

Owner Manual

Transfer Switch

RSS100 (Spec B) RSS200 (Spec B)

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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 enclosure closed and locked.
- Make sure only authorized personnel have the enclosure keys.
- All service and adjustments to the transfer switch must be performed only by an electrician or authorized service representative.

NOTICE

For transfer switches with closed transition capability, 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.

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

⚠ WARNING

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

1.3 Utility-To-Generator Set Applications

If the cabinet must be opened for any reason:

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

⚠ WARNING

AC power within the cabinet and the rear side of the cabinet door presents a shock hazard that can cause severe personal injury or death. With the breaker in the OFF position, the line side lugs are still energized.

2 Introduction

This is an open transition transfer switch. With an open transition switch, there is never a time when both sources are supplying power to the load. This manual includes information on the following types of Residential Safety Switch (RSS) transfer switch installations.

- RSS with controller: the RSS transfer switch with an Automatic Transfer Switch (ATS) control
 includes an operator panel located behind the hinged panel in the upper left hand corner on the front
 of the enclosure. Access to the control can be obtained by removing the controller cover screw. The
 door panel must be removed to gain access to transfer switch components.
- RSS without controller, one circuit breaker: access to the circuit breaker can be obtained by removing the outer door panel. An internal panel must be removed to gain access to transfer switch components.

Refer to the wiring diagrams at the end of this manual for specific information about switch configuration.

Use normal and necessary safety precautions before starting any service procedure. Identify all hazards by referring to the Safety Precautions portion of this manual and by observing all warnings and cautions within the manual. Whenever you are troubleshooting, remember that the generator set, the transfer switch, and the utility power source are all interdependent.

2.1 About the Manual

This manual covers models produced under the Cummins Inc.

This manual provides information necessary for the operation, installation, and service, of the transfer switch(es) identified on the cover of this manual. This manual also includes parts information.

This manual provides information necessary for operation of an RSS transfer switch with a control.

The RSS transfer switch with a control includes an operator panel located behind the hinged panel in the upper left hand corner on the front of the enclosure, as shown in **Figure 1**.

This manual contains service procedures for RSS transfer switches.

- Section 4 describes the basic operation of a transfer switch and provides information on model identification and how to obtain service.
- Section 7.3 provides information on how to troubleshoot transfer switches that include a controller, see Figure 2.
- Section 7.4 provides information on how to troubleshoot transfer switches that include a circuit breaker but do not include a controller, see Figure 3.
- Section 8 provides information on servicing the transfer switch.
- Appendix A includes parts information.
- · Appendix C includes transfer switch wiring diagrams.

Refer to the schematic and wiring diagrams at the end of this manual for specific information about transfer switch configuration.

Use normal and necessary safety precautions before starting any installation or service procedure. Identify all hazards by referring to the Safety Precautions portion of this manual and by observing all warnings and cautions within the manual. Whenever you are installing or troubleshooting, remember that the generator set, the transfer switch, and the utility power source are all interdependent.

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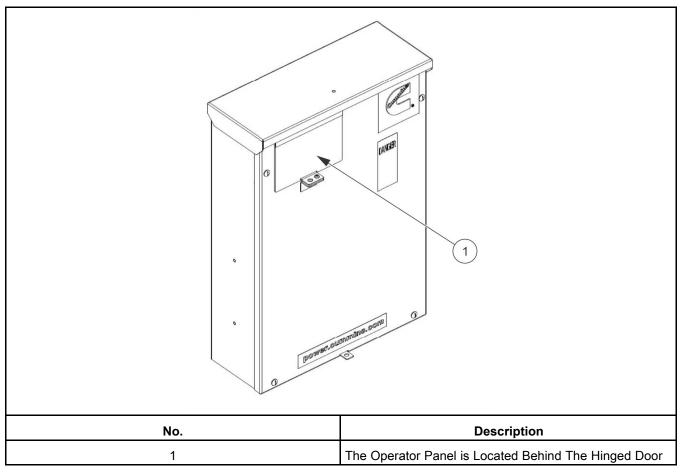


FIGURE 1. RSS TRANSFER SWITCH

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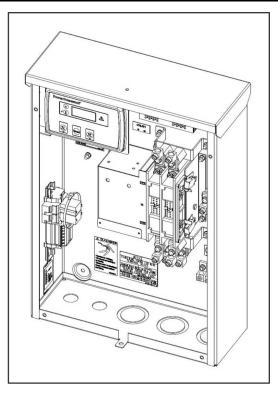


FIGURE 2. RSS TRANSFER SWITCH WITH CONTROLLER (DOOR PANEL REMOVED)

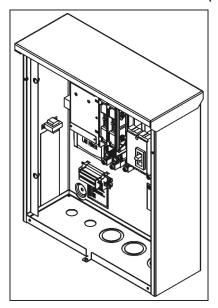


FIGURE 3. RSS TRANSFER SWITCH WITHOUT CONTROLLER, ONE BREAKER WITH DOOR PANELS REMOVED

2.2 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.

