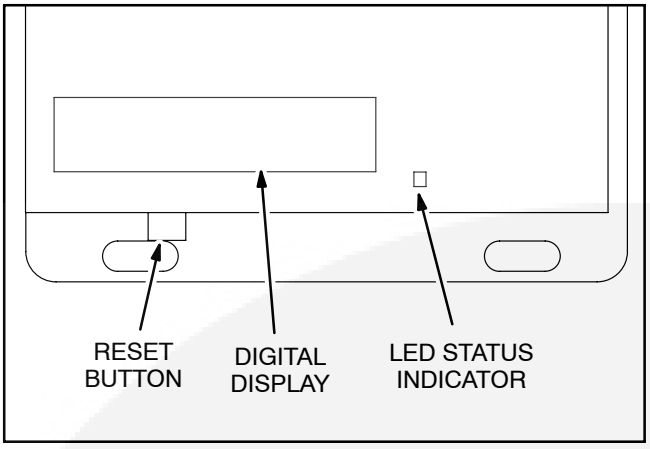


FIGURE 2-46. 2-AMP CHARGER CONTROL PANEL

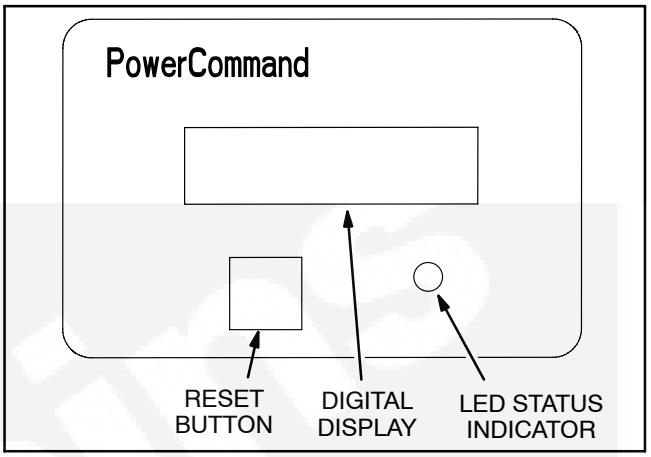


FIGURE 2-47. 15/12-AMP CHARGER CONTROL PANEL

Battery Charger Configuration

The **RESET** button on the control panel (see Figure 2-46) is used to configure the battery charger for the correct battery voltage. (More information on Setup menus is included in the Battery Charger Operator's Manual (901–0106).)

15/12-Amp Battery Charger

There are two types of 15/12-amp PowerCommand battery chargers (see Figure 2-48). All 15/12-amp battery chargers have a 20 amp DC circuit breaker switch on the front of the battery charger. The 120, 208, and 240 VAC battery chargers include two 10 amp AC circuit breaker switches and a circuit breaker guard, while the 277, 380, 416, and 600 VAC battery chargers include two AC fuse holders.

Control Panel

The 15/12-amp charger control panel includes a digital display, a Reset button, and an LED status indicator (see Figure 2-47).

- The 2-line x 16-character digital display displays menus and faults.
- The Reset button is used to select menu options and to clear fault messages.
- The status LED is displays the appropriate color for the following conditions.
  - **Green** – On solid indicates unit is charging
  - **Amber** – On solid indicates Equalizing
  - **Red** – On solid indicates a fault condition. The fault number is shown on the digital display.

Optional Battery Temperature Sensor

A connector for an optional battery temperature sensor is located on the front of the battery charger. When used to monitor battery temperature, the optional battery temperature sensor is connected from the battery charger to the positive terminal of the battery. A fault message (fault code 2263) is displayed if the battery temperature is too high (reaches 131 degrees F (55 degrees C)).

Battery Charger Configuration

The **RESET** button on the control panel (see Figure 2-47) is used to configure the battery charger. (More information on Setup menus is included in the Battery Charger Operator's Manual (901–0107).)

- **Battery Voltage and Type** – The battery charger must be correctly configured, using the Setup menus, for the correct battery voltage and type before it is connected to the battery. The battery voltage can be set for 12 or 24 VDC (default = 12 VDC). The battery type can be set for Lead-Acid, Gel, or AGM batteries (default = Lead-Acid).

  NOTE: A factory installed battery charger is set up for the proper DC battery voltage requested on the production order, with the Lead-Acid battery type selected as the default.

- **Battery Equalization** – Battery equalization is available for lead-acid batteries that are completely charged, using the Equalize Battery screen in the Setup menus. When battery equalization is in process, the LED status indicator turns amber.

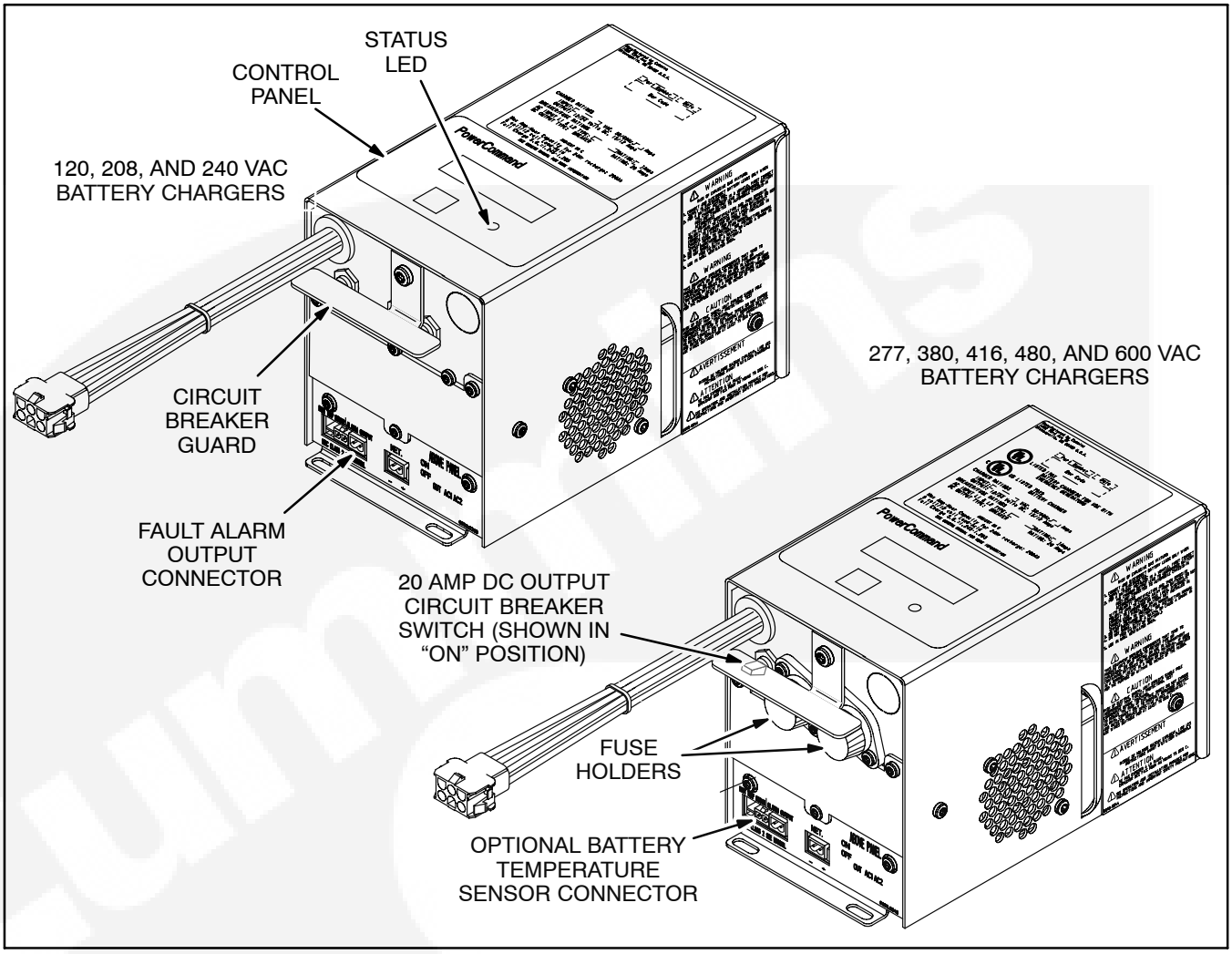


FIGURE 2-48. 15/12-AMP POWERCOMMAND BATTERY CHARGERS

Auxiliary Relays Option

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

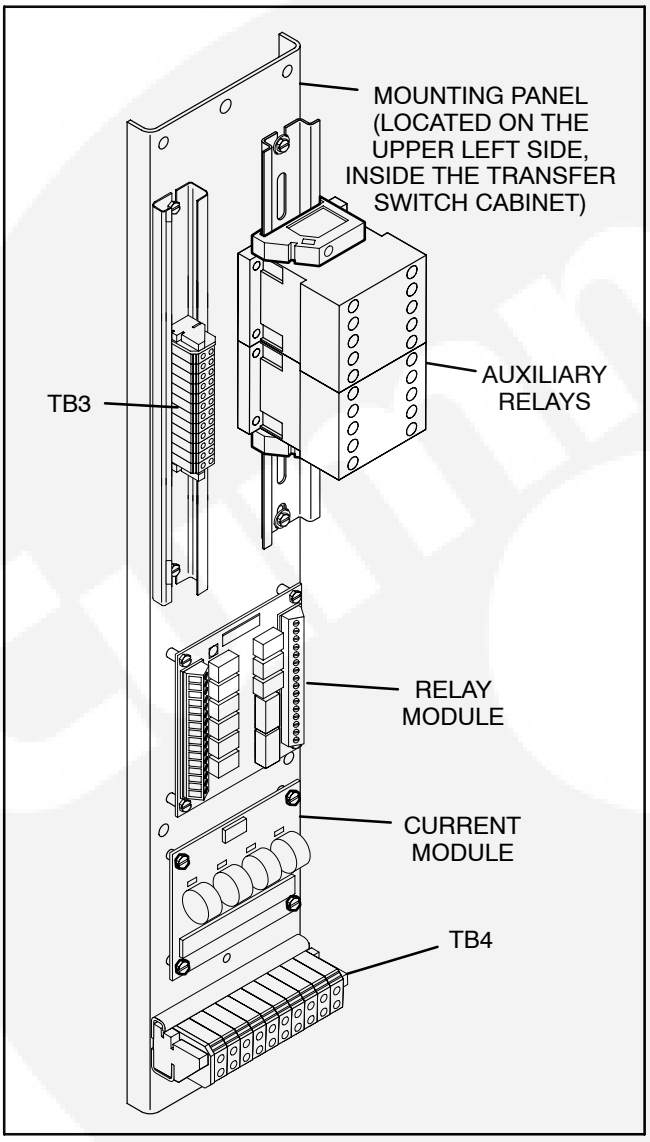


FIGURE 2-49. CONTROL WIRING CONNECTIONS

Connections to the auxiliary relays are made directly to the relay terminals. Figure 2-49 shows the location of the Auxiliary Relays on the options panel.

There are two types of auxiliary relay coils (12 VDC and 24 VDC). Table 2-1 lists several auxiliary relay options.

All relays have two normally open and two normally closed contacts that are rated for 10 amperes at 600 VAC (Figure 2-50).

Auxiliary Relay

TABLE 2-1. AUXILIARY RELAY

24 VDC COIL	INSTALLED, NOT WIRED
24 VDC COIL	EMERGENCY RELAY
24 VDC COIL	NORMAL RELAY
12 VDC COIL	INSTALLED, NOT WIRED
12 VDC COIL	EMERGENCY RELAY
12 VDC COIL	NORMAL RELAY

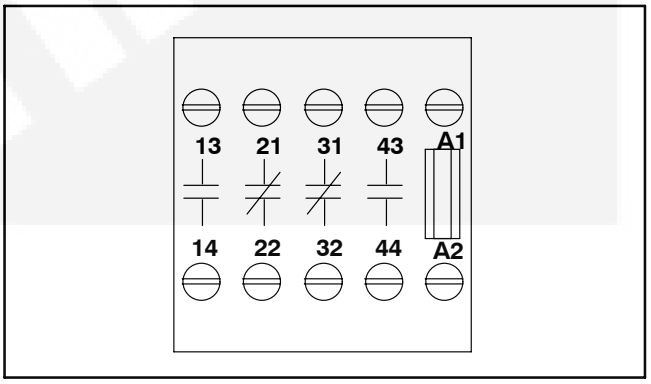


FIGURE 2-50. AUXILIARY RELAY TERMINALS

Relay Module Option

The Relay Module provides nine sets of Form-C contacts and two sets of normally open contacts that are rated for 2 Amps at 30 VDC or 0.60 Amps at 120 VAC (see Table 2-2).The module includes the Elevator Pre-Transfer Delay Signal. The relay contacts may be used with other applications.

The Relay Module is located on the left inside wall of the transfer switch enclosure. See Figure 2-49 for location in the enclosure and Figure 2-52 for details.

The status of the relay module (OK or Not Installed) can be viewed with the digital display (see Figure 2-51). This menu is included in the About submenus (see Figure 4-19).

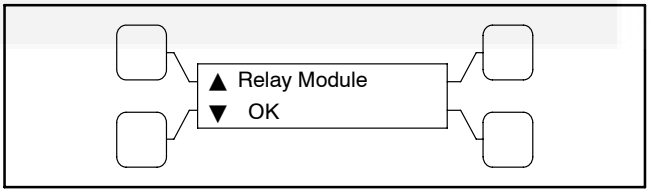


FIGURE 2-51. RELAY MODULE STATUS SUBMENU

TABLE 2-2. RELAY SIGNAL MODULE

Relay Signal	Control Type
Source 1 Connected	Level 1 and Level 2
Source 1 Available	Level 1 and Level 2
Source 2 Connected	Level 1 and Level 2
Source 2 Available	Level 1 and Level 2
Test/Exercise Active	Level 1 and Level 2
Load Shed Active	Level 1 and Level 2
Fail to Transfer/Retransfer	Level 2
Fail to Synchronize	Level 2
Elevator Pre-Transfer	Level 1 and Level 2
Transfer Switch Not In Auto	Level 1 and Level 2

The **Source 1 and Source 2 Connected** relays are energized when their respective power sources are available, ready to produce power, and connected to the load. These relays are latching relays and will retain their last state in case of a complete loss of power.

The **Source 1 and Source 2 Available** relays are energized when their respective power sources are producing power.

The **Test or Exercise Active** relay is energized when the system is in test or exercise mode.

The **Load Shed** relay is active when the transfer switch has been commanded to disconnect the load from power Source 2.

The **Fail to Transfer**/**Retransfer** relay is energized whenever the transfer switch does not *open* or *close* within a set time interval after the command to transfer or retransfer.

The **Fail to Synchronize** relay is energized when the two power sources did not come into synchronicity (frequency, voltage, phase) within a two-minute limit; during a transfer between two live sources.

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 (TDEL) 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, if available (see Figure 2-11). See Figure 4-12 for information on how to adjust the TDEL value using the digital display.

The ATS **Not-In-Auto** relay is energized when any one of the following occurs:

- Motor Disconnect Switch is set to Off
- Fail-to-Disconnect event is active
- Control is locked out
- Wiring harness is disconnected from J12 on the Power Module
- Controller is set to Offline

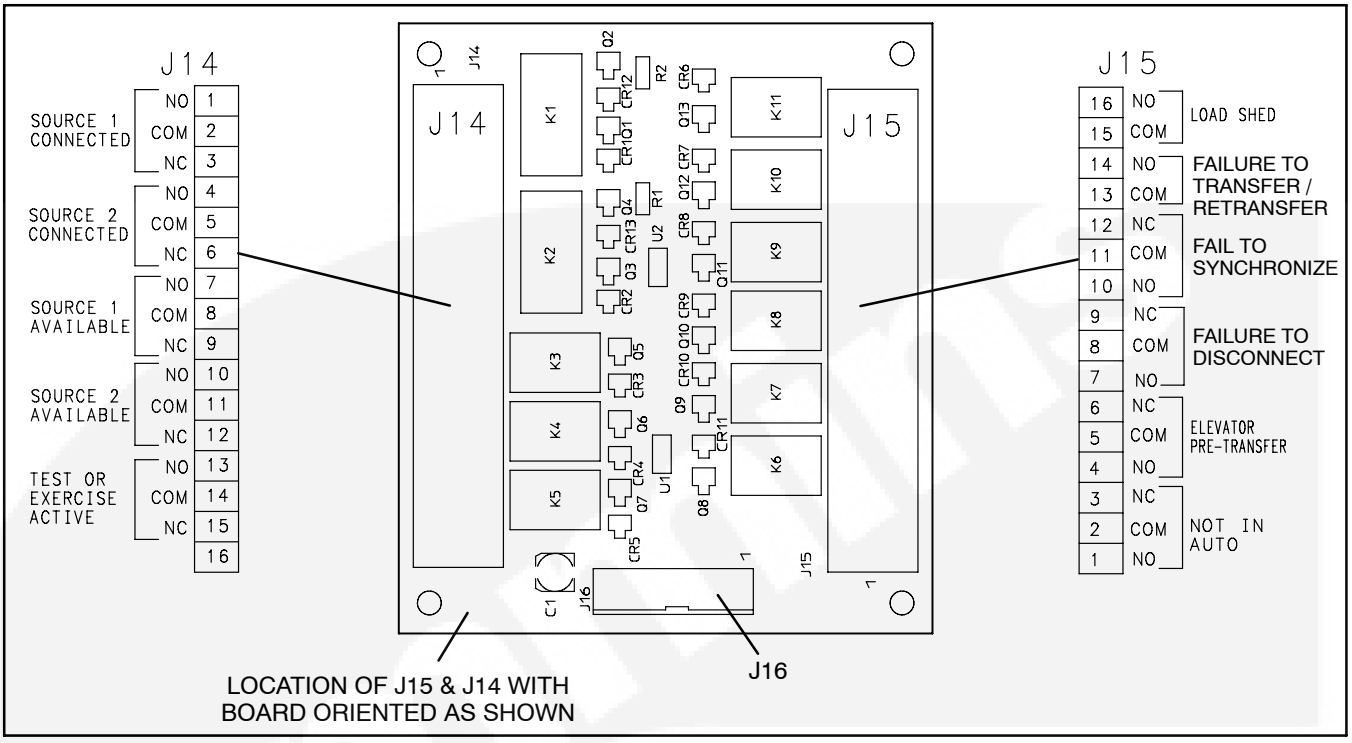


FIGURE 2-52. RELAY MODULE

Load Monitoring Option

Three-phase Level 2 controllers can include a load current and power sensor (Current Module) and current transformers installed on the load lines (see Figure 2-53). The control senses the all the load currents (including 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 seconds) can only be set with the InPower service tool.

