



Operator Manual

Our energy working for you.™



Transfer Switch **40-1000 Amperes**

OTECA (Spec A)
OTECB (Spec A)
OTECC (Spec A)
OTECD (Spec A)

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1 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.*

1.1 Electrical Shock and Arc Flash 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:

- The Operator **must** always keep the transfer switch cabinet closed and locked.
- Make sure only authorized personnel have the cabinet keys.
- All service and adjustments to the transfer switch **must** be performed only by an electrician or authorized service representative.



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

1.2 General Precautions

Refer to NFPA 70E Standard for Electrical Safety in the Workplace to be sure the proper personal protective equipment (PPE) is worn around this product.

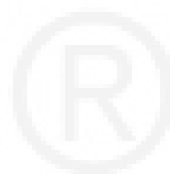
Follow these guidelines while working on or around electrical equipment.

- Place rubber insulated 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.
- Remove all jewelry when working on electrical equipment.
- Wear safety glasses whenever servicing the transfer switch.
- Do not smoke near the batteries.
- Do not work on this equipment when mentally or physically fatigued, or after consuming alcohol or any drug that makes the operation of equipment unsafe.



WARNING: *Incorrect service or replacement of parts can result in death, severe personal injury, and/or equipment damage. Service personnel must be qualified to perform electrical and/or mechanical service.*

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2 Introduction

2.1 Operator Manual

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

This Operator Manual provides information necessary for the operation of the transfer switch(es) identified on the cover of this manual. The transition capabilities of the transfer switch(es) are identified in the following sections.

2.2 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 of 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).
- Select Option 1 (press 1) and 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, distributors are listed under one of the following:

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

For outside North America:

- Call Cummins Power Generation at 1-763-574-5000, 7:30 AM to 4:00 PM Central Standard Time, Monday through Friday.

OR

- Send a fax to Cummins Power Generation using the fax number, 1-763-574-5298.

When contacting your distributor, always supply the complete model, specification and serial number as shown on the generator set nameplate.

2.3 Model Identification

If the transfer switch ever needs to be serviced, the distributor will need this information in order to properly identify your unit from the many types manufactured:

- Model No. (Product Model)
- Serial No. (Product Serial Number)
- Spec. (Product Specification Letter)

Model No.	
Model	
Serial No.	Spec.
Serie	
IMPORTANT ! Model & Serial No. Required When Ordering Parts. Model & No. Serie Requis Pour Commander Des Pieces.	
CUMMINS POWER GENERATION 1400 73rd Avenue N.E. Minneapolis, MN 55432 MADE IN U.S.A.	
CURRENT RATING:	AMPS
Voltage—	VAC
Frequency—	Hertz
Poles—	
Appl—	
FEATURES:	
WIRING DIAGRAM:	
BUILT IN COMPLIANCE WITH NFPA 70. AUTOMATIC TRANSFER SWITCH FOR EMERGENCY SYSTEMS.	
SA® For Electrical Equipment Only Pour Material Electrique Seuliment	

FIGURE 1. TRANSFER SWITCH NAME PLATE

2.4 Transfer Switch Application

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

If utility power is interrupted, the load is transferred to the generator set (genset). When utility power returns, the load is retransferred to the utility. The transfer and retransfer of the load are the two most basic functions of a transfer switch.

2.5 Specifications

2.5.1 Model OTEC

Transfer Switch Model OTEC Specifications:

Model	Amps	Cabinet Types	Util-to-Gen	Gen-to-Gen	Util-to-Gen & Util-to-Util	Transfer Modes
OTECA	40 70 125	All Amps: 1, 3R, 4, 4x, 12	X			OT PT
OTECB	150 225 260	All Amps: 1, 3R, 4, 4x, 12	X			OT PT
OTEC C	300 400 600	All Amps: 1, 3R, 4, 4x, 12	X			OT PT
OTEC D	800 1000	All Amps: 1, 3R, 4, 4x, 12	X			OT PT

2.6 Automatic Transfer Switch Typical Function

Automatic transfer switches perform the basic function of transferring the load to the available power source. The controller monitors each source for allowable voltage and frequency range.

The transfer switch(es) identified on the cover of this manual are designed for each, all or a combination of the following applications (If you are unsure which of these your transfer switch uses, refer to the Specifications section of this manual):

2.6.1 Open Transition with Sync Check

Open transition with sync check executes an open transition (OT) transfer 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.

2.6.2 Programmed Transition

Programmed transition executes a programmed transition (PT) transfer by disconnecting the load from the source of power, pausing in the neutral position of the transfer switch (between switched positions) to allow transient voltages from the load to diminish, and then the load is switched to the other source.

2.7 Utility-to-Generator Set Operation

In utility-to-generator set 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 Source 1 (Utility).
 5. Retransfers the load to Source 1.
 6. Sends a stop signal to the generator set.



3 Description

3.1 Cabinet

Cabinets are available in various configurations that meet UL and National Electrical Manufacturer's Association (NEMA) requirements. Each cabinet includes an identification label. The standard cabinet offerings are:

- Type 1 Indoor - general purpose
- Type 3R Outdoor - rainproof
- Type 4 Outdoor - watertight
- Type 4X Outdoor - watertight, stainless steel
- Type 12 Indoor - dust tight

3.2 Transfer Switch Components

The transfer switch opens and closes the contacts that transfer the load between the power sources (Source 1 and Source 2). The switch is mechanically interlocked to prevent simultaneous closing to both power sources (except in switches capable of closed transitions).

3.2.1 Contact Assemblies

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

3.2.2 Linear Actuator

The linear actuator moves the contact assemblies between the contacts of both power sources. Linear actuator operation is initiated automatically by the transfer switch control. Manual operation of the switch is also possible.

3.2.3 Auxiliary Contacts

Auxiliary contacts are provided on the utility and genset sides of the transfer switch. They are actuated by operation of the transfer switch during transfer and retransfer. The utility auxiliary contact switch is actuated when the transfer switch is connected to the utility. The genset auxiliary contact switch is actuated when the transfer switch is connected to the genset. The auxiliary contacts have current ratings of 10 amperes at 250 VAC. The contacts are wired to terminal block TB1.

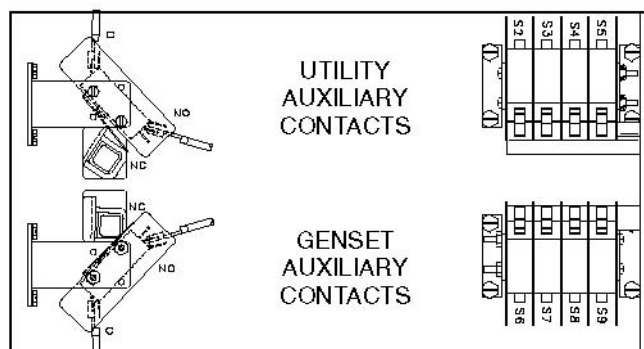


FIGURE 2. AUXILIARY CONTACTS

3.3 Available Transfer Modes

- Open Transition (OT) with Sync Check
- Programmed Transition (PT)

3.3.1 Open Transition with Sync Check

Open transition with sync check executes an open transition (OT) transfer 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.

3.3.1.1 Transfer from Source 1 to Source 2 (OT)

This sequence 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 control 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 1 power, the genset receives a remote start signal. The engine starts and accelerates to rated speed.
3. When the alternator output reaches the "pickup" level, the Source 2 Available indicator is lit. The control starts the Time Delay Normal to Emergency (TDNE) timer.

3.3.1.2 Transfer from Source 2 to Source 1 (OT)

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 control 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 genset is activated. When the engine cool-down delay expires, the genset shuts down and the Source 2 Available indicator goes out.

3.3.1.3 Sync Check Sensor

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.

Default Value:

- Frequency bandwidth: 1.0 Hz
- Voltage: 10 V
- Offset: 0 milliseconds

Range:

- The frequency bandwidth range is from 0.1 and 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 average voltage difference between the two sources must be equal to or less than the set value in order for transfer to occur.

Sequence of Events: 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.

3.3.2 Programmed Transition

Programmed transition executes a programmed transition (PT) transfer by disconnecting the load from the source of power, pausing in the neutral position of the transfer switch (between switched positions) to allow transient voltages from the load to diminish, and then the load is switched to the other source.

3.3.2.1 Transfer from Source 1 to Source 2 (PT)

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 control starts a Time Delay Engine 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 genset receives a remote start signal. The engine starts and accelerates to rated speed.
3. When the alternator output reaches the "pickup" 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. 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.

3.3.2.2 Transfer from Source 2 to Source 1 (PT)

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 (the Source 2 indicator goes out).
2. 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 1 position. The Source 1 Connected indicator lights and the Time Delay Engine Cooldown (TDEC) timer starts.
3. When the engine cool-down delay expires, the genset shuts down and the Source 2 Available indicator goes out.

3.4 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.*

For further information regarding installation, calibration and adjustment of these components, refer to the:

- Installation Manual (shipped with the product)
- Service Manual (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 in the OFF position. Return the switch to the Auto position after adjustments are completed.*



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

3.4.1 Front Panel Test - Sequence of Events

If the test button is pushed on the Front Panel, then the controller simulates a Source 1 or Utility failure and proceeds to transfer the load to the generator.

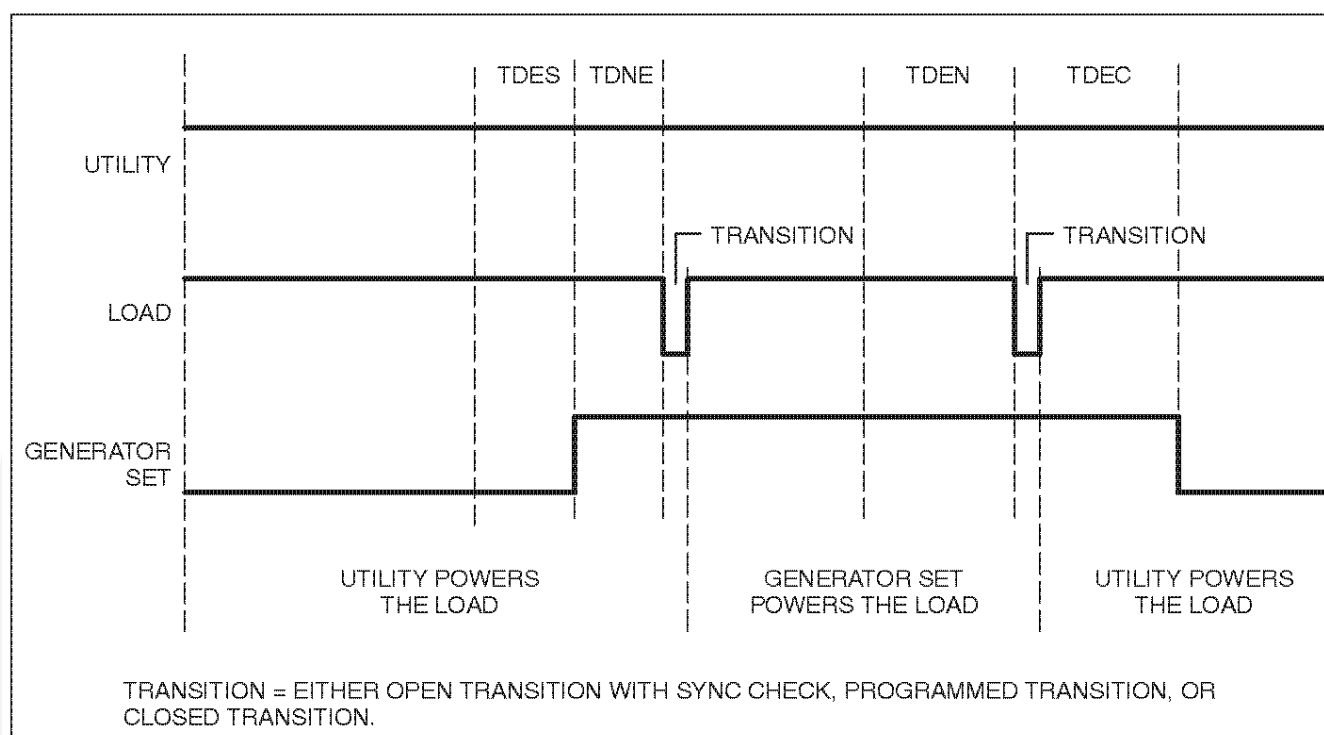


FIGURE 3. FRONT PANEL TEST SEQUENCE OF OPERATION

3.4.1.1 Remote Test Input

The transfer switch may be wired for a remote test input. The switch is used to start and stop manually initiated system tests. As with the control panel Test pushbutton, the remote test input can be configured to test with or without load.

A remote test input is set up by connecting a dry (voltage free) contact between TB2-5 and TB2-8. Closing the contact starts a test and opening the contact cancels the test. The Test LED flashes to signify the start of a test and stays on during the test.

Closing the contact causes the transfer switch to sense a (simulated) utility power failure and sends a start/run signal to the genset. If the control is set up to test with load, the load is transferred to the genset when the genset becomes available. The Utility Power Available LED remains on to show that the utility did not fail.

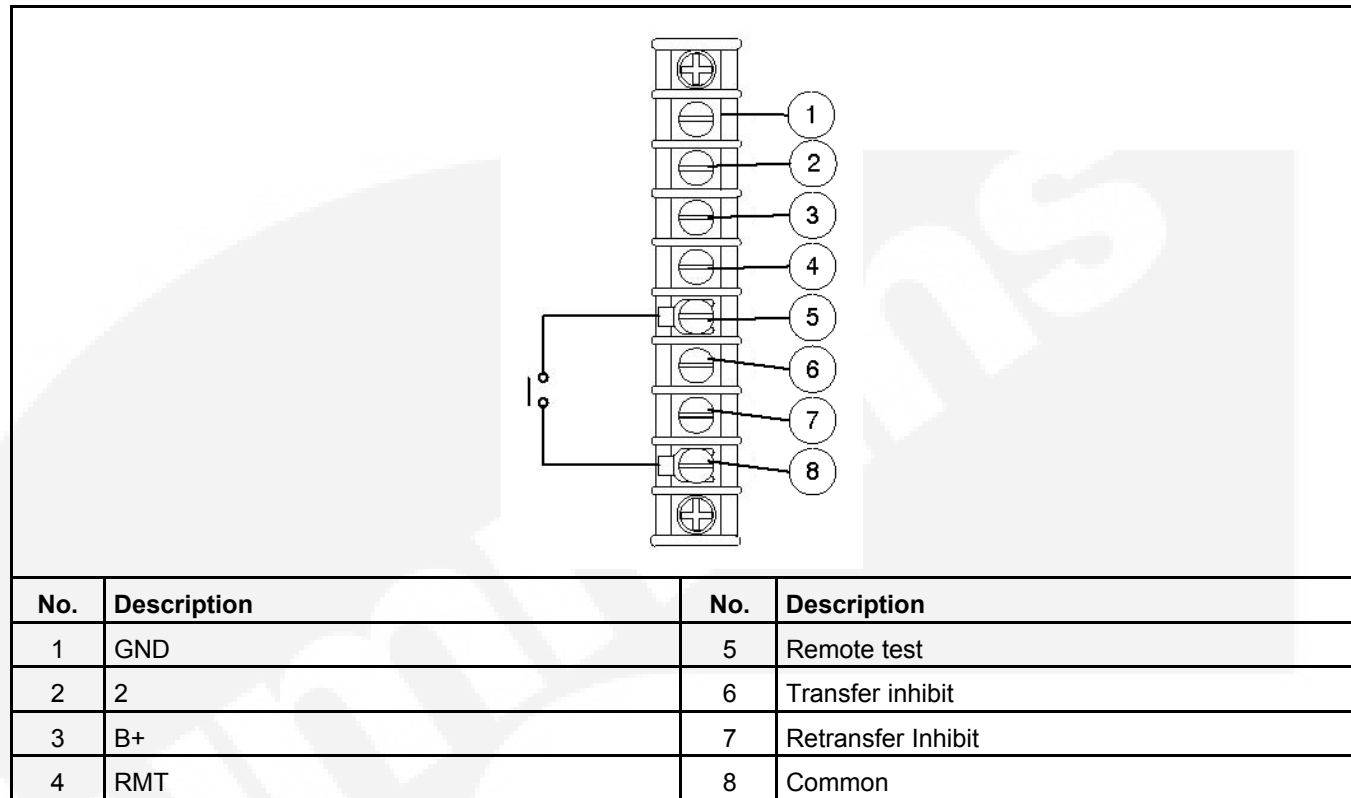


FIGURE 4. TB2 CONNECTIONS FOR REMOTE TEST TRANSFER



NOTE: TB1 and TB2 will accept 22 AWG - 12 AWG wire with 3/8 inch (10 mm) strip. Torque to 9 in-lbs.

3.4.1.2 Transfer Inhibit

A transfer inhibit input is set up by connecting a dry (voltage free) contact between TB2-6 and TB2-8. Closing the contact enables the feature and opening the contact disables it.

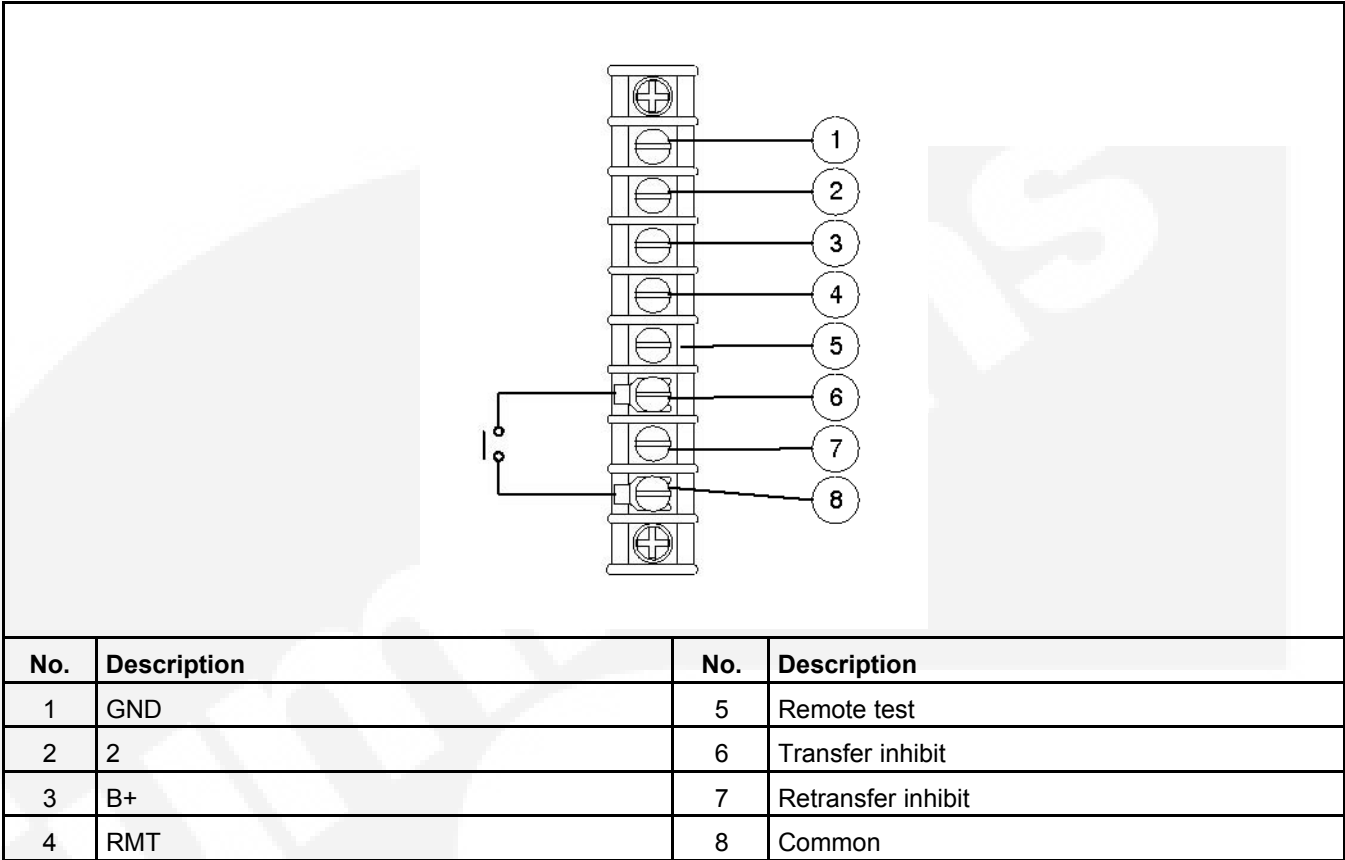


FIGURE 5. TB2 CONNECTIONS FOR TRANSFER INHIBIT

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

Pressing the Override pushbutton on the control panel bypasses the transfer inhibit input and bypasses TDNE. The TDNE runs if the transfer inhibit input is disabled.

3.4.1.3 Retransfer Inhibit

A retransfer inhibit input is set up by connecting a dry (voltage free) contact between TB2-7 and TB2-8. Closing the contact enables the feature and opening the contact disables it.

This feature is used to prevent the ATS from automatically transferring the load back to the utility. When enabled, load transfer will not take place unless the Override pushbutton on the control panel is pressed, the retransfer inhibit input is disabled, or the genset fails. If the genset fails, retransfer inhibit is ignored.