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The load is connected to the common of the transfer switch, see <u>Figure 4</u>. Under normal conditions, the load is supplied with power from the utility (as illustrated). If utility power is interrupted, the load is transferred to the generator set (genset). When utility power returns, the load is re-transferred to the utility. The transfer and retransfer of the load are the two most basic functions of a transfer switch.

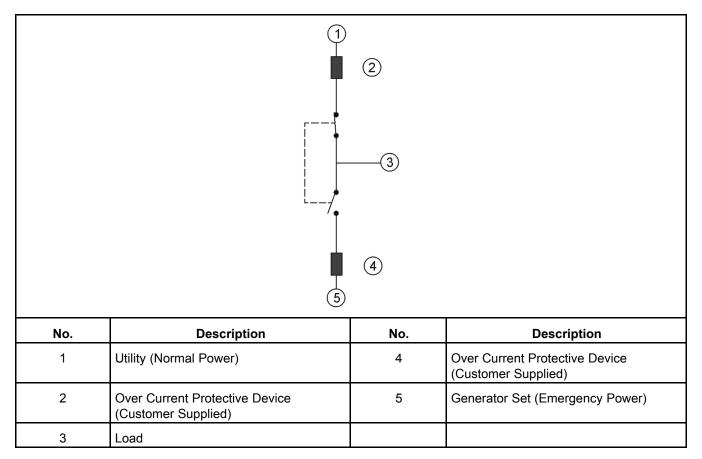


FIGURE 4. LOAD TRANSFER SWITCH (TYPICAL FUNCTION)

2.3 Transfer Switch Function

Transfer switches are an essential part of a standby power system. The utility (normal power source) is backed up by a generator (emergency power source). Should the utility fail, the transfer switch automatically switches the electrical load from the utility to the generator. When utility power returns, the transfer switch automatically switches the electrical load back to the utility.

Automatic transfer switches, capable of automatic operation without operator intervention, perform the basic function of transferring the load to the available power source. A controller monitors each source for allowable voltage and frequency range.

Automatic transfer switches, capable of automatic operation without operator intervention, are designed for utility-to-generator applications. In utility-to-generator applications, a transfer switch performs the following functions:

- 1. Senses the interruption of utility power.
- 2. Sends a start signal to the generator.
- 3. Senses generator power is available.
- 4. Transfers the load to the generator.

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- 5. Senses the return of utility power.
- 6. Retransfers the load to the utility.
- 7. Sends a stop signal to the generator.

	NOTICE	
Models with integral control.		

2.4 Model Identification

Identify your model by referring to the Model and Specification number as shown on the nameplate. The nameplate also includes electrical characteristics.

2.4.1 Transfer Switches with a Controller

The nameplate for transfer switches with a controller is located inside the cabinet, on the upper right side, see **Figure 5** for the RSS100 transfer switch and **Figure 6** for the RSS200 transfer switch.



FIGURE 5. RSS100 WITH CONTROL DISPLAY NAMEPLATE

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FIGURE 6. RSS200 WITH CONTROL DISPLAY NAMEPLATE

2.4.2 Transfer Switches without a Controller

The nameplate for transfer switches without a controller, one circuit breaker, is located inside the cabinet, on the lower left side, see for the RSS100 transfer switch and for the RSS200 transfer switch.

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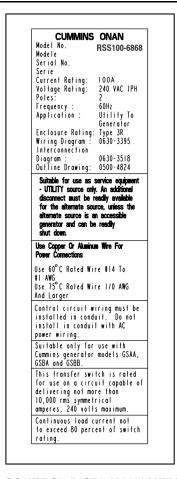


FIGURE 7. RSS100 WITHOUT CONTROL DISPLAY NAMEPLATE, ONE CIRCUIT BREAKER

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FIGURE 8. RSS200 WITHOUT CONTROL DISPLAY NAMEPLATE, ONE CIRCUIT BREAKER

2.5 Manufacturing Facilities

U.S. and CANADA	EMEA, CIS	BRAZIL
Cummins Inc. 1400 73rd Ave. NE Minneapolis, MN 55432 USA	Cummins Inc. Royal Oak Way South Daventry Northamptonshire NN11 8NU United Kingdom	Rua Jati, 310, Cumbica Guarulhos, SP 07180-900 CNPJ: 43.2201.151/0001-10 Brazil
Toll Free 1-800-CUMMINS™ (1-800-286-6467) Fax +1 763-574-5298	Phone +44 1327 88-6453 Fax +44 1327 88-6125	Phone 0800 286 6467
CHINA	INDIA	ASIA PACIFIC

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Cummins Inc. No.118 South Quanli Road , Wuhan Economic& Technological Development Zone , Hubei, P.R.China 430058	Cummins Inc. Plot No B-2, SEZ Industrial Area, Village-Nandal & Surwadi, Taluka- Phaltan Dist- Satara, Maharashtra 415523 India	Cummins Sales and Service Singapore Pte Ltd 85 Tuas South Avenue 1 Singapore 637419
Phone + 86 (27) 8421 4008 Fax + 86 (27) 8421 4804	Phone +91 021 66305514	Fax +65 6265 6909
LATIN AMERICA	MEXICO	
3350 Southwest 148th Ave. Suite 205 Miramar, FL 33027 USA	Eje 122 No. 200 Zona Industrial San Luis Potosi, S.L.P. 78395 Mexico	
Phone +1 954 431 551 Fax +1 954 433 5797	Phone +52 444 870 6700 Fax +52 444 824 0082	

2.5.1 How to Obtain Service

When a product requires servicing, contact your nearest Cummins Inc. distributor. To locate your local Cummins Inc. distributor, refer to www.cumminspower.com and select Distributor Locator. When contacting your distributor, always supply the complete model, specification, and serial number as shown on the nameplate.

