



Installation Manual

RST 60/100/200 Automatic Transfer Panel



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⚠ WARNING

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

Safety Precautions

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

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

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

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

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

Keep the transfer panel cabinet closed and locked. Make sure only authorized service personnel have access to the cabinet.

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

Instructions to Authorized Service Personnel

If the cabinet must be opened for any reason:

1. Move the operation selector switch on the generator set to OFF.
If the transfer panel is equipped with the 3-Wire Start Option, move the toggle switch to the Stop position.
2. Remove the AC power source to the cabinet.
3. Disconnect the starting batteries of the generator set (remove the ground [-] lead first).

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

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

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.

1. Introduction

INSTALLATION MANUAL

This manual provides information necessary for installing an RST (residential standby) transfer panel.

INTRODUCTION

The transfer panel is capable of automatic operation without operator involvement. It performs the following basic functions:

1. Senses interruption of the Normal power source.
2. Sends a start signal to the generator set (Emergency power source).
3. Transfers the load to the Emergency power source.
4. Senses the return of the Normal power source.
5. Retrainsfers the load to the Normal power source.
6. Sends a stop signal to the generator set.

TRANSFER PANEL APPLICATION

Transfer panels are an essential part of a building's standby or emergency power system. The Normal power source, commonly the utility line, is backed up by an Emergency power source, often an electric generating set. The transfer panel supplies the electrical load with power from either of these two sources.

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

RST Transfer Panel is a trademark of Onan Corporation.

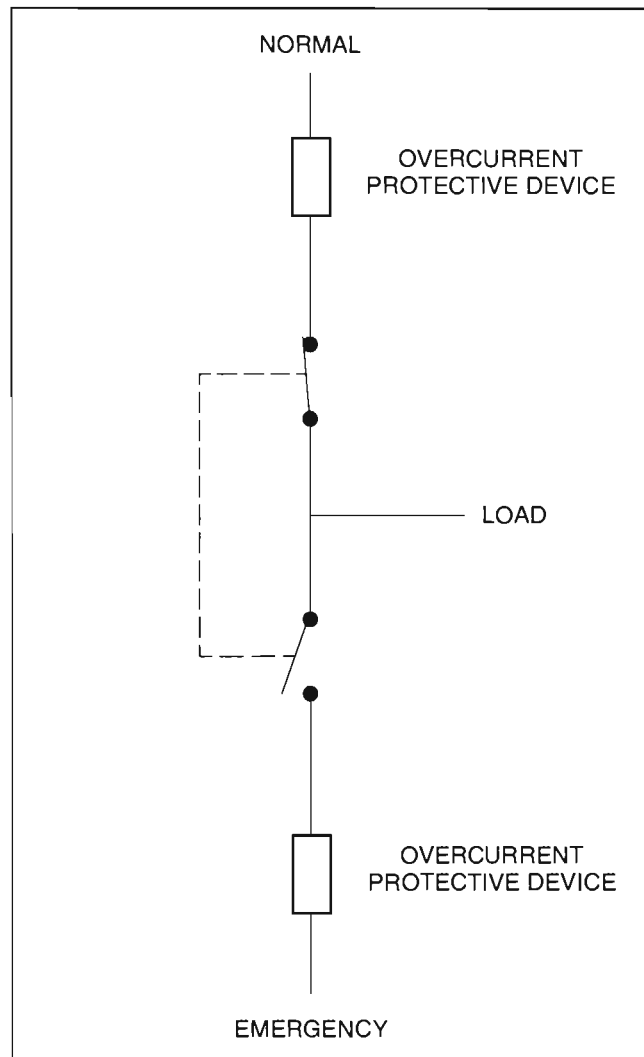


FIGURE 2-1. LOAD TRANSFER PANEL (TYPICAL FUNCTION)

TRANSFER PANEL PROTECTION

Transfer panels are continuously rated devices. With proper maintenance, they carry load currents up to their nameplate ratings for any time duration. Transfer panels are designed to withstand normally occurring surge currents from electrical devices in their load circuits. They are also designed to withstand the surge currents, which can occur on a short circuit or fault condition, as long as the available fault current does not exceed the rating of the panel and its protective device, and the transfer panel is installed with proper protective equipment.

Automatic transfer panels are required to be installed with appropriate overcurrent protection on

the normal source side and the emergency side of the transfer panel (Figure 2-1). Protective devices may be circuit breakers, fuses, or other suitable overcurrent protective system components. A list of allowable protective equipment is affixed to the transfer panel. The listed protective device must be installed at some point in the circuit between the transfer panel and the electrical services that feed the device.

MODEL IDENTIFICATION

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

When contacting the dealer or distributor regarding the transfer panel, always give the complete Model, Specification, and Serial number. This information is necessary to properly identify your unit among the many types manufactured.

HOW TO OBTAIN SERVICE

When the transfer panel requires servicing, contact your nearest dealer or distributor. Factory-trained Parts and Service representatives are ready to handle all your service needs.

If unable to locate a dealer or distributor, consult the Yellow Pages. Typically, our distributors are listed under:

**GENERATORS-ELECTRIC,
ENGINES-GASOLINE OR DIESEL, OR
RECREATIONAL VEHICLES-EQUIPMENT,
PARTS AND SERVICE.**

For the name of your local Cummins®/Onan® or Onan-only distributor in the United States or Canada, call 1-800-888-ONAN. (This automated service utilizes touch-tone phones only.) By entering your area code and the first three digits of your local telephone number, you will receive the name and telephone number of the distributor nearest you.

For the name of your local Cummins-only distributor, or if you need more assistance, please call:

Onan Corporation,
1-612-574-5000,
7:30 AM to 4:00 PM, Central Standard Time,
Monday through Friday.

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

Cummins is a registered trademark of Cummins Engine Company.
Onan is a registered trademark of Onan Corporation.
PowerCommand is a trademark of Onan Corporation.

2. Mounting

LOCATION

The location of the transfer panel varies with the application. Locate the panel in proximity of the commercial power supply circuit breaker. There should be enough room to add another circuit breaker to the emergency side of the transfer panel. A typical residential installation is shown in Figure 2-1.

The National Electrical Code (NFPA No. 70, Art 702-6) should be used as a guide for all AC wiring connections.

⚠️WARNING *Electrical connections must be installed by qualified electricians. Improper installation presents hazards of electrical shock and improper operation, resulting in severe personal injury or property damage.*

There must be a service disconnect in the commercial supply power line ahead of the transfer panel.

Cabinet dimensions are listed in Table 2-1.

Choose a vibration-free mounting surface that will support the weight of the panel. Avoid locations where unauthorized persons can damage or open the cabinet or that are near flammable liquids or gases; such as fuel tanks, or are hot, moist, or dusty; such as dryer vent lines.

⚠️WARNING *Because an electrical arc will occur during transfer, the panel must not be located near batteries, fuel tanks, solvents, or other sources of flammable liquids or gases.*

WALL MOUNTING

1. Use four 3/8 inch bolts for wall mounting. Refer to Figures 2-2 and 2-3 for the outline drawing of the panel. Measure and mark wall for drilling. Before drilling, check the location to be sure that no wires, or plumbing, gas, or exhaust lines run behind the wall.
2. Install two mounting bolts in the wall for the top cabinet mounting keyholes.
3. With the shipping box standing so the cabinet is upright, carefully remove the top and sides of the shipping box.
4. Raise the cabinet and mount it on the two mounting bolts in the wall. Provide support for the cabinet during installation.

⚠️WARNING *Improper lifting can cause severe personal injury. Have sufficient personnel for lifting and mounting the cabinet.*

5. Install two bottom mounting bolts, but do not tighten. (Do not remove the cabinet support until all bolts are installed.)
6. Push the cabinet against the wall. If the cabinet will not align flush against the wall, shim the mounting bosses as required.
7. Tighten all mounting bolts.

Refer to the outline drawings shown in Figures 2-2 and 2-3 for mounting hole dimensions.