Pressing the Override pushbutton on the control panel bypasses the retransfer inhibit input and bypasses the TDEN. The TDNE runs if the retransfer inhibit input is disabled.

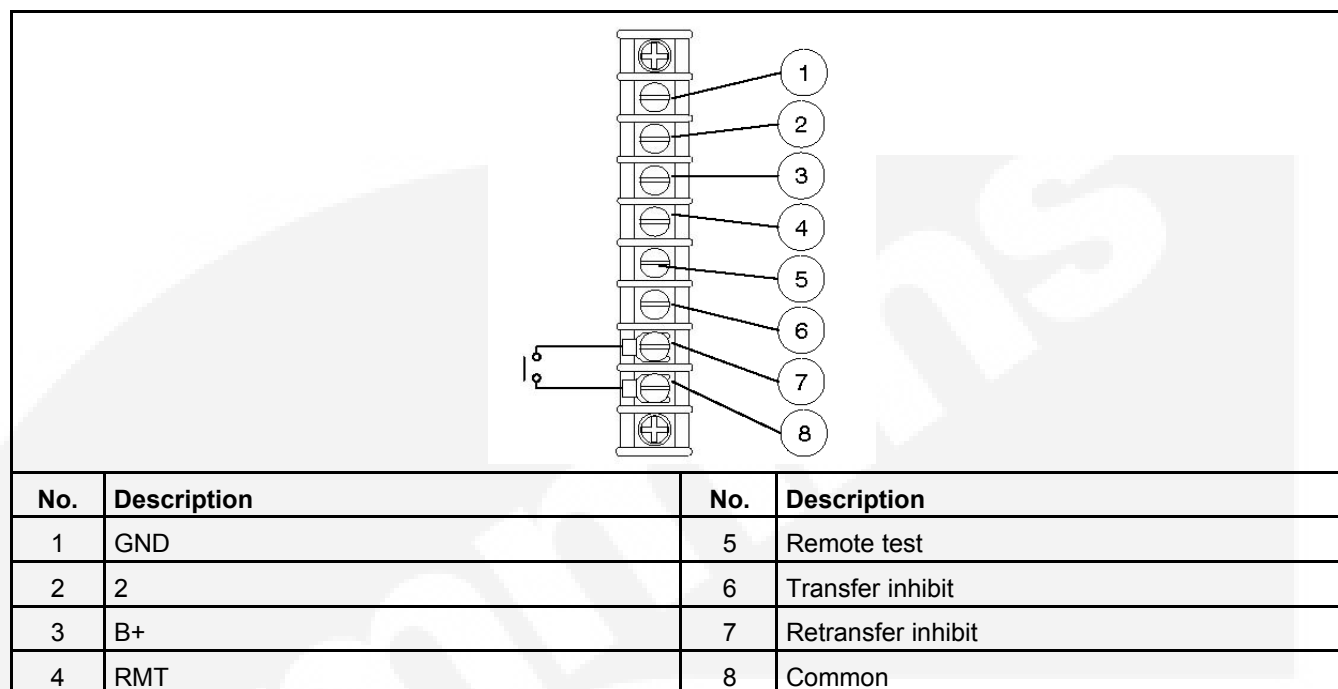


FIGURE 6. TB2 CONNECTIONS FOR RETRANSFER INHIBIT

3.5 Options

3.5.1 Battery Charger Options

Two battery chargers are available. 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.

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.

3.5.1.1 15/12-Amp Battery Charger

There are two types of 15/12-amp PowerCommand battery chargers. All 15/12-amp battery chargers have a 20 amp DC circuit breaker switch on the bottom of the battery charger.

- **The 120, 208, and 240 VAC battery chargers include:**
 - Two 10-Amp AC circuit breaker switches
 - A circuit breaker guard
- **The 277, 380, 416, and 600 VAC battery chargers include:**
 - Two AC fuse holders

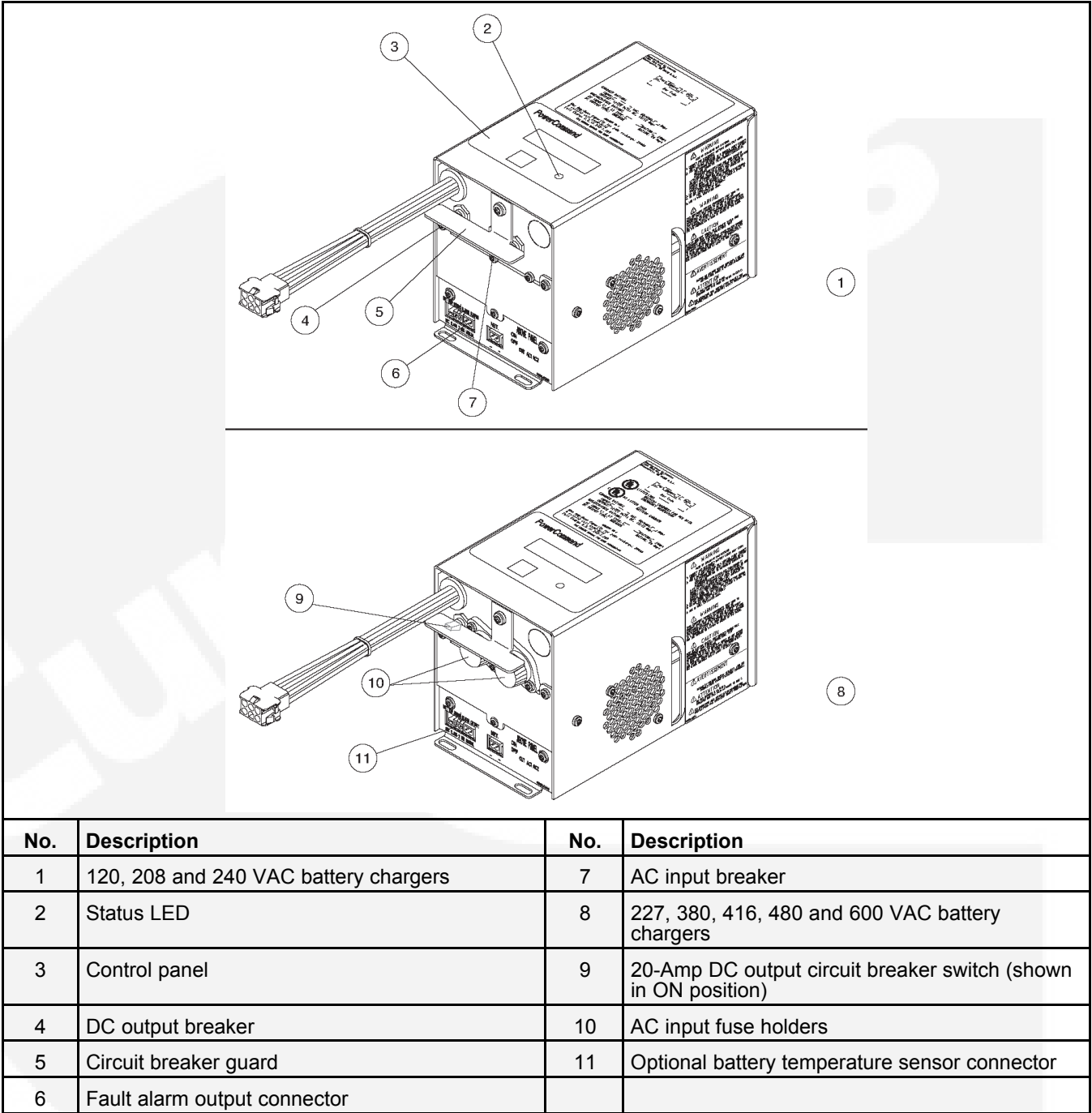


FIGURE 7. 15/12-AMP POWERCOMMAND BATTERY CHARGERS

3.5.1.1.1 Control Panel

The 15/12-amp charger control panel includes a digital display, a Reset button, and an LED status indicator.

- 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.

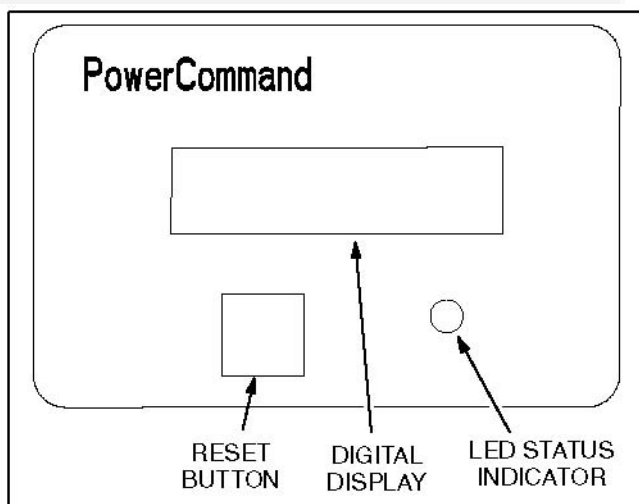


FIGURE 8. 15/12-AMP CHARGER CONTROL PANEL

3.5.1.1.2 Battery Charger Configuration

The **RESET** button on the control panel is used to configure the battery charger. (More information on Setup menus is included in the Battery Charger Operator Manual.)

- **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.

3.5.1.1.3 Optional Battery Temperature Sensor

A connector for an optional battery temperature sensor is located on the bottom 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 °F (55 °C)).

3.5.1.2 2-Amp Battery Charger

The 2-ampere battery charger 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.

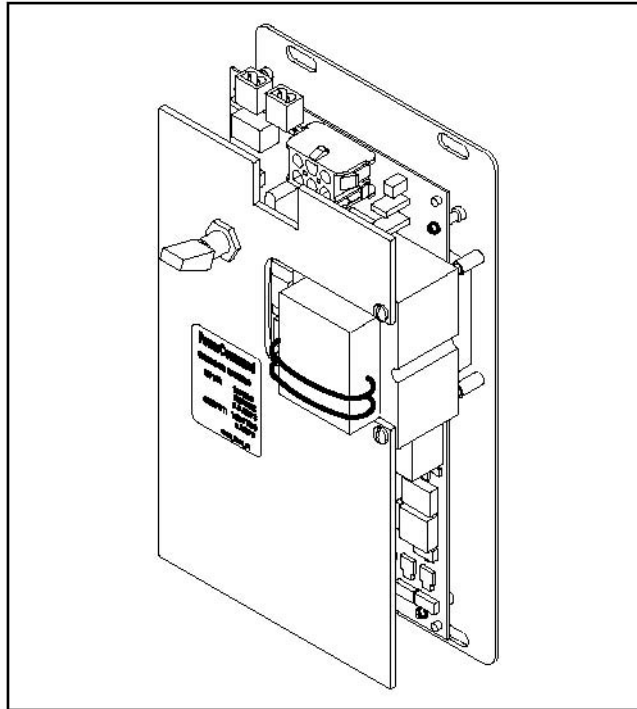


FIGURE 9. 2-AMP POWERCOMMAND BATTERY CHARGER

3.5.1.2.1 2-Amp Control Panel

The 2-amp battery charger control panel includes a digital display, a RESET button and an LED status indicator.

- 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.

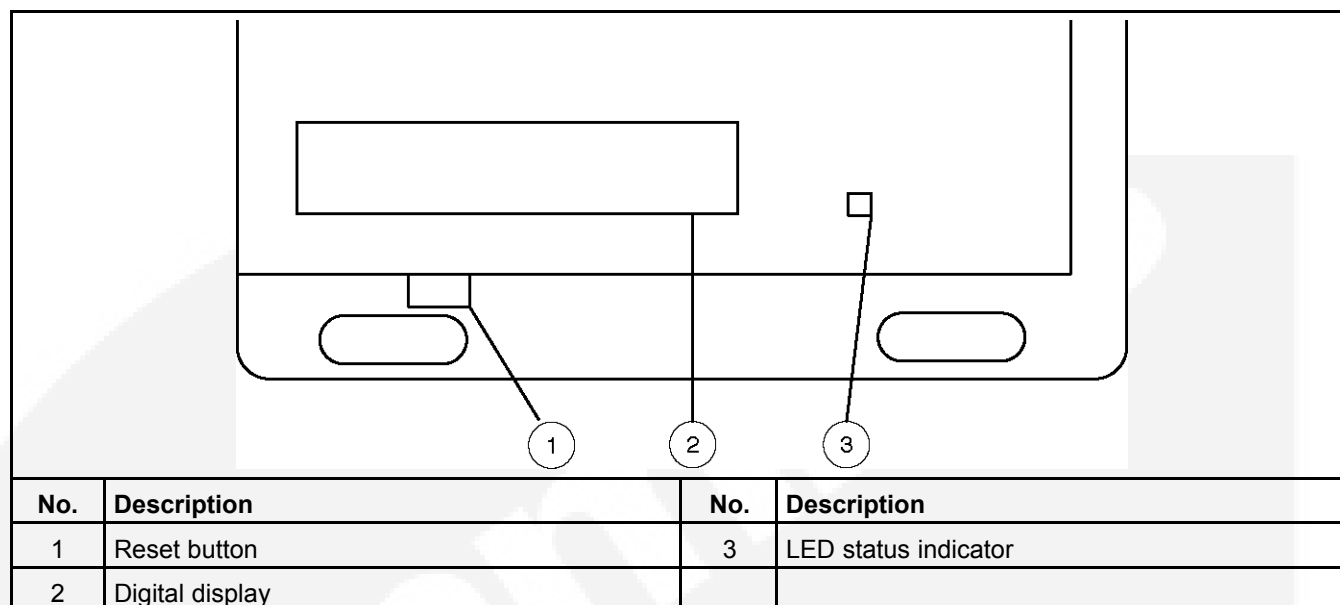


FIGURE 10. 2-AMP BATTERY CHARGER CONTROL PANEL

3.5.1.2.2 2-Amp Battery Charger Configuration

The **RESET** button on the control panel is used to configure the battery charger for the correct battery voltage. (More information on Setup menus is included in the Battery Charger Operator Manual.)

3.5.2 Auxiliary Relays Option

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

All relays have two normally open and two normally closed contacts that are rated for 10 Amps at 600 VAC. Connections to the auxiliary relays are made directly to the relay terminals.

There are two types of auxiliary relay coils:

- 12 VDC
- 24 VDC

3.5.3 Remote Override Input

To add remote override, connect a normally open, dry contact between P4-2 on the back of the control panel and TB2-8. Closing the contact enables the feature and opening the contact disables it.

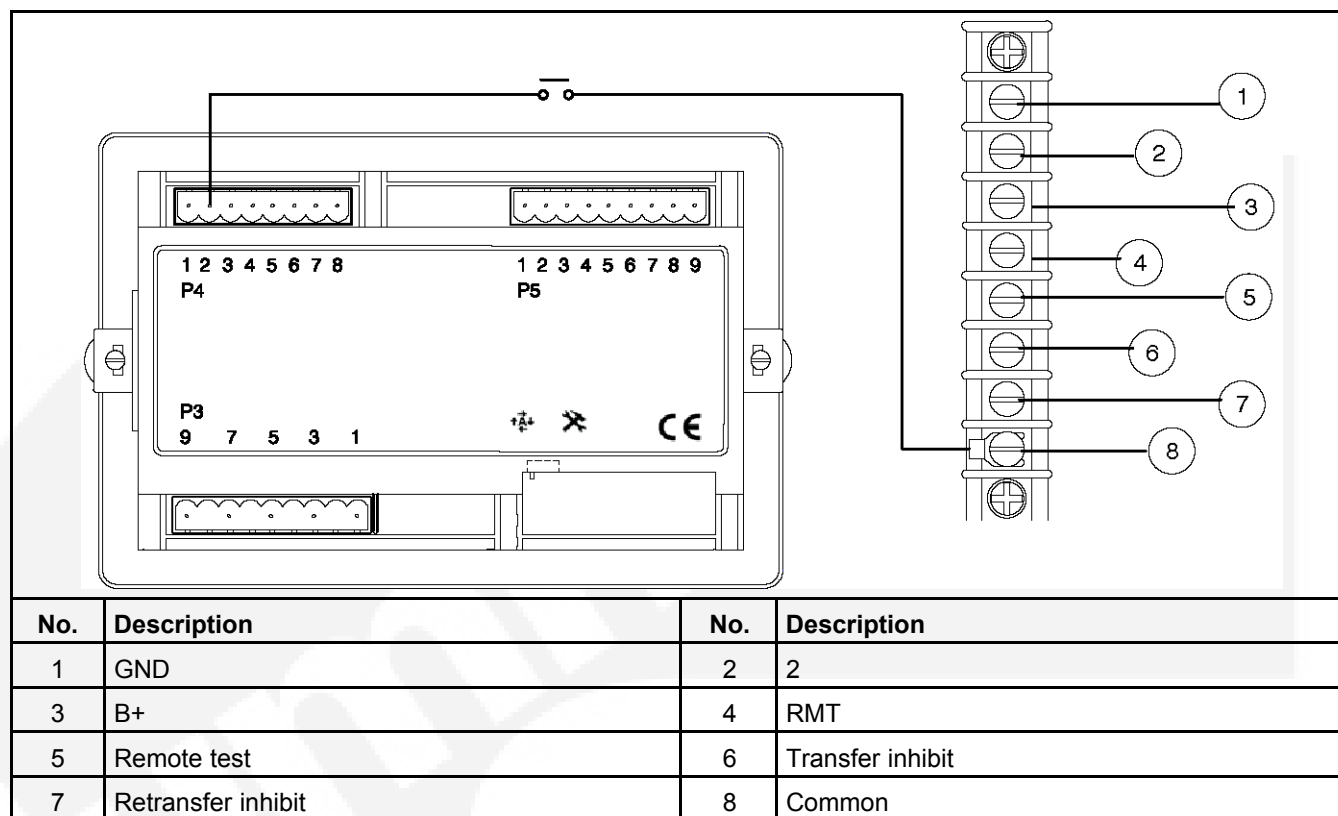


FIGURE 11. CONNECTIONS FOR REMOTE OVERRIDE INPUT



NOTE: TB1 and TB2 will accept 22 AWG - 12 AWG wire with 3/8 inch strip (10 mm). Torque to 9 in-lbs.

3.6 EC Control Panel

The EC control panel is located on the cabinet door.

The control features are divided into three groups:

- Control Function LEDs
- ATS Status LEDs
- Membrane Pushbuttons

3.6.1 Control Function LEDs

The control panel includes eight LEDs that display codes that indicate various control functions that can be configured. The first five LEDs display the function code and the last three LEDs display the value code for the displayed function.

With the exception of the first LED (Test), normally these LEDs are off and are only lit when in Configuration Mode. The Test LED is also used to notify the user of test periods.

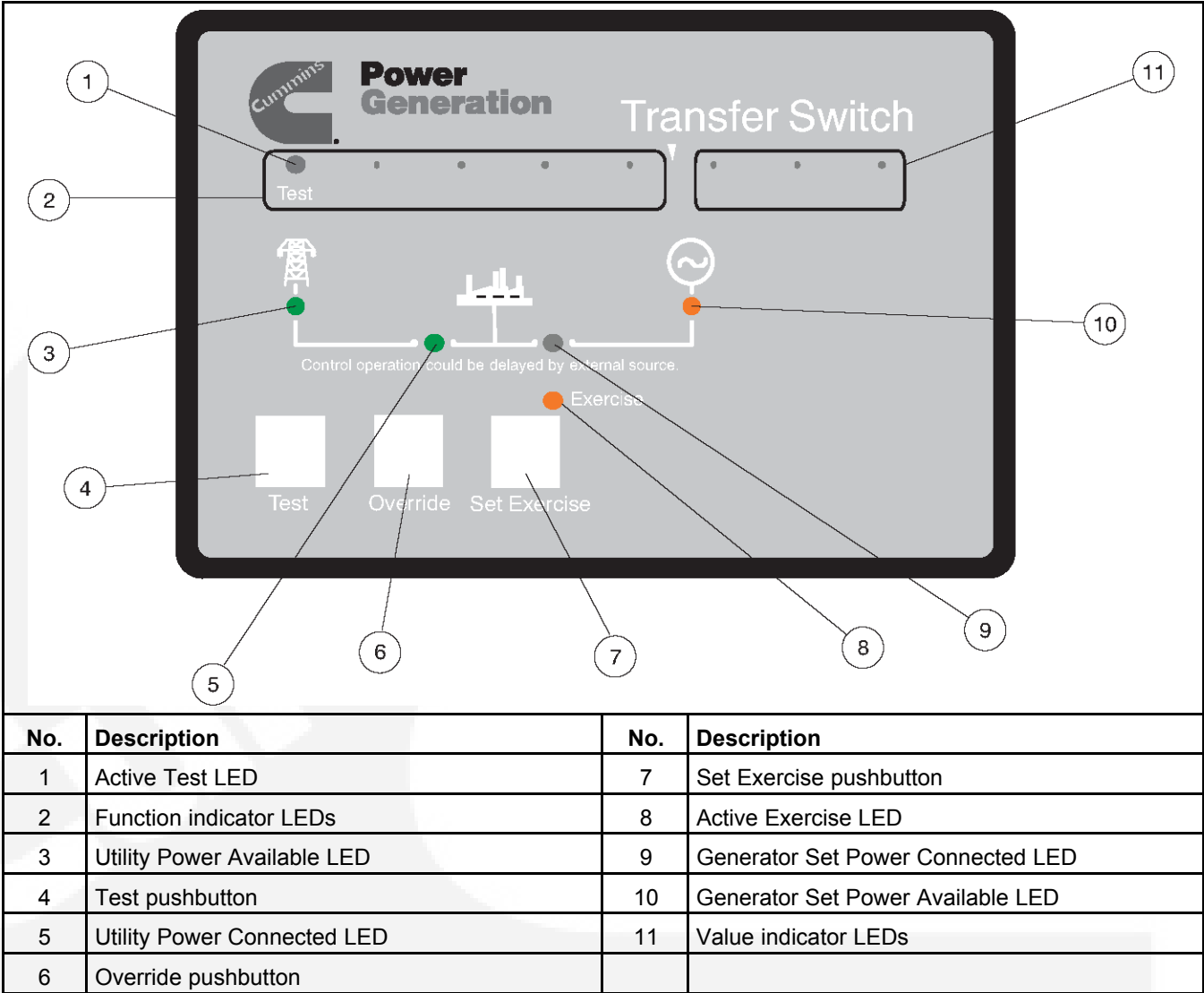


FIGURE 12. CONTROL FUNCTION LEDS

3.6.2 ATS Status LEDs

The control panel includes six LEDs that provide Automatic Transfer Switch (ATS) status information.