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

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

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

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

- For models with a controller, a model and serial number label, see <u>Figure 9</u> is located on the back
 of the controller cover. To view the label, remove the screw securing the controller cover and open
 the cover, see <u>Figure 10</u>.
- For models without a controller, a model and serial number label is located on the inner panel. To view the label, remove the outer panel, see Figure 11.

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Model No. ____

FIGURE 9. MODEL AND SERIAL NUMBER LABEL

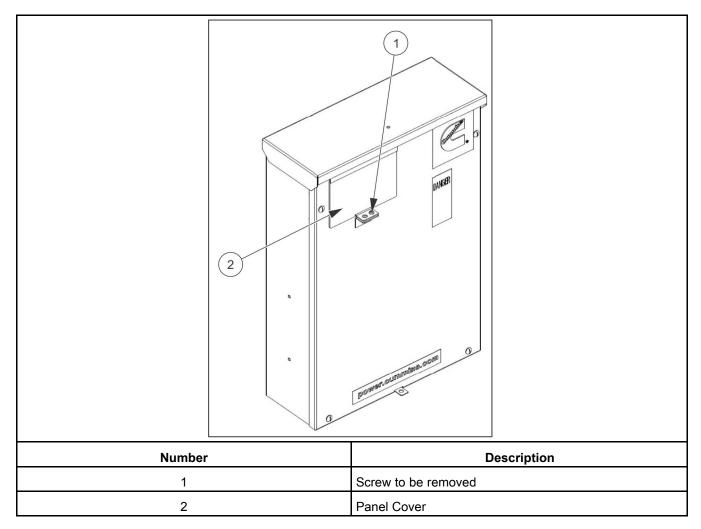


FIGURE 10. OPERATOR PANEL COVER

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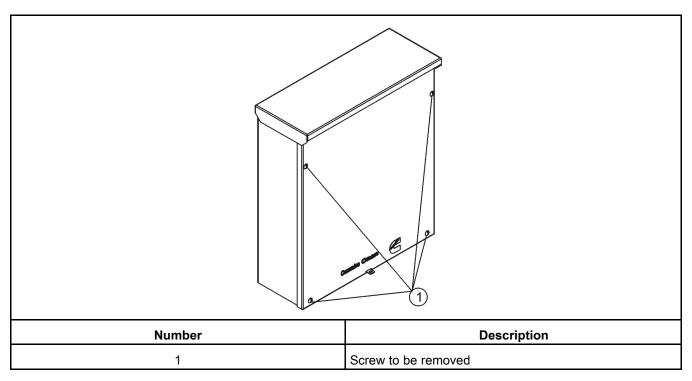


FIGURE 11. TRANSFER SWITCH WITHOUT CONTROLLER

2.5.1.1 Locating a Distributor

In the U.S. and Canada

To easily locate the nearest certified distributor/dealer for Cummins generator sets in your area, or for more information, contact us at $1-800-\text{CUMMINS}^{\text{TM}}$ (1-800-286-6467) or visit www.cummins.com/support.

If unable to contact a distributor using the automated service, consult the Internet.

If unable to arrange a service or resolve an issue, contact the Service Manager at the nearest Cummins distributor for assistance.

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

Outside the U.S. and Canada

Refer to <u>www.cummins.com/support</u> and select Sales and Service Locator, or send an email to ask.powergen@cummins.com.

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3 Description

This section describes how the basic components of a transfer switch function.

3.1 Transfer Switch with Control

Figure 12 shows the control panel display.