Amp Rating	Weight	Height	Width	Depth With Door	
				Closed	Open
60, 100	120 lbs (54.43kg)	29 in (737mm)	18 in (457mm)	11.06 in (281mm)	28.43 in (722mm)
200	155 lbs (70.31kg)	34 in (864mm)	21.5 in (546mm)	11.06 in (281mm)	31.87 in (809mm)

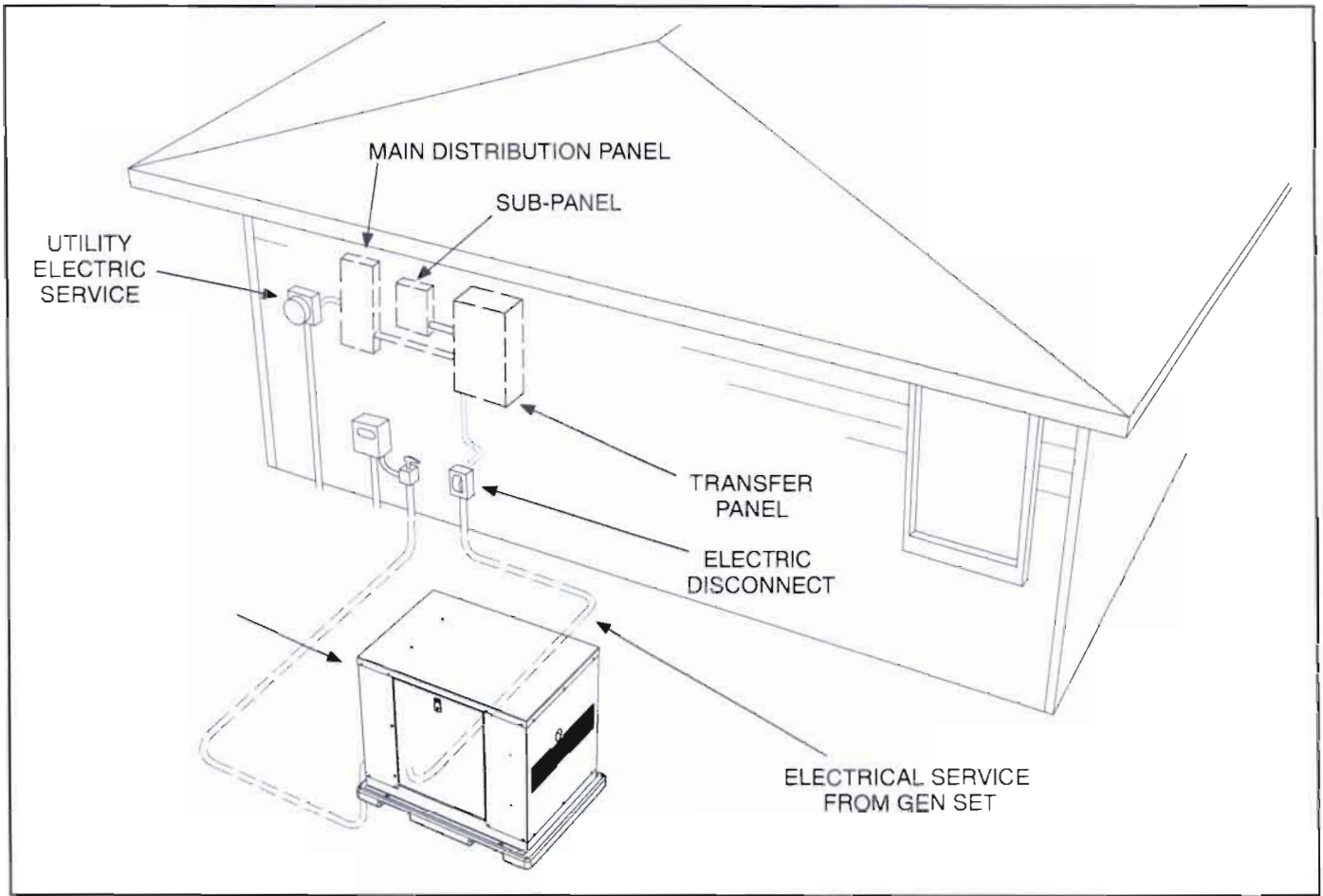


FIGURE 2-1. TYPICAL WALL-MOUNT INSTALLATION

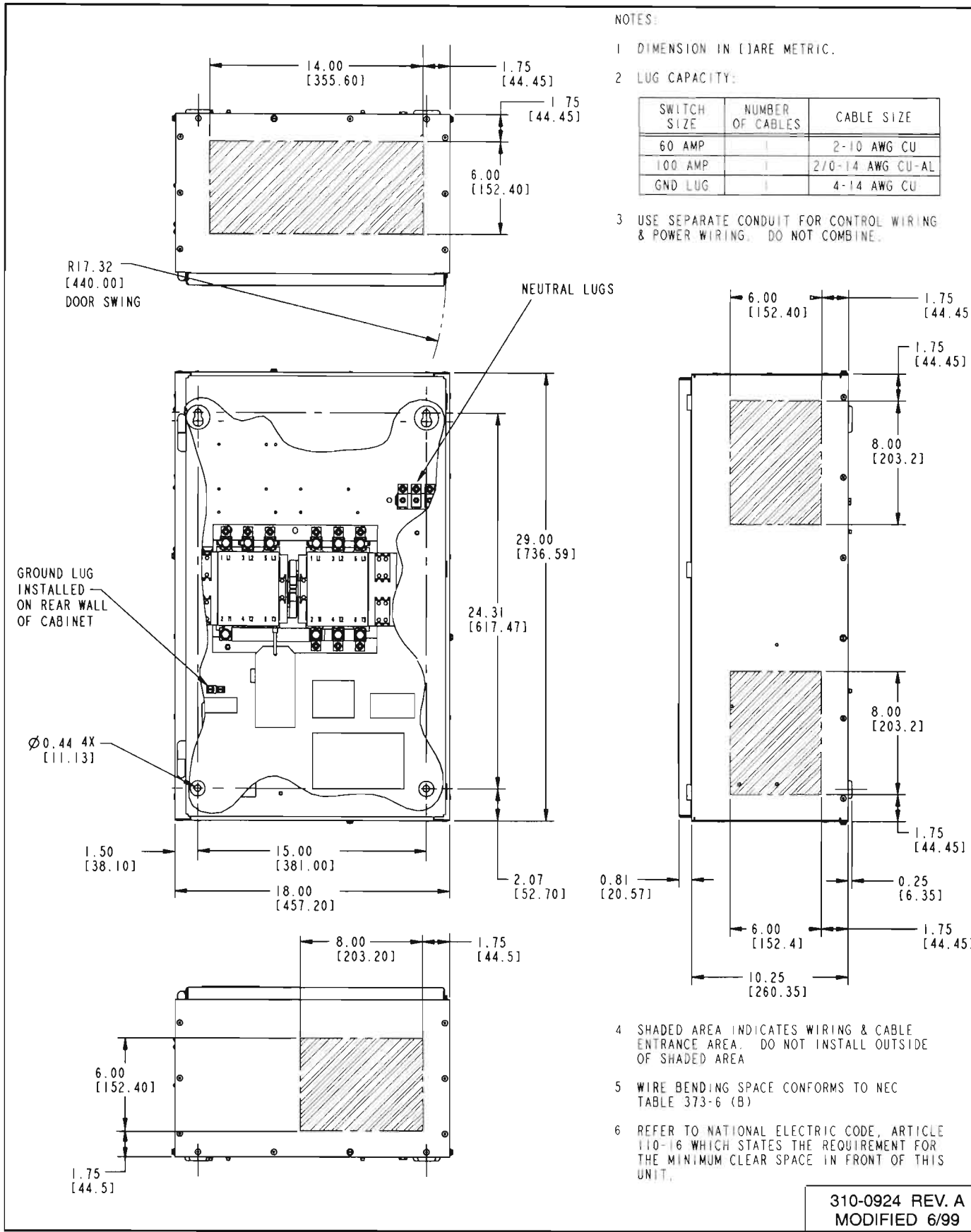


FIGURE 2-2 TYPICAL 60 & 100 AMP OUTLINE DRAWING

310-0924 REV. A
MODIFIED 6/99

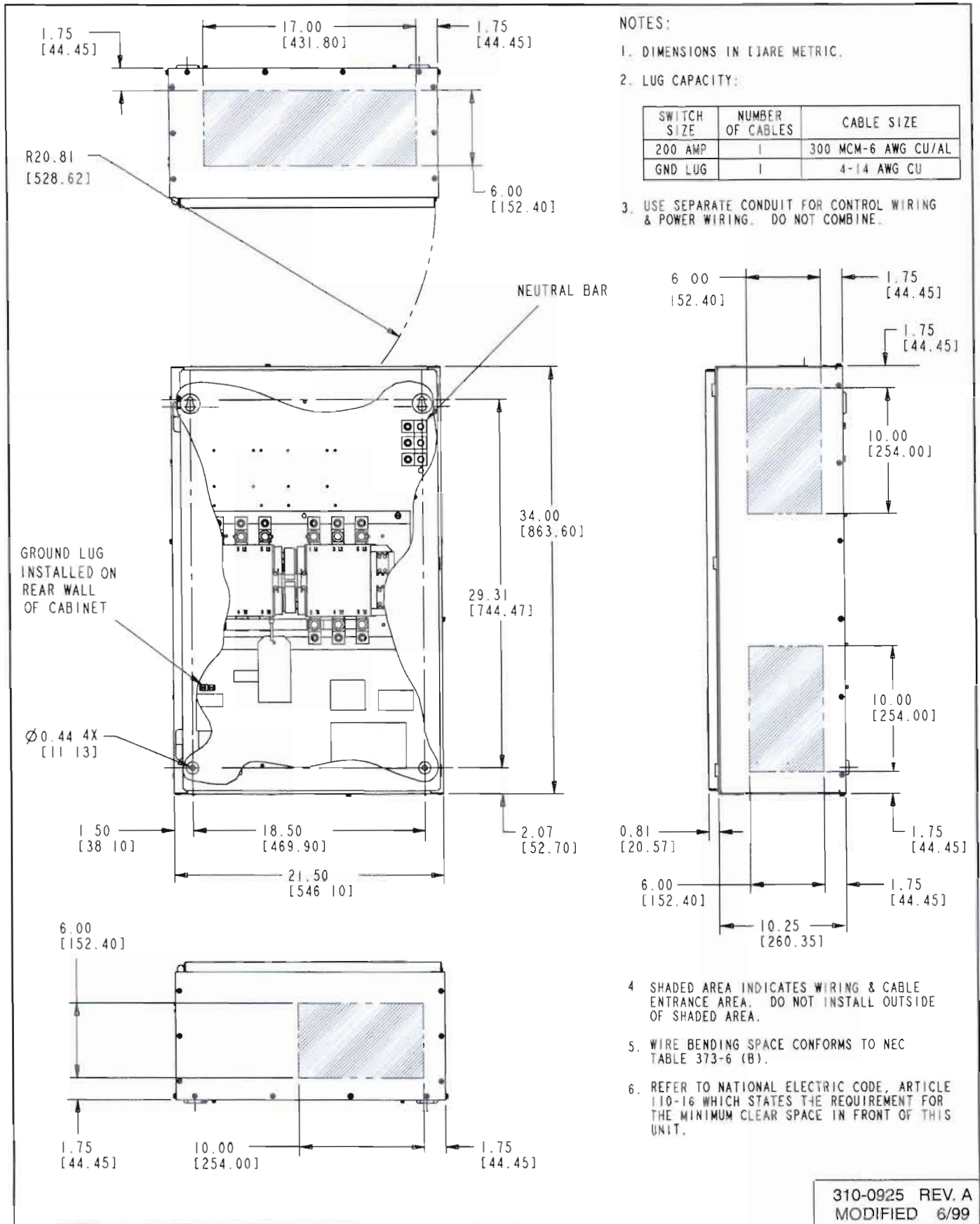


FIGURE 2-3. TYPICAL 200 AMP OUTLINE DRAWING

310-0925 REV. A
MODIFIED 6/99

3. Wiring

⚠ WARNING AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Only qualified personnel are to perform the following procedures.

WIRING CONSIDERATIONS

The correct wiring hub must be used when installing conduit to maintain the cabinet rating. When installing conduit, observe the following precautions:

1. Before beginning conduit installation, cover the transfer panel to prevent accidental entry of metal chips.
2. If using rigid conduit between the generator set and the transfer panel, install at least 2 feet (610 mm) of flexible conduit between the rigid conduit and generator set to absorb vibration.
3. Run control circuit wiring in separate conduit from the AC wiring; otherwise, induced currents could cause operational problems within the panel.

Control wire must be of the stranded type. Do not use solid wire.

4. Cutouts can be made through the top, bottom, or sides of the cabinet. (Refer to the transfer panel control box outline drawings in section 2.)