⚠CAUTION ***To avoid system faults, false alarms and fault messages, do not remove P40 from the Current Module while the CTs are energized unless the secondaries are shorted. For more information, refer to the Service Manual.***

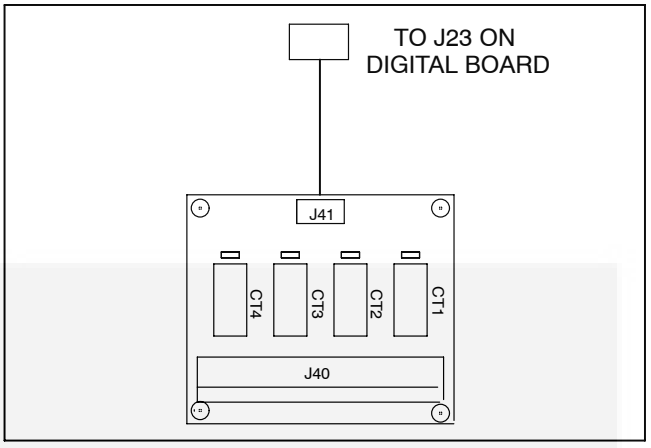


FIGURE 2-53. CURRENT MODULE

The status of the load current module (OK or Not Installed) can be viewed with the digital display (see Figure 2-54). This menu is included in the About submenus (see Figure 4-19).

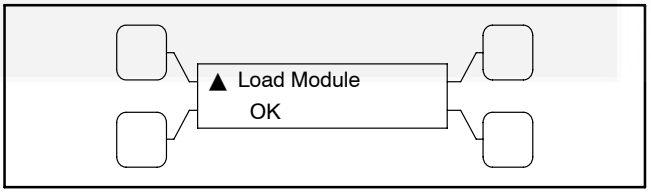


FIGURE 2-54. LOAD CURRENT MODULE STATUS SUBMENU

Network Communications Module Option

The Network Communications Module (NCM) provides a connection to the PowerCommand® network. The module is LonWorks compatible for integration into customer monitoring strategy. Refer to the FT-10 Network Installation and Operation Manual (900–0529) for network details.

With a PowerCommand network interface, B+ from the generator set is brought into the transfer switch by a lead connected from TB2, terminal 3 on the power panel assembly of the transfer switch to J27, pin 21 on the digital module.

The Network Interface Module is only enabled with the PC service tool.

For installations that include an NCM, stranded twisted pair network cable is connected to the left side of terminals 51 and 52 on TB3 (see Figures 2-49, 2-55, and 2-58). The NCM is located on the left side of the digital module (see Figure 2-39).

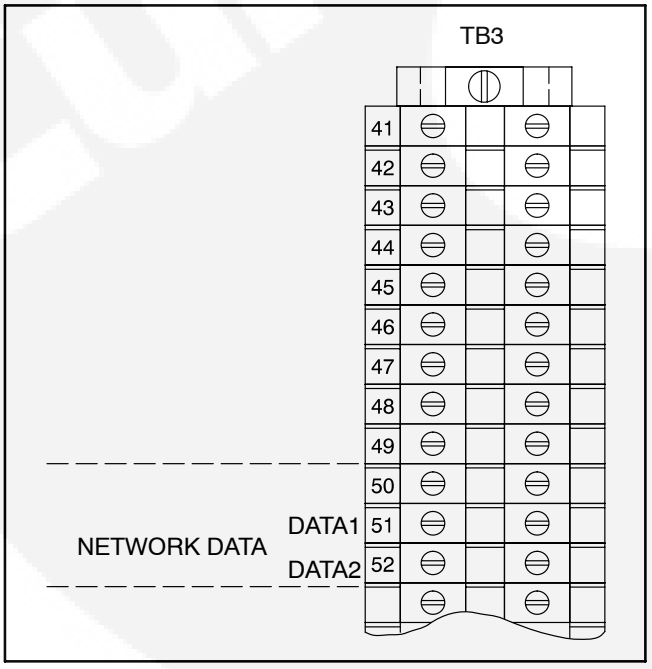


FIGURE 2-55. NETWORK CONNECTIONS

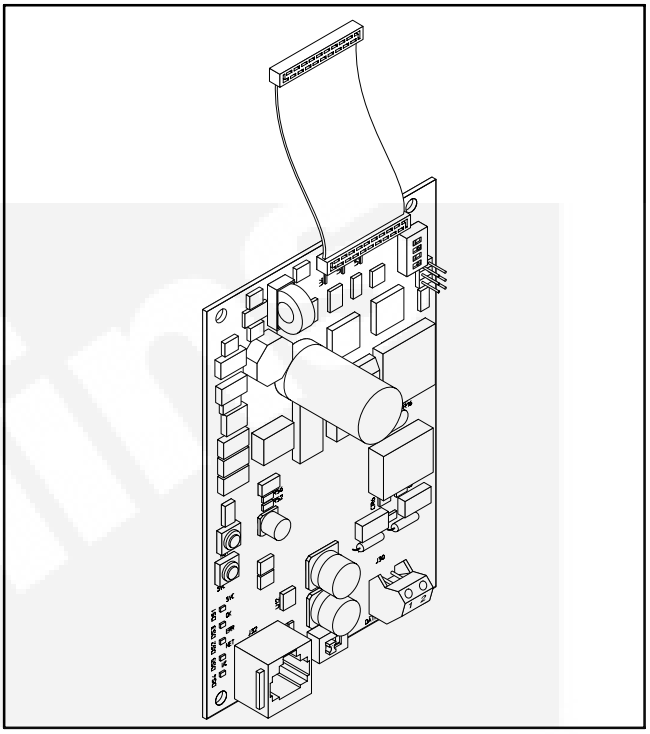


FIGURE 2-56. FIGURE 2-57. NETWORK COMMUNICATIONS MODULE (NCM)

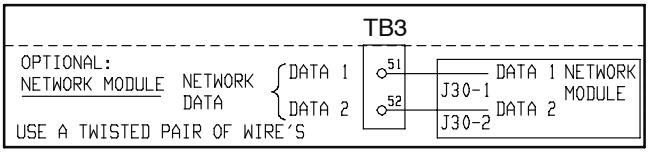


FIGURE 2-58. NETWORK COMMUNICATIONS MODULE CONNECTIONS

The status of the NCM (OK, Not Installed, Not Enabled, or Not Available) can be viewed with the digital display (see Figure 2-59). This menu is included in the About submenus (see Figure 4-19).

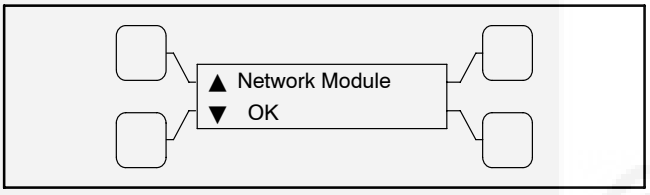


FIGURE 2-59. NETWORK MODULE STATUS SUBMENU

Network Sequencer

When an NCM is installed, controllers can include up to eight timed network variables to use for turning on loads in sequence after a transfer, a retransfer, or both. Each variable can be delayed up to 60 seconds for each of the outputs. 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.

The Sequencer feature allows 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. When used, a few seconds should be allowed between load steps to allow the generator voltage and frequency to stabilize.

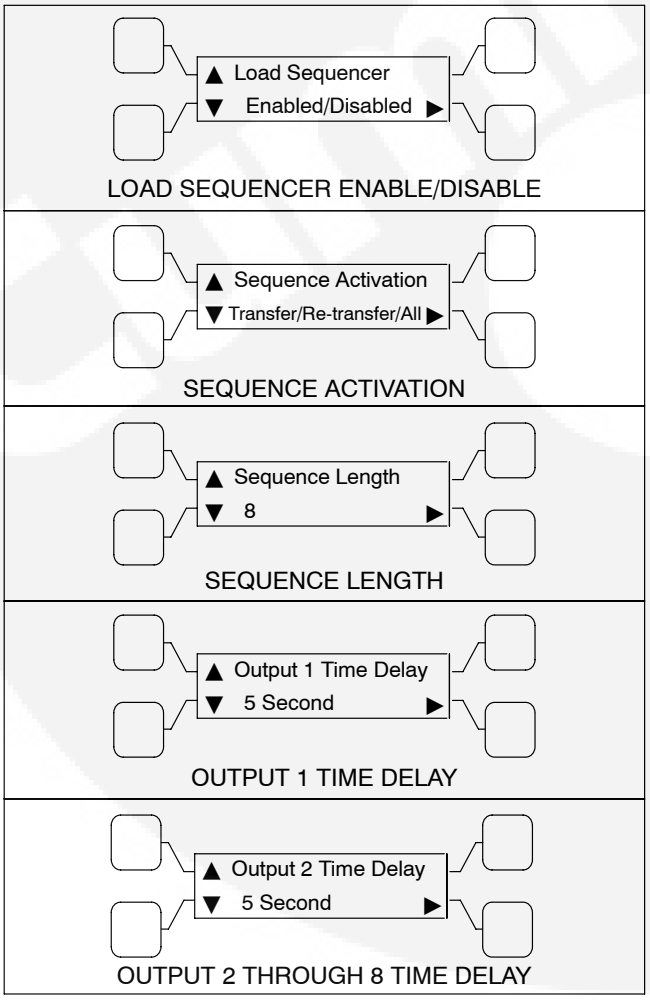


FIGURE 2-60. SEQUENCER SUBMENUS

The Sequencer submenus (see Figure 2-60), available through the digital display, can only be viewed if the NCM is installed and enabled. These menus allow the user to enable/disable the feature, set the operational mode, activate up to eight relay output signals, and set an output time delay from 0 to 60 seconds for each of the outputs. Additional information on how to adjust these values is included in Figure 4-18.

Network System Device Status

If an NCM is installed, the user can view the status of up to 32 LonWorks networked devices through the digital display. The status of networked generator sets, additional ATSs, and the Master Control (if connected) can be viewed. Examples of status menus are shown in Figure 2-61. For additional information on these menus, see Figure 4-20.

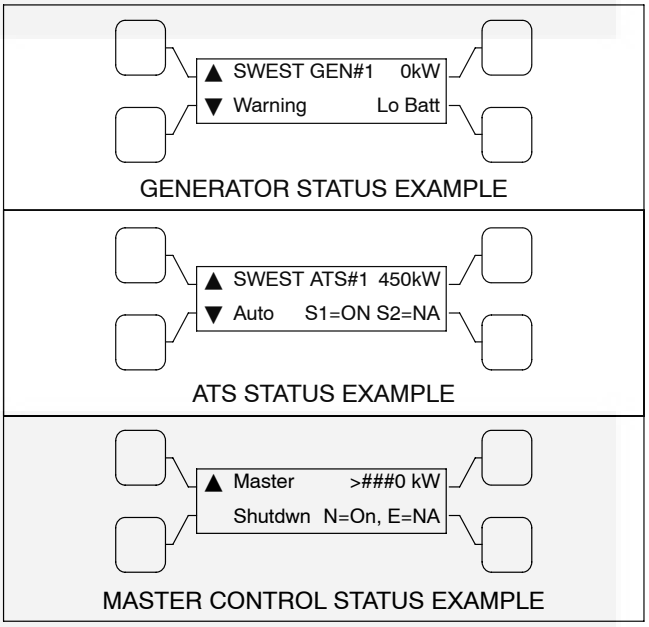


FIGURE 2-61. SYSTEM SUBMENUS

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. Figure 2-62 shows the wiring necessary for the load shed option.

Load Shed is enabled or disabled from the PC service tool or the digital display, if available.

⚠WARNING ***Executing load shedding on transfer switches that are not designed for this option can result in severe personal injury, and equipment or property damage. Load Shedding can only be executed in Transfer Switches capable of Programmed Transition because the Source 1 and Source 2 contacts can be positioned in the Neutral Position. Typically, Open Transition Transfer Switches with Sync Check do not have a Neutral Position for their contacts and must not be used to execute Load Shedding.***

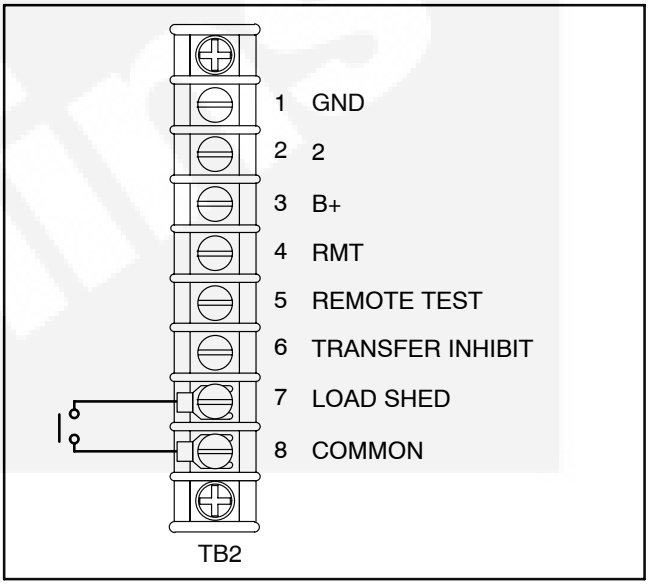


FIGURE 2-62. LOAD SHED TB2 CONNECTION

THIS PAGE LEFT INTENTIONALLY BLANK

3. Operation

AUTOMATIC OPERATION

Place control switches in the positions given below.

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

For utility-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 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. Verify that the generator switch is in the OFF position.
2. Verify that the transfer switch is not under load.
3. For Type 3R and 12 cabinets, open the transfer switch outer door.
4. Move the circuit breaker handle to the Off position.

   NOTE: The circuit breakers include a trip button which can be pressed instead of moving the handle to the Off position.

5. Remove power to the control by disconnecting the J1 connector (see Figures 2-39 through 2-42).
6. **Transfer - from the utility (Normal) to the generator set (Emergency):**

   a. Pull the upper manual operator handle down.

   b. Push the lower manual operator handle down.

Retransfer - from the generator set (Emergency) to the utility (Normal):

a. Pull the lower manual operator handle up.

b. Push the upper manual operator handle up.

NOTE: Remember that the transfer switch transfers the load to the active power source. (If both power sources are available, it transfers the load to the utility.)

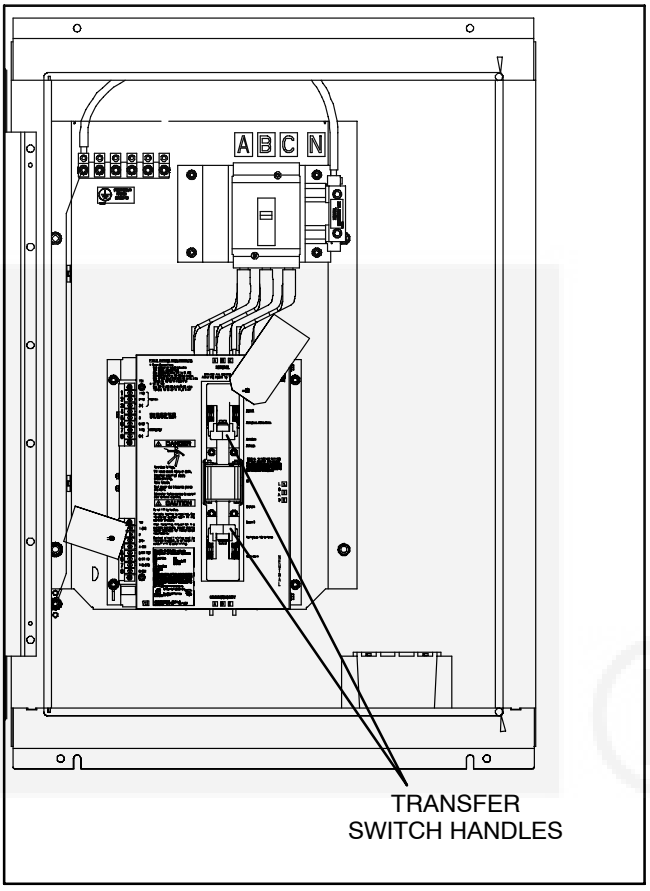


FIGURE 3-1. MANUAL OPERATION, 40–1000 AMP SWITCHES

⚠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.***

7. To return to automatic operation, restore power to the control by reconnecting the J1 connector.

8. Move the circuit breaker handle to the On position.

   NOTE: If the trip button was pressed in step 4, the circuit breaker handle must first be moved to the Off position and then moved to the On position.