· Membrane Pushbuttons

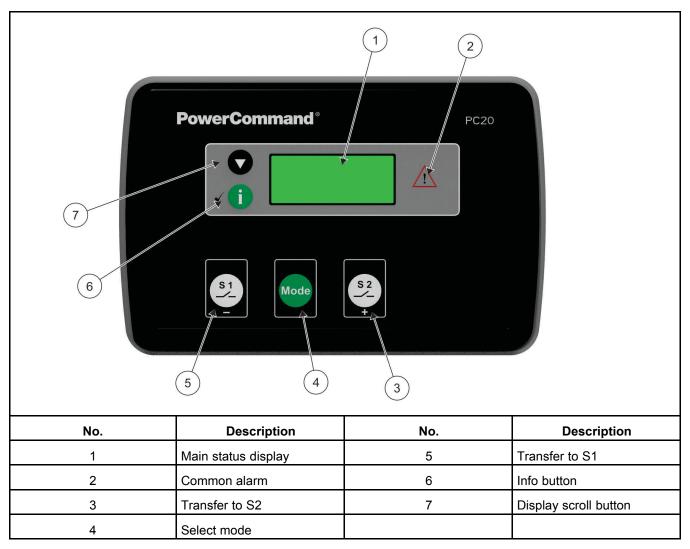


FIGURE 12. CONTROL PANEL

3. Description 6-2021

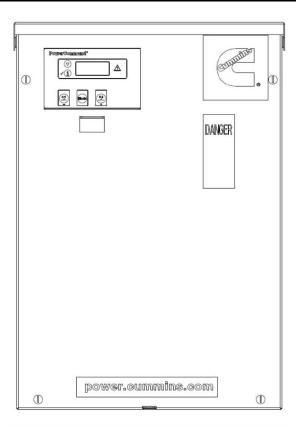


FIGURE 13. CABINET DOOR (SHOWN WITHOUT HINGED COVER)

3.1.1 Main Status Display

The control panel includes a graphic display capable of displaying alarm icons and other instrumentation. Once selected, a display page will remain on the LCD display until the user selects a different page or, after an extended period of inactivity, the module will revert to the status display. The display contrast is configurable and features an LED backlight.

3.1.2 Membrane Pushbutton

The operator panel includes five membrane pushbuttons.

- **Down Button:** This buttons scrolls through the items in the currently displayed page.
- INFO Button: This button changes between the various pages About, Status, Instrumentation, Alarms, Event Log, LCD Indicators. This button is also used to confirm changes made to the transfer switch mode and control settings..
- Mode Selection Pushbutton: This button allows transfer switch modes to be selected. Transfer switch modes include Automatic, Manual, Test, Start inhibit, and Prohibit return.
- Load Switching Control Pushbutton: Two fascia mounted buttons are provided for load switching
 operation when in manual mode. These buttons are enabled/disabled in the modules PC
 configuration Suite so refer to your configuration file to ensure the configuration has enabled the
 buttons.
- S2 Button: Pressing this button when generator power (S2) is on load opens Generator Power (S2) load switch.

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Pressing this button when Utility Power (S1) is on load and Generator Power (S2) is available, will open Utility Power (S1) load switch, waits for the duration of the Non-sync Transfer Time Delay timer, then closes Generator Power (S2) load switch.

3. Description 6-2021

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4 Operation

4.1 Transfer Switches with an Operator Panel

The transfer switch provides five operator pushbuttons and a main status display screen that indicate operation status.

To access the operator panel, remove the screw securing the panel cover and open the cover (see <u>Figure</u> 15).

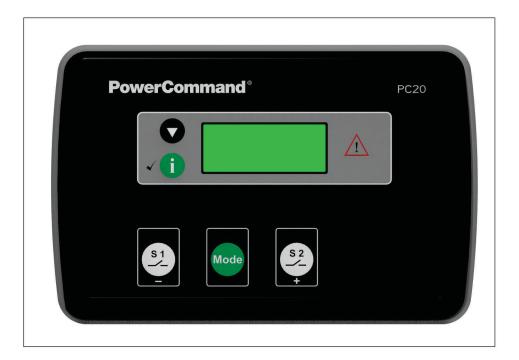


FIGURE 14. CONTROL PANEL

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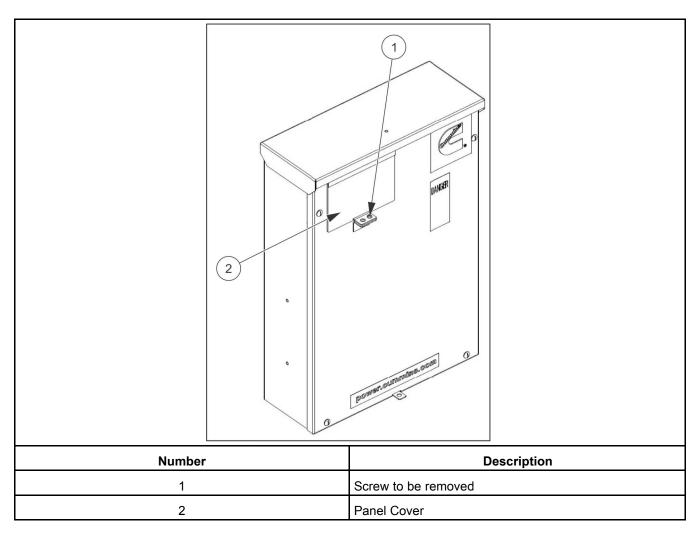


FIGURE 15. OPERATOR PANEL COVER

4.2 Complete System Test

A complete system test is recommended to verify that the electrical system is working properly. Testing the system once every three months is required to make sure the transfer switch will transfer the load to the generator set, should there be a utility power failure.

To complete a system and periodic test,

- 1. Switch the main circuit breaker from the "ON" to the "OFF" position.
- Press the Mode button on the operator panel and select the Test mode by pressing the Info button. Test mode allows the operator to start and stop the transfer switch manually, and if required change the state of the load switching devices. Test on load and Test off load is selectable in the software.
- 3. Make sure the following occur:
 - a. The generator set control receives a signal to start the generator set.
 - b. After the generator set starts, the load is transferred from the utility to the generator set.
 - c. If the generator set (or S2) fails to become available before S2 fail delay timer expires. This is an indicator on the main status display, but the starting signal will remain active.