⚠ CAUTION Installation debris can cause equipment failure and damage. Use extreme care to keep drill chips and filings out of the relays, contacts, and other parts of the automatic transfer panel when mounting or connecting conduit. Screwdrivers should be used carefully to prevent damage to components.

AC CONNECTIONS

Perform wiring in the following sequence:

1. Test the operation of the generator set from its own controls.
2. Stop the generator set by pushing the control switch to OFF and disconnect the negative (-) lead from the cranking battery to prevent starting.

⚠ WARNING Failure to prevent the generator set from starting before wiring procedures are performed presents a shock hazard that can cause severe personal injury or death.

Table 4-1 shows the type and range of conductor sizes the transfer panel will accept.

TABLE 4-1. TERMINAL LUG CAPACITY (FOR COPPER (CU) OR ALUMINUM (AL) CONDUCTORS)

Panel Amp Rating	Number of Conductors	Size Range of Conductors
60	1	2 - 10 AWG CU
100	1	2/0 - 14 AWG CU/AL
200	1	300 MCM - 6 AWG CU/AL
GROUND LUG	1	4 - 14 AWG CU

3. Connect conductors of sufficient size to carry rated current from the line, load, and generator set directly to the transfer panel terminals.

The Normal power and Emergency power connections are marked L1, L2 and L3 The load connections are marked T1, T2 and T3. A neutral bar with lugs is standard. See Figure 3-1.

Use the National Electrical Code (NFPA No. 70, Art 702-6) as a guide for AC wiring connections and type between the genset and the transfer panel.