9. For Type 3R and 12 cabinets, close the cabinet outer door.

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 (when available) can be used to set exercise parameters, as shown in *Section 4*.

GENERATOR SET MANUAL START TEST

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 cools down and stops.

4. Reset the Test With/Without Load variable to the desired value for regularly scheduled generator set 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. To bypass the transfer time delay and cause a faster load transfer, press the Override switch. 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 a faster 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 generator set 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 (962-0523). 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 trained and experienced personnel, according to procedures in the Service Manual (962-0523).***

⚠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 generator set 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, contact your dealer or distributor.

   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 (962-0523). 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 every two years (see Figures 3-2 and 3-3). Figures 2-39 through 2-42 show where the Digital Module is located on the transfer switch.

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.

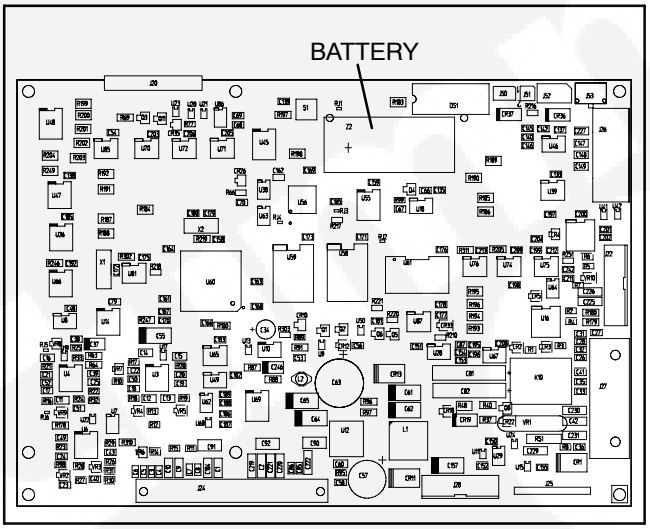


FIGURE 3-2. LEVEL 1 DIGITAL MODULE

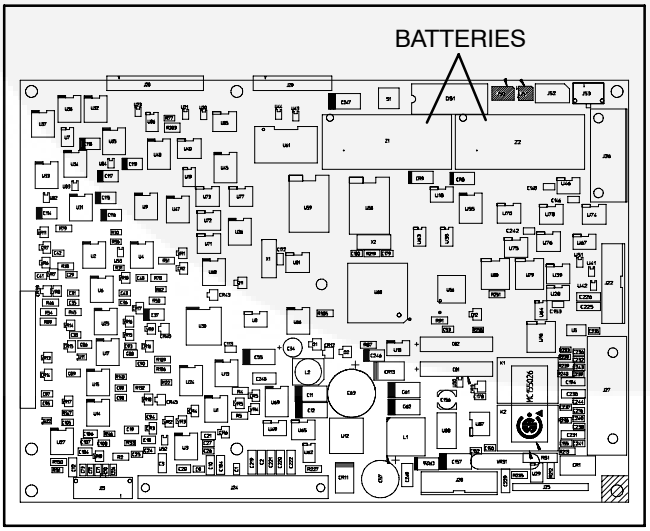


FIGURE 3-3. LEVEL 2 DIGITAL MODULE

CIRCUIT BREAKER PLANNED MAINTENANCE

NOTE: The following information is used with permission from Schneider Electric (see the footnote at the bottom of the page).

Inspection and Preventative Maintenance

Molded case circuit breakers normally require very little maintenance. The Company recommends that inspection procedures be performed on a regular basis. Inspection frequency depends on operating and environmental conditions associated with the application. Visual inspections as indicated in steps 1, 2, 4, and 7 under “Procedures” can be performed any time electrical workers or maintenance personnel are in the vicinity of the electrical equipment. Other inspections can be done during normal maintenance intervals. It is recommended that the circuit breaker mechanism be exercised annually as explained in step 5. Inspection and maintenance may be required more frequently if adverse operating or environmental conditions exist.

Guidelines

The molded case of a Square D molded case circuit breaker should not be opened. Opening the case or disassembling the circuit breaker voids the manufacturer’s warranty and compromises the integrity of the device. Opened or otherwise inoperable circuit breakers should be destroyed or returned to the Company to prevent them from being returned to service. Removal of auxiliary or accessory covers does not constitute opening the molded case.

Procedures

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Take precautions to ensure that no accidental contact is made with live components during this check.

Failure to follow this instruction will result in death or serious injury.

1. Verify circuit breaker application and rating.

   Make sure that the circuit breaker is properly applied within labeled voltage, ampere rating, maximum current interrupting ratings and to Company recommendations. Compare the circuit breaker faceplate data to the installation drawings. Verify trip unit settings on Micrologic® electronic-trip circuit breakers with the coordination study. After completing inspection and maintenance procedures, insure that all trip unit settings for all functions are set according to the coordination study.

2. Check for overheating while equipment is energized.

   While the circuit breaker is normally operating, under load and at operating temperature, check the exposed, accessible, insulated face of the circuit breaker and adjacent dead front surfaces of the enclosure for overheating. To do this, place the palm of you hand on the outside of the enclosure. If you cannot maintain a three-second contact with the circuit breaker face, the cause should be investigated.

   Allow initially energized circuit breaker at least three hours to reach operating temperate. Compare the surface temperature of individual circuit breakers with the surface temperature of other circuit breakers in the installation. Circuit breaker surface temperatures vary according to loading, position in the panelboard and ambient temperature. If the surface temperature of a circuit breaker is considerably higher than adjacent circuit breakers, the cause should be investigated.

   Thermographic inspection methods may also be used to evaluate overheating with equipment energized (see “Thermographic Inspection” on page 3-7).

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Disconnect all power sources before performing steps 3 through 7. Assume that all circuits are live until they are completely de–energized, tested, grounded and tagged. Consider all sources of power, including the possibility of backfeeding and control power.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.Failure to follow these precautions will result in serious injury or death.

Failure to follow this instruction will result in death or serious injury.

3. Check for overheating while the equipment is de-energized.

   Visually inspect electrical components for discoloration. This may indicate overheating. If there is no evidence of overheating or loose connections, do not disturb or retorque connections.

   Copper Connections:

   If evidence of overheating is found on terminals, connectors, conductors or conductor insulation, clean and dress all affected connections and bus bars to NEMA Standards Publication AB4.

   Aluminum Connections:

   Overheated aluminum connectors must be replaced and damaged portions of the

conductor removed. If the conductor is not long enough to properly terminate the circuit breaker when the damaged portion is removed, make an appropriate splice using a new length of rated conductor.

I-Line® Panelboard Connections:

If the I-Line panelboard jaw connections are pitted, discolored or deformed, the circuit breaker must be replaced. I-Line jaws are gauged and tested during the manufacturing process. They are not field replaceable. Do not bend or adjust them.

If electrical joint compound is removed from I-Line connections, it must be reapplied before reinstallation of the circuit breaker(s). This compound is necessary to ensure the integrity of the connection. I-Line panelboard connections require Square D PJC-7201 joint compound.

Drawout Connections:

If the electrical joint compound is removed from drawout connections, it must be reapplied before reinstallation of the circuit breakers. This compound is necessary to ensure the integrity of the connection. Drawout connections for SE circuit breakers require Square D PJC-8311 joint compound. Drawout connections for Masterpact® NW circuit breakers require S48899 grease.

After cleaning and/or replacing damaged parts, torque all connections to values specified by Square D. Refer to Square D Class 601 and Class 602 catalogs for additional information regarding torque values.

4. Check for cracks in the molded case.

   Any circuit breaker with a cracked molded case should be replaced because its ability to withstand short-circuit interruption stresses is reduced.

5. Exercise circuit breaker mechanism.

   Toggle the circuit breaker handle on and off several times to ensure that mechanical linkages are free. Trip the circuit breaker with the push-to-trip button. Reset and turn the circuit breaker back on. Repeat to ensure operability. If the circuit breaker does not trip, or if it does not reset after tripping, it must be replaced.

6. Clean the circuit breaker.

   Remove any buildup of dust, dirt, grease or moisture from circuit breaker surfaces with a lint-free dry cloth or vacuum cleaner. Do not use compressed air. Use caution when using detergent-based cleaners or solvents: these may deteriorate faceplate, labels, and insulation materials. Clean contact surfaces of circuit breaker terminals and terminal pads or bus bars with a nonabrasive cleaner. Abrasive cleaners will remove plating, resulting in joint deterioration.

   If electrical joint compound is removed from I-Line or drawout connections, Square D PJC-7201 or PJC-8311 joint compound, respectively, must be reapplied before reinstalling the circuit breakers. This compound is necessary to ensure the integrity of the connection.

7. Inspect the enclosure.

   The enclosure should be clean and dry. All covers and trip pieces should be in place.

Thermographic Inspection

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Only qualified electrical workers with training and experience on low-voltage circuits should perform thermographic inspections. These workers must understand the hazards involved in working with or near low-voltage equipment. Perform such work only after reading this complete set of instructions.

Failure to follow this instruction will result in death or serious injury.

Infrared thermographic inspection techniques may be useful in evaluating the operating condition of circuit breakers and terminations. Comparison to stored infrared thermographic images may be useful for the preventive maintenance of circuit breakers and end-use equipment. The actual amount of heat emitted is a function of both load current and ambient conditions. Interpretation of infrared survey requires experience and training in this type of inspection.

Allow initially energized circuit breakers at least three hours to reach operating temperature. Compare the thermographic images of individual circuit breakers to previously stored images of the same circuit breakers.

THIS PAGE LEFT INTENTIONALLY BLANK

4. Digital Display Menu System

This section describes the Digital Display Menu System and navigation through the menus. The menus display status information, events, and set-up 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 2-39 through 2-42). The system menus can also be accessed with the PC 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. Refer to Figure 4-1.

MAIN MENUS

The main menu system consists of three top-level menus that list vertical menus (or submenus). The submenus display status information. This information cannot be changed in the main menus. The main menus contain eight submenus including the Setup Menus.

PASSWORD AND 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 menus is described in Figure 4-7 and 4-8.

NAVIGATION

Refer to Figure 4-22 at the end of this section for an overview of menu navigation. This illustration can also be used to locate a submenu and determine how to access it.

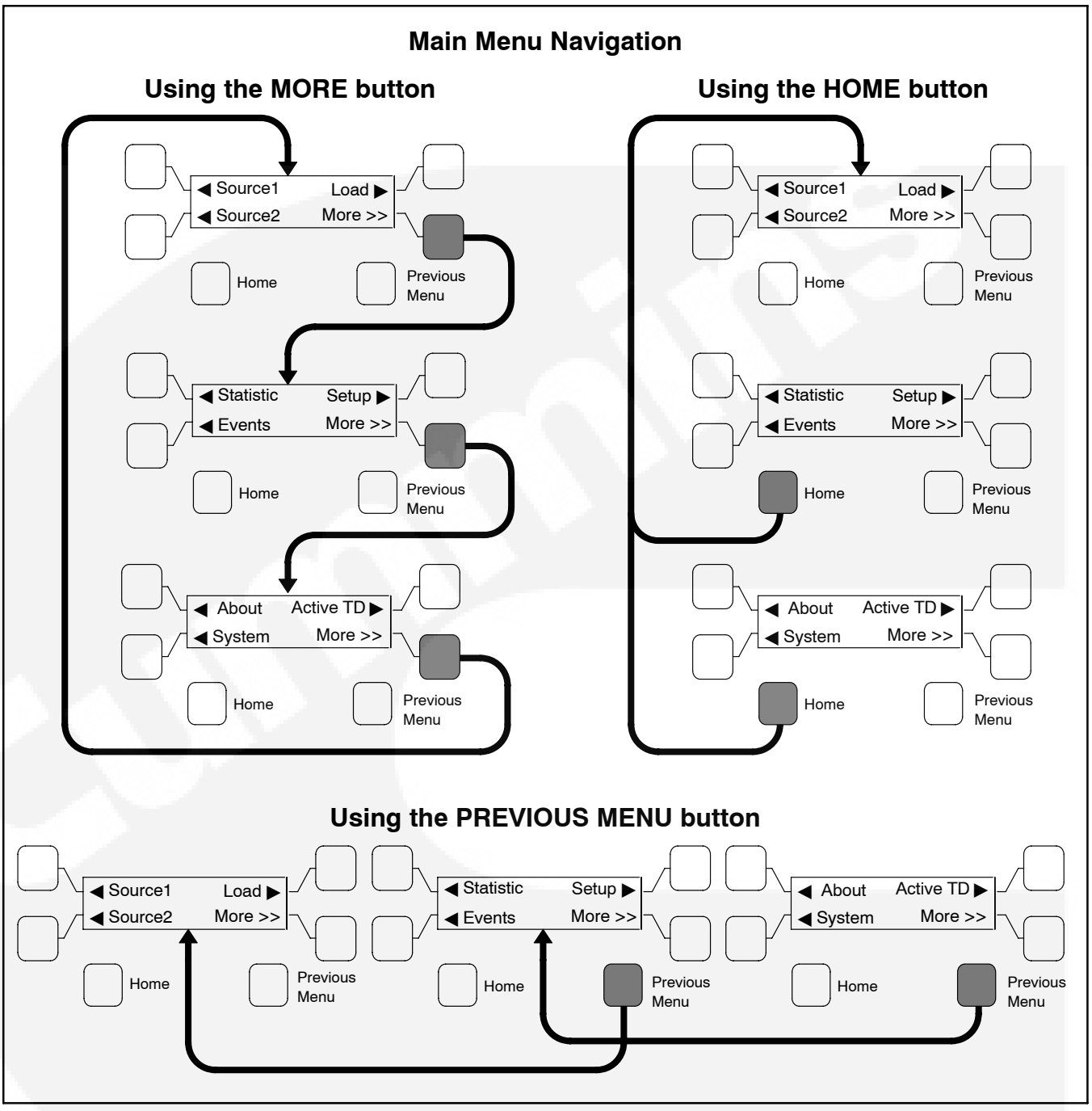
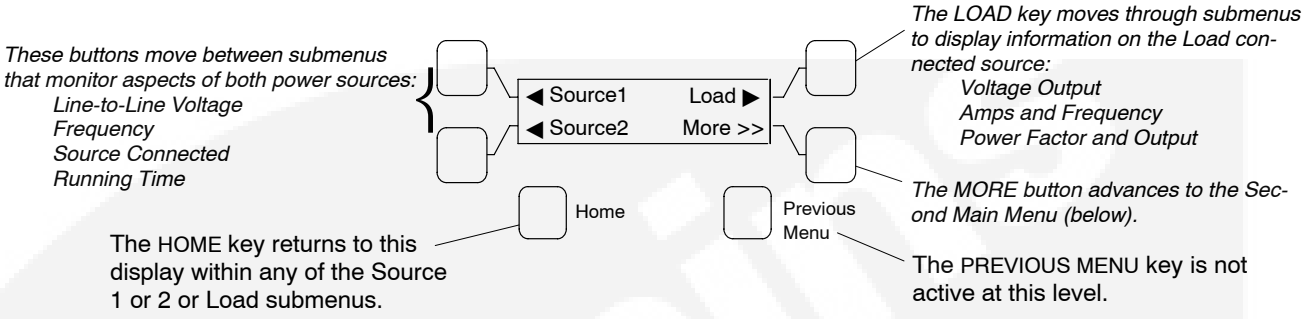