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- d. The generator set (or S2) will continue to remain on load unless:
 - i. S2 supply fails the S2 supply is placed back on load if available.
 - ii. An input is given for Open/Close S1.
- 4. Switch the main circuit breaker from the OFF to the ON position.
- 5. Press the Mode button on the operator panel and select the START INHIBIT mode by pressing the Info button.
- 6. Make sure the following occur:
 - a. The load is immediately transferred back to the utility.
 - b. Once the transfer switch is connected to utility power, the generator set receives a signal to cool down the generator set.
 - c. The generator set stops after the engine Cooling time delay has expired.

4.3 Generator Set Exerciser

The generator set should be run at least once every 28 days to make sure it operates properly. The exerciser will automatically start the generator set and let it run for the defined duration once every 7 days. The automatic exercise is set by pressing the Set Exercise pushbutton.

4.3.1 Setting an Exercise Period

The operator must be present at the transfer switch to set the start time of the exercise. There are two ways to start an exercise period. It can be set to start immediately and repeat at this time every 7 days.

To set up the exercise period, ref to the table below.

Configuration Parameters			
901	Enable scheduler	On (1). Off (0)	
902	On or off load	On (1). Off (0)	
903	Start time	0.00	
904	Day	1-7 (Day, 1=Monday)	
905	Duration	0.00	

- 1. Set the Enable scheduler to On.
- 2. Select the On or Off load depending on site preference.
- Set the Start time for the exercise period.
- 4. Select between Monday to Sunday based on site preference for the exercise period to happen.
- 5. Set the duration of the exercise period.

4.3.2 Cancelling Repeat Exercise Periods

Set the Enable scheduler to Off to cancel the repeat exercise periods.

4.3.3 Canceling an Active Exercise Period

Press the Mode button to select Start Inhibit mode to cancel active exercise period.

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4.3.4 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.

4.4 Sequence of Events

The control executes a prescribed sequence of events for all transfer switch operations.

4.4.1 Utility-to-Generator Set Sequence of Events for Transfer Switches with a Controller

The following describes the sequence of events for an RSS transfer switch during a utility power failure. In this example, Warming Time is set higher than zero, Non-Sync Transfer Time and Elevator Delay are set to zero, and phase check is not enabled.

The following steps describe what normally happens when the transfer switch is connected to the Utility, utility power fails, and the switch transfers to the Generator (see Section B.0 on page 105).

- 1. While the transfer switch is connected to the utility, utility power fails.
- 2. The Start Delay begins.
- 3. When the Start Delay expires, the internal start contact closes P4-2 and P4-3, sending a start signal to the generator set.
- 4. When the generator set starts and produces power, the main display will show the S2 voltage and frequency data, signaling if the S2 is available.
- 5. A Warming timer begins.
- 6. After the Warming timer expires, the Open Normal (P1-4) and Close Emergency (P1-6) output is grounded, energizing the K2 relay coil which closes the contacts (K2-8/K2-12 and K2-5/K2-9) to move the transfer switch from utility to generator set. The S2 auxiliary switch within the switch mechanism breaks the signal to the ATS operator coil (C).
- 7. Limit switch ASW removes the ground signal from P2-1, signaling that the transfer switch has disconnected from utility; then the Main display will show the S1 breaker line to be opened and limit switch BSW provides a ground signal to P2-2, signaling that the transfer switch has connected to the generator set; then the S2 breaker line will show to be closed on the main display, de-energizing the K2 relay by opening K2-8/K2-12 and K2-5/K2-9.
- 8. The load is transferred to the generator.

4.4.2 Generator Set-to-Utility Sequence of Events for Transfer Switches with a Controller

The following describes the sequence of events for an RSS transfer switch that occur after the load has been transferred to the generator set and then utility power is restored. In this example, the Return Delay is set higher than zero, Non-Sync Transfer Time and Elevator Delay are set to zero, and phase check is not enabled.

The following steps describe what normally happens when the transfer switch is connected to the generator, utility power returns, and the switch moves from the generator to the utility (see <u>Section B.0 on page 105</u>).

- 1. The utility returns.
- 2. A Return Delay begins.

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3. After the Return Delay timer expires, the Open Emergency (P1-6) and Close Normal (P1-4) output is grounded, energizing the K1 relay coil, closing the normally open K2 contacts (K1-8/K1-12 and K1-5/K-9) to move the transfer switch to the utility. The S1 auxiliary switch within the switch mechanism breaks the signal to the ATS operator coil (C).

- 4. Limit switch BSW removes the ground signal from P2-2, signaling the ATS has disconnected from the generator set. The Generator Connected LED goes out and limit switch ASW provides a ground signal to P2-1, signaling that the transfer switch has transferred the load; then the Utility Connected LED lights, and the K1 relay coil is de-energized, opening K1-8/K1-12 and K1-5/K1-9.
- 5. The control starts the Cooling timer.
- 6. When the Cooling timer expires, the P4-1 to P4-2 contact opens, the generator set stops running, and the Generator Power Available LED goes out.
- 7. The load is retransferred to the utility.