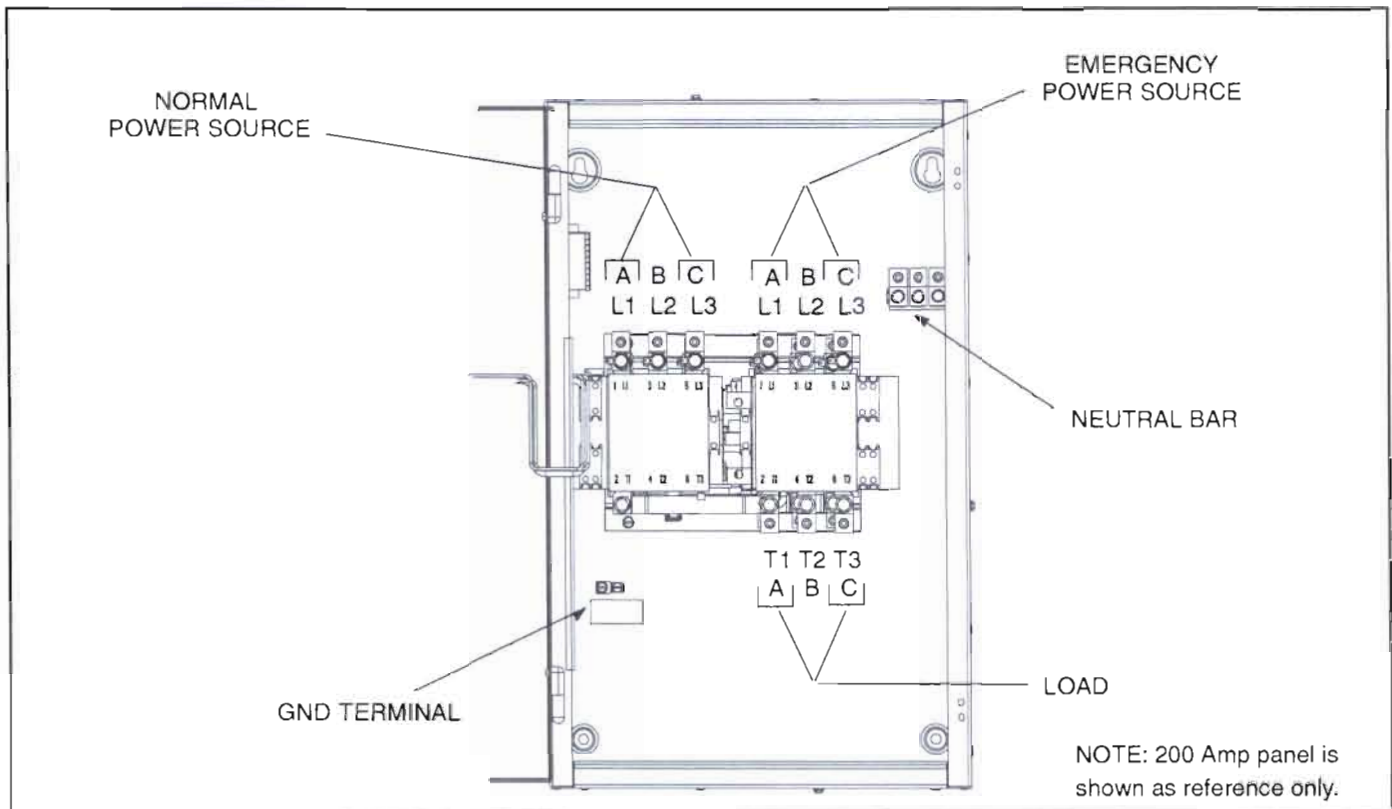


FIGURE 3-1. RTS GENSET LINE CONNECTIONS

4. On this 240-volt single phase switch, connect the two hot lines to the L.1 and L3 lugs and connect the neutral line to the neutral bar.
5. Connect power cables to the load terminals T1 and T3. Tighten the lugs as indicated in Table 4-2.
6. Make sure both AC power sources are disconnected.

⚠ WARNING AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Make sure that both AC power sources are disconnected.

TABLE 4-2. LUG TORQUES

SET SCREW SOCKET SIZE (ACROSS FLATS)	MINIMUM TORQUE FOR PROPER OPERATION
3/16 IN	80 IN-LBS (9 N•M)
1/4 IN	200 IN-LBS (23 N•M)
5/16 IN	275 IN-LBS (31 N•M)
3/8 IN	375 IN-LBS (43 N•M)
1/2 IN	500 IN-LBS (57 N•M)
9/16 IN	600 IN-LBS (68 N•M)

CONTROL CONNECTIONS

Connections of standard and optional control wiring are made at terminal blocks TB2 and optional TB3 (Figure 3-2).

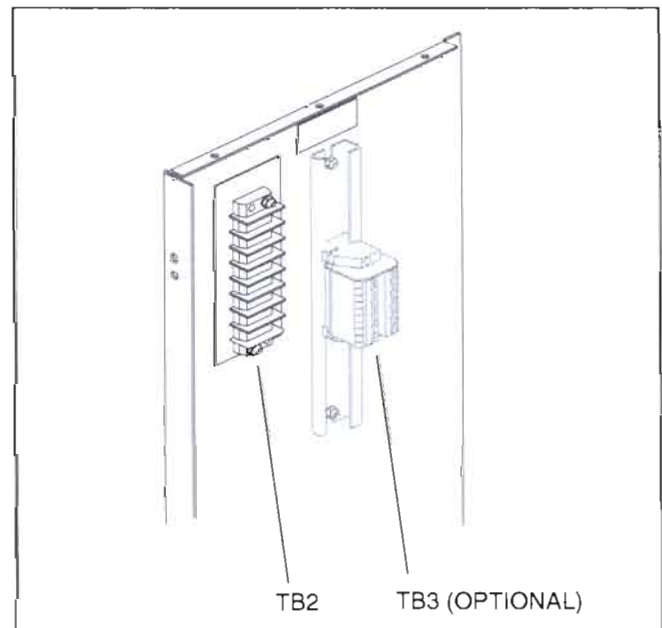


FIGURE 3-2. CONTROL WIRING CONNECTIONS

Remote Start-Stop Connections

Use number 18 to number 12 AWG wire. Resistance must not exceed 0.5 ohm per line. Use stranded wire only. For connections to the TB2 screw terminals, use number 8 ring or spade terminals. For connections to TB3, strip the insulation back 3/8 inch (10 mm).

Two-Wire Starting: Two-wire starting for Onan water-cooled generator sets uses terminals B+, GND (ground), and RMT of terminal block TB2.

(OPTIONAL) Three-Wire Starting: (Available only with a field installed 3-Wire Start Kit.)

Three-wire starting for Onan generator sets uses terminals 1, 2, 3, 4, and 5 of terminal block TB3 (Figure 3-4).

Connect terminals 1, 2, 3, and 4 to terminals on the generator set, as shown in Figure 3-4. With diesel sets that use the preheat circuit, connect terminal 5 on TB3 to terminal H on the generator set control.

Terminals 6, 7, and 8 of TB3 (Figure 3-5) are for connection to the overcrank alarm contacts. These (Form C) contacts are rated for 4 amperes at 120 VAC or 3 amperes at 30 VDC and are provided for customer use.

Ground Switching: Determine whether your generator set has a switching ground or a switching B+ remote start system:

1. Measure the DC voltage from the Start terminal to the Ground terminal. (The starting battery must be connected.)

If 12 VDC is measured, it is a switching ground system.

If 0 VDC is measured, it is a switching B+ system.

For 3-wire start systems using a switching ground, install or make sure a jumper (provided in envelope attached to TB2) is connected from TB2-GND to TB2-2. Make no other connections to TB2; terminals GND, 2, B+, and RMT.

For 3-wire start systems using switching B+, install or make sure a jumper (provided in envelope at-

tached to TB2) is installed from TB2-2 to TB2-B+ and another from TB2-B+ to TB3-1. Make no other connections to TB2; terminals GND, 2, B+, and RMT.

⚠ WARNING *Improper wiring of start-stop connections can result in severe personal injury or equipment damage. Carefully follow all wiring instructions and make no other connections to TB2; terminals GND, 2, B+, and RMT when a three-wire start system is used.*

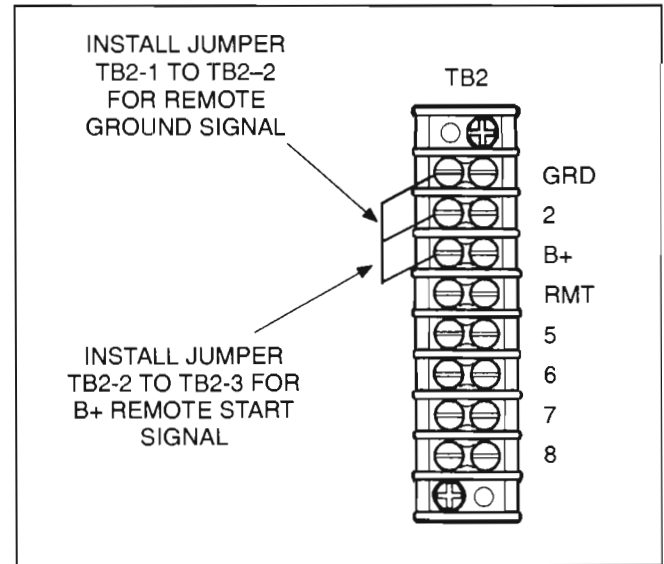


FIGURE 3-3. TWO WIRE START CONNECTIONS

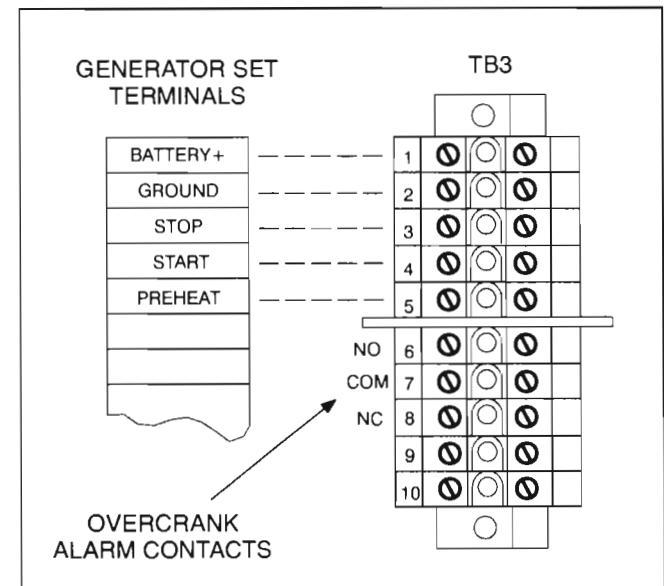


FIGURE 3-4. THREE-WIRE START CONNECTIONS

INSPECTION AND CLEANUP

Inspect all wiring to be certain that:

- Wiring does not interfere with switch operation.
- Wiring will not be damaged as door opens and closes.
- No wiring is left loose and unconnected.