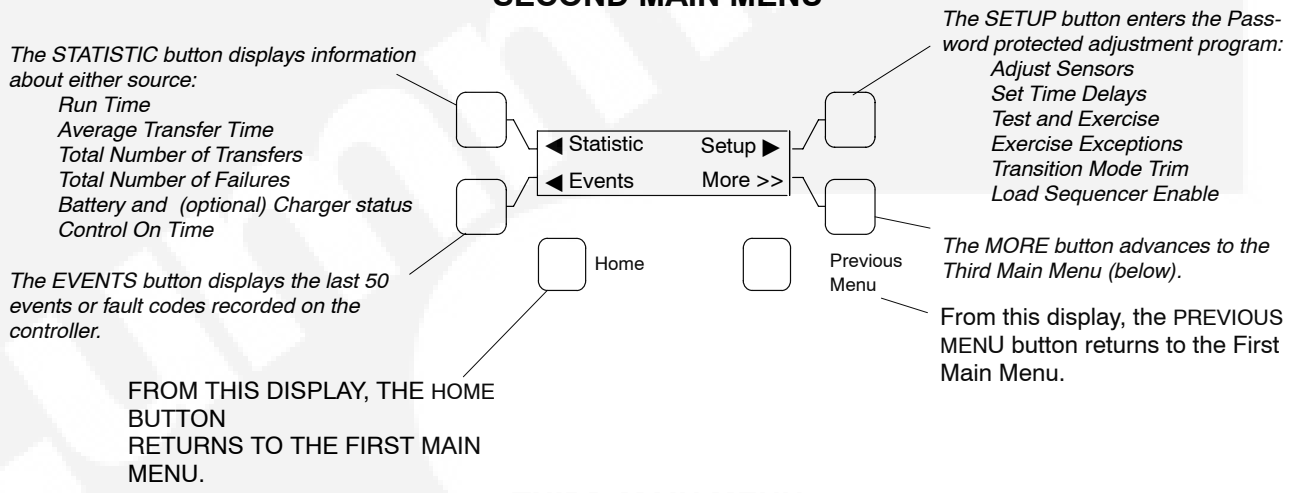
FIGURE 4-1. NAVIGATION

MAIN MENU DESCRIPTIONS

FIRST MAIN MENU



SECOND MAIN MENU



THIRD MAIN MENU

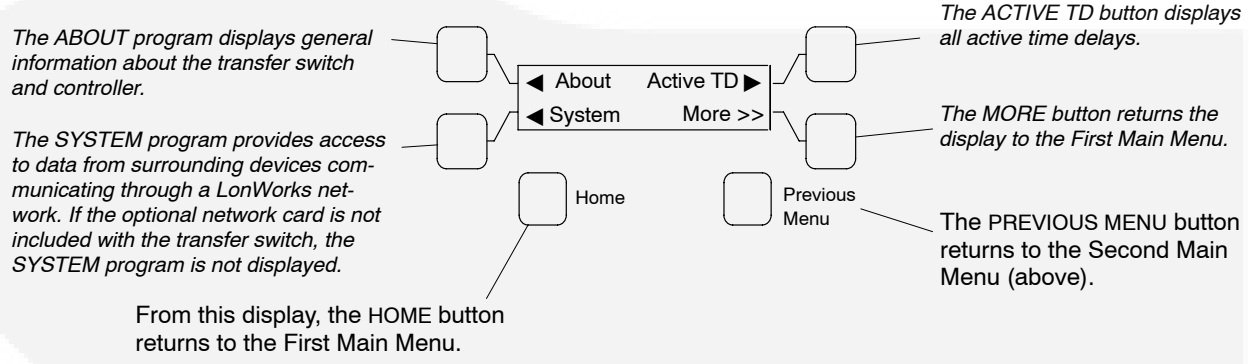


FIGURE 4-2. MAIN MENUS

FIRST MAIN MENU – Source 1 and Source 2 Submenus

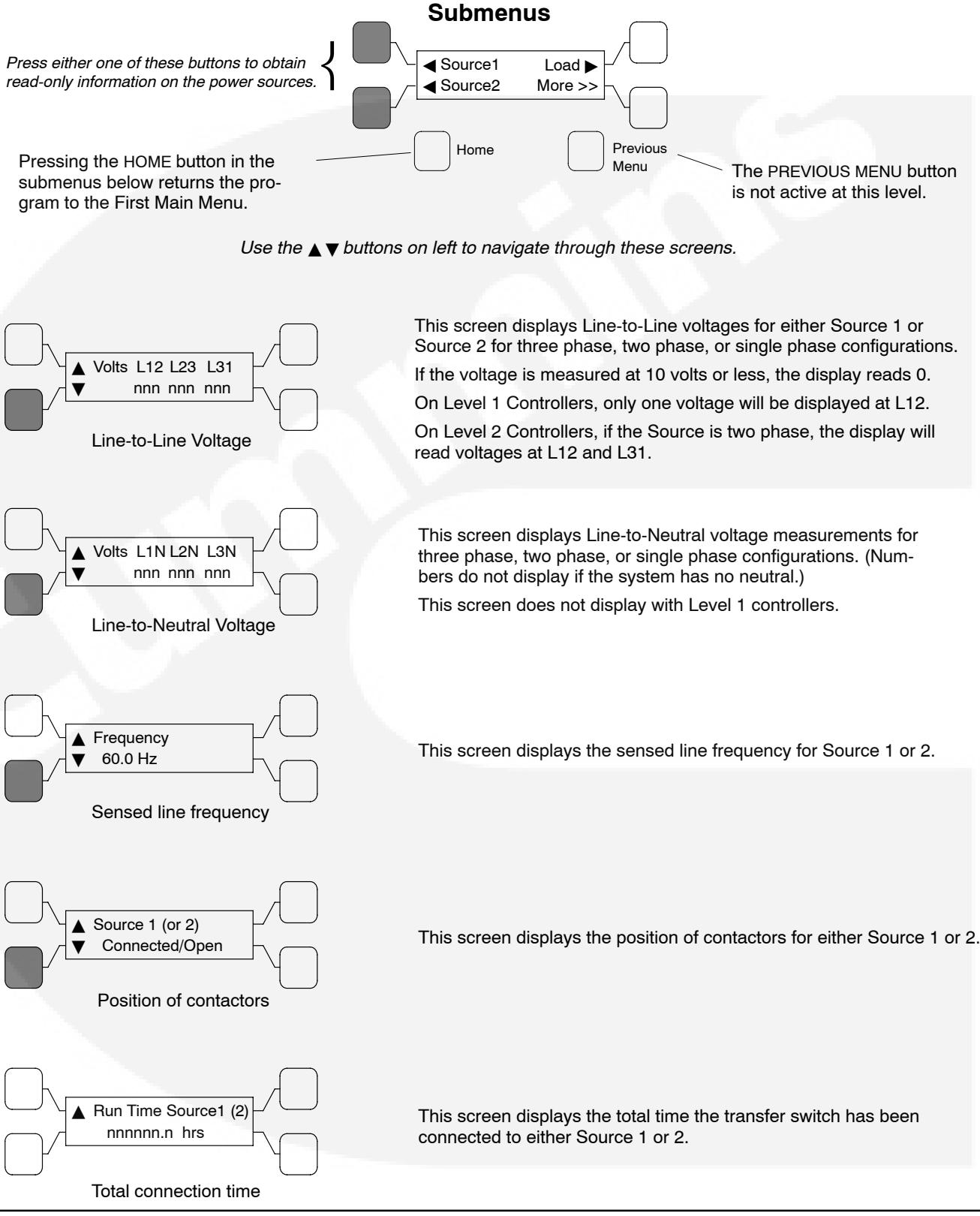
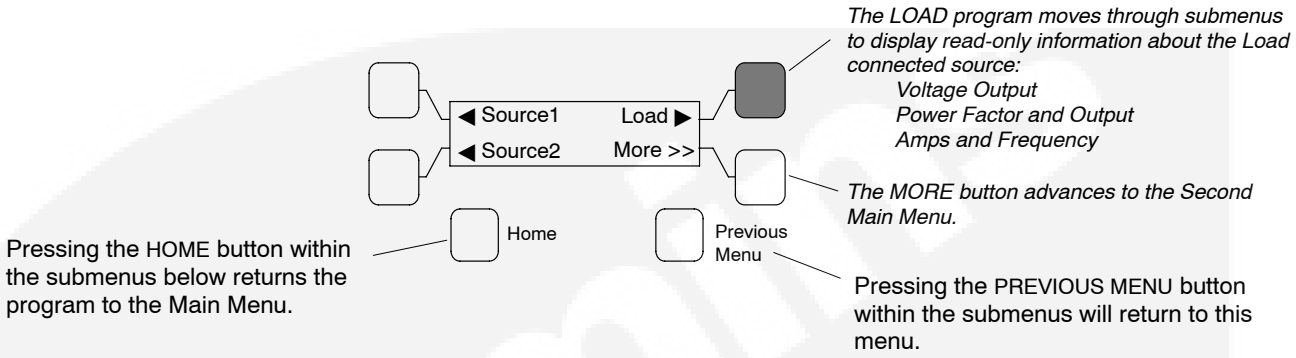


FIGURE 4-3. SOURCE 1 AND 2 SUBMENUS

FIRST MAIN MENU – Load Submenus

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



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

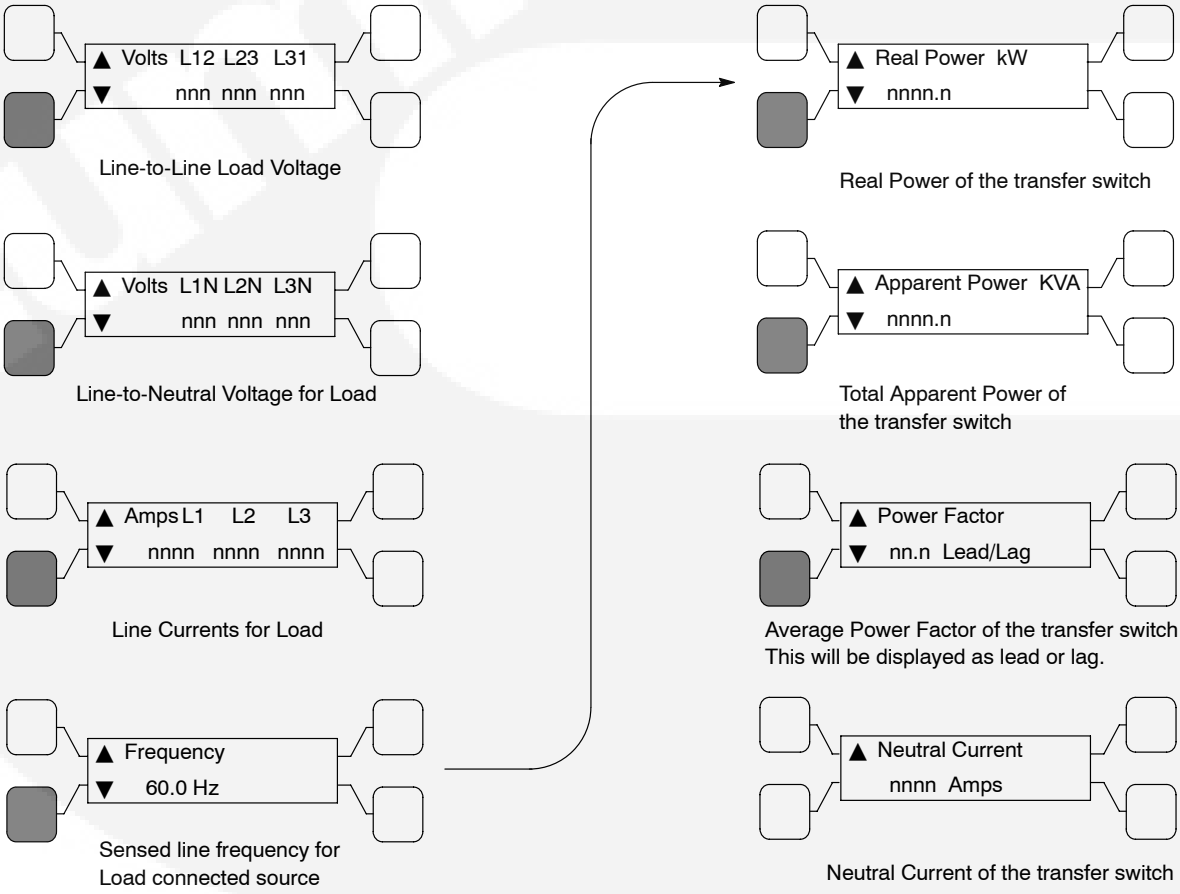
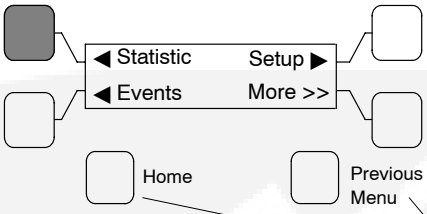


FIGURE 4-4. LOAD SUBMENUS

SECOND MAIN MENU – Statistics Submenus

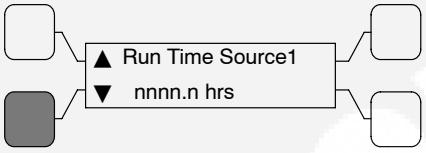
The STATISTICS program displays read-only information about either source:

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

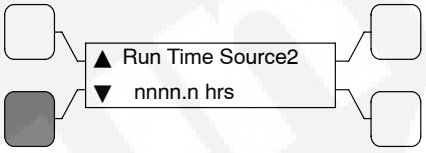


From this display, the PREVIOUS MENU and HOME buttons return the program to the First Main Menu.

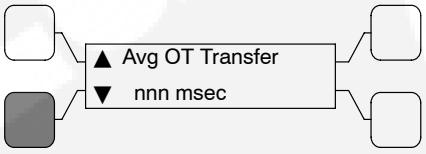
Use the ▲▼ buttons on left to navigate through these screens.



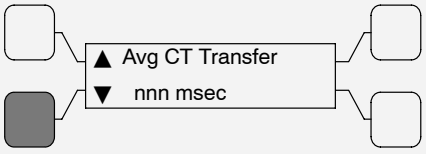
Total time the transfer switch has been connected to Source 1



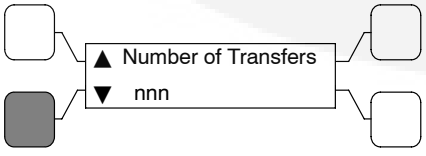
Total time the transfer switch has been connected to Source 2



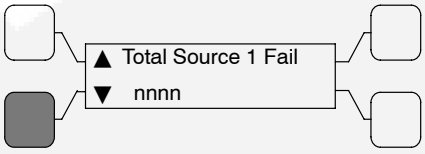
Average time over the last four transfers between the start of the command to move the switch from the old source (OT) and the position sensor sensing that the movement was completed.



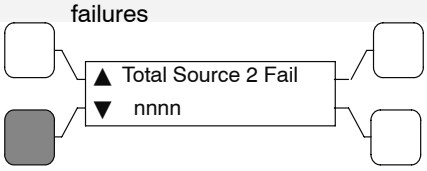
Average time over the last four transfers between the start of the command to close the new switch (CT) and the position sensor sensing that the movement was completed. NOTE: This function is not available with service entrance transfer switches.



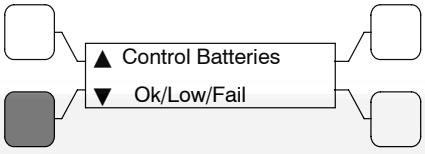
Total number of switch transfers in both directions.



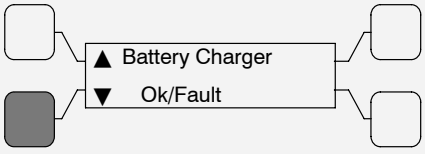
Total number of Source 1 failures



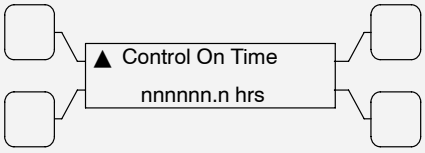
Total number of Source 2 failures (includes under-voltage, over-voltage, over/under frequency)



Status of lithium batteries on controller board



Status of optional generator battery charger



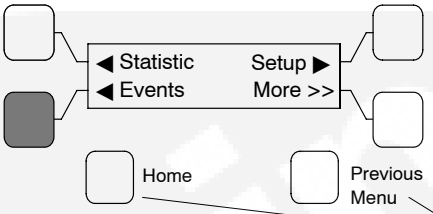
Displays the amount of time the controller board has been operating since initialization. Value is stored permanently.

FIGURE 4-5. STATISTICS SUBMENUS

SECOND MAIN MENU – Events Submenus

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 submenus, 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.

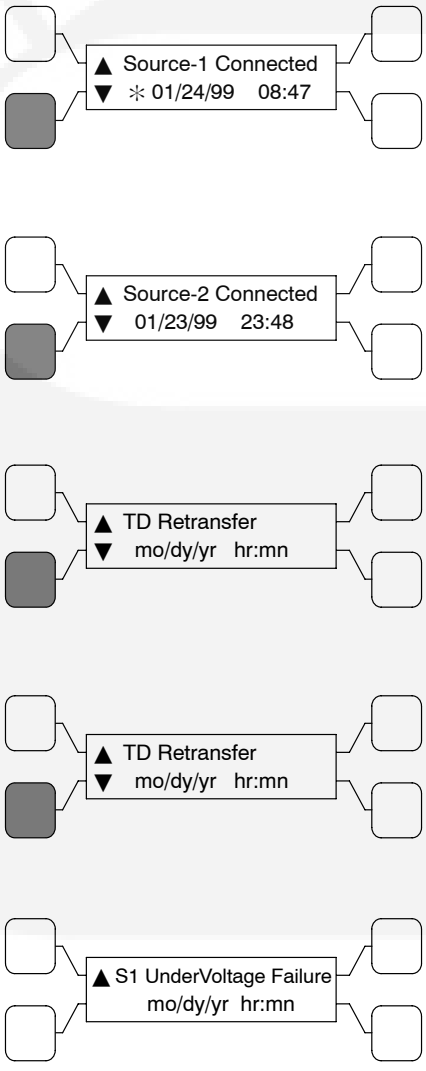


FIGURE 4-6. EVENTS SUBMENUS

SECOND MAIN MENU – Setup Submenus

Password

The SETUP button enters the Password protected adjustment programs to:

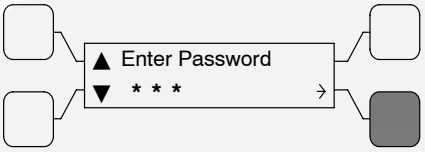
Adjust Sensors
Set Time Delays
Test and Exercise
Exercise Exceptions
Transition Mode Trim
Load Sequencer Enable

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

The MORE button advances to the Third Main Menu.