Utility Power Available: This green LED is lit when the utility power source has acceptable output voltage.

Genset Power Available: This amber LED is lit when the genset power source has acceptable output voltage and frequency.

Both power source LEDs can be lit simultaneously.

Utility Power Connected: This green LED is lit when utility power is supplying power to the load.

This LED flashes once per second if there is a failure to connect to or disconnect from utility power, when commanded. The control makes five attempts (there is ten seconds between each attempt) to connect to or disconnect from utility power before it flashes the failure.

Genset Power Connected: This amber LED is lit when the genset is supplying power to the load.

This LED flashes once per second if there is a failure to connect to or disconnect from the genset, when commanded. The control makes five attempts (there is ten seconds between each attempt) to connect to or disconnect from the genset before it flashes the failure.

Test: This amber LED is lit when there is an active test period. This LED flashes twice per second when the Test pushbutton is pressed to set or cancel a test period.

Exercise: This amber LED lights when repeat exercise periods have been set. This LED flashes twice per second when the Set Exercise pushbutton is pressed to set or cancel an exercise. This LED flashes once per second during an active exercise period.

3.6.3 Membrane Pushbuttons

The control panel includes three membrane pushbuttons.

Test: The Test pushbutton is used to set or cancel a test period. The control can be configured to test the genset with or without load.



NOTE: The Test pushbutton is also used in the Configuration Mode to step through the function codes.

Override: The Override pushbutton is used to terminate or bypass some time delays, to stop the Power Connected LEDs from flashing as a result of a failure to connect to or disconnect from a power source and to cancel an active exercise period.



NOTE: The Override pushbutton is also used in the Configuration Mode to step through the value codes.

Set Exercise: The Set Exercise pushbutton is used to set or cancel repeat exercise periods using the integrated exerciser.



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4 Operation

4.1 Transfer Switch Configuration

The transfer switch is preset at the factory to operate using default settings. The control will operate the transfer switch when power is applied. However, you may wish to adjust some of the settings for your application.

The transfer switch must be installed correctly, with DC power present, before any adjustments to the configuration can be made. If the transfer switch is connected to utility power, the Utility Power Connected LED will be lit if battery power is available. Utility or genset voltage need not be present to adjust the configuration.

The following tables show which control functions should not be changed and which functions can be changed for your application.

TABLE 1. FUNCTIONS PRESET AT THE FACTORY THAT SHOULD NOT BE CHANGED

Function	Factory Setting
System Nominal Voltage Table	Set for your system voltage
System Nominal Voltage	Set for your system voltage
System Nominal Frequency	Set for your system frequency
System Phase	Set for your system
External Exercise	Set to "On" if the external exerciser option was ordered; otherwise, set to "Off"

TABLE 2. FUNCTIONS THAT CAN BE CHANGED

Function	Factory Setting
TDES (Time Delay Engine Start)	3 Seconds
TDNE (Time Delay Normal to Emergency)	5 Seconds
TDEN (Time Delay Emergency to Normal)	10 Minutes
TDEC (Time Delay Engine Cool-down)	10 Minutes
TDPT (Time Delay Programmed Transition)	0 Seconds
TDEL (Time Delay Elevator Signal)	0 Seconds
Test With or Without Load	Without Load
Exercise With or Without Load	Without Load
Utility Under-voltage Pickup	90%
Utility Under-voltage Dropout	85%
Phase Check	Off
Return to Programmed Transition	Off
Elevator Post Transfer Delay	Off
Exercise Repeat Interval	Every 7 Days

4.2 Manual Operation

The transfer switch has operator handles for manually transferring the load. Manual operation must be performed by qualified personnel under **No-Load Conditions** only.

4.2.1 Manual Operation of Transfer Switches



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.*



WARNING: *AC power within the cabinet and the rear side of the cabinet door presents shock hazards that can cause severe personal injury or death. Use extreme caution to avoid touching electrical contacts with body, tools, jewelry, hair, clothes, etc.*

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.
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.
7. **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.



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.*

8. To return to automatic operation, restore power to the control by reconnecting the J1 connector.
9. Move the circuit breaker handle to the ON position.



NOTE: If the trip button was pressed in the previous steps, the circuit breaker handle must first be moved to the OFF position and then moved to the ON position.

10. For type 3R and 12 cabinets, close the cabinet outer door.

4.2.2 Pushbutton Operation

The following sections describe the operation of the pushbuttons that are located on the control panel.

4.2.2.1 Test Pushbutton

The Test button is used to:

- Start a generator set test. The Test LED flashes if the Test pushbutton is pressed and held for two seconds.
- Terminate a generator set test. The Test LED goes out if the Test pushbutton is momentarily pressed.

4.2.2.2 Override Pushbutton

The Override button is used to:

- Terminate the following system time delays:
 - Time Delay Engine Start (TDES)
 - Time Delay Normal to Emergency (TDNE)
 - Time Delay Emergency to Normal (TDEN)
- Bypass the TDNE timer and transfer the load immediately during an active Transfer Inhibit input.
- Bypass the TDEN timer and retransfer the load immediately during an active Retransfer Inhibit input.
- Stop the Utility Power Connected LED from flashing as a result of a failure to connect to or disconnect from the utility when commanded.
- Stop the Genset Power Connected LED from flashing as a result of a failure to connect to or disconnect from the generator set when commanded.
- Cancel an active exercise period.

The Program Transition (TDPT), Elevator signal (TDEL) and Engine Cool Down (TDEC) time delays are not affected by pressing this pushbutton.

4.2.2.3 Set Exercise Pushbutton

This pushbutton is only used with the integrated exerciser and only functions if the External Exercise function is disabled (set to OFF).

The Set Exercise button is used to:

- Set a delayed repeat exercise period when the pushbutton is pressed and held for five seconds.
- Start an immediate exercise period (that also repeats) if the pushbutton is pressed momentarily within ten seconds of starting the delayed exercise period.
- Cancel a repeatable exercise period if the pushbutton is pressed and held for five seconds.

4.3 System Testing

4.3.1 Test With or Without Load

This Feature allows a transfer switch operator to test the transfer switch and generator power system.

The test is configurable to be with load or without load.

- A test **with load** initiates a load transfer.
 - A test **without load** starts the generator and runs it without load.
1. Set the control setting to test with or without load, as desired.
 2. To start a test, press and hold the Test pushbutton for two seconds or ground the Remote Test input.
 3. To end the test, momentarily press the Test pushbutton or remove the ground from the Remote Test input.



NOTE: When ending a test with load, you can bypass the retransfer time delay (TDEN) and cause the immediate load retransfer by pressing the Override button. The generator stops after the engine cool-down time delay (TDEC).

4.3.2 Test With Load - Sequence of Events

The following describes the sequence of events of a transfer switch during a test with load.

In this example, TDPT is set to zero, the phase check sensor is disabled, the Transfer Inhibit and Retransfer Inhibit inputs are inactive and TDEL is set to zero.

The utility must be acceptable during the entire test event. Acceptability is determined by the active source sensor (under-voltage sensor). If, at any time, the under-voltage sensor determines that the utility is not acceptable, the test is terminated.

Before a test can begin, the transfer switch must be connected to the utility power source and utility power must be available.

1. Verify that the transfer switch is set to test with load.
2. Verify that the green Utility Power Connected LED on the control panel is lit.
3. Verify that the green Utility Power Available LED on the control panel is lit.
4. Press and hold the control panel Test pushbutton for two seconds or ground the Remote Test input to initiate the test. The Test LED flashes two times per second for two seconds, acknowledging that the test was activated. Once the test period starts, the Test LED stays on continuously.
5. The control simulates a utility power failure but the Utility Power Available LED remains lit as long as the utility is still available.
6. The control starts the TDES timer. After the timer expires, the control de-energizes the start relay, closing the start contact to signal the generator to start.
7. When the generator output is acceptable (the Generator set Power Available LED is lit) the control starts the TDNE timer.
8. After the TDNE timer expires, the transfer switch transfers to the generator set (the Generator set Power Connected LED is lit).

9. The control continues to run the generator with the transfer switch connected to the generator set until the control panel Test pushbutton is momentarily pressed or the ground is removed from the Remote Test input.
10. After this action, the control starts the TDEN timer. The Test LED flashes twice per second for two seconds to acknowledge the operation and then the Test LED goes out.
11. After TDEN timer expires, the transfer switch retransfers back to the utility (the Utility Power Connected LED is lit).
12. Once the transfer switch is connected to utility power, the control starts the TDEC timer.
13. After the timer expires, the control energizes the start relay, opening the start contact to signal the generator to stop.

4.3.3 Test Without Load - Sequence of Events

The following describes the sequence of events of a transfer switch during a test without load.

In this example, the generator is started and runs without load for the duration of the test.

The utility must be acceptable during the entire test event. Acceptability is determined by the active source sensor (under-voltage sensor). If, at any time, the under-voltage sensor determines that the utility is not acceptable, the test is terminated.

Before a test can begin, the transfer switch must be connected to the utility power source and utility power must be available.

1. Verify that the transfer switch is set to test without load.
2. Verify that the green Utility Power Connected LED on the control panel is lit.
3. Verify that the green Utility Power Available LED on the control panel is lit.
4. Press and hold the control panel Test pushbutton for two seconds or ground the Remote Test input to initiate the test. The Test LED flashes two times per second for two seconds, acknowledging that the test was activated. Once the test period starts, the Test LED stays on continuously.
5. The control de-energizes the start relay, closing the start contact to signal the generator to start. When the generator set starts and produces power, the amber Generator set Power Available LED lights.
6. The control continues to run the generator without load until the control panel Test pushbutton is momentarily pressed or the ground is removed from the Remote Test input.
7. After the control panel Test pushbutton is momentarily pressed or the ground is removed from the Remote Test input, the control flashes the Test LED twice per second for two seconds to acknowledge the operation and then goes out.
8. The control energizes the start relay, opening the start contact to signal the generator to stop.

4.4 Sensors

4.4.1 Utility Sensor

The utility sensor monitors all phases of the utility for under-voltage conditions. Both the pickup and dropout set points are adjustable. The set points are listed in the following table.

The following image illustrates how the pickup and dropout settings work.

4.4.1.1 Utility Under-Voltage Set Points

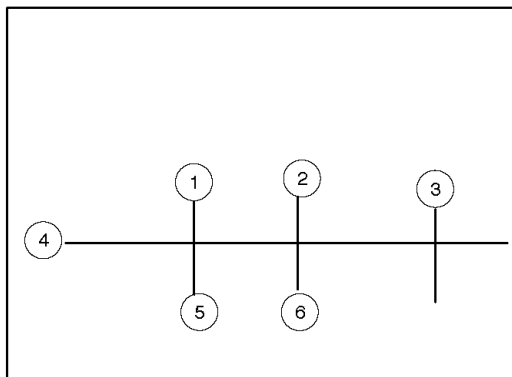


NOTE: If the utility under-voltage pickup is set at 90%, then the dropout has to be set lower than 90%.

TABLE 3. UTILITY UNDER-VOLTAGE SET POINTS

Description	Available Set Points
Under-voltage Pickup (% of Nominal)	95%
	90%
Under-voltage Dropout (% of Nominal)	90%
	85%
	80%
	70%

4.4.1.2 Under-Voltage Sensing



No.	Description	No.	Description
1	Drop-out setting (204V)	2	Pick-up setting (216V)
3	Nominal set point (240V)	4	Volts
5	85% of Nominal	6	90% of Nominal

4.4.2 Generator Sensor

The generator sensor is a single phase sensor that monitors under-voltage and under-frequency conditions. All the pickup and dropout settings are fixed and are not adjustable. The generator set under-voltage and under-frequency set points are listed in the following table.

4.4.2.1 Generator Set Under-Voltage and Under-Frequency Set Points

TABLE 4. GENERATOR SET UNDER-VOLTAGE AND UNDER-FREQUENCY SET POINTS

Description	Set Point
Under-voltage Pickup (% of Nominal)	90%
Under-voltage Dropout (% of Nominal)	75%
Under-frequency Pickup (% of Nominal)	90%
Under-frequency Dropout (% of Nominal)	75%

4.4.3 Phase Check Sensor

The phase check sensor can be enabled (set to ON) for applications that require a fast transfer of a load between two live sources (both Power Source Available LEDs are lit). The phase check sensor determines when the relative phase difference (less than 25° and approaching 0°) and the frequency differences (less than 1 Hz) of the two sources are within specified limits. When all conditions are met, a transfer is initiated.

If enabled, the phase check sensor is activated after all time delays have expired, just before the transfer switch transfers the load, and only when both sources are available.

4.4.4 Return to Programmed Transition

This feature can be used in conjunction with the phase check sensor. If, for some reason the two sources do not fall within the specified limits of the phase check sensor for a period of two minutes, then the control bypasses the phase check sensor, returns to the Programmed Transition sequence of operation and transfers the load.

If this feature is enabled, the Programmed Transition Time Delay (TDPT) should be set greater than zero. The actual setting depends on your load.

4.5 Generator Set Exerciser

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

The control includes an integrated exerciser that is set by pressing the Set Exercise pushbutton. In addition, there may also be an optional fully programmable external exerciser clock installed and wired to a control input.

If both types of exercisers are available, only one exerciser can operate at a time. The control panel must be configured for the type of exerciser being used. This is done by setting the External Exerciser function ON or OFF.

- If the **integrated exerciser is used**, the External Exercise ON/OFF function must be set to OFF.
- If the **external exerciser is used**, the External Exercise ON/OFF function must be set to ON.

- If the **external exerciser is factory-supplied**, the External Exercise ON/OFF function is set to ON at the factory.
- If the **external exerciser is not factory installed**, the External Exercise ON/OFF function is set to OFF.

4.5.1 Exercise With or Without Load

The exercise with/without load configuration works with both types of exercisers. The default value is, without load.

- When with load is selected, the load is transferred to the genset.
- When without load is selected, the generator set runs with no load for the duration of the exercise period.

4.5.2 Integrated Exerciser

This function is standard and is built into the control. With this exerciser, the exercise period is 20 minutes and repeats every 7, 14, 21 or 28 days. The default value is 7 days.

The integrated exercise function cannot be used unless the External Exercise function is disabled (set to OFF).

Before an exercise can begin, the transfer switch must be connected to utility power and utility power must be available (the green Utility Power Available LED must be lit).

4.5.2.1 Power Loss Backup

If DC power is removed from the control panel, the exercise clock uses a replaceable lithium battery to back up the time setting. The battery is good for ten years and does not need to be serviced. The battery is attached to the time chip on the control board.

If no exercise period is set, the Exercise LED is off.

4.5.2.2 Setting the Integrated Exercise Period

The exercise period will repeat every 7, 14, 21 or 28 days, depending on the settings of the Exercise Repeat interval.

1. Verify that the Exercise LED is off and the External Exercise function is disabled (set to OFF). If the External Exercise function is enabled, the integral exerciser is disabled.
2. To set the exercise start time for a repeat exercise period, press and hold the Set Exercise pushbutton for 5 seconds. The Exercise LED flashes at a rate of twice per second for 5 seconds and then stays on when the exercise period is set. A delayed 20 minute exercise period will start in 12 hours. At that time, the Exercise LED flashes at a rate of once per second during the entire exercise period. When the exercise period is over, the Exercise LED quits flashing and remains on to signify that repeat exercise periods are enabled.
3. To start an immediate exercise period and have it repeat, momentarily press the Set Exercise pushbutton a second time within ten seconds of starting the delayed exercise period. Momentarily pressing and releasing the Set Exercise pushbutton a second time starts an immediate 20 minute exercise period instead of waiting for 12 hours. The Exercise LED flashes at a rate of once per second during the entire exercise period. When the exercise period is over, the Exercise LED stops flashing and remains on to signify that repeat exercise periods are enabled.

4.5.2.3 Canceling Repeat Exercise Periods

With the control panel Exercise LED on steady, press and hold the Set Exercise pushbutton for 5 seconds.

The Exercise LED flashes at a rate of twice per second for 5 seconds and then goes out to signify that repeat exercise periods are cancelled.

4.5.2.4 Canceling An Active Exercise Period

Active exercise periods can be cancelled by pressing the Override pushbutton on the control panel or by grounding the remote override input on the back of the control panel.

4.5.2.5 Power Source Failure During An Active Exercise Period

If either power source fails during an active exercise period, the control immediately terminates the exercise and proceeds with the automatic mode of operation.

4.5.2.6 Exercise With Load Sequence of Events

1. When an exercise period becomes active, the Exerciser LED flashes at a rate of once per second.
2. The control signals the generator to start.
3. When the generator output is acceptable, the control transfers the load to the generator, following the configuration set points.
4. After the exercise period has ended, the control retransfers the load back to the utility, following the configured set points.
5. Once the load is connected to utility power, the control runs the generator set unloaded for the duration of the cool-down timer (TDEC).
6. After the TDEC timer expires, the control signals the generator set to stop.
7. Unless the repeat exercise periods have been cancelled, the Exercise LED quits flashing and remains on to signify that repeat exercise periods are set. If the exerciser is not set up to repeat exercises, the Exercise LED goes out.

4.6 External Exercise Clock Option

The optional external exercise clock includes a real-time clock that keeps track of the time and date. The 7-day clock can be set for automatic changeover for summer/winter (daylight savings/standard) time. The exercise clock can be used with 12 or 24 VDC operation.

Up to 28 programs are available to set exercise start and stop times. One program is required to start an exercise period and a second one is required to stop an exercise period.

The exercise clock has a built-in test feature that can be used to initiate an exercise that has not been programmed or cancel a programmed exercise in process.



NOTE: The clock includes a non-replaceable lithium battery with a life expectancy of at least ten years. If the clock battery is weak during a power failure, the clock will need to be replaced.

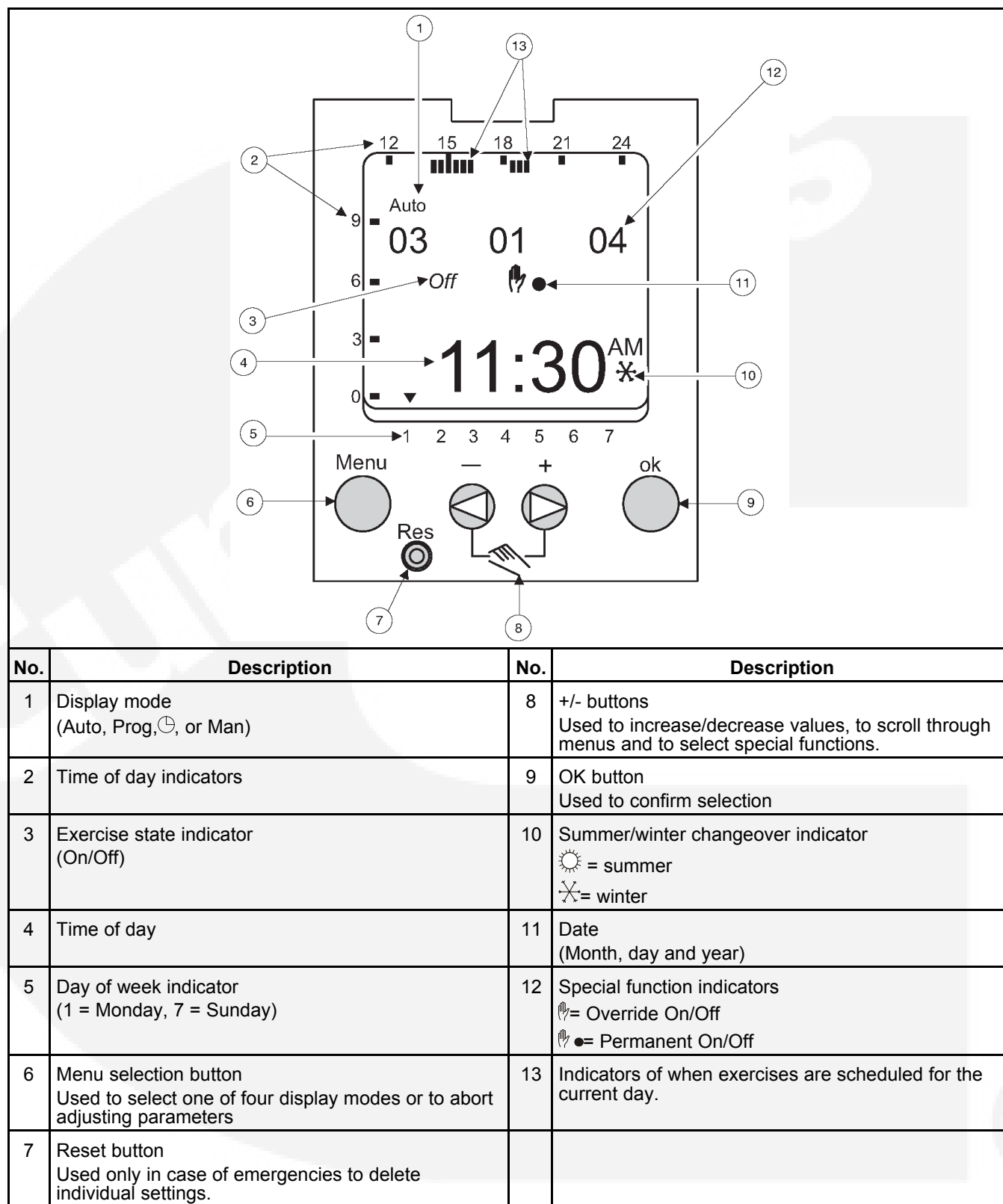


FIGURE 13. EXTERNAL EXERCISE CLOCK

4.6.1 Using the Menu Button

The Menu selection button is used to select three display modes that have adjustable menus.