4.4.3 Utility-to-Generator Set Sequence of Events for Transfer Switches without a Controller

The following describes the sequence of events for an RSS transfer switch during a utility power failure.

The following steps describe what normally happens when the transfer switch is connected to the Utility, utility power fails, and the switch transfers to the generator set (see **Section B.0 on page 105**).

- 1. While the transfer switch is connected to the utility, the utility power fails. After a three second delay Start Delay, the generator set control starts the generator set.
- After the generator warms up (five second Warming Time), the generator control signals the relay coil (K1), energizing the relay coil which opens K1-1/K1-9 and K1-2/K1-10 and closes K1-7/K1-11 and K1-8/K1-12 to move the transfer switch from the Utility position to the Generator position. The S2 auxiliary switch within the transfer switch mechanism breaks the signal to the ATS operator coil (C).
- 3. The K1 relay de-energizes by opening K1-7/K1-11 and K1-8/K1-12, and after the TDNE timer expires, closing K1-1/K1-9 and K1-2/K1-10.
- 4. Limit switch ASW removes the ground signal (TB4-5), signaling the transfer switch has disconnected from the Utility; then the BSW limit switch provides a ground signal to TB4-6, signaling that the transfer switch has connected to the generator set. The generator set receives a signal to indicate the switch position on the generator side.
- 5. The load is transferred to the generator set.

4.4.4 Generator Set-to-Utility Sequence of Events for Transfer Switches without a Controller

The following steps describe what normally happens when the transfer switch is connected to the generator, utility power returns, and the switch moves from the generator to the utility (see <u>Section B.0 on page 105</u>).

- 1. The utility returns.
- 2. The generator set control receives a signal from TB4-1/TB4-2 of the step down transformer to indicate that utility power is available.
- 3. The generator set control signals the relay coil (K1), energizing the relay coil which opens K1-1/K1-9 and K1-2/K1-10 and closes K1-7/K1-11 and K1-8/K1-12 to move the transfer switch from the generator position to the utility position. The S1 auxiliary switch within the transfer switch mechanism breaks the signal to the ATS operator coil (C).

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 The K1 relay de-energizes by opening K1-7/ K1-11 and K1-8/K1-12, and after the Return Delay timer expires, closing K1-1/K1-9 and K1-2/K1-10 to move the transfer switch mechanism signal to the ATS operator coil (C).

- 5. Limit switch BSW removes the ground signal (TB4-6), signaling the transfer switch has disconnected from the generator set; then the ASW limit switch provides a ground signal to TB4-5, signaling that the transfer switch has connected to the utility. The generator set control receives a signal to indicate switch position on the utility side.
- 6. The load is transferred to the utility.
- 7. After a ten minute delay to let the engine cool down, the generator stops.

4.5 Transfer Switch without an Operator Panel

For operation of a transfer switch without an operator panel, refer to the controller manual that came with your GSAA, GSBA, or GSBB generator.

5 Installation

5.1 Installation - Mounting

5.1.1 Introduction

Proper storage, installation, operation, and maintenance helps to increase the life of the transfer switch. **Installation is to be done only by licensed certified electricians**.

⚠ WARNING

AC power within the cabinet presents a shock hazard that can cause severe personal injury or death. Incorrect installation, service, or parts replacement can result in severe personal injury, death, and/or equipment damage. All corrective service procedures must be done only by technically trained and experienced personnel.

Each RSS transfer switch is factory wired and tested. Installation of the RSS transfer switch includes the following.

- · Mounting a transfer switch cabinet
- · Connection of all Utility, Generator, and Load cables (covered in Chapter 3)
- · Connection of low voltage signal circuits (covered in Chapter 3)
 - For transfer switches with a controller, refer to Figure 48 through Figure 55.
 - For transfer switches without a controller, refer to <u>Figure 57</u>. RSS transfer switches without
 a controller are only designed to be installed with GSAA, GSBA, and GSBB generators.
 Installing this transfer switch with any other generator model will void the warranty.

5.1.2 Installation Overview

These installation recommendations apply to typical installations. Whenever possible, these recommendations also cover factory designed options or modifications. However, because of the many variables in any installation, it is not possible to provide specific recommendations for every situation. If there are any questions not answered by this manual, contact your nearest Cummins distributor for assistance.

5.1.2.1 Safety Considerations

The transfer switch has been carefully designed to provide safe and efficient service when properly installed, maintained, and operated. However, the overall safety and reliability of the complete system depends on many factors outside the control of the manufacturer. To avoid possible safety hazards, make all mechanical and electrical connections to the transfer switch exactly as specified in this manual. All systems external to the transfer switch must comply with all applicable codes. Make certain all required inspections and tests have been completed and all code requirements have been satisfied before certifying the installation is complete and ready for service.

Verify that both power source voltages match the nameplate rating prior to installation.