Entering the Password Program

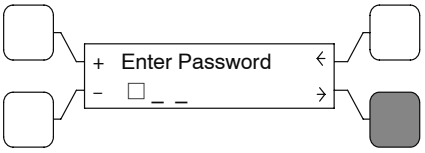
Press the Setup button to access the setup password menu.



The password is 574.

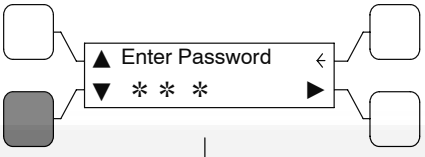
Use the + and – buttons to select numbers.

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



NOTE: Except for the "View/Edit Exercise" and "View/Edit Exception" submenus available starting with software version 1.13.244, entering the password is required to change setup parameters. The remaining 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.

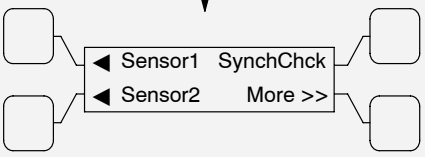
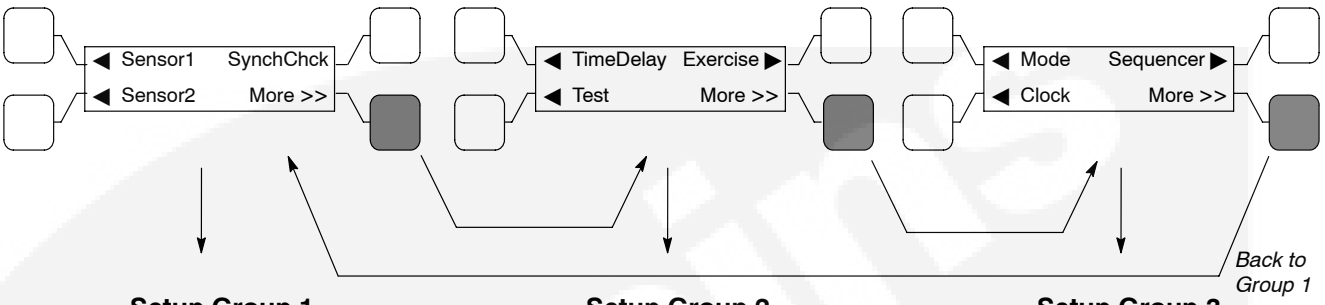


FIGURE 4-7. PASSWORD SUBMENUS

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 Submenus* are used for setting the:

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

See Figure 4-10 for Sensor Submenus.

The *SynchChck* sensor submenus allow programming synchronous conditions for Source 1 and Source 2 that must be met before transferring from one to the other source. See Figure 4-11 for Sync Check submenus.

Setup Group 2

The *Time Delay* submenus 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

Refer to 4-12 for Time Delay submenus.

Test submenus allow programming the front panel test switch to test the source with or without a load.

Exerciser submenus allows programming an exercise routine for Power Source 2 and are available only on utility-to-genset controls. The number of exercise programs that can be set is dependent upon the software version installed and the type of control. See Figure 4-14 for Exercise submenus. *Exercise* submenus also allow for adding and deleting exercise exceptions. See Figure 4-15 for Exercise Exceptions submenus. Up to 8 routines and exceptions can be programmed using the PC service tool.

Setup Group 3

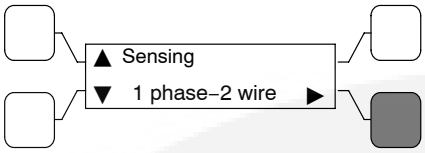
The *Mode* submenu allows programming the type of transition the switch uses. See Figure 4-16.

The *Clock* submenus program the time and date, as well as daylight savings time. See Figure 4-17.

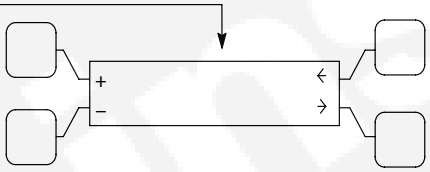
Load *Sequencer* is a software feature, available only with LonWorks Network Communication Module. This program allows the user to send a predetermined sequence of event announcements in a timed, sequential order to turn the load off and on. See FIgure 4-18.

FIGURE 4-8. SETUP DESCRIPTION

Changing Setup Parameters



When this button is pressed within any submenu, 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 it's 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 submenus will invoke a SAVE CHANGES/CANCEL CHANGES screen when exiting the Setup Submenu 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 CHANGES/CANCEL CHANGES screen is invoked.

Saving or Canceling Setup Parameters

Changing any data within the setup submenus invoke this screen when exiting the Setup Submenu Groups.

Use the "Cancel changes" button to delete any setup parameter changes that were made during the current session. The program will revert to it's original data.

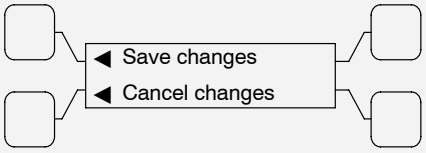
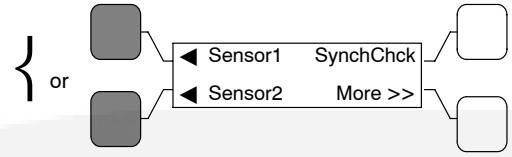


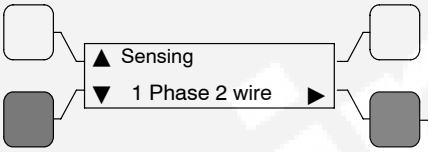
FIGURE 4-9. CHANGING SETUP PARAMETERS

Setup – *Group 1*
Sensor 1 and Sensor 2 Submenus



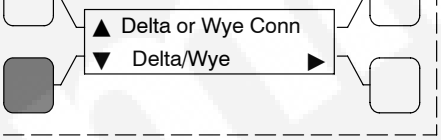
Sensor 1 and Sensor 2 submenus are identical except:

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.
See Note 2.

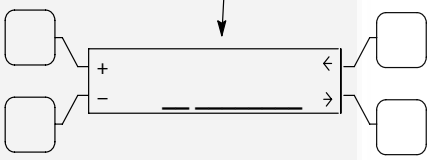
Level 2 Controllers Only



Delta or Wye Configuration. This menu is only displayed with Level 2 Controllers.

Chose Delta or Wye (Wye).

When this button is pressed in any submenu, 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.

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 submenus will invoke a SAVE CHANGES/CANCEL CHANGES screen when exiting the Setup Submenu Groups.

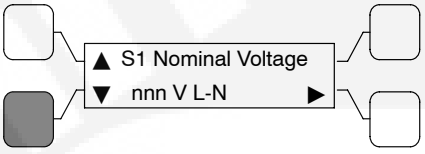
If the PREVIOUS MENU button is pressed during an editing session, the data will not be changed.

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

System Voltage for Source 1 or 2

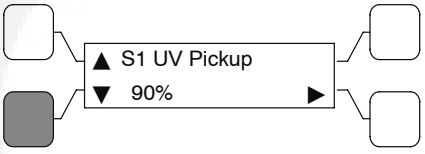
Enter the system voltage between 110 and 600 VAC.

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



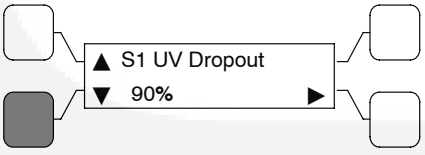
Under-Voltage Sensor Pick-Up

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



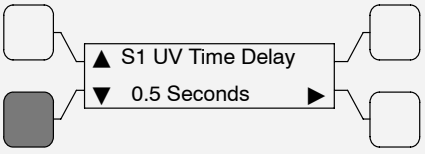
Under-Voltage Sensor Drop-Out Voltage

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



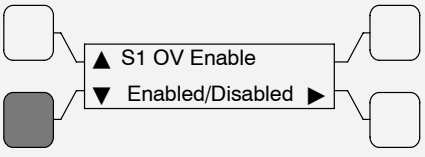
Under-Voltage Drop-Out Time Delay

Enter an time between 0.0 and 4.0 seconds (0.5 seconds).



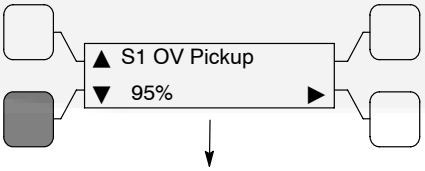
Over-Voltage Sensing Enable

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%).



Continued on next page

Note 1: Default values are in parenthesis.

Note 2: Not all sensing choices are valid for for all combinations of Level 1/Level 2 and Source 1/Source 2 transfer switches. Only the valid choices are displayed.

FIGURE 4-10. SETUP GROUP 1 – SENSOR SUBMENUS

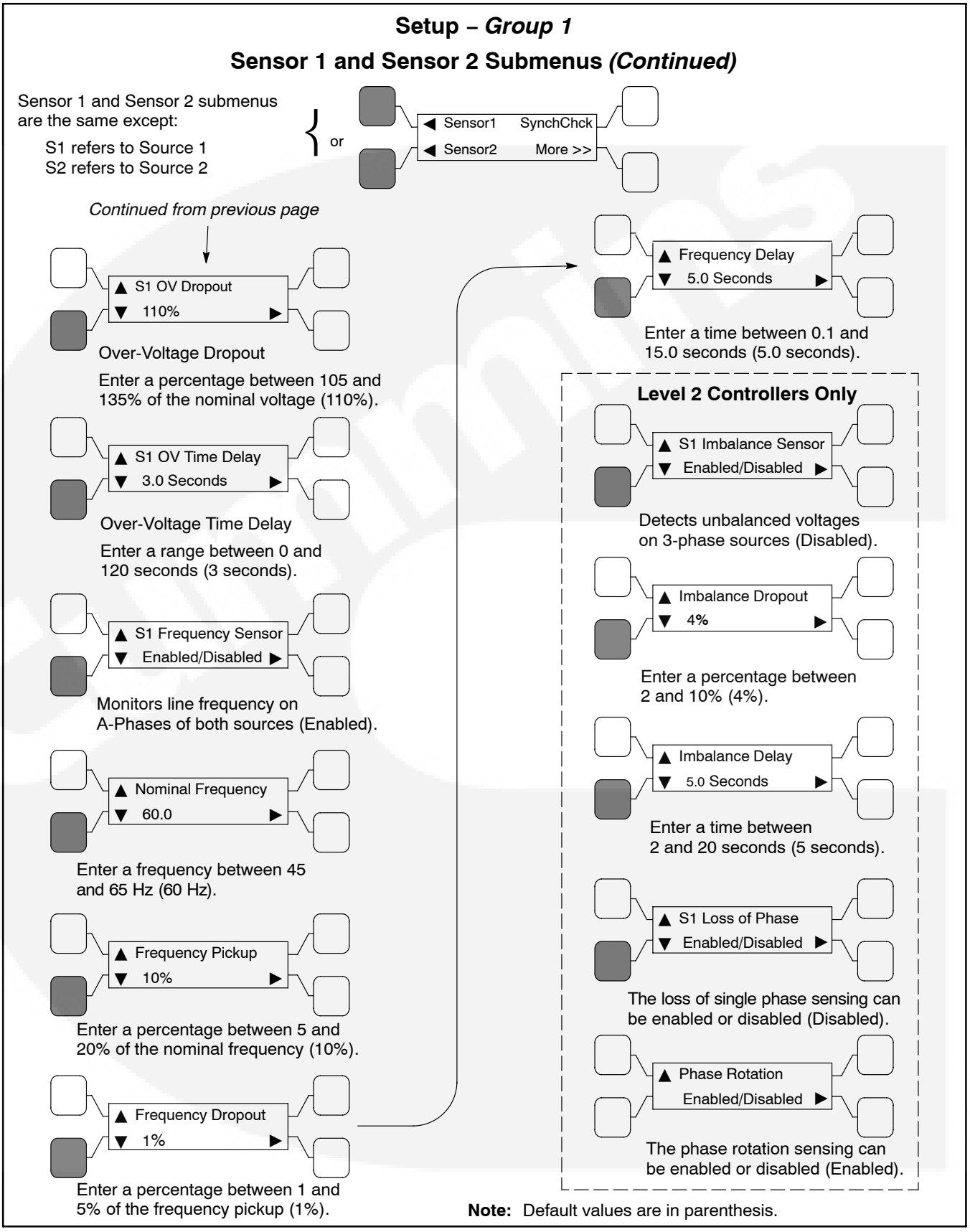
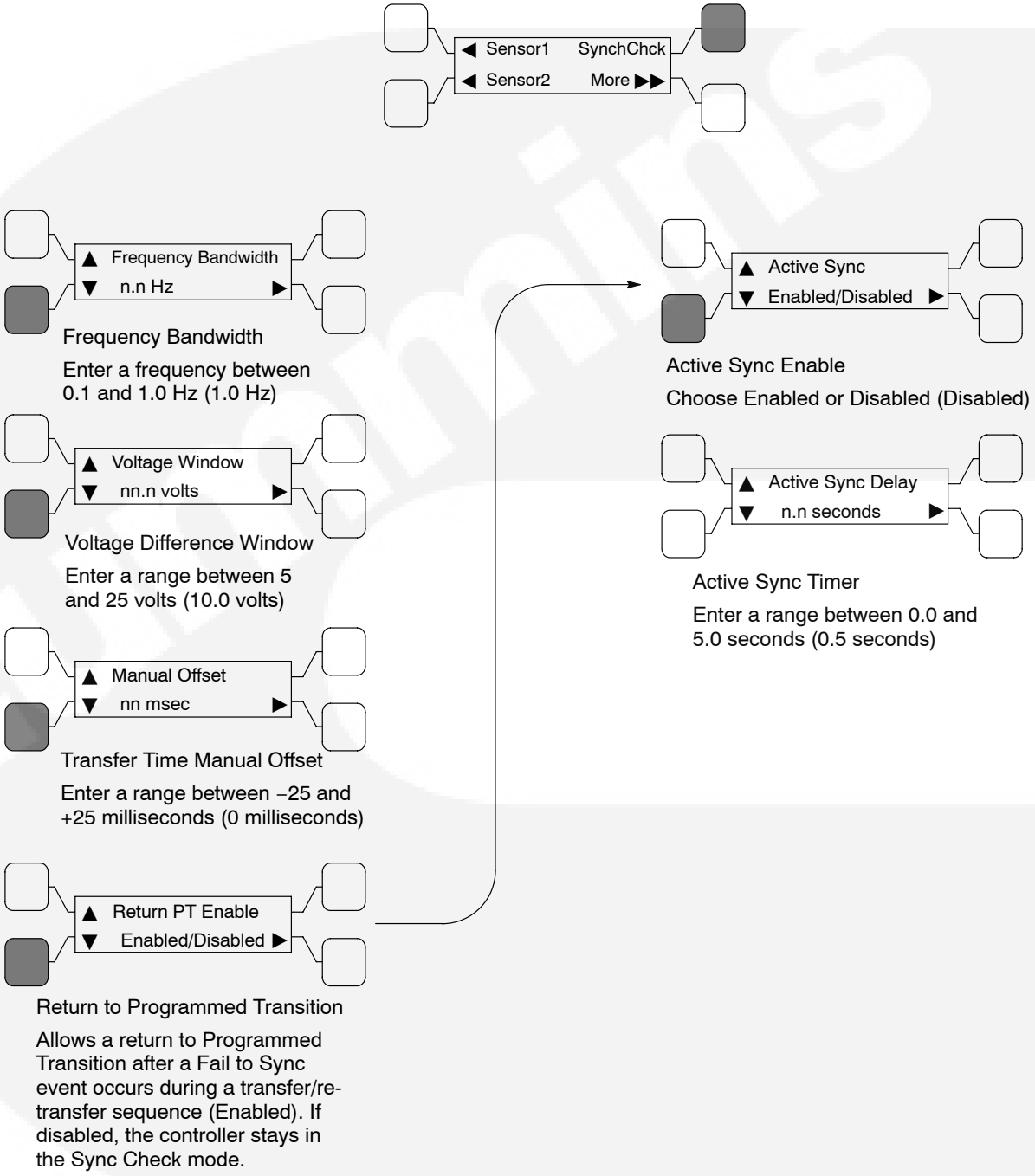


FIGURE 4-10. SETUP GROUP 1 – SENSOR SUBMENUS (CONTINUED)

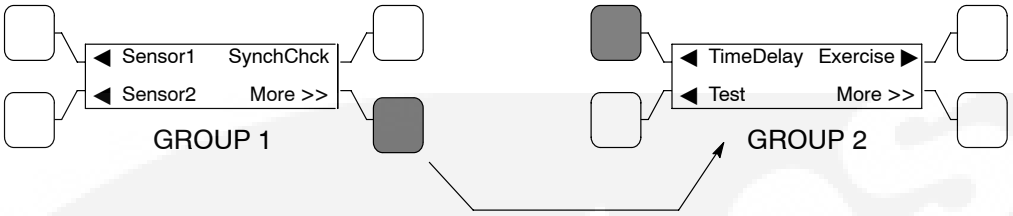
Setup – *Group 1*
Sync Check Submenus



Note: Default values are in parenthesis.