After mounting and wiring the cabinet, clean the interior with a vacuum cleaner to remove any chips, filings, or dirt from the cabinet interior and components.

Installation is not yet complete.

Do not energize the transfer panel until instructed to do so in sections 4 and 5.

4. Setup and Calibration

BEFORE CALIBRATING

The RST transfer panel is equipped with a control package with factory preset undervoltage sensing and time delays.

After installing the transfer panel, the undervoltage sensing must be calibrated.

Install J1 Connector

Install connector J1 when all of the wiring is complete. Also install connectors for any installed options.

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

Connect the Battery

Make sure that the RUN switch on the generator is in the OFF position and connect the battery (negative [-] lead last). If applicable, reconnect the external battery charger.

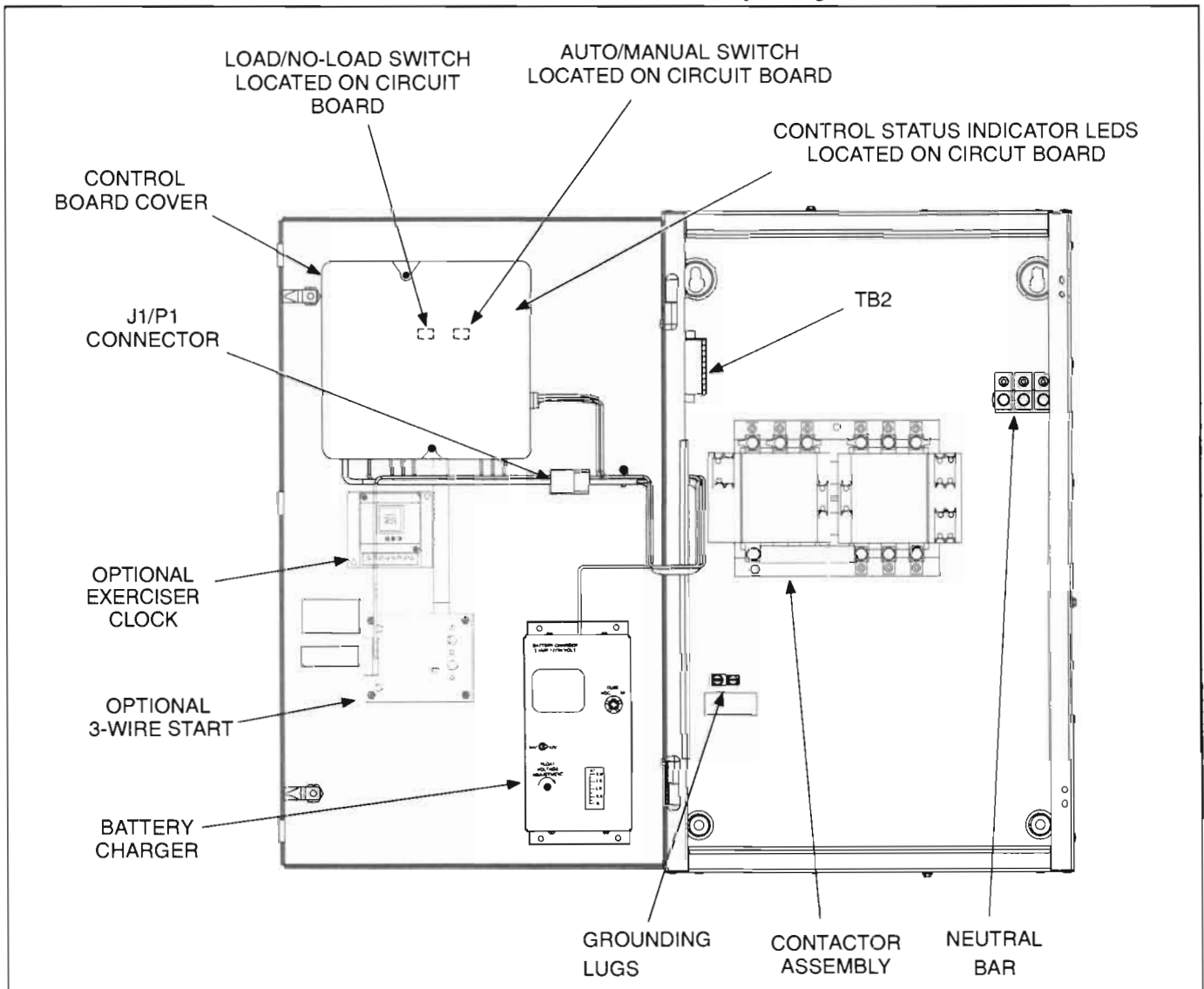


FIGURE 4-1. LOCATION OF CONTROL COMPONENTS

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

Connect AC Line Power

Connect AC line power to the automatic transfer panel. The Normal Available and Normal Connected LEDs on the control board will light if the voltage sensors are calibrated. See Figure 4-2.

VOLTAGE SENSORS

The control package has undervoltage sensing for one phase of the Normal and Emergency sides with fixed pickup and dropout settings. The Pickup voltage is preset to 85% of Normal, and Dropout is preset to 75% of Pickup.

Undervoltage Sensor Calibration

Voltage sensors monitor the Normal and Emergency power sources for an undervoltage condition.

⚠CAUTION Incorrect setting of the calibration (Cal) adjustments will result in abnormal operation of the transfer switch.

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

All adjustments are made by turning the appropriate potentiometer with a screwdriver. The adjustment potentiometers are accessed by removing the cover from the control board.

A separate voltage sensor is used for each power source. The adjustment pot locations are shown in Figure 4-3.

- The Normal sensor monitors the Normal (utility) power source.

- The Emergency sensor monitors the Emergency (generator set) power source.

To calibrate the undervoltage sensors:

1. Check that nominal voltage is present on all phases of the source being calibrated (Normal or Emergency).
2. Move the calibration switch (Figure 4-3) to the CAL position.
3. Slowly turn the undervoltage calibration (Cal) potentiometer counterclockwise until the Source Available LED corresponding to the source sensor being calibrated turns OFF.
4. Slowly turn the undervoltage calibration (Cal) potentiometer clockwise until the Source Available LED turns ON.
6. The undervoltage sensor is now calibrated. Repeat this procedure for the other source.

Return the calibration switch (Figure 4-3) to the 85 % position.