- **Clock mode** is used to set the correct date and time. This mode can also be used to automatically switch to the correct summer/winter time.
- **Program mode (Prog)** is used to set, review and clear exercise start/stop times.
- **Manual mode (Man)** is used to enter a 4-digit code to prevent changing settings by unauthorized personnel.

When adjustments are completed, the Home menu (Auto mode) is redisplayed. The Menu button can also be used to abort adjusting parameters and return to the Home menu.

4.6.2 Using the +/- Buttons

Pressing the + or -button is used to:

- Increase or decrease a parameter in an adjustable menu
- Select the next or previous menu.

Simultaneously pressing the + and -buttons is used to select special functions.

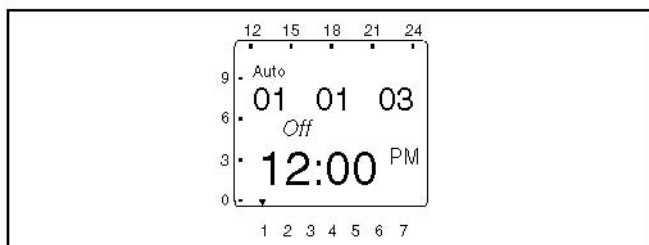
- Initiate an exercise.
- Override an active exercise.
- Select permanent on/off mode.

4.6.3 Using the ok Button

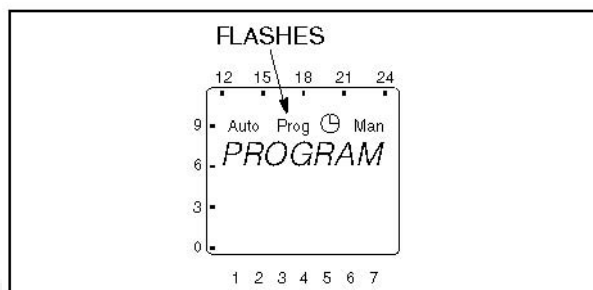
The OK button is used to confirm the menu selection or program adjustments you have made. Upon pressing the OK button, the next available menu is displayed and, if any program adjustments were made, the changes are saved.

4.6.4 Setting the Clock with Summer/Winter Time (Daylight Savings Time)

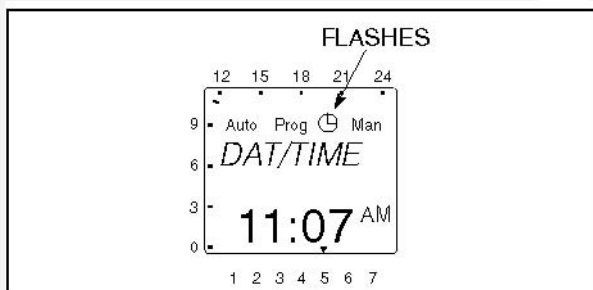
The clock is programmed with the correct date and central USA standard time and with the correct daylight savings time settings. If it is necessary to change these settings, the following describes how to adjust the time and date and how to set the clock to automatically switch to summer/winter time (daylight savings time).



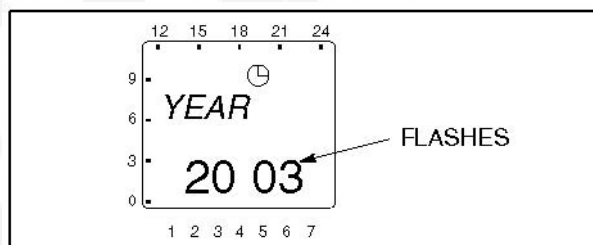
1. Press the Menu button on the exercise clock. The Program menu is displayed.



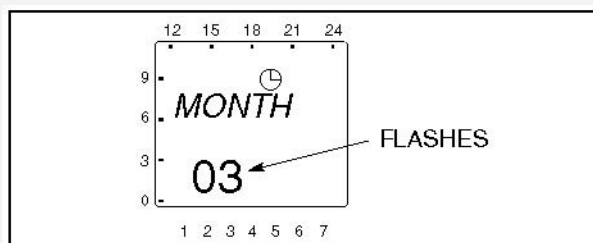
2. Press the **+** button. The Date/Time menu is displayed.



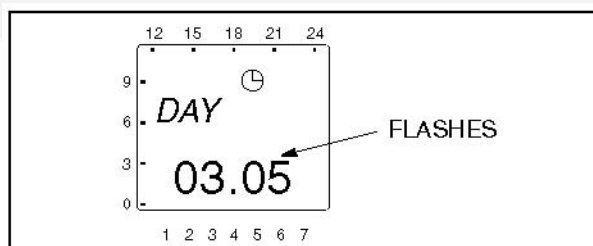
3. Press the **ok** button to display the Year menu.



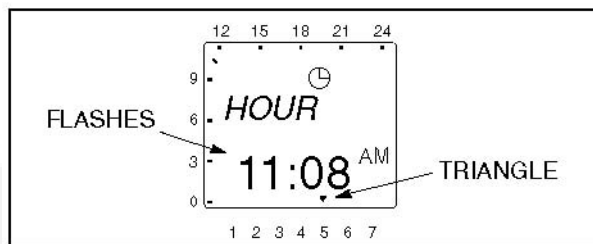
4. Press the **+** or **-** button to set the correct year. Press the **ok** button to display the Month menu.



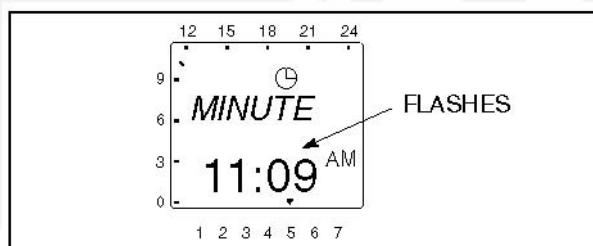
5. Press the **+** or **-** button to set the correct month. Press the **ok** button to display the Day menu.



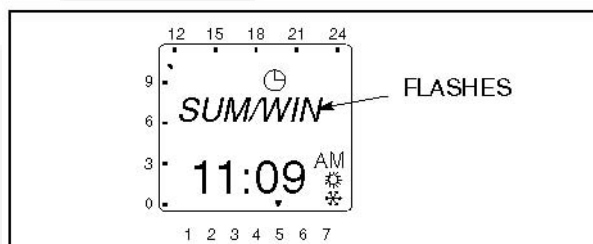
6. Press the **+** or **-** button to set the correct day. Press the **ok** button to display the Hour menu. A small triangle is displayed above the assigned number in the display for the day of the week (1 = Monday, 7 = Sunday).



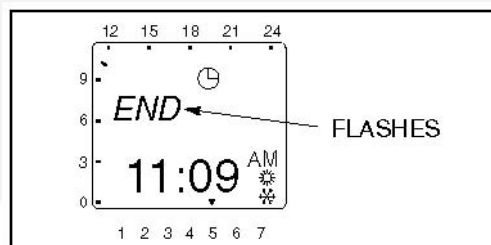
7. Press the **+** or **-** button to set the correct hour. A line is displayed on the screen indicating the hour of the day selected (the left side of the screen is for the first half of the day [AM] and the top of the screen is for the second half of the day [PM]). Press the **ok** button to display the Minute menu.



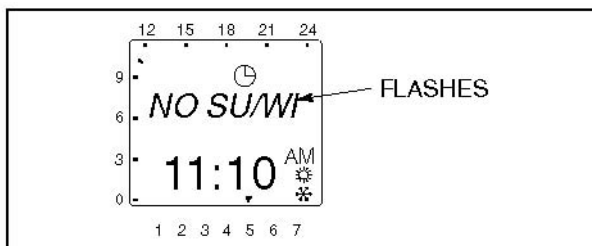
8. Press the **+** or **-** button to set the correct minute. Press the **ok** button to display the Summer/Winter menu.



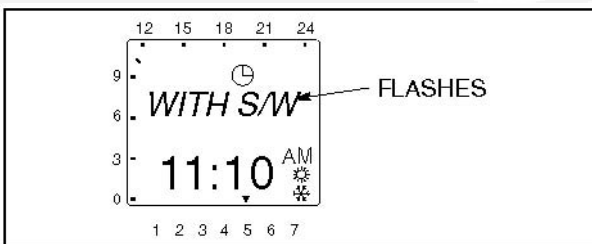
NOTE: If you do not wish to set the clock for automatic summer/winter changeover at this time, press the **+** or **-** button. "End" is displayed on the screen. Press the **ok** button to return to the Home menu.



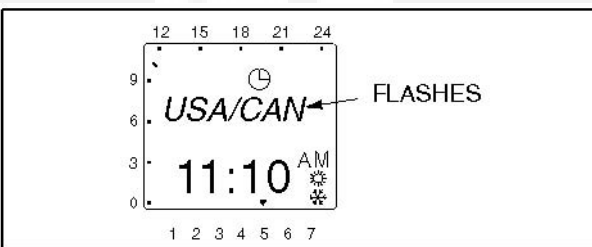
9. Press the **ok** button to display the No Summer/Winter menu.



10. Press the **+** or **-** button to display the With Summer/Winter menu.



11. Press the **ok** button to display the World Area menu.

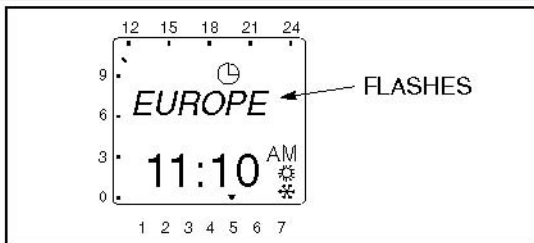


12. Either select one of the world areas that has been programmed for automatic time correction or else set up your own changeover times.



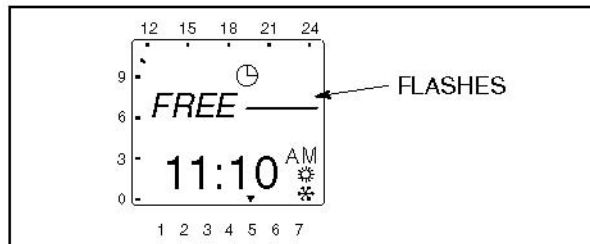
NOTE: With the Daylight Savings Time program set for North America,

- The first Sunday in April moves the time forward one hour.
- The last Sunday in October moves the time back one hour.
- If you wish to select one of the world areas (Europe, GP/P, SF/GR/TR, USA/CAN) that has been programmed for automatic time correction, press the **+** or **-** buttons until the correct world area is selected.

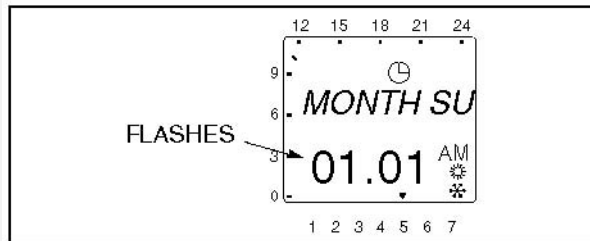


- To set up your own changeover times, press the **+** or **-** buttons from the World Area menu until the word "Free" is displayed.

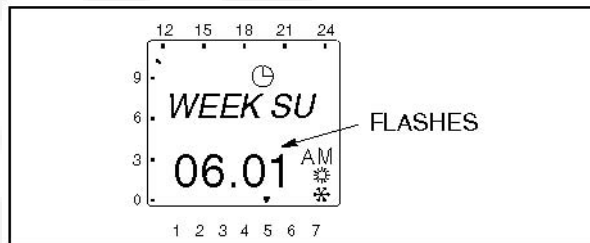
13.



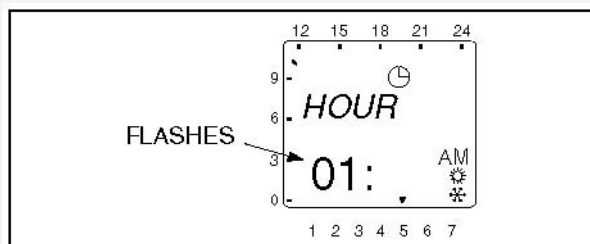
14. Press the **ok** button to display the menu for setting the month when the Summer changeover will take place. Press the **+** or **-** buttons until the desired month is displayed.



15. Press the **ok** button to display the menu for setting the week when the Summer changeover will take place. Press the **+** or **-** buttons until the desired week (1 thru 5 [1 = first week, 4 = fourth week, 5 = last week]) is displayed.

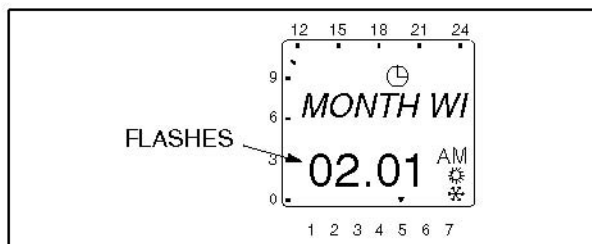


16. Press the **ok** button to display the menu for setting the hour of the day when the Summer changeover will take place. Press the **+** or **-** buttons until the desired hour (1 thru 3) is displayed.

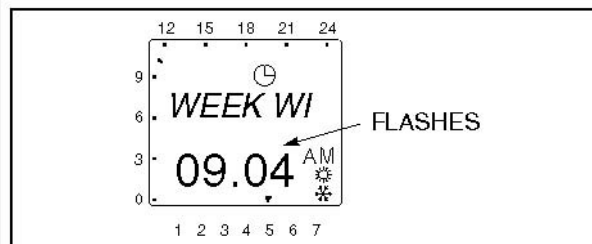


NOTE: The starting time can only be set for 1:00, 2:00, or 3:00 AM.

17. Press the **ok** button to display the menu for setting the month when the Winter changeover will take place. Press the **+** or **-** buttons until the desired month is displayed.

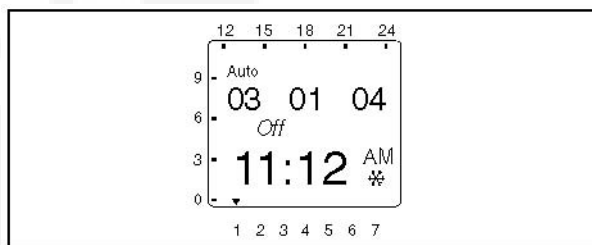


18. Press the **ok** button to display the menu for setting the week when the Winter changeover will take place. Press the **+** or **-** buttons until the desired week (1 thru 5 [1 = first week, 4 = fourth week, 5 = last week]) is displayed.



NOTE: The starting time for the winter changeover is the same time that was set previously.

19. Press the **ok** button. The Home menu is redisplayed and the appropriate summer/winter symbol is displayed.

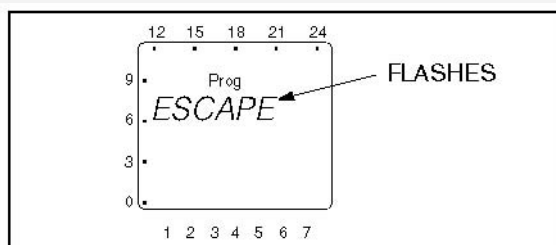


4.6.5 Setting Exercise Start and Stop Times

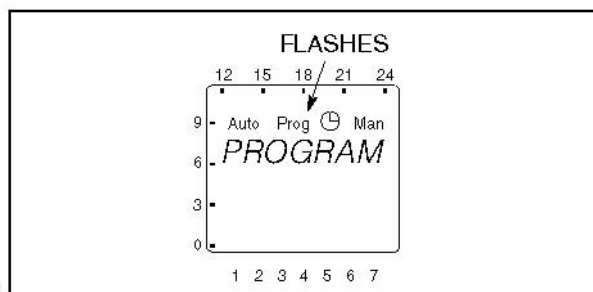
Up to 28 programs can be used to set exercise start and stop times. One program is required to start an exercise period and a second one is required to stop an exercise period.



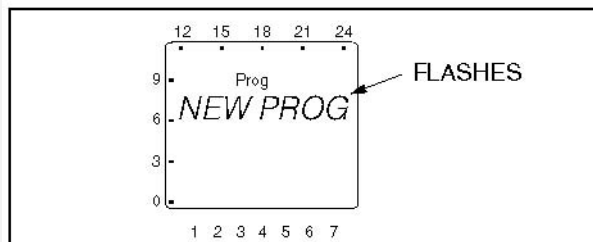
NOTE: If the Menu button is pressed before a Start/Stop program is saved, the word "Escape" is displayed on the screen. The program settings are lost and the Home menu is displayed after two seconds or by pressing the OK button.



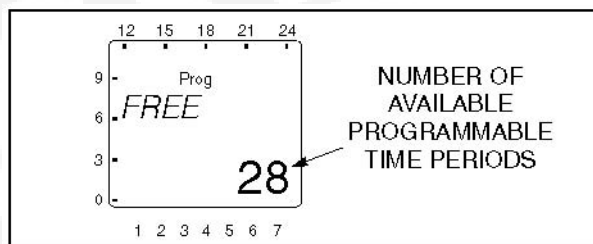
1. From the Home menu, press the Menu button. The Program menu is displayed.



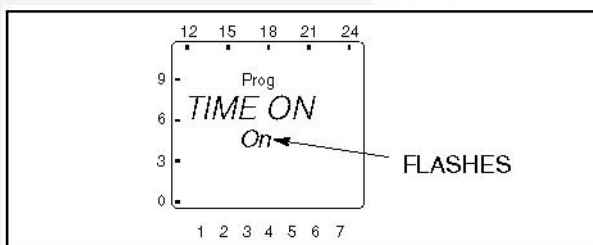
2. Press the OK button. The New Program menu is displayed.



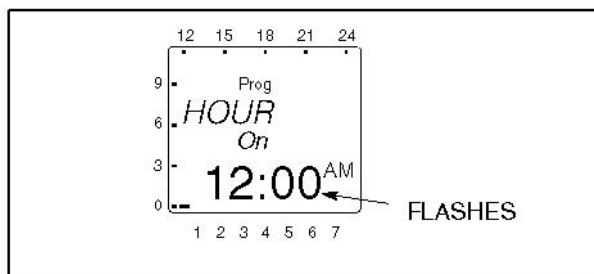
3. Press the OK button. The number of available programmable time periods (maximum of 28) is temporarily displayed.



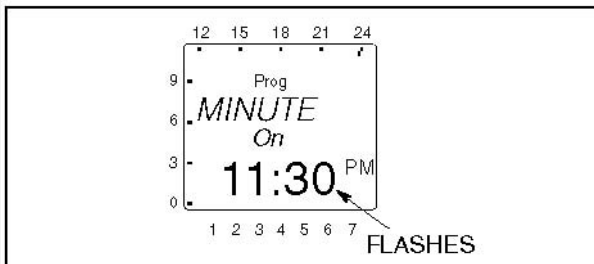
4. The Starting Time (Time On) menu is displayed. Press the OK button.



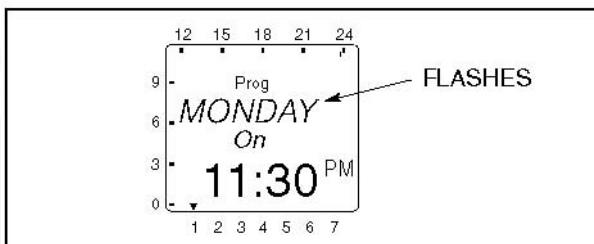
5. The Hour menu is displayed. Press the + or - buttons to set the desired exercise starting hour (default = 12:00 AM). A line is displayed on the screen indicating the hour of the day selected (the left side of the screen is for the first half of the day [AM] and the top of the screen is for the second half of the day [PM]). Press the OK button.