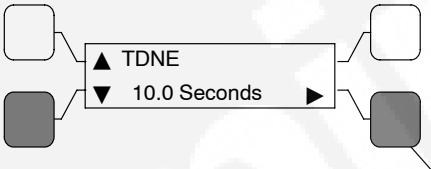
FIGURE 4-11. SYNC CHECK SUBMENUS

Setup – *Group 2*
Time Delay Submenus



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

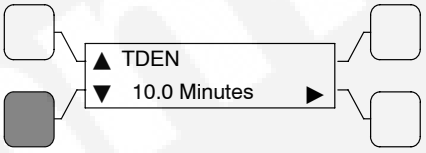
Enter a time from 0 to 120 seconds (10 seconds). See Note 2.

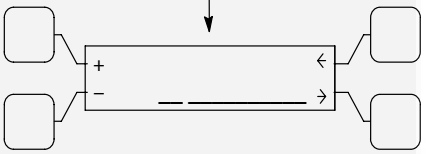


When this button is pressed in any submenu, a cursor appears in the location of the editable field. In most cases, there is only one field to edit.

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

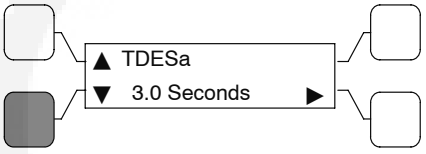
Enter a time from 0 to 30 minutes (10 minutes).





Sets the time delay for Engine Start on generator set (a) used in a utility-generator mode. Prevents nuisance generator set starting during brief power interruptions.

Enter a range from 0 to 15 (Level 1 controls or 0 to 120 (Level 2 controls) seconds (3.0 seconds). See Notes 2 and 3.



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

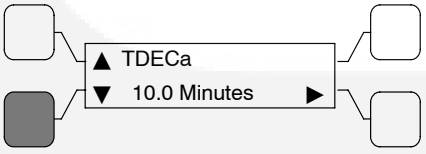
Default values are shown in parenthesis.

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.

Sets the time delay for Engine Cool-down following a re-transfer.

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

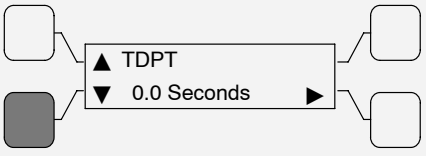


If changes are made, press the ⇢ button to enter the new value and return to the previous menu.

Changing any data within the setup submenus will invoke a SAVE CHANGES/CANCEL CHANGES screen when exiting the Setup Submenu Groups.

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

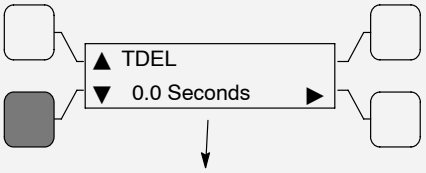
Enter a time from 0 to 60 seconds (0 seconds). See Note 2.



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

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

Enter a time from 0 to 60 seconds (0 seconds). See Note 2.



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

Continued on next page

Note 1: Default values are in parenthesis.

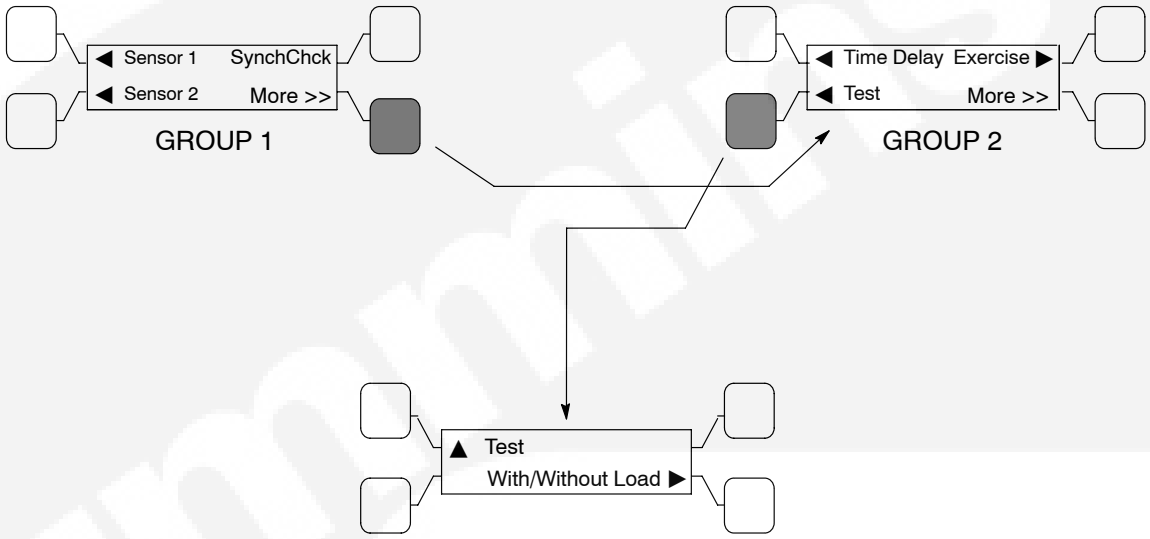
Note 2: TDNE, TDESa, TDEL, and TDPT values up to 20 seconds are adjustable in 1 second increments. Values over 20 seconds are adjustable in 5 second increments.

Note 3: For long engine start time delays (over 15 seconds) a remote battery source should be used.

FIGURE 4-12. SETUP GROUP 2 – TIME DELAY SUBMENUS

Setup – *Group 2*

Test Submenus



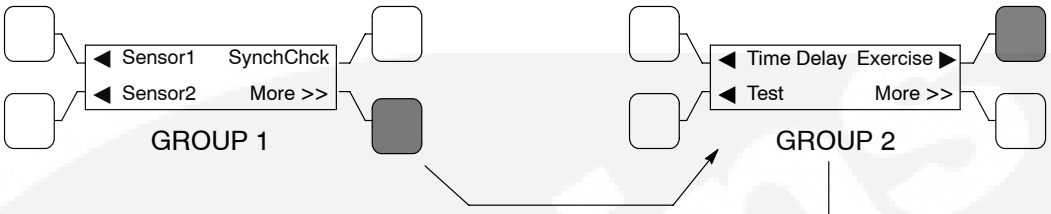
Allows an operator to automatically test the transfer switch, generator and power system.

Sets the function of the Test Switch on the front panel (Default = Test With Load).

Note: Default values are in parenthesis.

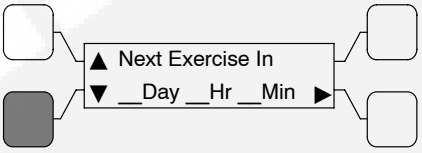
FIGURE 4-13. SETUP GROUP 2 – TEST SUBMENUS

Setup – *Group 2*
Exercise Submenus



Level 1 Controllers allow for setting two exercise periods and Level 2 Controllers allow for setting eight exercise periods from the digital display screen.

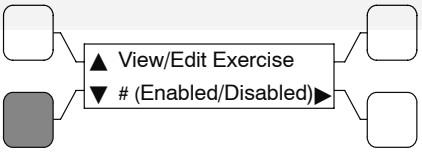
Displays the Time remaining until the next exercise cycle. If no exercises are enabled, the message “No Next Exercise” is displayed.



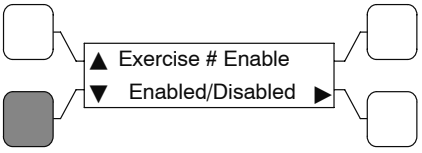
This screen allows for selecting one of the available exercises and displays its status. *****

Enter a number between 1 and 8 (Default = 1).

NOTE: Only Exercises 1 and 2 are available with Level 1 controllers. Exercises 1 through 8 are available with Level 2 controllers.



This menu is used to enable/disable the Exercise selected in the previous menu. (Default = Disabled)

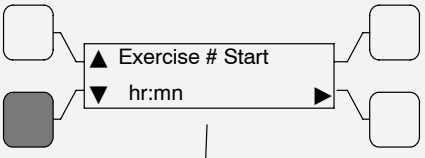


The first of four programming submenus for the Exercise cycle. Sets the day an Exercise cycle will occur

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)



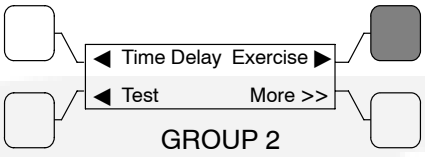
Continued on next page

***** If a password (see the Setup Password Submenu in Figure 4-7) is not entered:

- Only the View/Edit Exercise and View/Edit Exception menus can be modified.
- When the View/Edit Exercise or View/Edit Exception menus are modified, the Save Changes/Cancel Changes submenu is displayed upon exiting the Exercise submenus.

FIGURE 4-14. SETUP GROUP 2 – EXERCISE SUBMENUS

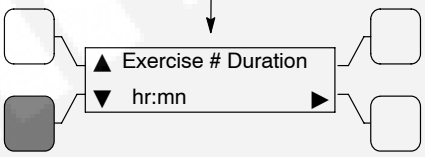
Setup – *Group 2*
Exercise Submenus *(Continued)*



Continued from previous page

Sets the length of Time the exercise cycle will run.

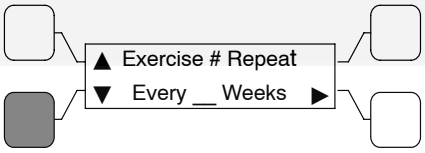
Enter a time within a 24 hour period:
hr = 0–23, mn = 0–59. (Default = 00:00)



Sets an interval the exercise cycle will repeat.

Enter a cycle between 0 and 100 weeks. (Default = 0 weeks). Typical values are 1 or 2.

Set the value to 0 to exercise one time only.
Set the value to 1 to exercise once a week.
Set the value to 2 to exercise every other week.
Set the value to 52 to exercise once every 52 weeks.

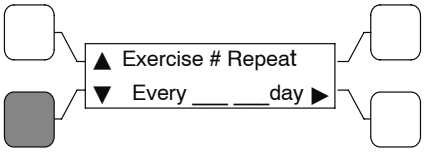


OR

Enter a cycle for a specific day of the month (1st, 2nd, 3rd, 4th, or 5th ____day of the month).

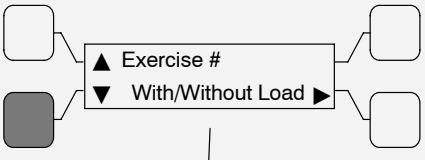
For example, set the value to 1st Monday to exercise only on the first Monday of each month.

NOTE: After selecting the ▶ button, press the down or up button (▼ or ▲) until the desired 1st thru 5th ____day value is displayed. The menus required to set a specific day of the month to exercise are displayed when you use the ▼ button to go below "0" or the ▲ button to go above "100."



NOTE: The day of the week displayed in this menu matches the day selected on the first "Exercise # Start" menu.

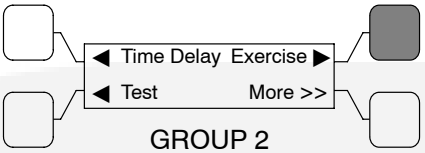
Enables or disables the first exercise program to run the generator(s) with or without a load. (Default = Without Load)



Continued on next page

FIGURE 4-14. SETUP GROUP 2 – EXERCISE SUBMENUS (CONTINUED)

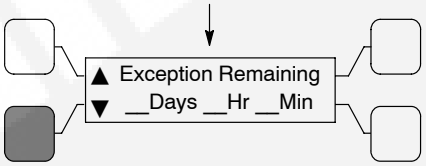
Setup – *Group 2*
Exercise Exceptions Submenus



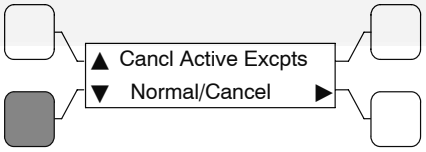
Level 1 Controllers allow for setting two exceptions and Level 2 Controllers allow for setting exceptions to the eight exercise programs setup from the digital display screen.

Continued from previous page

Indicates the time remaining for the exception of the longest duration. If there are no active exceptions, the message “No Excepts Active” is displayed on the first line.



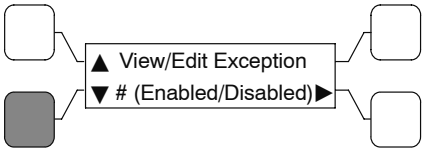
This screen allows canceling all exceptions. (Default = Normal)



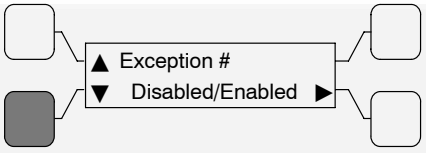
This screen allows for selecting an Exception and displaying its status. *****

Enter a number between 1 and 8 (Default = 1).

NOTE: The number selected here must match the Exercise number selected in the “View/Edit Exercise” menu.

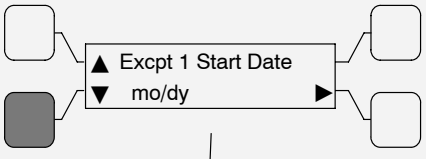


This menu is used to enable/disable the Exception selected in the previous menu. (Default = Disabled)



Sets the month and day for Exception 1.

Enter a starting date that the exercise will not run: mo = 1–12, dy = 1–31.



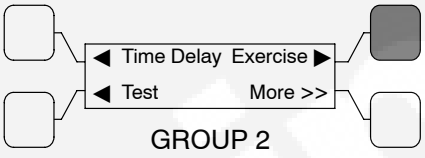
Continued on next page

***** If a password (see the Setup Password Submenu in Figure 4-7) is not entered:

- Only the View/Edit Exercise and View/Edit Exception menus can be modified.
- When the View/Edit Exercise or View/Edit Exception menus are modified, the Save Changes/Cancel Changes submenu is displayed upon exiting the Exercise submenus.

FIGURE 4-15. SETUP GROUP 2 – EXERCISE EXCEPTIONS SUBMENUS

Setup – *Group 2*
Exercise Exceptions Submenus *(Continued)*

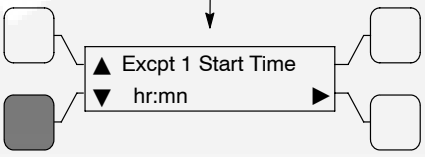


GROUP 2

Continued from previous page

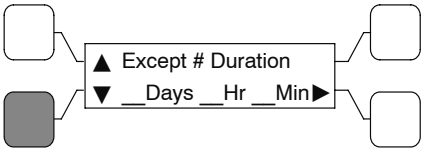
Sets a time of day for Exception 1.

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



Sets the Time period that the Exception will override the same numbered Exercise.

Enter a time: days = 1–31, hr = 0–23, mn = 0–59.