5.1.3 Equipment Inspection and Storage

Once you have received the transfer switch, inspect it for any damage. Check for damage to the enclosure, the transfer switch, the control panel (if applicable), and the wiring harness.

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Prior to installation, make sure the transfer switch is stored in a clean dry place, protected from dirt and water. Provide ample air circulation and heat, if necessary, to prevent condensation from gathering on the equipment. Be sure to adhere to the transfer switch storage and operating requirements listed below.

Transfer Switch	Storage Temperature	Operating Temperature (Ambient)	Humidity
RA 100A, RA 200A	-22 °F to +158 °F (-30 °C to +70 °C)	-4 to +140 °F (-20 to +60 °C)	Up to 90% @ 68 °F (20
RA 400A	-13 °F to +131 °F (-25 °C to +55 °C)	-4 to +131 °F (-20 to +55 °C)	°C)

5.1.4 Location

The location of the transfer switch in the existing electrical circuit varies with the application and the type of entrance switch.

There must be a service disconnect (circuit breaker or fuses) in the power line ahead of the transfer switch, see **Table 1** through **Figure 20**).

A typical installation of a transfer switch with a controller is shown in <u>Figure 19</u>. It is a graphical representation of the diagram shown in <u>Figure 18</u>.

A typical installation of a transfer without with a controller is shown in <u>Figure 21</u>. It is a graphical representation of the diagram shown in <u>Figure 20</u>.

Cabinet dimensions and weights are listed in Table 1.

Choose a vibration-free mounting surface that supports the weight of the switch. Avoid locations that are near flammable liquids or gases, or are hot, moist, or dusty.

WARNING

An electrical arc occurs during transfer that can ignite flammable vapors or gases, resulting in severe personal injury or death. The switch must not be located near batteries, fuel tanks, solvents, or other sources of flammable liquids or gases, or in areas sharing ventilation with such sources.

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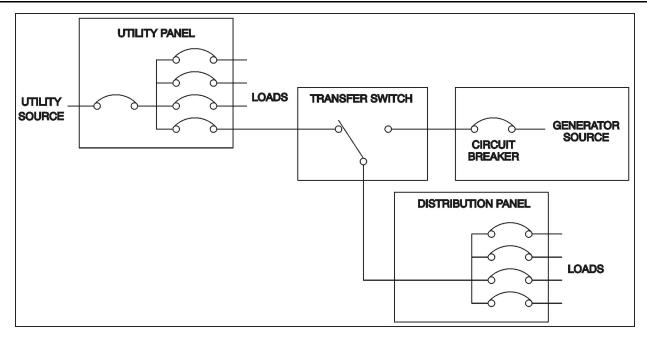


FIGURE 16. PARTIAL COVERAGE SYSTEM (TRANSFER SWITCH WITH CONTROLLER)

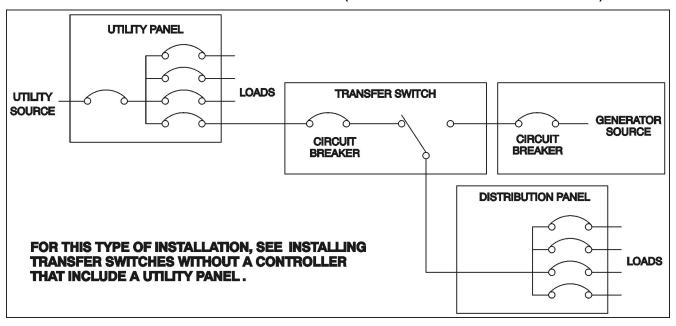


FIGURE 17. PARTIAL COVERAGE SYSTEM (TRANSFER SWITCH WITHOUT CONTROLLER)

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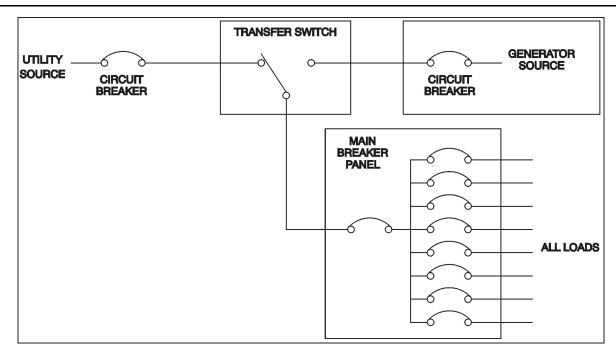


FIGURE 18. TOTAL COVERAGE SYSTEM (TRANSFER SWITCH WITH CONTROLLER)

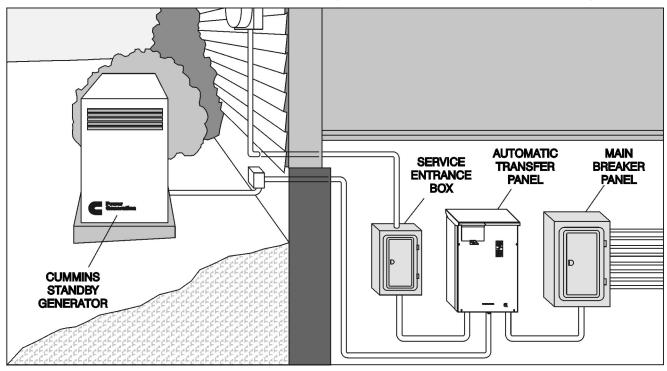


FIGURE 19. TYPICAL WALL-MOUNT INSTALLATION (SHOWN SCHEMATICALLY IN FIGURE 18)