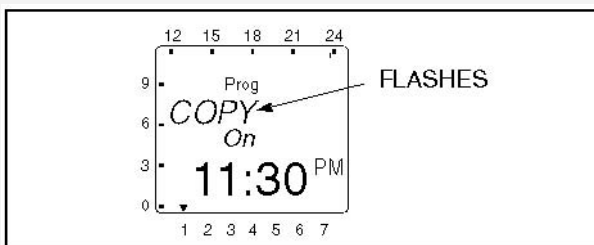
6. The Minute menu is displayed. Press the + or - buttons to set the desired exercise starting minute. Press the OK button.



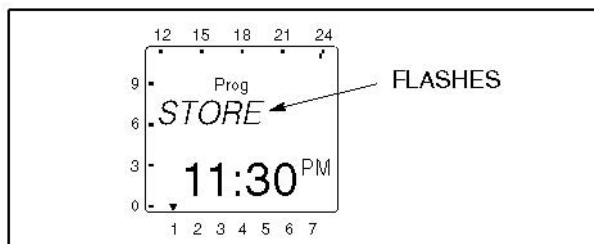
7. A menu is displayed for selecting the day of the week the exercise is to begin (default = Monday). Press the + or - buttons to select the desired day of the week. A small triangle is displayed above the assigned number in the display for the day of the week (1 = Monday, 7 = Sunday). Press the OK button.



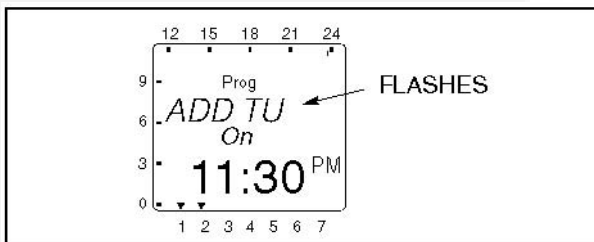
8. The Copy menu is displayed. If you do not wish to have the exercise repeat more than once a week, go to step 9. If you do wish to have the exercise repeat more than once a week, go to step 10.



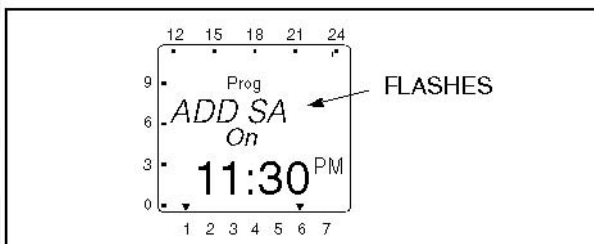
9. Press the + or - buttons. The Store menu is displayed. Press the OK button. Go to step 13.



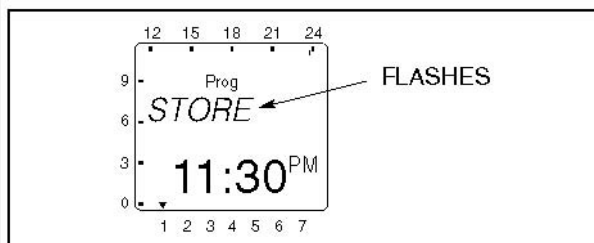
10. To repeat an exercise more than once a week, press the OK button when the Copy menu is displayed. The Add ___ day menu is displayed. The day after the day selected in step 7 is displayed.



11. Press the + or - buttons to select the desired day of the week that an exercise is to begin. Press the OK button.



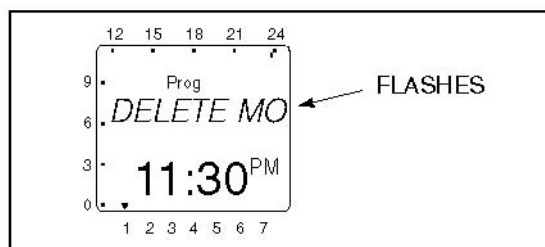
12. Press the + or - buttons. The Store menu is displayed. Press the OK button.



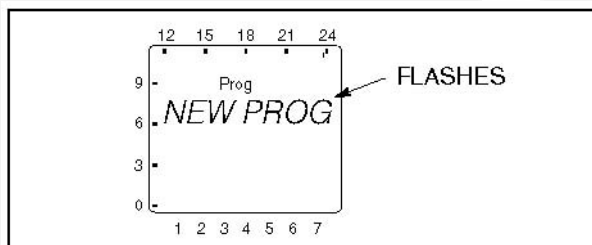
NOTE:

After setting all days of the week that an exercise is to be repeated, you can use the + or - buttons to cycle through the days and recheck the programs. When a day that has a set program is redisplayed, it can be deleted. In the menu shown below, press the OK button to delete the displayed program.

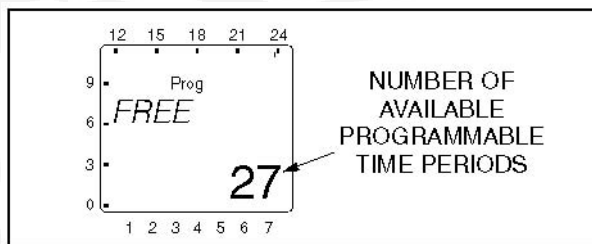




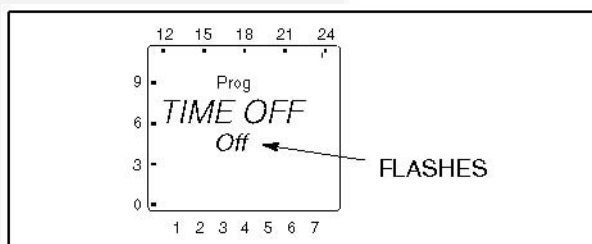
13. The New Program menu is redisplayed.



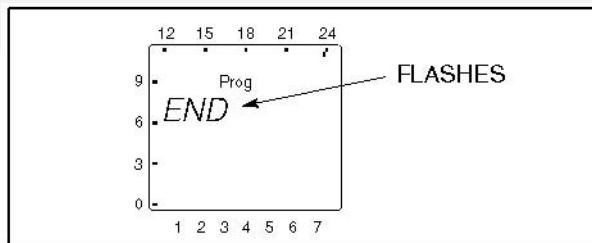
14. Press the OK button to enter a time the exercise is to end. The number of available programmable time periods is temporarily displayed. Please note that the number of available programmable time periods has now decreased by one.



15. The Ending Time (Time Off) menu is displayed. Press the OK button.



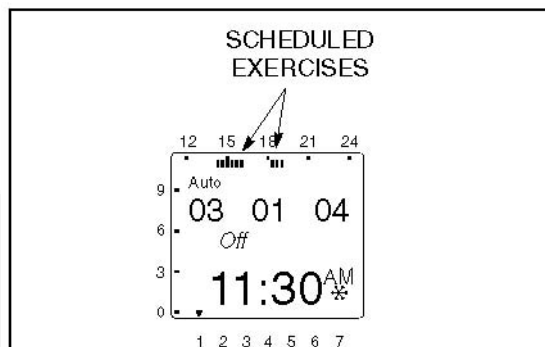
16. Repeat steps 5 through 13 to set up the stop time for your exercise.
 17. When the New Program menu is redisplayed, press the + or - buttons until "End" is displayed.



18. Press the OK button to return to the Home menu.



NOTE: If there are any exercises scheduled for the current day, those time periods are indicated on the screen.



4.6.6 Checking the Programs

The Check Program menus can be used to review all set exercise start/stop times and, if necessary, delete them.

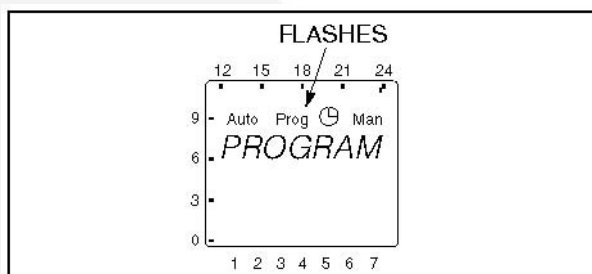


NOTE: If the Menu button is pressed while viewing start/stop programs, the Program Check function is aborted and the Home menu is redisplayed.

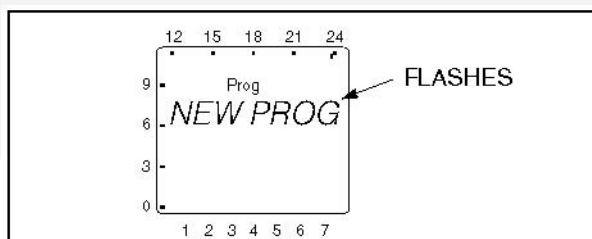
4.6.6.1 Reviewing Exercise Start/Stop Times

All exercise start and stop exercise parameters can be viewed from the Program Check menu. Normally, the starting time is followed by the ending time for a programmed exercise. However, if a second exercise period overlaps the time frame of the first exercise period in the current day, two start times are displayed, followed by two stop times.

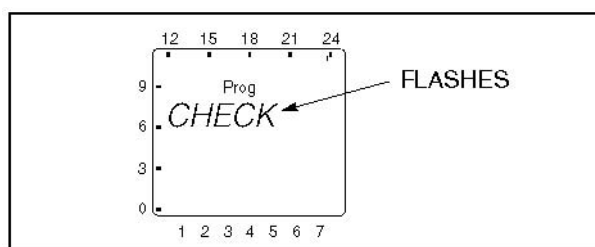
1. From the Home menu, press the Menu button. The Program menu is displayed.



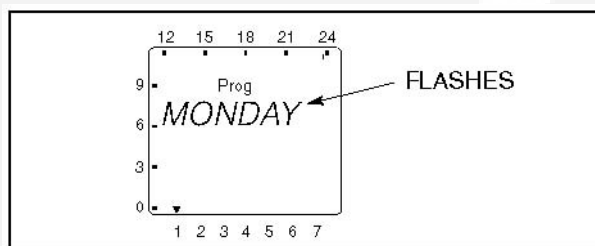
2. Press the OK button. The New Program menu is displayed.



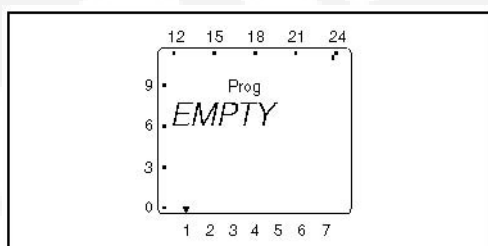
3. Press the + button once. The Check menu is displayed.



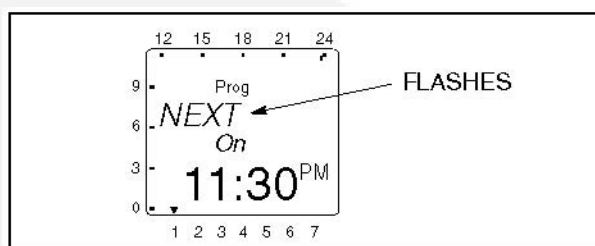
4. Press the OK button. The Monday menu is displayed.



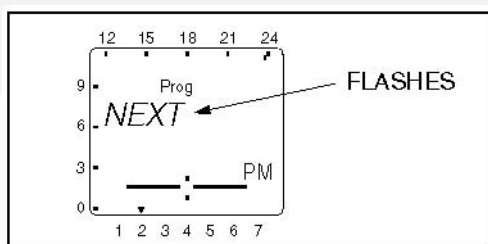
NOTE: If no exercise periods are set up, the message "Empty" is displayed. To return to the New Program menu, press the ok button.



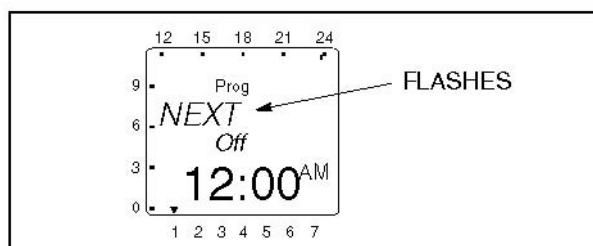
5. Use the + or - buttons to select the day of the week you wish to check. Press the OK button. The starting time for the first exercise for the selected day is displayed.



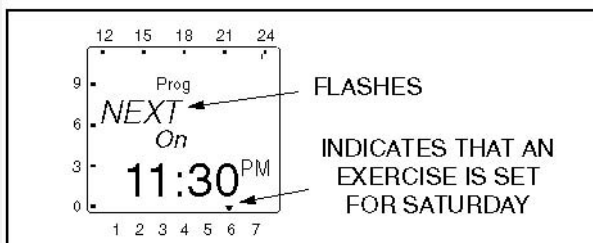
NOTE: If a day does not have any set exercise periods, the screen below is displayed.



6. Press the OK button. The ending time for the first exercise for the selected day is displayed.

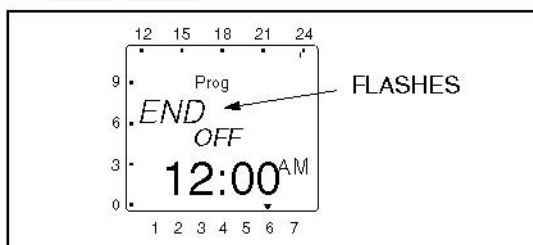


7. Press the OK button. The next exercise start time is displayed. If the next start time is not on the day selected in step 5, the day of the week is indicated on the bottom of the screen.

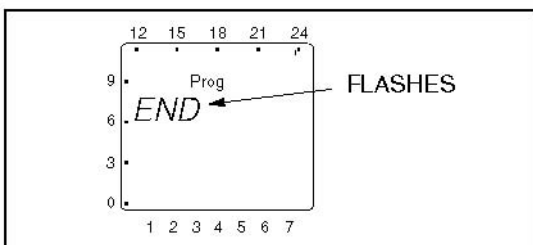


8. Review additional set exercise periods and return to the Main menu.

- To exit the Check Programs function without reviewing all set exercise periods, press the + or - buttons until "END" is displayed. Press the OK button to return to the Main menu.

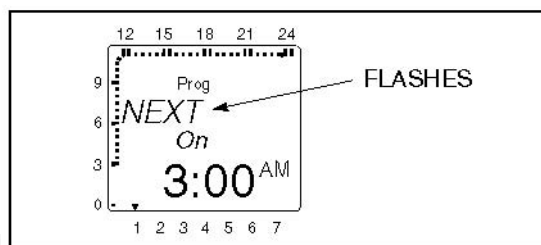


- To review all set exercise periods, repeat steps 6 and 7 until the word "END" is displayed. Press the OK button to return to the Main menu.



NOTE:

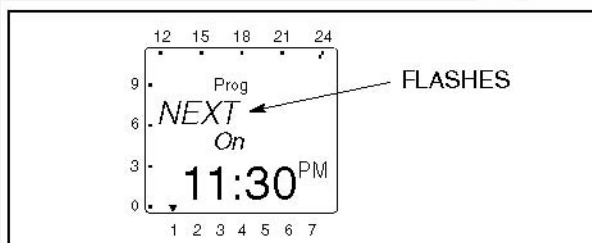
If an exercise period has been programmed with a start time only, a continuous band of segments is displayed on the left side and top of the screen showing the time of day the incomplete exercise period is set to begin. This band of segments is also displayed on any other exercise periods scheduled for that day.



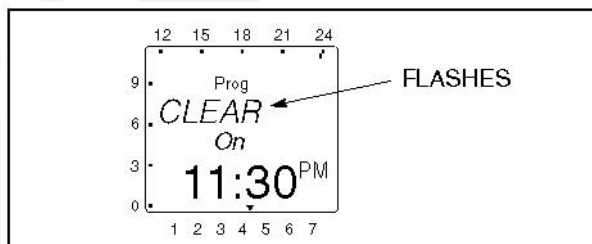
If an exercise period has been programmed with a stop time only, no special indicator is displayed. The stop time is simply ignored.

4.6.6.2 Deleting Exercise Start/Stop Times

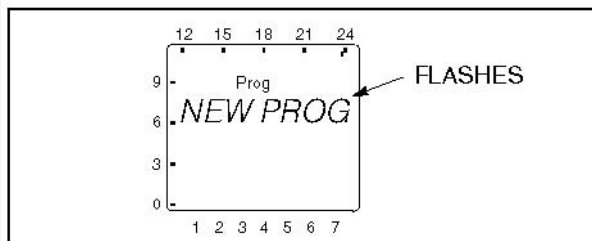
While checking the programs, you can also delete individual start and stop times.



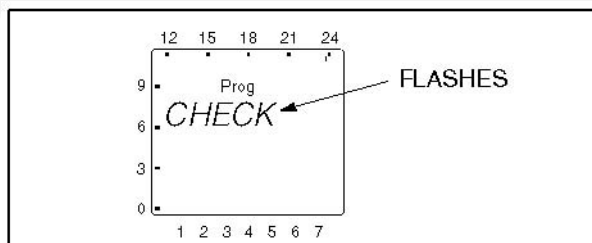
1. When an programmed exercise start time is displayed, press the + or - buttons until "Clear" is displayed.



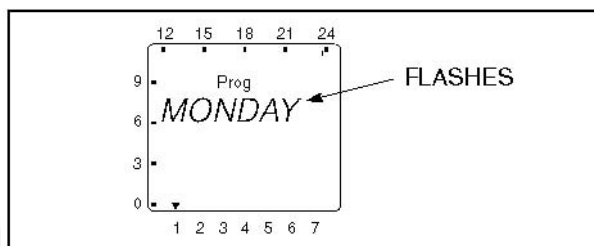
2. Press the OK button. The New Program menu is redisplayed.



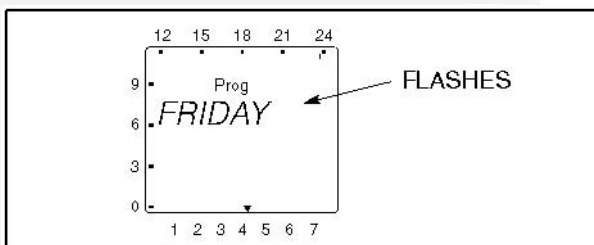
3. Press the + button once. The Check menu is displayed.



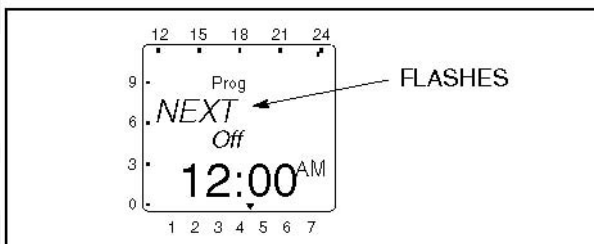
4. Press the OK button. The Monday menu is displayed.



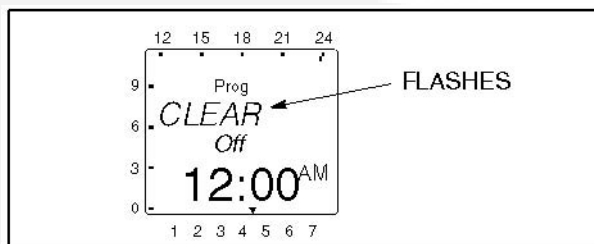
5. If necessary, use the + or - buttons to select the day of the week that includes the exercise ending time you wish to delete.



6. Press the OK button.



7. Press the + or - buttons until "Clear" is displayed.

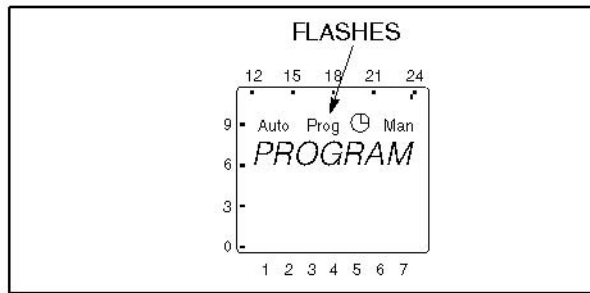


8. Press the OK button. The New Program menu is redisplayed.

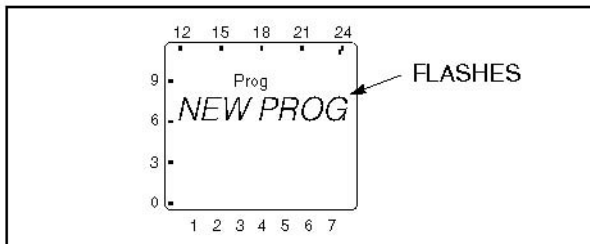
Individual or all exercise periods can also be cleared.

4.6.7 Erasing (Clearing) A Programmed Exercise Period

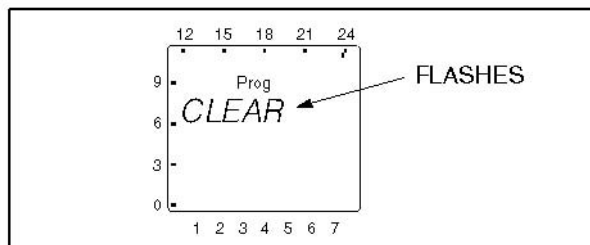
1. From the Home menu, press the Menu button. The Program menu is displayed.