This menu allows for enabling/disabling repeating the Exception. (Default = Disabled)

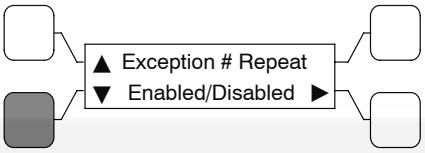


FIGURE 4-15. SETUP GROUP 2 – EXERCISE EXCEPTIONS SUBMENUS (CONTINUED)

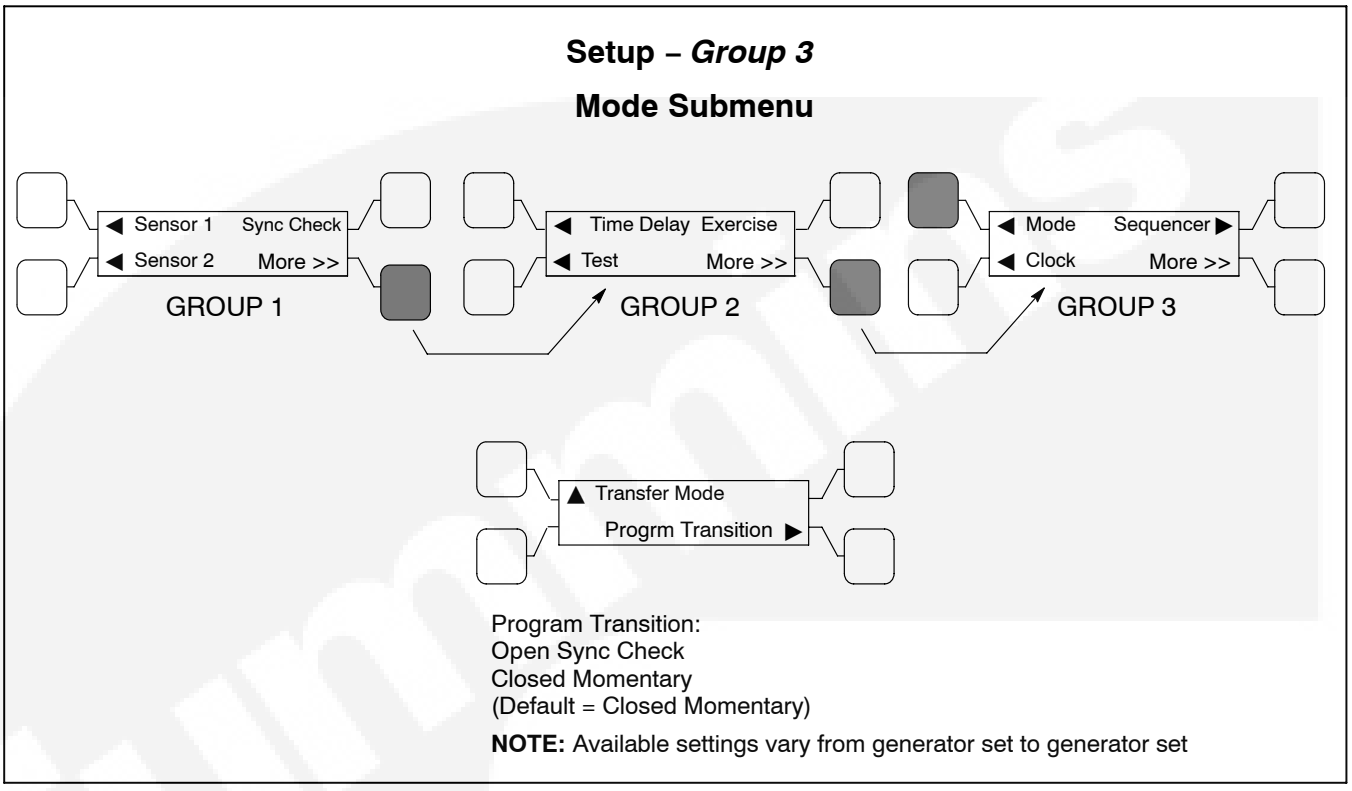
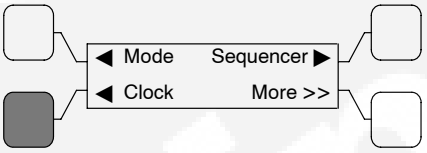


FIGURE 4-16. SETUP GROUP 3 – MODE SUBMENU

Setup – *Group 3*

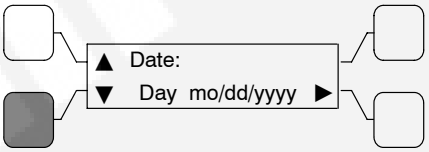
Clock Submenus

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



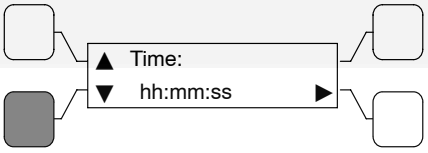
Sets the actual day and date.

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

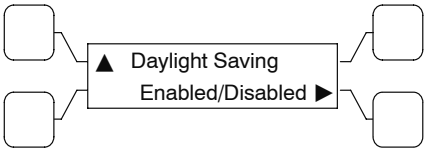


Sets the actual time of day.

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.

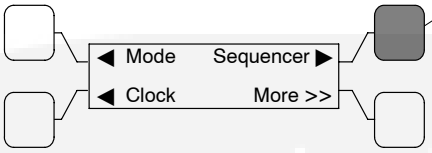
Daylight Saving Time is set to:

- The second Sunday in March – moves the time forward one hour.
- The first Sunday in November – moves the time back one hour.

FIGURE 4-17. SETUP GROUP 3 – CLOCK SUBMENUS

Setup – *Group 3*

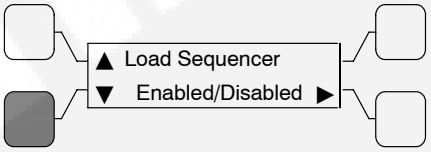
Sequencer Submenus



The Sequencer submenus 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. When used, a few seconds should be allowed between load steps to allow the generator voltage and frequency to stabilize.

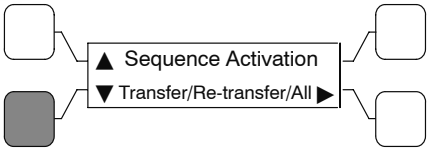
Sequencer is available only with the optional Network Communication Module. The module must be installed and enabled with the PC service tool before these screens are displayed.

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



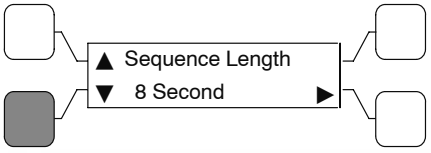
Sets activation for certain operational modes.

Choose Transfer, Re-transfer, or All



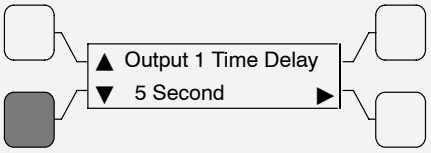
The control can activate a maximum of 8 relay output signals.

Enter the number of relay output signals desired to activate: 1 thru 8.



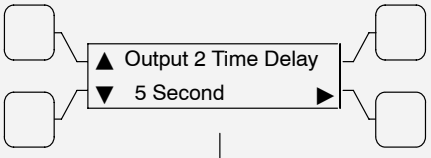
When Load Sequencer is triggered, the controller deactivates all remote relay output signals. Starting with Relay 1, the controller counts down the specified time delay, then activates Relay 1.

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.



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

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

FIGURE 4-18. SETUP GROUP 3 – SEQUENCER SUBMENUS

THIRD MAIN MENU – About Submenus

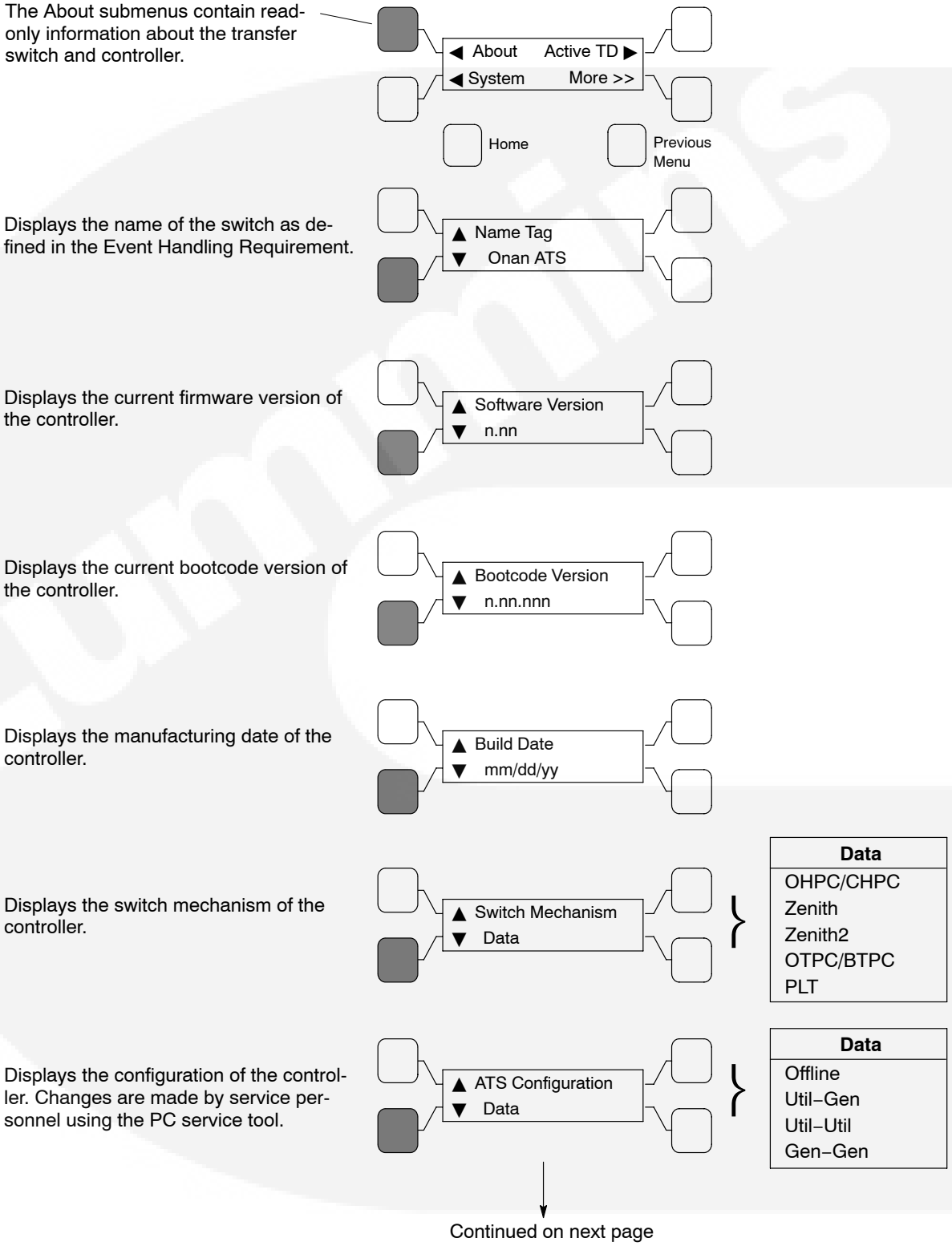
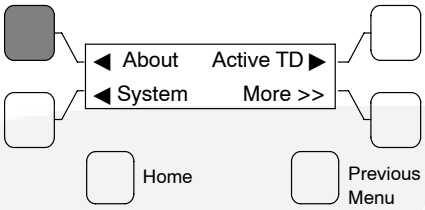


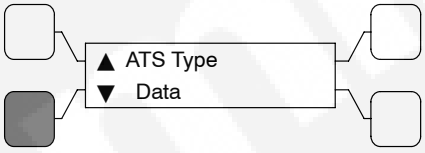
FIGURE 4-19. THIRD MAIN MENU – ABOUT SUBMENUS

THIRD MAIN MENU – About Submenus *(continued)*



Continued from previous page

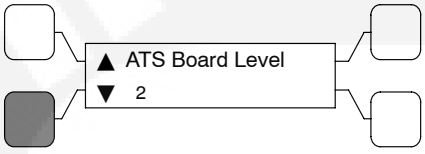
Displays the mode of operation the control is using. Adjustments can be made by service personnel using the PC service tool.



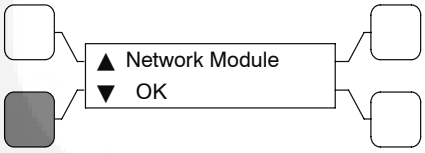
Data
OT = Open Transition
CT = Closed Transition*
BT = Bypass Transition

* Closed Transition is not available with service entrance transfer switches

Displays the ATS board level (1 or 2).

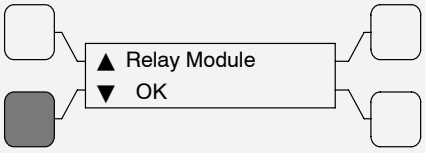


This screen indicates if a Network Communications Module is installed and enabled.



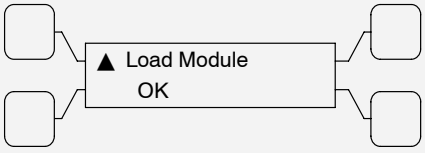
Hardware Detected	Software Enabled	Data
True	True	OK
False	True	Not Installed
True	False	Not Enabled
False	False	Not Available

This screen indicates if the Relay Module hardware is installed.



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

This feature is not available on Level 1 controllers.



Data
OK
Not Installed

FIGURE 4-19. THIRD MAIN MENU – ABOUT SUBMENUS (CONTINUED)