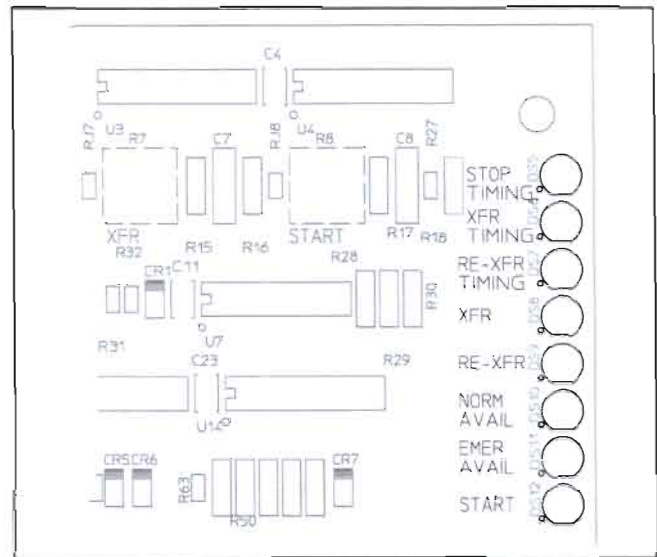


FIGURE 4-2. CONTROL BOARD LEDs

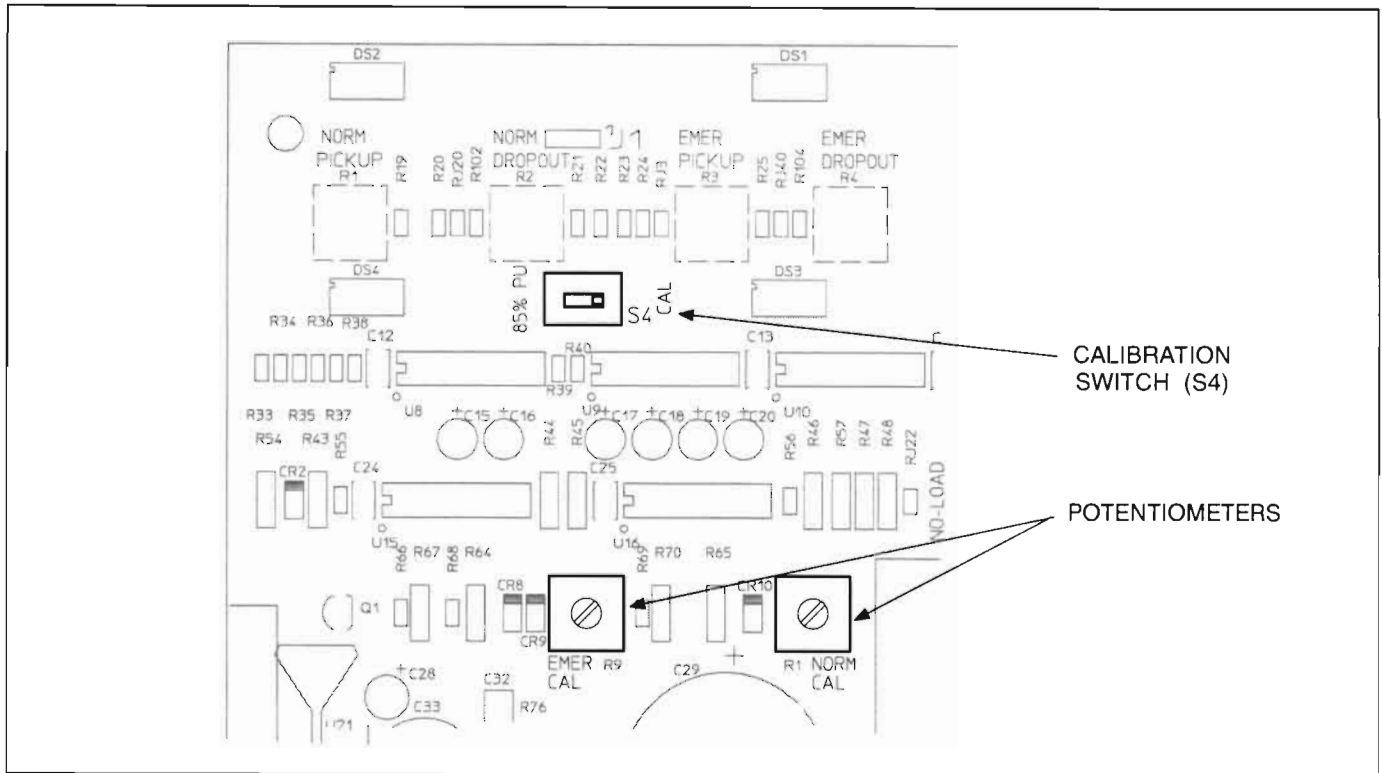


FIGURE 4-3. UNDERVOLTAGE CALIBRATION, PICKUP AND DROPOUT ADJUSTMENT

TIME DELAY

The time delays control the four following functions:

- Start time delay
- Stop time delay
- Transfer time delay
- Retransfer time delay

The time delays on are preset as follows:

DELAY	SETTING
Start	3 seconds
Stop	5 minutes
Transfer	3 seconds
Retransfer	5 minutes

3-WIRE START MODULE (OPTIONAL)

The 3-Wire Start module has two adjustable timers.

The Preheat timer delays the start signal to allow preheating the generator set. The Preheat timer's range of adjustment is 0 to 60 seconds.

If a preheat delay is desired, make sure that the Preheat timer's On/Off switch is in the On position.

The Overcrank timer limits the time that the generator set starter is allowed to operate. The Overcrank timer's range of adjustment is 0 to 120 seconds.

To set the timers, align the slots on the potentiometers with the desired markings on the faceplate (Figure 4-4).

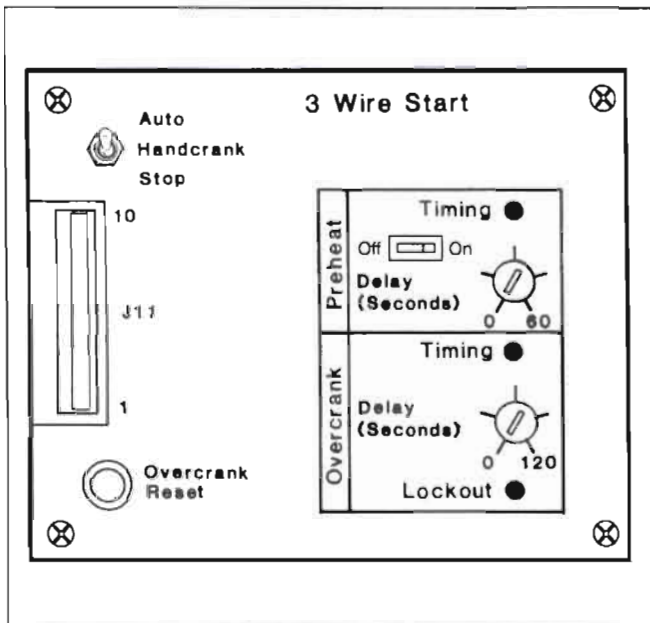


FIGURE 4-4. 3-WIRE START EXERCISER CLOCK (OPTIONAL)

The exerciser clock is used to start and run the generator set at programmable intervals and for selected durations. It is a 7-day, 24-hour clock that can store and execute up to four start/stop programs per day (one minute minimum duration). The exerciser clock also has a test feature that can be used to initiate a genset start and run cycle.

Onan recommends exercising the generator at least 30 minutes a month with a load.

Programming the exerciser clock requires setting the time of day and entering the exercise start and stop times as described in the following sections. The exerciser clock has backup power for approximately six hours. After six hours the day and time will have to be reset. Exercise programs will not be lost during a power outage (exercise programs are stored in EEPROM).

To reset the exerciser clock program:

Resetting the exerciser clock erases all existing day, time and exercise program settings.

Depress and hold the arrow, plus and set buttons (→) (+) (●) simultaneously. Release the plus and set buttons while continuing to hold

the arrow button. When all aspects of the LCD display appear, release the arrow button.

To set the day and time:

1. With the exerciser clock powered, press all three buttons simultaneously to reset the time. The time display area will show (-- : --) and a small clock symbol will appear in the upper left corner of the display. Refer to Figure 4-5.
2. Press the arrow (→) button once to set the day-of-week. The clock symbol will begin flashing to indicate the clock is being programmed and the display will show midnight (0:00).
3. Press the plus (+) button as many times as necessary until the current day-of-week is displayed.
Example: 1 = Monday, 2 = Tuesday, etc.
4. Press the arrow (→) button again to set the hour of the day. The clock uses 24-hour (military) time.