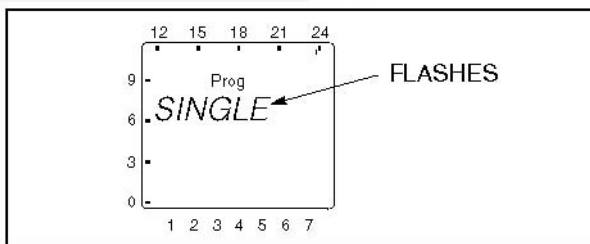
2. Press the OK button. The New Program menu is displayed.



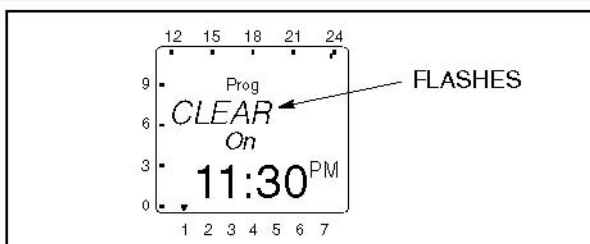
3. Press the + or - button until the Clear menu is displayed.



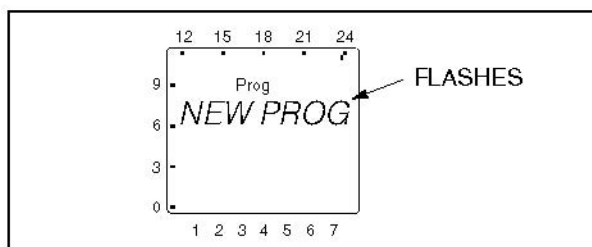
4. Press the + or - button until "Single" is displayed.



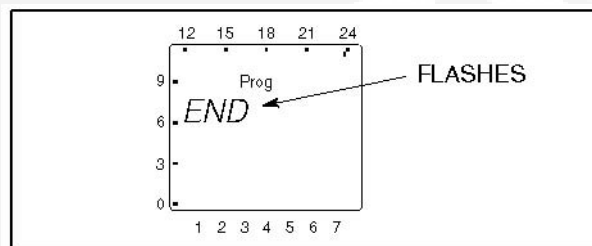
5. Press the OK button. The first exercise start time of the week is displayed. To select a different exercise start time, press the + or - buttons until the desired time is displayed.



6. Press the OK button. The New Program menu is redisplayed.



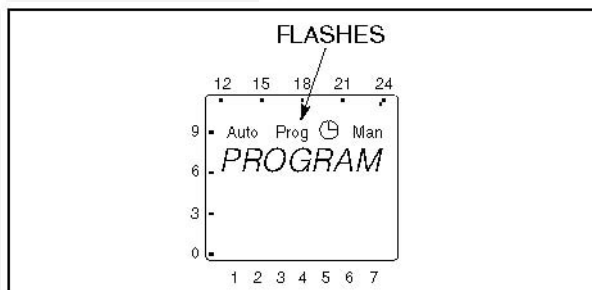
7. Repeat steps 3 through 6 to erase the stop time for the exercise period erased above.
8. If necessary, repeat steps 3 through 7 for any additional exercise periods that need to be erased.
9. When the New Program menu is redisplayed, press the + or - buttons until the word "END" is displayed.



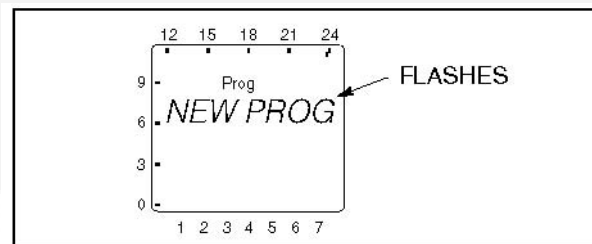
10. Press the OK button to return to the Home menu.

4.6.8 Erasing (Clearing) All Programmed Exercise Periods

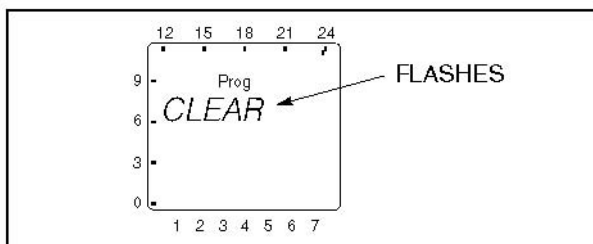
1. From the Home menu, press the Menu button. The Program menu is displayed.



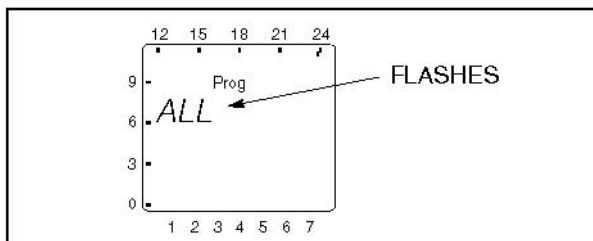
2. Press the OK button. The New Program menu is displayed.



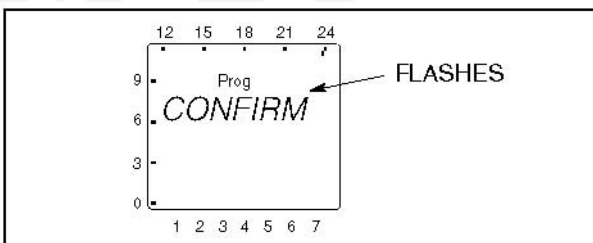
3. Press the + or - buttons until the Clear menu is displayed.



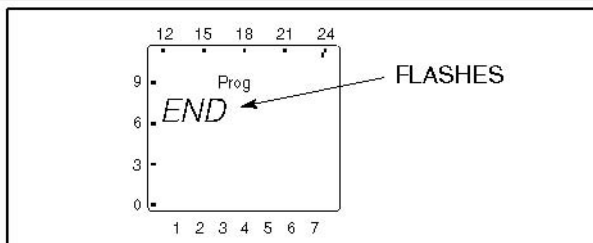
4. To clear all set exercise periods, press the + or - buttons until "All" is displayed. Press the OK button.



5. The word "Confirm" is displayed. To continue clearing all exercise programs, press the OK button. To abort clearing all exercise programs, press the + or - buttons.



6. The new program menu is redisplayed. Press the + or - buttons until the word "END" is displayed.



7. Press the OK button to return to the Home menu.

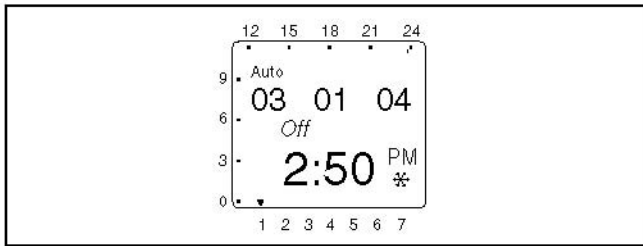
4.6.9 Initiating or Overriding an Exercise Program

The exercise clock has a built-in test feature that can be used to initiate an exercise that hasn't been programmed or cancel a programmed exercise in process.

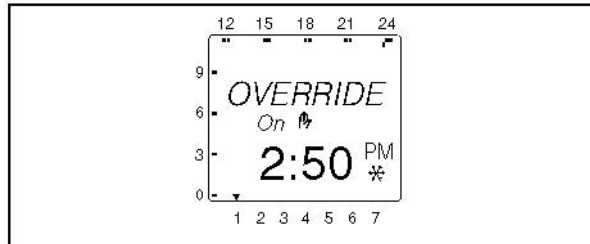
The control panel Load/No Load function can be set to test the genset with or without load, as desired.

4.6.9.1 Initiating an Exercise

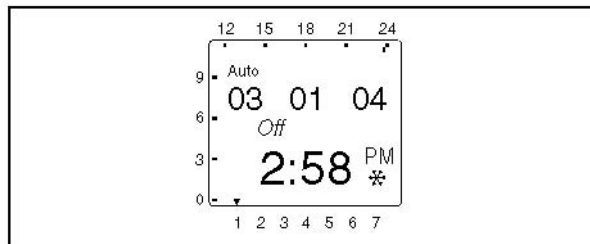
In the example shown below, "Off" indicates that no exercise is currently active.



1. With the Home menu displayed, simultaneously press the + and - buttons for approximately one second. "Override" and a hand symbol are displayed on the screen. In addition, "Off" is switched to "On" and the exercise is initiated.

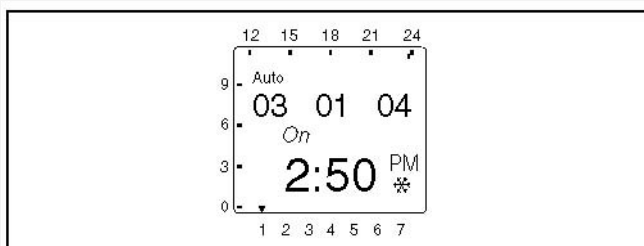


2. To end the exercise, simultaneously press the + and - buttons for approximately one second. The original Home menu is redisplayed and "On" is switched back to "Off."

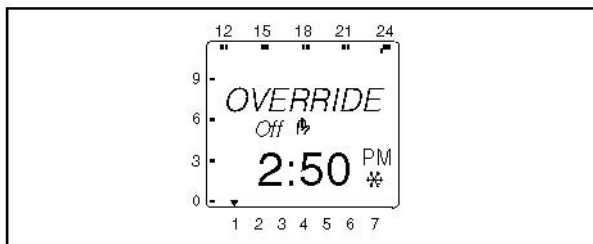


4.6.9.2 Overriding an Exercise

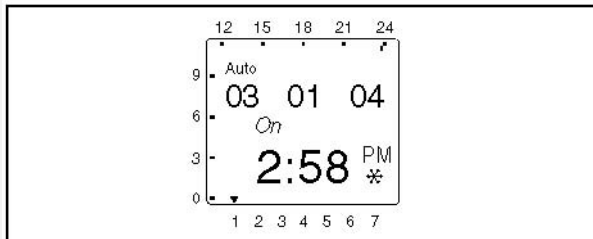
In the example shown below, "On" indicates that an exercise is currently active.



1. With the Home menu displayed, simultaneously press the + and - buttons for approximately one second. "Override" and a hand symbol are displayed on the screen. In addition, "On" is switched to "Off" and the exercise is stopped.



2. To restart the exercise, simultaneously press the + and - buttons for approximately one second. The original Home menu is redisplayed and "Off" is switched back to "On."

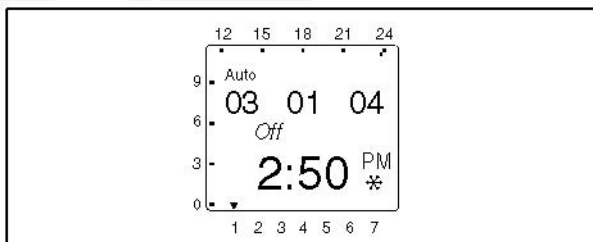


4.6.10 Selecting Permanent On/Off Mode

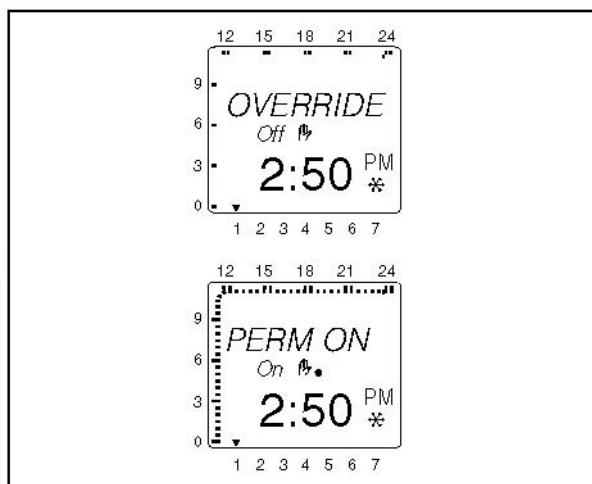
The exercise clock has a permanent on/off mode feature.

4.6.10.1 Selecting Permanent On/Off Mode Without an Active Exercise

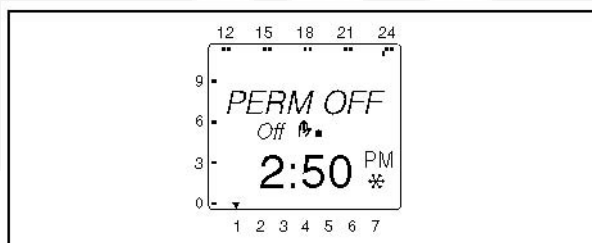
In the example shown below, "Off" indicates that no exercise is currently active.



1. With the Home menu displayed, simultaneously press the + and - buttons for approximately two seconds. The Override menu is first displayed and then the "Perm On" and the hand/dot symbols are displayed on the screen. In addition, a continuous band of segments is displayed on the left side and top of the screen and "Off" is switched to "On."



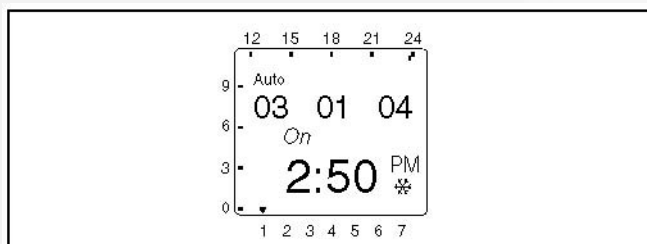
2. To switch to Permanent Off mode, press the + and - buttons for approximately two seconds. "Perm Off" is displayed and "On" is switched back to "Off."



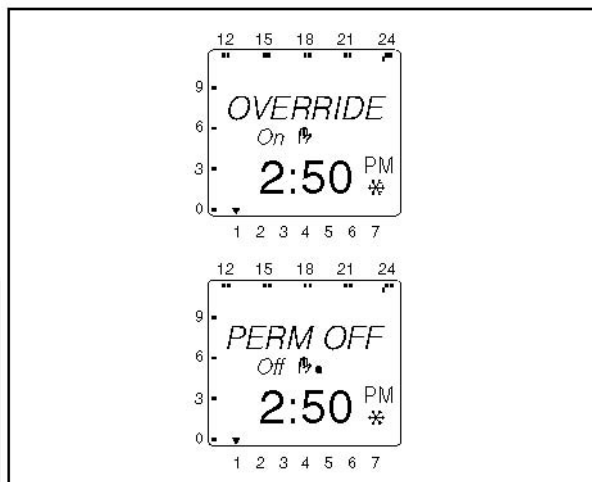
3. To return the clock to its original state, simultaneously press the + and - buttons for approximately one second. The original Home menu is redisplayed.

4.6.10.2 Selecting Permanent On/Off Mode With an Active Exercise

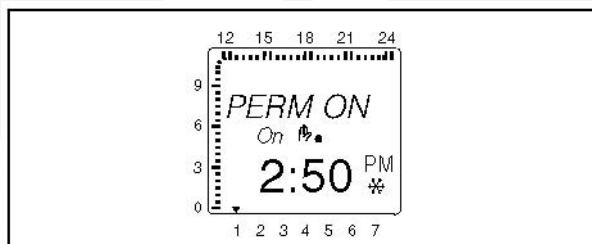
In the example shown below, "On" indicates that an exercise is currently active.



1. With the Home menu displayed, simultaneously press the + and - buttons for approximately two seconds. The Override menu is first displayed and then the "Perm Off" and the hand/dot symbols are displayed on the screen. In addition, "On" is switched to "Off."



- To switch to Permanent On mode, press the **+** and **-** buttons for approximately two seconds. "Perm On" is displayed and "Off" is switched back to "On." In addition, a continuous band of segments is displayed on the left side and top of the screen.



- To return the clock to its original state, simultaneously press the **+** and **-** buttons for approximately one second. The original Home menu is redisplayed.

4.6.11 Adding A Security Code

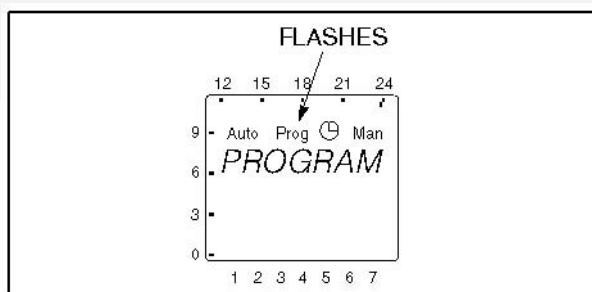
A 4-digit security code number can be entered to prevent unauthorized personnel from using the clock.

Once a security code has been set up, the exercise clock is locked 90 seconds after the last keystroke. It can only be operated again after the correct PIN code is entered.

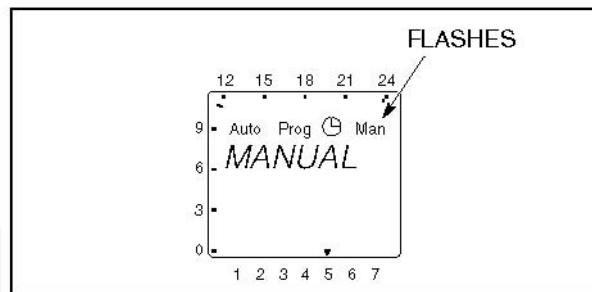


CAUTION: Once a PIN code has been activated and the Reset button is pressed (see "Resetting the Timer" on the following page), the exercise timer can no longer be activated without a valid PIN code. The device must be replaced.

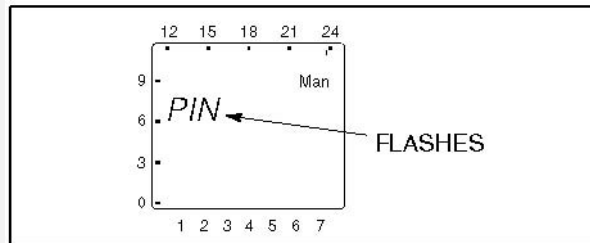
- From the Home menu, press the **Menu** button. The Program menu is displayed.



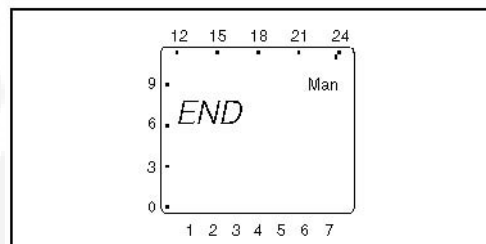
2. Press the **+** button twice. The Date/Time menu is displayed, followed by the Manual menu.



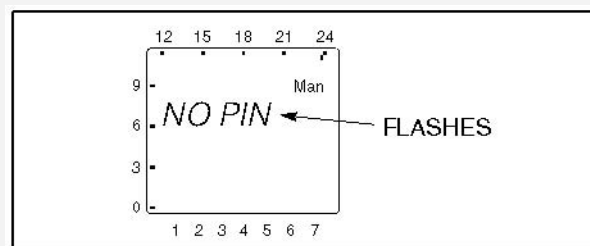
3. Press the OK button to display the Pin menu.



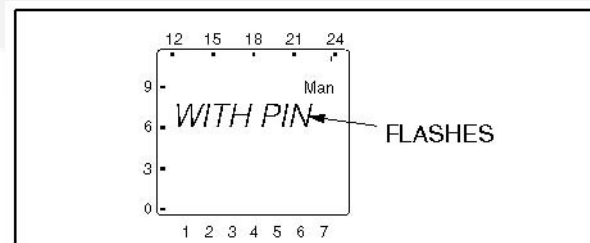
NOTE: If the **+** or **-** button is pressed now, the message "End" is displayed. Press the OK button to return to the Home menu.



4. Press the OK button to display the No PIN menu.



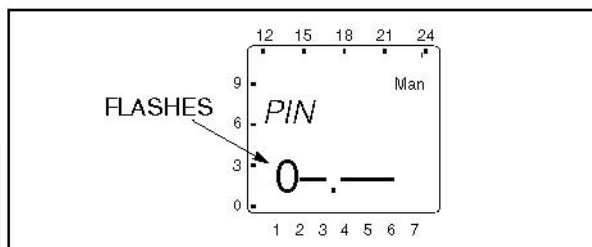
5. Press the **+** or **-** buttons to display the With PIN menu.



6. Press the OK button to display the PIN Number menu.



NOTE: If you choose not to enter a 4-digit access code at this time, the only way to exit Manual mode is to press the reset (Res) button.



7. Press the + or -buttons to enter the first digit of your 4-digit access code.
8. Press the OK button. Then press the + or -buttons to enter the second digit of your 4-digit access code.
9. Repeat step 8 for the third and fourth digit of your 4-digit access code.
10. Press the OK button. The Home menu is then redisplayed.

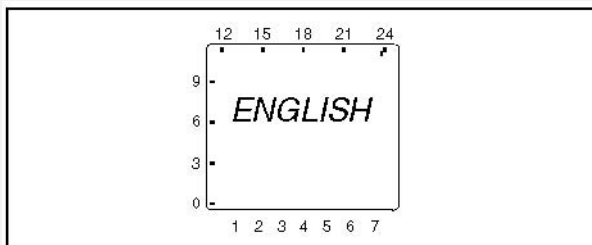
4.6.12 After Programming the Exerciser Clock

1. Make sure the External Exercise function on the transfer switch control panel is set to "On."
2. Place the generator set operation selector switch in the Remote position.
3. Check the system for proper operation as described in the Operator's Manual.