THIRD MAIN MENU – System Submenus

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

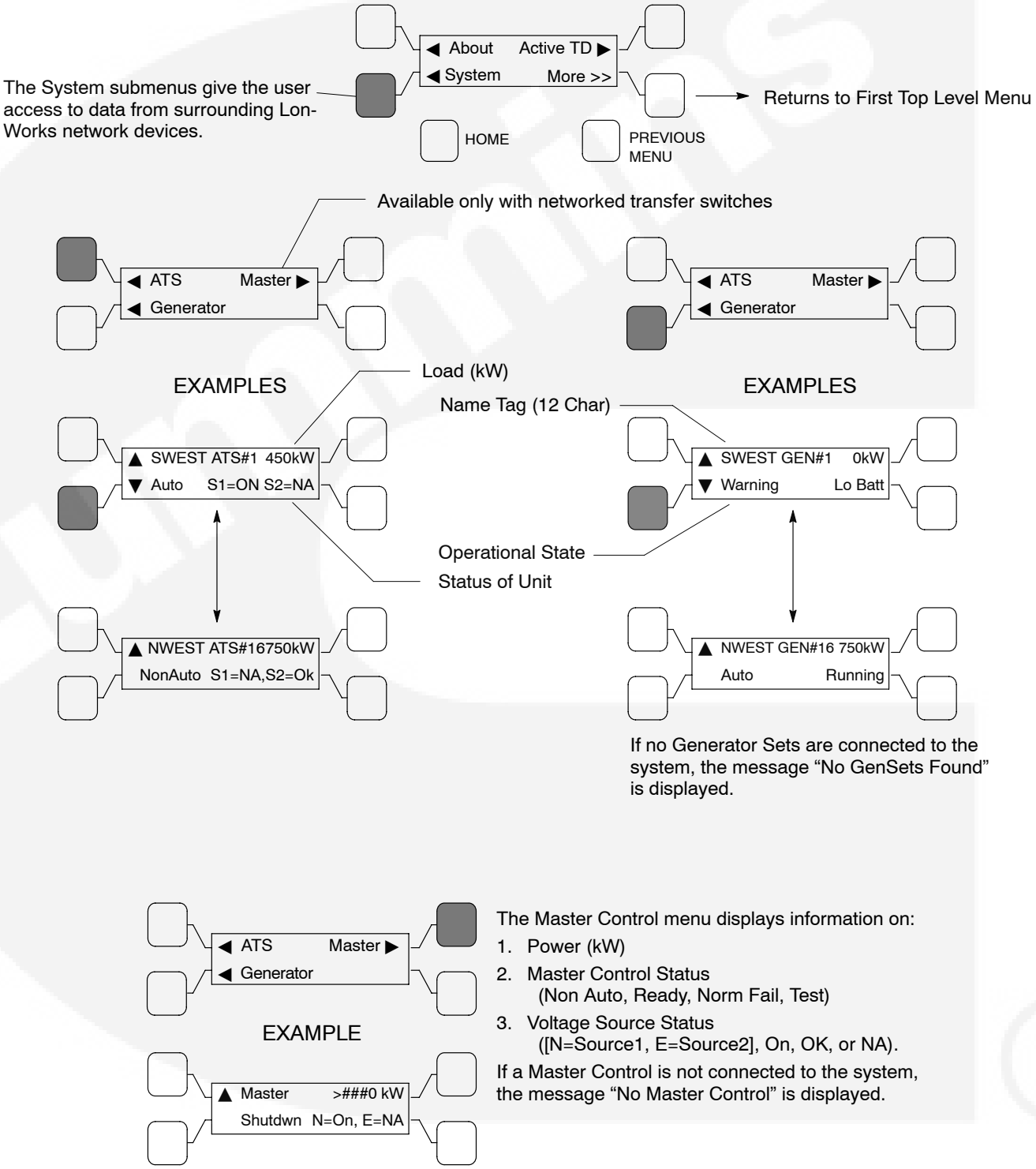


FIGURE 4-20. THIRD MAIN MENU – SYSTEM SUBMENUS

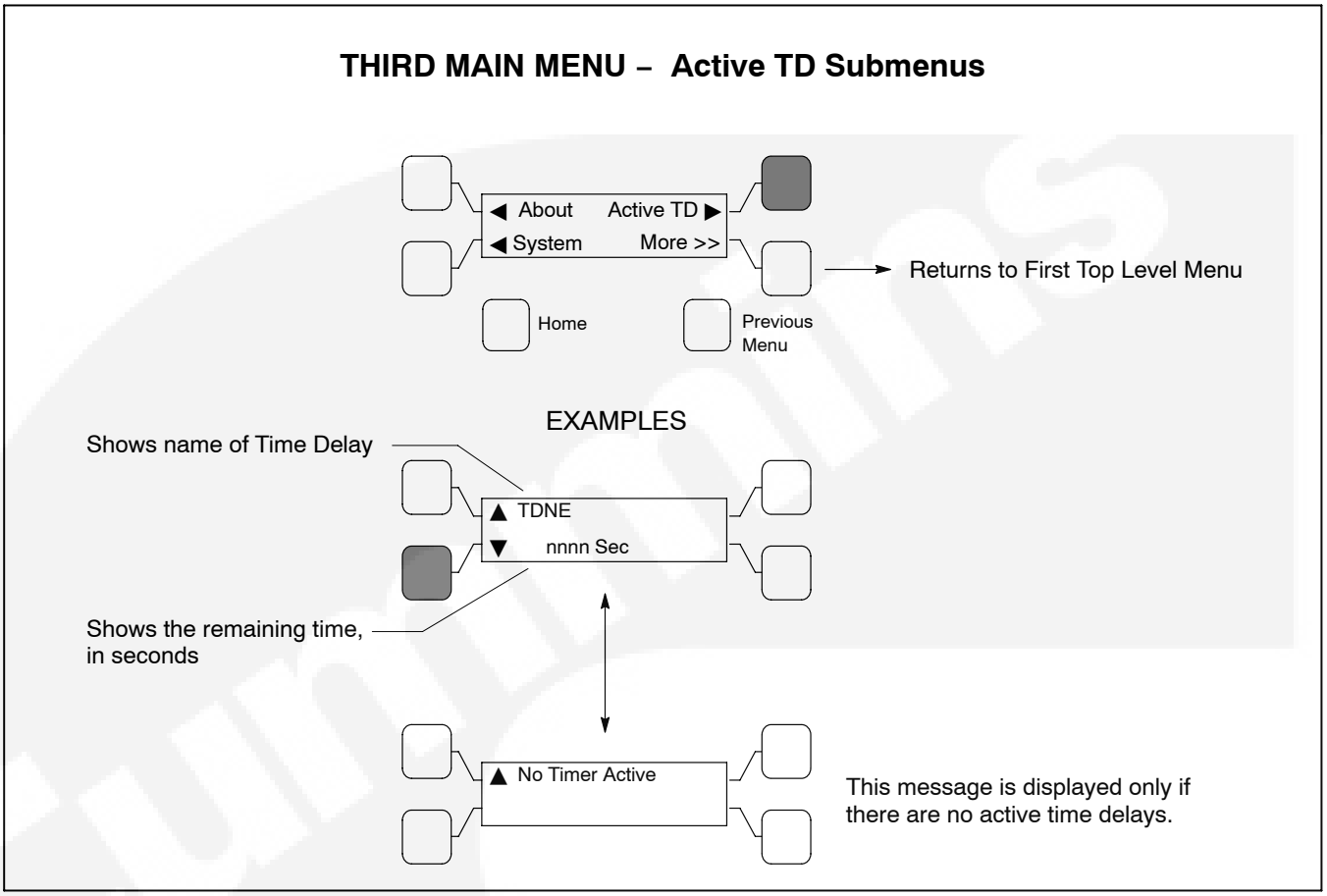
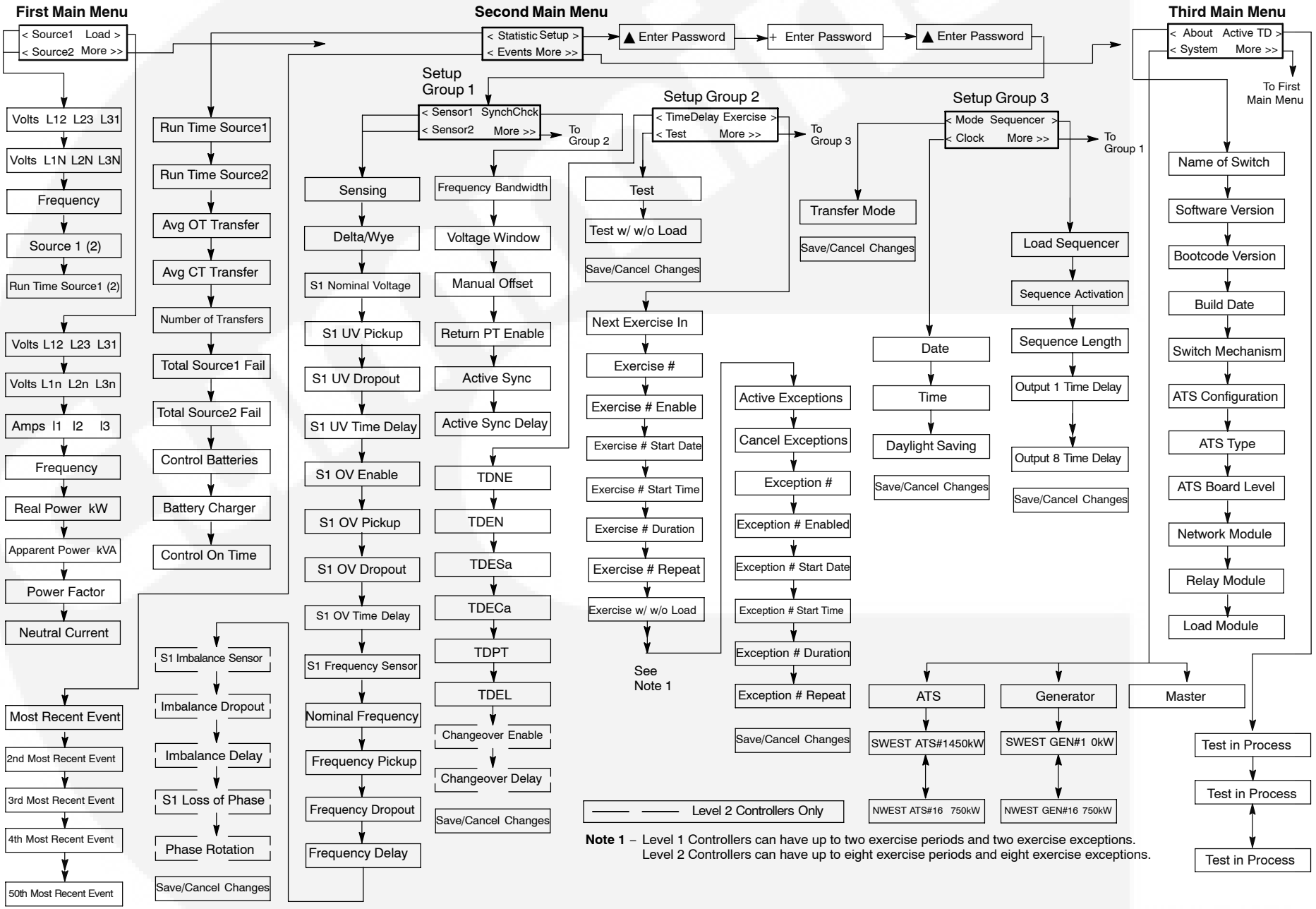


FIGURE 4-21. THIRD MAIN MENU – ACTIVE TD SUBMENUS



Note 1 – Level 1 Controllers can have up to two exercise periods and two exercise exceptions.
Level 2 Controllers can have up to eight exercise periods and eight exercise exceptions.

FIGURE 4-22. MENU SYSTEM MAP

THIS PAGE LEFT INTENTIONALLY BLANK

5. Events

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 Section 6: “Troubleshooting” 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 an active or inactive state. 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.

FAULT EVENTS

The events listed below describe misoperation of the ATS. Some faults will require operator intervention either at the front panel level or physically service the ATS mechanism.

Control Locked Out

This event gets triggered whenever any of the following events happen.

- S1 Fail to Close
- S1 Fail to Open
- S2 Fail to Close
- S2 Fail to Open

Fail to Retransfer

For utility-to-genset applications, this event is active if the transfer switch failed to move from Source 2 to Neutral or Neutral to Source 1 within a preset time limit.

The controller first verifies that the transfer switch moved from Source 2 to Neutral within the time limit defined in the Fail to Open 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 time limits are exceeded, the controller changes the fault status to active. The fault remains active until the **Reset** button is pressed.

Fail to Transfer

For utility-to-genset applications, this event is active if the transfer switch failed to move from Source 1 to Neutral or Neutral to Source 2 within a preset time limit.

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

If the time limits are exceeded, the controller changes the fault status to active. The fault remains active until the Reset button is pressed.

S1 Failed to Close

While attempting to transfer the load to Source 1, this event is detected if the control is not able to close the Source 1 contacts. This event is followed by a “Control Locked Out” event.

S1 Failed to Open

While attempting to transfer the load to Source 2, this event is active if the control is not able to open the Source 1 contacts. This event is followed by a “Control Locked Out” event.

S2 Failed to Close

While attempting to transfer the load to Source 2, this event is detected if the control is not able to close the Source 2 contacts. This event is followed by a “Control Locked Out” event.

S2 Failed to Open

While attempting to transfer the load to Source 1, this event is active if the control is not able to open the Source 2 contacts. This event is followed by a “Control Locked Out” event.

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.

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.

Emergency Start A

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

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.

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.

Fail to Sync

This event indicates the two power sources have failed to synchronize either voltage, phase, or frequency within the time limit of 120 seconds.

The event stays active until the Reset/Lamp Test button on the front panel is pressed. The Fail to Sync relay output stays closed until the Reset button is pressed.

After a Fail to Sync event occurs, another Fail to Sync event may occur or, if set up to do so, the transfer switch may go to open transition. If not set up to go to open transition, a series of Fail to Sync events may repeat until the system synchronizer is adjusted or repaired.

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 (not available with Service Entrance transfer switches). When this input is active, it indicates that generator A is shutdown (and locked out).

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.

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.

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: 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.

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: 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: Transfer Inhibit

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

Phase Rotation Failure

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

Service Tool Connected

This event is be 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.

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

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 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 1 Loss of Phase Failure

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

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 Under-Voltage Failure

This event is active when ever Source 1 voltage is less than the 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 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.

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 2 Loss of Phase Failure

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

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 Under-Voltage Failure

This event is active whenever Source 2 voltage is less than the 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

Speed Adjust

This event is used to send a *Speed Adjust* message to a network generator control. The controller sends the message and logs the event.

This signal causes the generator set to increase speed (1/2 Hz) to sync with the utility. This signal ends when the transfer is complete.

Sync Check Active

This event is active whenever an in-phase transfer (using the Sync Check Sensor) is pending.

Sync Enable

This event is only displayed if active synchronicity is enabled. This event becomes active when the control sends a *Sync Enable* message to a network generator control.

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.

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 generator sets with PowerCommand 3200 controls.

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.

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 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.

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.

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 located 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.

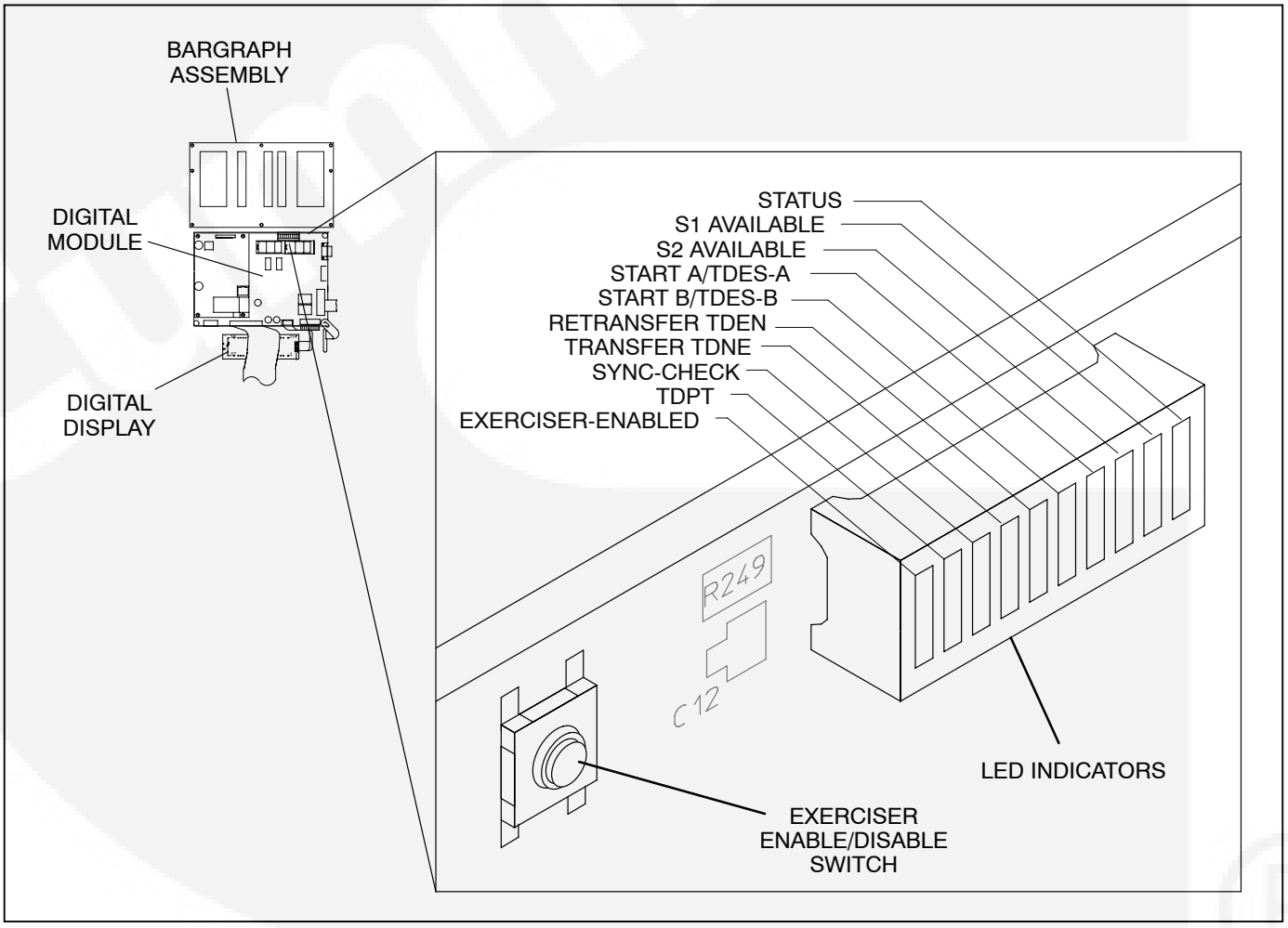


FIGURE 6-1. LED LOCATION ON DIGITAL MODULE

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	1. Lights constantly when the control has commanded Source 2 to start 2. Blinks at 1/2 Hz rate during the time delay to engine start (TDESa)
Start B/TDES-B	This indicator is only used for genset-to-genset applications when Source 1 is a generator not a utility. 1. Lights constantly when the control has commanded Source 1 to start 2. Blinks at 1/2 Hz rate during the time delay to engine start (TDESb)
Retransfer/TDEN	1. Lights when the control energizes the Retransfer relay 2. Blinks at 1/2 Hz rate during the time delay to retransfer (TDEN)
Transfer/TDNE	1. Lights when the control energizes the Transfer relay 2. Blinks at 1/2 Hz rate during the time delay to transfer (TDNE)
Sync-Check	Blinks at 1-second rate when the in-phase sensor is active (maximum of 120 seconds).
TDPT	Time Delay Programmed Transition Blinks at 1/2 Hz rate during the programmed transition time delay
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 generator set 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 Power Generation 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 Auto. Check for fault indicators on the generator set control.

   ⚠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.***

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.

3. The operation selector switch on the generator set control panel should be set to Auto.

Generator Set Starts During Normal Power Service

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

   NOTE: 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.

2. Momentary voltage dips might cause voltage sensors to initiate generator set starting. Check the parameter settings in Setup menus.

3. 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 Auto.

   ⚠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.

5. Check to see if the main breaker may be either tripped or off.

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.

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
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

⚠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.***

CONTROLLER CHECKSUM ERROR (343)

Possible Cause:

The checksum of the Flash EPROM does not match the checksum stored in the controller

Corrective Action:

1. Reset the control by removing power.
2. Remove and re-install Digital Module batteries (see Figures 3-2 or 3-3).
3. Contact Cummins Power Generation Service if checksum error is repeated on power up.
4. Reset real-time clock (see Figure 4-17).

LOW CONTROLLER BATTERY (441)

Possible Cause:

Low Lithium battery voltage

Corrective Action:

1. Replace Digital Module batteries. (See Figures 3-2 or 3-3.)
2. Press the Reset button on the front panel.
3. Reset real-time clock (see Figure 4-17).

ATS FAIL TO CLOSE: TRANSFER (1113)

Possible Cause:

A transfer between Source 1 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 Power Generation Service.

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)

Possible Cause:

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 Power Generation Service.

BATTERY CHARGER MALFUNCTION (597)

Possible Cause:

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. Refer to the battery charger Operator Manual.
3. Refer to the fault definitions following this table.
4. Contact Cummins Power Generation Service.

NETWORK COMMUNICATIONS ERROR (1468)

Possible Cause:

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 Power Generation 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 2 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 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).

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.

More information on the battery charger is included in the Battery Charger Operator Manual (901–0106 for 2 amp battery chargers or 901–0107 for 15/12 amp battery chargers).

THIS PAGE LEFT INTENTIONALLY BLANK

7. Time Delay Glossary

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.
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.
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.
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.

THIS PAGE LEFT INTENTIONALLY BLANK

Cummins Power Generation
1400 73rd Ave. NE
Minneapolis, MN 55432 USA

Phone 1 763 574 5000
Toll-free 1 800 888 6626
Fax 1 763 574 5298
Email ask.powergen@cummins.com
www.cumminspower.com