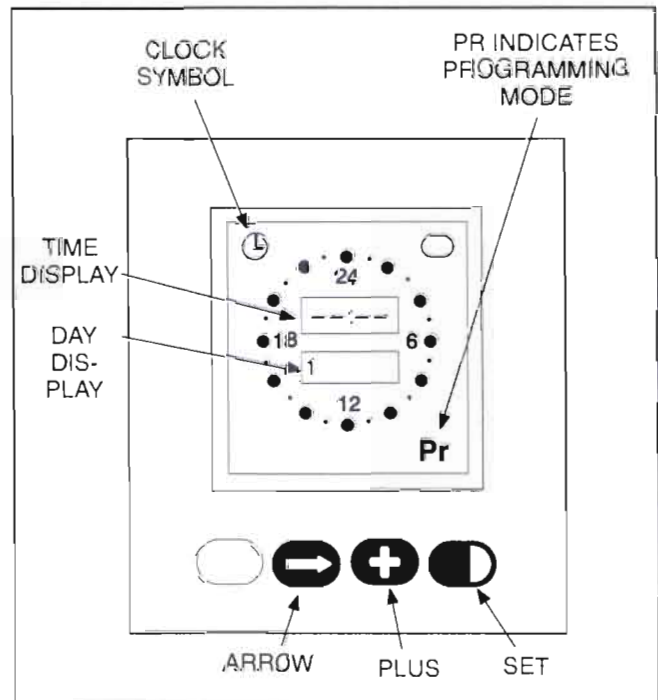


FIGURE 4-5. EXERCISER CLOCK

5. Press the plus (+) button until the current hour is displayed.
Example: 2:00 PM is 14:00.
6. Press the arrow (→) button again to set the minutes.
7. Press the plus (+) button until the current minutes are displayed.

Note that by holding the plus (+) button down, the minutes will increment in 5 minute intervals.

8. To set or change the exercise program, press the arrow (→) button again and go to step two in the following section. To return to the normal operating mode, press the arrow (→) button eight times (clock symbol appears in the display).

To set the exercise start and stop time:

1. Press the arrow (→) button four times to start the programming mode.
2. The letters **Pr** will appear in the lower right hand corner of the display when the programming mode is reached (**Pr** will be flashing if there are no existing programs).
Press the arrow (→) button as many times as necessary to advance to the day to be programmed.
To clear an existing program for the day selected, press the plus and set (+) (■) buttons at the same time.
3. Press the plus (+) button to increment the **Start** time of the exercise program. The display will show midnight (0:00). Note that by holding the (+) button down, the minutes increment in 15 minute intervals. When the **Start** time is reached, press the set (■) button (ON Mode is indicated, Figure 4-6).
Then increment the time with the plus (+) button to the desired **Stop** time. When the **Stop** time is reached, press the set (■) button (OFF Mode is indicated, Figure 4-6).

Example to exercise the genset one hour:

Set Start at 7:00 PM (19:00)

Set Stop at 8:00 PM (20:00)

Note that the exercise time is indicated by a band of segments illuminated around the outer ring of the clock from the start to the stop time.

To clear the program, press the plus and set (+) (■) buttons at the same time.

4. Pressing the arrow (→) button advances to the next day. The program is copied to the next day if the next day does not have an existing program.

To change or clear the program, press the plus and set (+) (■) buttons at the same time.

Double check the program setting for each day. Press the arrow (→) button repeatedly until the clock mode is passed and the program mode (Pr) is reached. Carefully check each days program and clear any unwanted programs.

5. When finished programming, press the arrow (→) button until the clock appears in the upper left corner of the display.

During the exercise period, the ON mode is indicated in the ellipse in the upper right corner of the display (Figure 4-8).

To check the programs:

Push the arrow (→) button to review each setting.

To erase (clear) a program:

Press the arrow (→) button until the program mode (Pr) is reached. Press the arrow (→) button again to select the desired day. To clear the program for the day selected, press the plus and set (+) (■) buttons at the same time.

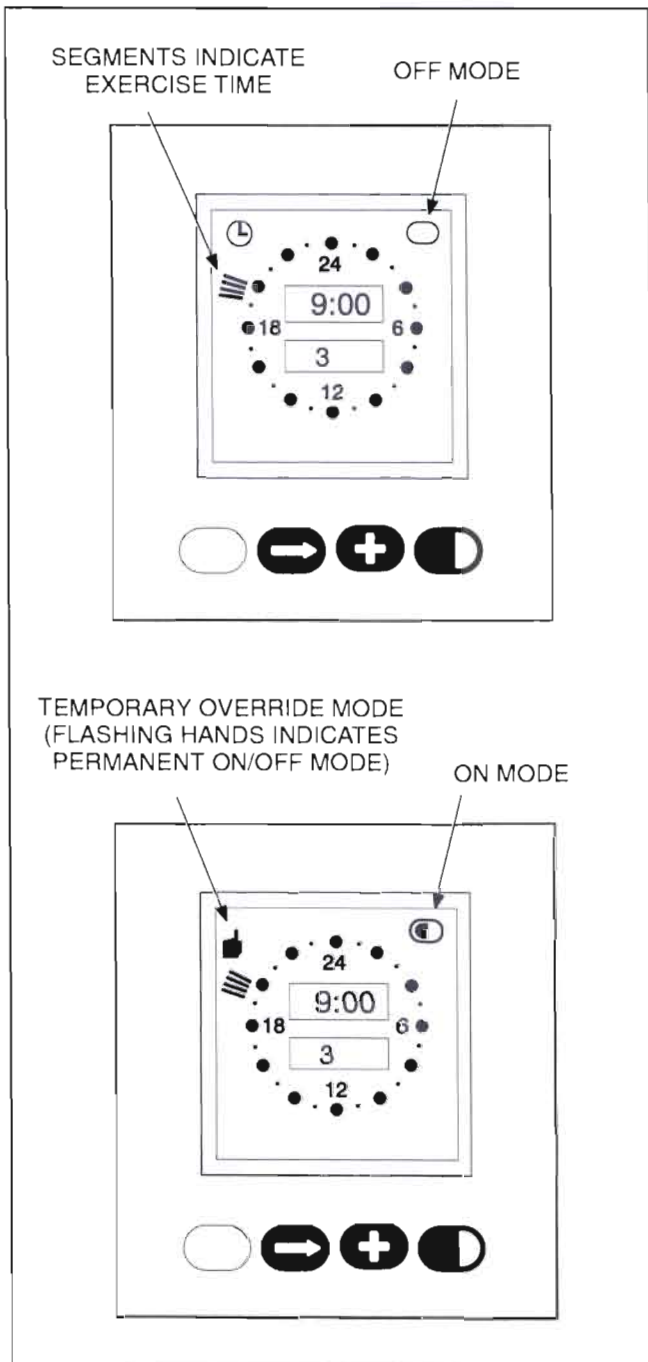


FIGURE 4-6. EXERCISER CLOCK ON/OFF MODE

To Initiate or Override an Exercise Program:

The exerciser clock has a built-in test feature. Once the clock time has been set, the set (D) button can be used to initiate a test or to cancel a test in progress.

With the normal source connected and available, pressing the set (D) button once initiates a test sequence. A hand is displayed in the upper left corner of the display and the ON mode is indicated inside the ellipse in upper right corner of the display (Figure 4-6). Pressing the set (D) button again stops the test and the ellipse indicates the OFF mode.

To temporarily override an activated exercise program, *momentarily* press the set (D) button. A small hand will appear in the upper left corner of the display (Figure 4-6). The current program is overridden and the clock automatically sets the next program. Momentarily pressing the set (D) button again returns to the current program.

Permanent On/Off Mode:

Holding the set (D) button down until a *flashing hand appears* in the upper left corner of the display initiates the permanent On/Off mode. The ON mode is indicated by a continuous band of segments illuminated around the clock. The OFF mode is indicated by all of the segments around the clock being off. Pressing the set (D) button momentarily toggles between the permanent On and permanent Off modes. Holding the set (D) button down until the clock symbol returns to the upper left corner of the display, ends the continuous On/Off mode and returns to the normal program mode.

FLOAT BATTERY CHARGER

The float-charge battery charger regulates its charge voltage to continuously charge the battery. As the battery approaches full charge, the charging current automatically tapers to zero amperes or to steady-state load on the battery.