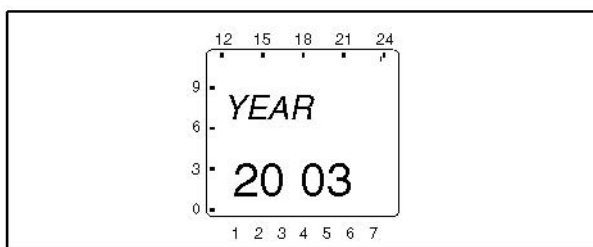
4.6.13 Resetting the Timer

The Reset button should only be used in cases of an emergency. Resetting the timer erases all existing language, date, and time settings. Upon pressing the Res button, the clock is set to 12:00 midnight, Wednesday, January 1, 2003. However, scheduled exercise periods remain intact.

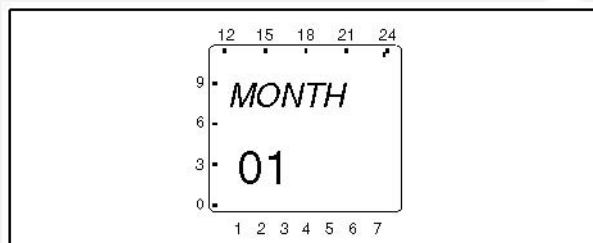
1. Use a pointed object to press the Res button for approximately one second. Two information screens are displayed and the default national language is flashed.



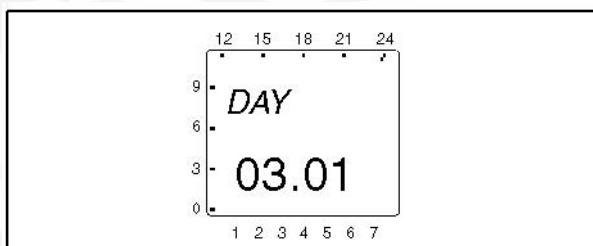
2. If the incorrect language is being displayed, use the + or -button to scroll through the available languages (English, Espanol, Francais, Portugal, Italiano, or Deutsch).
3. When the desired language is displayed, press the OK button. The year is displayed next.



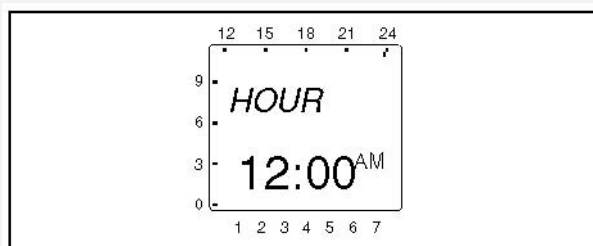
4. Press the + button until the correct year is displayed and then press the OK button. The month is displayed next.



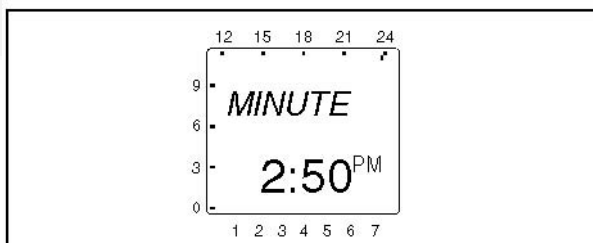
5. Press the + or -button until the correct month is displayed and then press the OK button. The screen then shows the day value flashing.



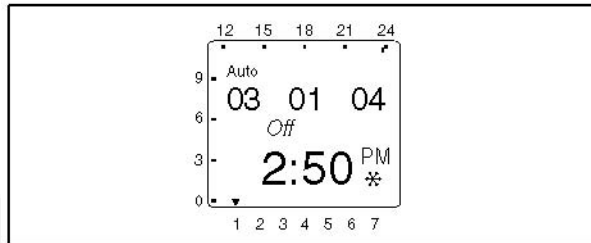
6. Press the + or -button until the correct day is displayed. Press the OK button. The screen then shows the hour value flashing.



7. Press the + or -button until the correct hour is displayed. Press the OK button. The screen then shows the minute value flashing.



8. Press the + or -button until the correct minute is displayed. Press the OK button. The screen then displays the correct date and time.



4.7 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. If repair or component replacement is necessary, call your dealer or distributor.



WARNING: *AC power within the cabinet and the rear side of the cabinet door presents a shock hazard that can cause severe personal injury or death. Incorrect installation, service or parts replacement can result in severe personal injury, death and/or equipment damage. All corrective service procedures must be done only by technically qualified personnel, according to procedures in the Service Manual.*



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.*

TABLE 5. PLANNED MAINTENANCE

Disconnect All Sources of AC Power:

1. 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.)
2. If there is an external battery charger, disconnect it from its AC power source. Then disconnect the set starting battery (negative [-] lead first).

Clean:

1. Thoroughly dust and vacuum all controls, meters, switching mechanism components, interior buswork and connecting lugs.
2. Close the cabinet door and wash exterior surfaces with a damp sponge (mild detergent and water).



WARNING: *Do not allow water to enter the cabinet, especially at meters, lamps and switches.*

Inspect:

1. Check bus work and supporting hardware for carbon tracking, cracks, corrosion or any other types of deterioration. If replacement is necessary, contact your dealer or distributor.
2. Check stationary and movable contacts. If contact replacement is necessary, contact your dealer or distributor.
3. Check system hardware for loose connections.
4. Check all control wiring and power cables (especially wiring between or near hinged door) for signs of wear or deterioration.
5. Check all control wiring and power cables for loose connections.
6. Check the cabinet interior for loose hardware.

Perform Routine Maintenance:

1. Tighten bus work, control wiring, power cables and system hardware as necessary.



NOTE: Hardware torque values are given in the Service Manual.

2. Re-torque all cable lug connections.



NOTE: Lug torque requirements are listed in the Service Manual.

Connect AC Power and Check Operation:

1. Connect the set starting battery (negative [-] lead last). Connect the utility AC power source, enable the generator set power source. If applicable, connect power to the battery charger.
2. Verify proper operation of the battery charger.
3. Test system operation as described in this section. Close and lock the cabinet door.

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5 Control Panel Configuration

The control panel can be used to configure ATS functions. When in Configuration Mode, the value code for the various control functions can be modified.

The control panel has a series of eight LEDs that display codes that indicate various control functions that can be configured. The first five LEDs display the function code and the last three LEDs display the value code for the displayed function.

With the exception of the Test LED, the function and value LEDs are not lit during automatic operation (Automatic Mode).

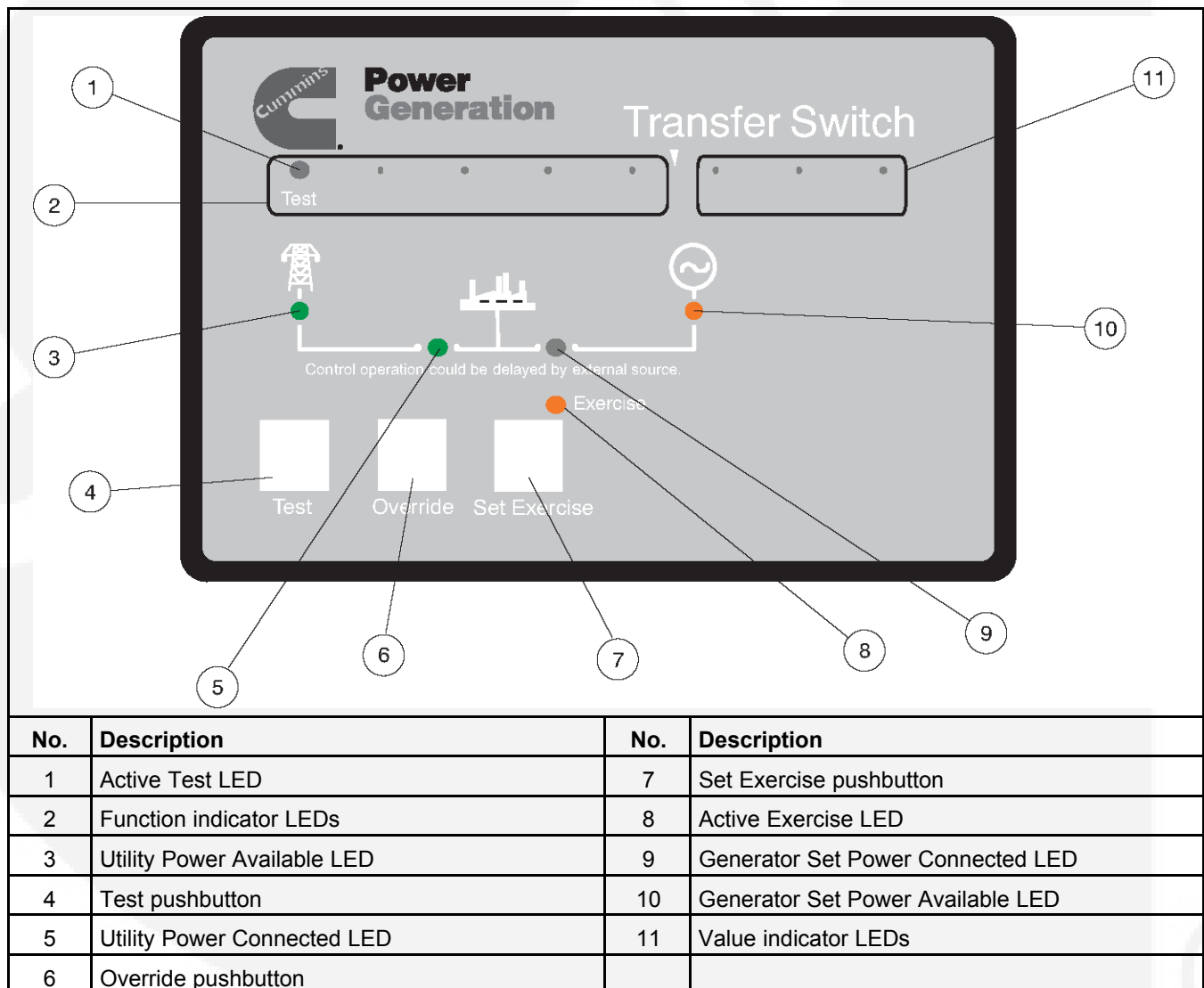


FIGURE 14. CONTROL PANEL

5.1 Modifying the Configuration

The control has been configured at the factory and does not require additional adjustments. However, you may wish to adjust some of the settings for your application.



CAUTION: *Incorrect settings can result in the transfer switch failing to operate correctly. Only authorized trained personnel should make changes to the control function settings. External Exercise, System Nominal Voltage, System Nominal Frequency, and Single Phase/Three Phase settings are made at the factory and should not require any additional adjustments.*

1. Slide the selector switch to the **Configuration Mode** position. TDES is always the first function shown when entering Configuration Mode.
2. Press the **Test** pushbutton to scroll through the various control function codes displayed with the first five LEDs.
3. Once the desired function is selected, press the **Override** pushbutton to change the associated value code displayed with the last three LEDs.
4. When configuration is completed, return the selector switch back to the **Automatic Mode** position.

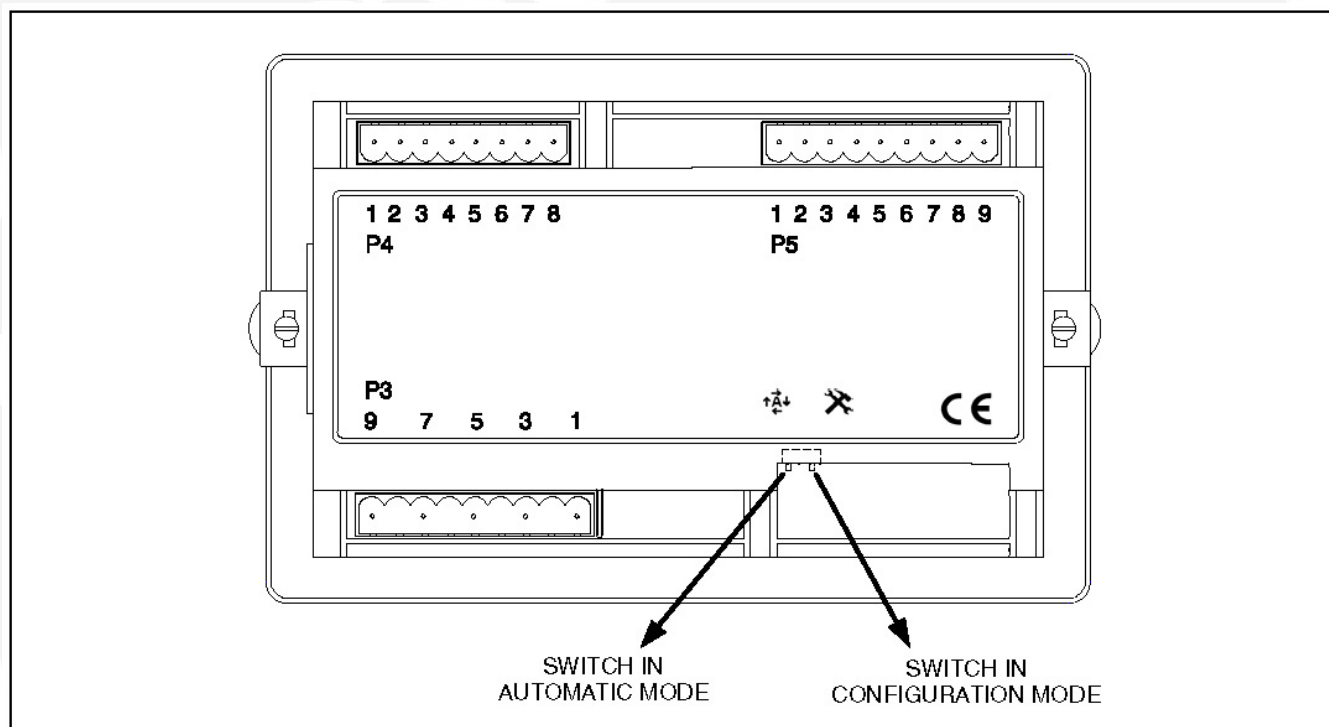


FIGURE 15. NORMAL/CONFIGURATION MODE SELECTOR SWITCH

5.2 Adjustable Features



NOTE: ** signifies that the control function is set at the factory and should not require adjusting.

5.2.1 Not Available

Function	Function Code	Value Code	Value (Default)
Not Available	○ ○ ○ ○ ○	N/A	

5.2.2 Time Delay Engine Start (TDES)

Function	Function Code	Value Code	Value (Default)
TDES (Time Delay Engine Start)	○ ○ ○ ○ ●	○ ○ ○	0 Seconds (Disabled)
		○ ○ ●	0.5 Second
		○ ● ○	1 Second
		○ ● ●	2 Seconds
		● ○ ○	3 Seconds
		● ○ ●	4 Seconds
		● ● ○	6 Seconds
		● ● ●	10 Seconds

5.2.3 Time Delay Normal to Emergency (TDNE)

Function	Function Code	Value Code	Value (Default)
TDNE (Time Delay Normal to Emergency)	○ ○ ○ ● ○	○ ○ ○	0 Seconds (Disabled)
		○ ○ ●	1 Second
		○ ● ○	2 Seconds
		○ ● ●	3 Seconds
		● ○ ○	5 Seconds
		● ○ ●	30 Seconds
		● ● ○	120 Seconds
		● ● ●	300 Seconds

5.2.4 Time Delay Emergency to Normal (TDEN)

Function	Function Code	Value Code	Value (Default)
TDEN (Time Delay Emergency to Normal)	○ ○ ○ ● ●	○ ○ ○	0 Minutes (Disabled)
		○ ○ ●	0.1 Minutes (for testing)
		○ ● ○	5 Minutes
		○ ● ●	10 Minutes
		● ○ ○	15 Minutes
		● ○ ●	20 Minutes
		● ● ○	25 Minutes
		● ● ●	30 Minutes

5.2.5 Time Delay Engine Cool-Down (TDEC)

Function	Function Code	Value Code	Value (Default)
TDEC (Time Delay Engine Cool-Down)	○ ○ ● ○ ○	○ ○ ○	0 Minutes (Disabled)
		○ ○ ●	0.1 Minutes (for testing)
		○ ● ○	5 Minutes
		○ ● ●	10 Minutes
		● ○ ○	15 Minutes
		● ○ ●	20 Minutes
		● ● ○	25 Minutes
		● ● ●	30 Minutes

5.2.6 Time Delay Program Transition (TDPT)

Function	Function Code	Value Code	Value (Default)
TDPT (Time Delay Program Transition)	○ ○ ● ○ ●	○ ○ ○	0 Seconds (Disabled)
		○ ○ ●	0.5 Second

Function	Function Code	Value Code	Value (Default)
		○ ● ○	1 Second
		○ ● ●	2 Seconds
		● ○ ○	3 Seconds
		● ○ ●	4 Seconds
		● ● ○	6 Seconds
		● ● ●	10 Seconds

5.2.7 Time Delay Elevator Signal (TDEL)

Function	Function Code	Value Code	Value (Default)
TDEL (Time Delay Elevator Signal)	○ ○ ● ● ○	○ ○ ○	0 Seconds (Disabled)
		○ ○ ●	1 Second
		○ ● ○	2 Seconds
		○ ● ●	3 Seconds
		● ○ ○	5 Seconds
		● ○ ●	30 Seconds
		● ● ○	120 Seconds
		● ● ●	300 Seconds

5.2.8 Test With/Without Load

Function	Function Code	Value Code	Value (Default)
Test With/Without Load	○ ○ ● ● ●	○ ○ ○	Without Load
		○ ○ ●	With Load

5.2.9 External Exercise On/Off

Function	Function Code	Value Code	Value (Default)
**External Exercise On/Off	○ ● ○ ○ ○	○ ○ ○	Off
		○ ○ ●	On

5.2.10 Exercise With/Without Load

Function	Function Code	Value Code	Value (Default)
Exercise With/Without Load	○ ● ○ ○ ●	○ ○ ○	Without Load
		○ ○ ●	With Load

5.2.11 System Nominal Voltage Table Selection

Function	Function Code	Value Code	Value (Default)	
**System Nominal Voltage Table Selection	○ ● ○ ● ○	○ ○ ○	Table 1 ↓	
		○ ○ ●		Table 2 ↓

5.2.11.1 System Nominal Voltage

Function	Function Code	Value Code	Value (Default)	
**System Nominal Voltage	○ ● ○ ● ●	○ ○ ○	115	400
		○ ○ ●	120	415
		○ ● ○	190	440
		○ ● ●	208	460
		● ○ ○	220	480
		● ○ ●	230	550
		● ● ○	240	575
		● ● ●	380	600

5.2.12 System Nominal Frequency 50/60 Hz

Function	Function Code	Function Code	Value (Default)
**System Nominal Frequency 50/60 Hz	○ ● ● ○ ○	○ ○ ○	60 Hz
		○ ○ ●	50 Hz

5.2.13 Single Phase/Three Phase

Function	Function Code	Value Code	Value (Default)
**Single Phase/Three Phase	○ ● ● ○ ●	○ ○ ○	Three Phase
		○ ○ ●	Single Phase

5.2.14 Utility Under-Voltage Pickup

Function	Function Code	Value Code	Value (Default)
Utility Under-voltage Pickup	○ ● ● ● ○	○ ○ ○	90%
		○ ○ ●	95%

5.2.15 Utility Under-Voltage Dropout

Function	Function Code	Value Code	Value (Default)
Utility Under-voltage Dropout	○ ● ● ● ●	○ ○ ○	90%
		○ ○ ●	85%
		○ ● ○	80%
		○ ● ●	70%

5.2.16 Phase Check On/Off

Function	Function Code	Value Code	Value (Default)
Phase Check On/Off	● ○ ○ ○ ○	○ ○ ○	Off
		○ ○ ●	On

5.2.17 Return to Programmed Transition On/Off

Function	Function Code	Value Code	Value (Default)
Return to Programmed Transition On/Off	● ○ ○ ○ ●	○ ○ ○	Off
		○ ○ ●	On

5.2.18 Elevator Post Transfer Delay On/Off

Function	Function Code	Function Code	Value (Default)
Elevator Post Transfer Delay On/Off	● ○ ○ ● ○	○ ○ ○	Off
		○ ○ ●	On

5.2.19 Exercise Repeat Interval

Function	Function Code	Value Code	Value (Default)
Exercise Repeat Interval	● ○ ○ ● ●	○ ○ ○	Every 7 days
		○ ○ ●	Every 14 days
		○ ● ○	Every 21 days
		○ ● ●	Every 28 days

6 Troubleshooting

6.1 Control Panel Indicators

The control panel contains six LED indicators that provide some information about the current control status and may be helpful in troubleshooting the transfer switch.

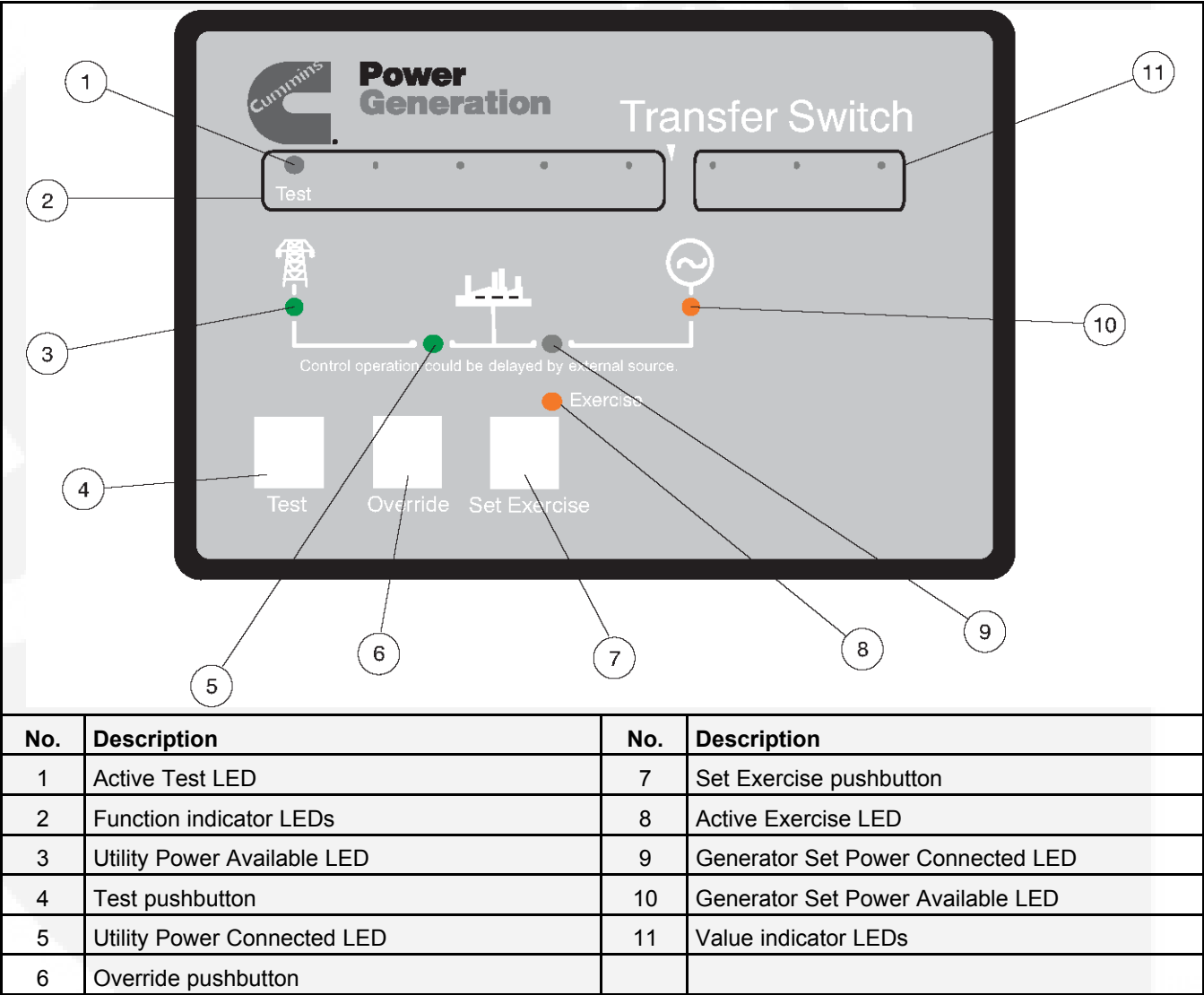


FIGURE 16. CONTROL PANEL

TABLE 6. CONTROL PANEL LED INDICATORS

Indicator	Definition
Utility (Normal) Power Available	This indicator lights when the utility source voltage sensor has determined that Utility power is available and is within acceptable voltage limits.

Indicator	Definition
Utility (Normal) Power Connected	<ol style="list-style-type: none"> 1. Lights constantly when the transfer switch is connected to Utility Power. 2. Is off when the transfer switch is not connected to Utility Power. 3. Blinks twice per second when the transfer switch has failed to connect to or disconnect from Utility Power when commanded.
Genset (Emergency) Power Available	This indicator lights when the generator source voltage sensor has determined that generator power is within acceptable voltage and frequency limits.
Genset (Emergency) Power Connected	<ol style="list-style-type: none"> 1. Lights constantly when the transfer switch is connected to Genset Power. 2. Is off when the transfer switch is not connected to Generator Power. 3. Blinks twice per second when the transfer switch has failed to connect to or disconnect from Genset Power when commanded.
Exerciser Enabled	<p>The following describes the Exercise Enabled LED when an exercise is enabled.</p> <ol style="list-style-type: none"> 1. Lights constantly when integrated repeat exercise periods have been set. 2. Blinks twice per second when the Set Exercise button is pressed and held to set or cancel an integrated exercise period. 3. Blinks once per second when an integrated or external exercise period is active. 4. Is off when no integrated repeat exercise periods are set.
Active Test	<ol style="list-style-type: none"> 1. This indicator blinks at two times per second rate during the two seconds that the Test button is pressed to acknowledge that a test has been activated or when the remote test input is grounded. 2. The indicator lights constantly during the test and goes out once the test is completed or normal power has failed.

6.2 Troubleshooting



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

Diagnosis of problems involves observing system operation. If you cannot determine the problem, contact Cummins/Onan 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. Whenever the cabinet door is open, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothes, hair, etc.*

Several of the steps listed on the following pages include checking on the control panel settings. To check the control settings, open the transfer switch door and slide the selector switch on the back on the control panel to the Configuration Mode position.

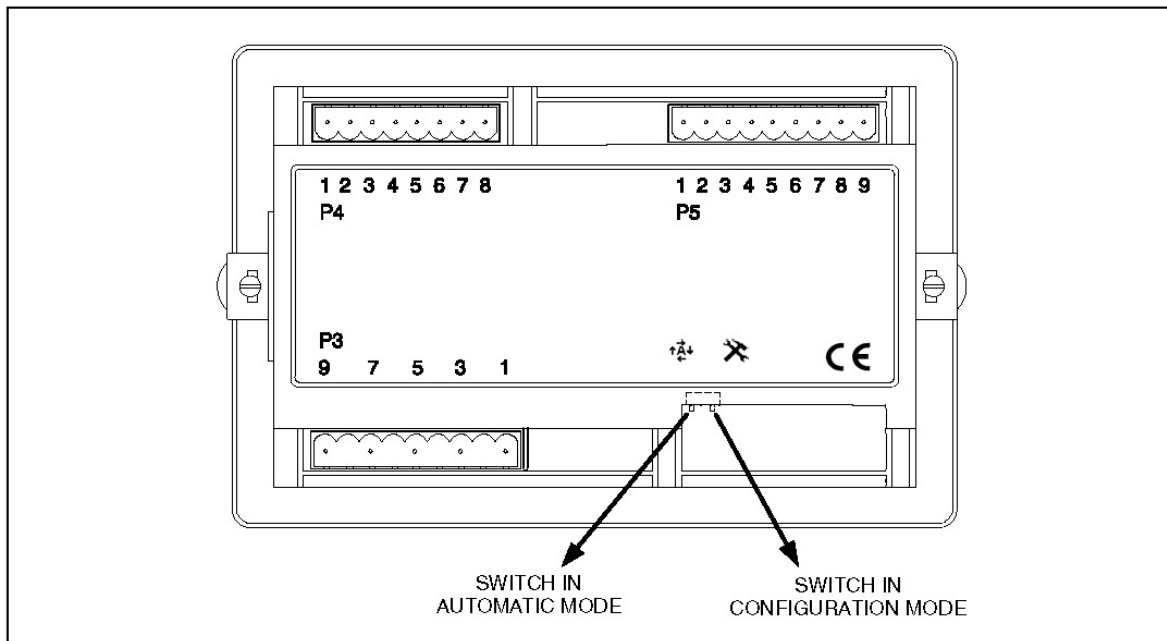


FIGURE 17. NORMAL/CONFIGURATION MODE SELECTOR SWITCH

6.2.1 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.
2. Start the generator set using its start-stop controls. If it does not crank, check the starting batteries. If it cranks but does not start, check the fuel supply. If the problem persists, call your dealer or distributor.



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



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

6.2.2 Generator Set Starts During Normal Power Service

Make sure the Utility Undervoltage Pickup setting is higher than the Dropout setting.

You may have to lower the Dropout setting. You may also have to raise the TDES.

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. Use extreme caution to avoid touching electrical contacts whenever the cabinet door is open.

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

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

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

6.2.3 Generator Set Does Not Exercise

Make sure an exercise period is set.

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.*

6.3 Troubleshooting Transfer Switch Without the Digital Display



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

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

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

Sync check could be active and the sources could be out of sync, or TDNE or TDEL could be timing.

1. Check the output voltage of the power source by observing the voltmeter on the generator set.



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

Check the transfer inhibit input, if this is active the ATS will not transfer. (Press the override button)

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

Sync check could be active and the sources could be out of sync, or TDEL could be timing.

1. The retransfer time delay period may not have expired. Press the override button.



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. 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.
3. If the switch still does not retransfer, manually return the switch to the Source 1 position (see Operation). Call your dealer or distributor.

Check the retransfer inhibit input, if it is active the ATS won't transfer. (Press the override button).

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

The stop time delay function may not have expired. Wait for the duration of TDEC. If the generator still doesn't stop, make sure the generator switch is in Auto then stop the generator set with its Start/Stop switch and call your dealer or distributor.

6.3.4 System Does Not Test With Load



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.*

The ATS must be in Normal and normal power must be available.

1. Check the control setting to verify that the Test With/Without Load function has been set to With Load.
2. If the control has been set to Test With Load,
 - a. The transfer time delay may not have expired. The TDNE can be set for up to 300 seconds. If you do not wish to wait until the time delay expires, press the Override pushbutton.

FUNCTION CODE FOR TDNE					VALUE CODE			VALUE (Default in <i>bold italics</i>)
°	°	°	•	°	°	°	°	0 Seconds (Disabled)
°	°	°	•	°	°	•	°	1 Second
°	°	°	•	°	•	°	°	2 Seconds
°	°	°	•	°	•	•	°	3 Seconds
°	°	°	•	°	•	°	°	5 Seconds
°	°	°	•	°	•	•	°	30 Seconds
°	°	°	•	°	•	°	°	120 Seconds
°	°	°	•	°	•	•	°	300 Seconds

- b. There may be an active transfer inhibit. If a transfer inhibit is enabled, the load transfer will not take place until the Override pushbutton on the control panel is pressed or the transfer inhibit input is disabled.
- c. There may be an active TDEL. Wait until the time delay has expired. The TDEL can be set for up to 300 seconds.

FUNCTION CODE FOR TDEL					VALUE CODE			VALUE (Default in <i>bold italics</i>)
°	°	•	•	°	°	°	°	0 Seconds (Disabled)
°	°	•	•	°	°	•	°	1 Second
°	°	•	•	°	•	°	°	2 Seconds
°	°	•	•	°	•	•	°	3 Seconds
°	°	•	•	°	•	°	°	5 Seconds
°	°	•	•	°	•	•	°	30 Seconds
°	°	•	•	°	•	°	°	120 Seconds
°	°	•	•	°	•	•	°	300 Seconds

- d. A phase check may be enabled. When the phase check function is enabled, the genset does not assume the load until both sources are within acceptable limits of the phase check sensor.

6.3.5 System Does Not Exercise With Load



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.

The ATS must be in Normal and normal power must be available.

Is an exercise programmed? Is the external clock enabled?

Set the generator set switch to Auto.

1. Check the control setting to verify that the Exercise With/Without Load function has been set to With Load.

2. If the control has been set to Exercise With Load,

- a. The transfer time delay may not have expired. The TDNE can be set for up to 300 seconds. If you do not wish to wait until the time delay expires, press the Override pushbutton.

FUNCTION CODE FOR TDNE					VALUE CODE			VALUE (Default in bold italics)
°	°	°	•	°	°	°	°	0 Seconds (Disabled)
°	°	°	•	°	°	•	°	1 Second
°	°	°	•	°	°	•	°	2 Seconds
°	°	°	•	°	°	•	•	3 Seconds
°	°	°	•	°	°	°	°	5 Seconds
°	°	°	•	°	°	°	•	30 Seconds
°	°	°	•	°	°	•	°	120 Seconds
°	°	°	•	°	°	•	•	300 Seconds

- b. There may be an active transfer inhibit. If a transfer inhibit is enabled, the load transfer will not take place until the Override pushbutton on the control panel is pressed or the transfer inhibit input is disabled.
- c. There may be an active TDEL. Wait until the time delay has expired. The TDEL can be set for up to 300 seconds.

FUNCTION CODE FOR TDEL					VALUE CODE			VALUE (Default in bold italics)
°	°	•	•	°	°	°	°	0 Seconds (Disabled)
°	°	•	•	°	°	•	°	1 Second
°	°	•	•	°	°	•	°	2 Seconds
°	°	•	•	°	°	•	•	3 Seconds
°	°	•	•	°	°	°	°	5 Seconds
°	°	•	•	°	°	°	•	30 Seconds
°	°	•	•	°	°	•	°	120 Seconds
°	°	•	•	°	°	•	•	300 Seconds

- d. A phase check may be enabled. When the phase check function is enabled, the genset does not assume the load until both sources are within acceptable limits of the phase check sensor.

6.3.6 External Exercise Clock Does Not Start An Exercise

The ATS must be connected to Normal and normal power must be available and the generator set switch should be set to 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.

1. Check the control setting to verify that the External Exercise function has been set to On.
2. Check the exercise program to see if exercise periods have been set up.

3. Check the exercise program to verify that both start and stop times for the exercise period have been set up. The exercise will not start if only the start time is set up.

6.3.7 External Exerciser Does Not Repeat an Exercise

Check the external exercise clock Permanent On/Off Mode setting. Exercises will not repeat if this feature is set to Off. Is the clock set up to repeat?

6.3.8 Battery Charger Fails To Charge (If Equipped)

Check the battery charger fuse(s) and circuit breaker(s). Replace, if necessary, with fuses of the correct rating. Fuse ampere ratings are shown on the charger faceplate. Also, check the LED status indicator on the battery charger.



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.*



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.

6.3.9 Battery Loses Water

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



NOTE: The float voltage cannot be adjusted on some chargers. If you are unable to adjust voltage, call your dealer or distributor.

6.3.10 Battery Loses Charge

Battery charger could be bad, there could also be too large of a load on the battery. Change the battery or lessen the load.

The battery charger float voltage could be too low (if equipped with battery charger). Call your dealer or distributor.

6.4 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.

6.4.1 Fault Events

Fault events should be considered alarms for the transfer switch operator. They indicate that the transfer switch is not operating correctly.

6.4.1.1 Fault Codes and Messages

The following table lists the fault codes and fault message, and gives corrective actions for each fault code.


TABLE 7. FAULT CODES AND MESSAGES

343	Controller Checksum Error
441	Low Controller Battery
1113	ATS Fail to Close: Transfer
1114	ATS Fail to Close: Retransfer
597	Battery Charger Malfunction
477*	Network Battery Low
1468	Network Communications Error
* This fault code only applies to older transfer switches that included an Network Communications Module (NCM) with batteries.	

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.

6.4.1.2 Troubleshooting Fault Codes

TABLE 8. TROUBLESHOOTING

 WARNING: <i>Some ATS service procedures present hazards that can result in severe personal injury or death. Only qualified service personnel with knowledge of electricity and machinery hazards should perform service. See Safety Precautions.</i>	
CONTROLLER CHECKSUM ERROR (343) The checksum of the Flash EPROM does not match the checksum stored in the controller	
Corrective Action: <ol style="list-style-type: none"> 1. Reset the control by removing power. 2. Remove and re-install Digital Module batteries. 3. Contact Cummins/Onan Service if checksum error is repeated on power up. 4. Reset real-time clock. 	
LOW CONTROLLER BATTERY (441) Low Lithium battery voltage	
Corrective Action: <ol style="list-style-type: none"> 1. Replace Digital Module batteries. 2. Press the Reset button on the front panel. 3. Reset real-time clock. 	

6.5 Fault Event Definitions

6.5.1 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.

6.5.2 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).

6.5.3 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.

6.5.4 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.

6.5.5 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).

6.5.6 Network Battery Low

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

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

6.5.7 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).

6.6 15/12-Amp Battery Charger Troubleshooting and Faults

The 15/12-amp battery charger includes one set of Form-B alarm contacts (corresponding to the status LED on the control panel). When red, this LED indicates a fault condition. The control panel also displays fault codes.

When a fault occurs, the red fault LED lights and a brief description of the fault and the numeric fault code is displayed on the digital display. To correct the fault, find the fault code number and take the suggested corrective actions. If the problem persists, call an authorized Cummins Power Generation distributor for help.

6.6.1 Clearing Faults

Most displayed faults are cleared by removing the fault. However, faults 379 - OVER CURR, 442 - HIGH BATT VOLT, and 9115 - BATT FAIL can only be cleared by cycling completely through the Setup menus or by powering down the charger after the fault is corrected. (More information on Setup menus is included in the Battery Charger Operator's Manual.)

6.6.2 Fault Alarm Output Connector

The battery charger includes a fault output relay that is activated (contacts close) when faults occur. The contacts are rated at 2 amps/30 VDC. This feature can be used by wiring a fault indicator to the fault alarm output connector located on the front of the battery charger. A 2-pin plug connector (323-1678-02) is shipped with the 15/12-amp transfer switch battery charger.

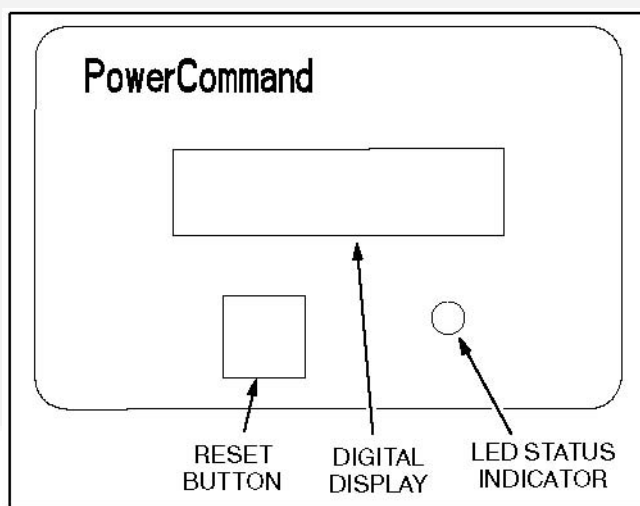





FIGURE 18. 15/12-AMP CHARGER CONTROL PANEL

6.6.3 Troubleshooting Using Fault Codes

TABLE 9. TROUBLESHOOTING USING FAULT CODES

<p> WARNING: Some battery charger service procedures present hazards that can result in severe personal injury or death. Only trained and experienced personnel may perform service.</p> <p> WARNING: Ignition of explosive battery gasses can cause severe personal injury. Do not smoke or cause any spark, arc or flame while servicing batteries.</p>			
Fault	Description	Possible Cause	Solution
379 - OVER CURR	Output Overload	Output current is excessive. Charger control may be failing.	Cycle through the Setup menus to try and clear the fault. If the fault returns, the charger control may have failed.
441 - LOW BATT VOLT	Low Battery Voltage	1. No battery connected.	Connect the battery.
		2. Output breaker is in the OFF (down) position.	Verify the output breaker is ON (up) position.
		3. A 12V battery is connected but the charger is set for 24V charging.	Attach a 24V battery or set the charger for 12V charging.
		4. Battery can no longer maintain charge.	Replace the battery.
		5. The wire between the charger and the battery is loose or broken.	Check the wire.
442 - HIGH BATT VOLT	High Battery Voltage	1. A 24V battery is connected but the charger is set for 12V charging.	Attach a 12V battery or set the charger for 24V charging.
		2. Large load dump may have caused momentary voltage rise.	Cycle through the Setup menus to clear the fault and restart charging.
2331 - LOW AC VOLT	Low Input Voltage	AC input voltage is more than 10% below nominal rated voltage.	Check level of input voltage. Charger will not operate with voltage 10% or more below nominal.
2358 - HIGH AC VOLT	High Input Voltage	AC input voltage is more than 10% above nominal rated voltage.	Check level of input voltage. Charger will not operate with voltage 10% or more above nominal.
2263 - HIGH BATT TEMP (For installations that include the optional battery temperature sensor)	Battery Temp above 55 °C.	1. Battery's ambient temperature is too high.	Move the battery into a cooler location. Charger will automatically begin charging again after the battery temperature lowers.
		2. Possible shorted cells within the battery is causing an excessive battery temperature increase.	Replace the battery.

2544 - OVER TEMP	Charger is overheating	1. Charger's ambient temperature is too high.	Move the charger into a cooler location. Charger will automatically begin charging again after the internal temperature lowers.
		2. Charger's internal cooling fan is blocked, failed or air inlets are covered.	Verify that the charger's air inlets on the side of the charger are not blocked and nothing is interfering with fan rotation.
9115 - BATT FAIL	Unrecoverable battery	The battery can no longer hold a charge or has been damaged excessively due to extremely deep discharge.	Replace the battery and cycle through the Setup menus to clear the fault.
 NOTE: Faults 379 (OVER CURR), 442 (HIGH BATT VOLT) and 9115 (BATT FAIL) can only be cleared by: <ul style="list-style-type: none"> • disconnecting the charger harness plug • cycling through the Setup menus or • recycling the power 			



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