NOTE: The pulsing meter indicates the charger is working.

The battery charger is rated for 2 amperes at 12 or 24 VDC.

Power to the battery charger is supplied directly from the Normal source through connector J6/P6. The output of the battery charger is connected to the GND and B+ terminals of TB2 (or TB3 if the 3-Wire Start module is used). Refer to sheets 2 and 4 of the schematic and wiring diagram package.

Battery Charger Float Voltage

The float voltage is set at the correct value at the factory and should not require adjustment. However, if the battery shows signs of being overcharged or undercharged, the float voltage can be adjusted. A high specific gravity, bubbling of electrolyte, and loss of water indicate a high float voltage. A low specific gravity indicates a low float voltage.

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

To check and adjust the float voltage, the following tools are needed:

- a fully charged test battery
- a hydrometer
- a small screwdriver
- an accurate voltmeter (0.5% accuracy)

Checking the voltage: Use the following procedures to check the float voltage.

⚠ CAUTION *Do not attempt to adjust or test the battery charger with a deeply discharged battery. Use a fresh, fully charged battery when adjusting or testing the charger.*

⚠ CAUTION *Always disconnect the battery charger from its AC source (remove the charger's AC input fuses) before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage DC control circuits.*

1. Turn the operation selector switch for the generator set to OFF and disconnect the starting battery (negative [-] lead first).

The selector switch is located on the generator set control panel on two-wire start systems and on 3-Wire Start module on three-wire start systems.

2. Connect the fully charged battery (negative [-] lead last) to the generator set and verify the charge condition with the hydrometer.

A fully charged lead-acid battery will have a specific gravity of 1.260 at 77° F (25° C).

3. Connect the voltmeter directly to the battery terminals and measure the voltage.

Make sure the 12/24 volt selector switch is in the correct position.

4. Compare the voltage reading with the value shown in Table 4-1. If the voltage is above or below the recommended float voltage, open the cabinet door and adjust as specified in Step 5. If the voltage is correct, proceed to Step 7.
5. Use a small screwdriver to turn the adjustment potentiometer (located on charger panel) counterclockwise to decrease the float voltage and clockwise to increase the float voltage. Adjust in small steps and wait five minutes for the voltage to stabilize before making additional adjustments.

⚠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. Avoid touching electrical contacts. Do not wear jewelry or loose clothing. Stand on a dry, non-conductive surface such as a rubber mat or wooden platform.*

6. When adjustments are complete, close and lock the transfer panel cabinet door.
7. Disconnect the voltmeter from the battery terminals and disconnect the test battery (negative [-] lead first) from the generator set.
8. Reconnect the generator set starting battery (negative [-] lead last) and place the operation selector switch in the Auto (three-wire start) or Remote (two-wire start) position.

TABLE 5-1. BATTERY FLOAT VOLTAGES

Lead-Acid Batteries	
Battery Voltage	Float Voltage
12	13.3
Nickel-Cadmium Batteries	
Float Voltage Charge Per Cell	
1.38 to 1.45 volts	
Example: Float charge for 10 cell battery should be 13.8 to 14.5 volts.	

5. System Checkout

⚠️ 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 Improper operation of the generator set presents a hazard that can cause severe personal injury or death. Observe all safety precautions in your generator set Operation and Installation manuals.

STARTING TEST

Two-Wire Starting

1. Move the selector switch on the engine control to RUN. The generator set should start and run.
2. Move the selector switch to OFF. The generator set should stop. Return the selector switch to Remote for automatic operation.

Three-Wire Starting (Optional)

1. Move the Stop/Auto/Handcrank switch on the 3-Wire Start module to Handcrank.

2. Push the start button on the generator set control. The generator set should start and run.
3. Move the Stop/Auto/Handcrank switch from Handcrank to Stop. The generator set should stop.
4. Move the Stop/Auto/Handcrank switch to Auto. The generator set should not start.

TEST TRANSFER WITH LOAD

1. Move the Load/No-Load switch on the control circuit board to the Load position (Figure 4–1).
2. Keep the Auto/Man switch in the Auto position at all times to enable the automatic retransfer function.
3. Replace the cover over the circuit board and close the cabinet door.

⚠️ 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. Close the cabinet door.

4. Notify occupants prior to removing utility power.

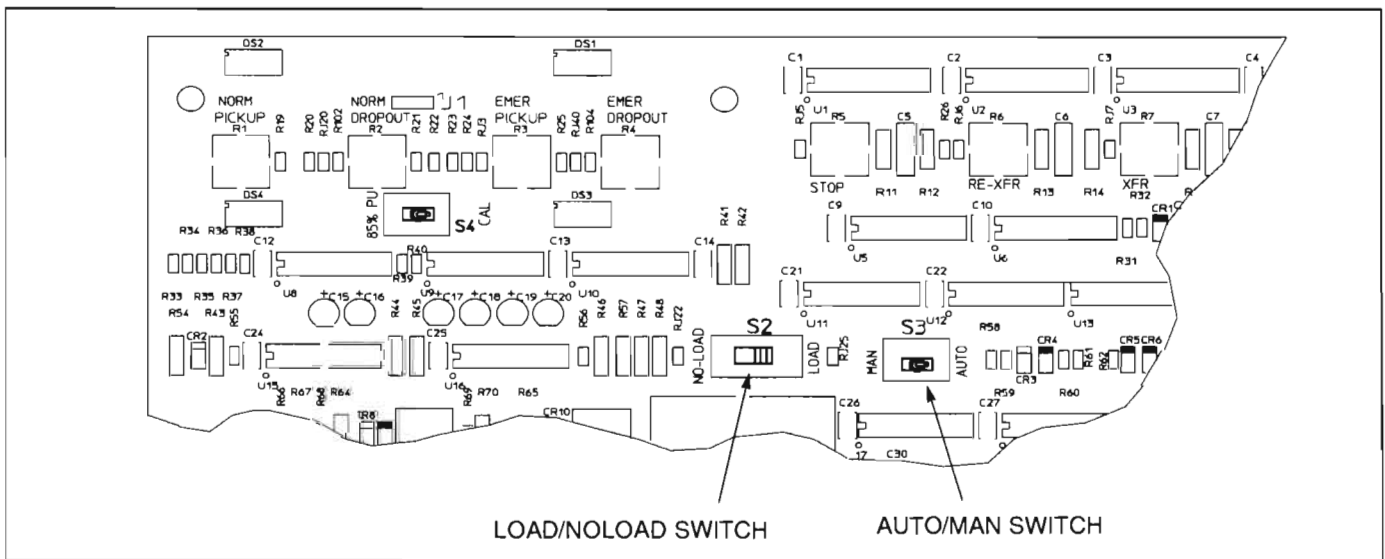


FIGURE 4–1. CONTROL CIRCUIT BOARD

5. Turn off any electronic devices, computers etc. prior to removing utility power.

If the standby power is supporting all circuits within the home, turn off any electronic appliances and reduce other loads until the total load does not exceed 80% of the generator's kW rating.

6. Remove the AC utility power to the transfer panel.

If the transfer panel is wired to a secondary distribution panel, open the breaker(s) in the main distribution panel that supply utility power to the transfer panel.

7. After testing, return AC utility power.

8. Keep the transfer panel door securely closed at all times and make sure only qualified service personnel have access to the cabinet.

TEST OVERCRANK FUNCTION THREE-WIRE STARTING

If the optional 3-Wire Start module is installed:

1. Disconnect the positive start lead from the start solenoid or starter.
2. Move the Stop/Auto/Handcrank switch on the 3-Wire Start module to Auto.
3. Turn On the remote test switch (if connected). The Lockout lamp on the 3-Wire Start module should light at the end of the crank period (0 to 120 seconds—per setting).
4. Turn off the remote test switch.
5. Move the Stop/Auto/Handcrank switch to Stop and push the Overcrank Reset button (the Lockout lamp should go out).
6. Reconnect the positive lead to the starter or start solenoid.
7. Move the Stop/Auto/Handcrank switch to Auto.

Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432
1-800-888-6626
763-574-5000 International Use
Fax: 763-528-7229

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