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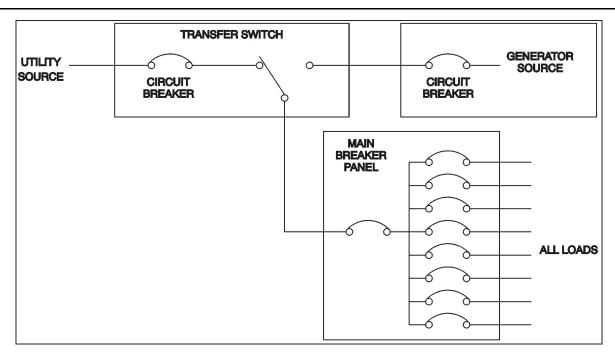


FIGURE 20. TOTAL COVERAGE SYSTEM (TRANSFER SWITCH WITHOUT CONTROLLER, ONE CIRCUIT BREAKER)

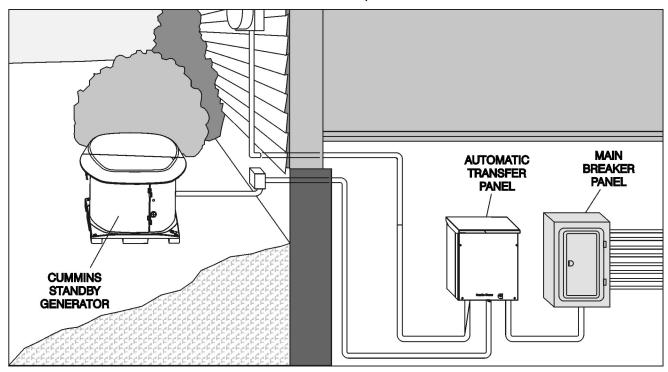


FIGURE 21. TYPICAL WALL-MOUNT INSTALLATION (SHOWN SCHEMATICALLY IN FIGURE 20)

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Switch Current Rating	Height	Width	Depth	Weight
100 Amp with Controller	24.0 in. (619 mm)	17.0 in. (433 mm)	7.4 in. (187 mm)	33 lb (15 kg)
200 Amp with Controller	27.1 in. (688 mm)	18.2 in. (463 mm)	7.4 in. (187 mm)	46 lb (21 kg)
100 and 200 Amp One Circuit Breaker, without Controller	23.3 in. (591.5 mm)	20.2 in. (513 mm)	7.9 in. (200 mm)	58 lb (26 kg)

TABLE 1. APPROXIMATE CABINET DIMENSIONS

5.1.5 Installing Transfer Switches without a Controller that Include a Utility Panel

Transfer switches without a controller are rated service entrance equipment. The main bonding jumper is factory installed in the connected position between Neutral and the Ground Bus Bar. By installing a transfer switch without a controller shown in <u>Figure 17</u>, the main bonding jumper (see Figure 3-2) should be removed or moved from a connected position to a disconnected position.

5.1.6 Mounting

RSS transfer switches are mounted to a wall. Follow the mounting instructions listed below and refer to the appropriate outline drawing, Figure 59 through Figure 60, for installation dimensions, specifications, and mounting hole patterns. Enough room must be allowed to remove the door panel for inspection and servicing of the switch, as per NEC and local codes.

- 1. Make sure that the wall where the transfer switch is to be mounted is suitable to hold firmly the weight and size of the transfer switch, within a reasonable safety factor.
- 2. Check the location to be sure no wires or plumbing, gas, or exhaust lines run behind the wall.
- 3. Make sure that all anchorage fasteners used to bolt the switch to wall are strong enough to withstand the switch weight and its vibration during operation, within a reasonable safety factor.
- 4. Use four 1/4 inch bolts for wall mounting. Measure and mark wall for drilling.
- 5. Install two mounting bolts in the wall for the top cabinet mounting keyholes.
- 6. With the shipping box standing so that the cabinet is lying down, carefully remove the top and the foam from the shipping box.

⚠ WARNING

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

- 7. Remove the transfer switch from the box and remove the plastic covering.
- 8. Raise the cabinet and mount it on the two mounting bolts in the wall. Provide support for the cabinet during installation.
- 9. Install two bottom mounting bolts, but do not tighten them. (Do not remove the cabinet support until all bolts are installed.)
- 10. Push the cabinet against the wall. If the cabinet will not align flush against the wall, shim the mounting bosses as required, using metal shims.

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11. When the switch is installed on the wall, the switch cabinet should be squared up before final fastener tightening. Make sure the installed transfer switch is square and level upon completion of the installation.

12. Tighten all mounting bolts.

5.2 Installation - Wiring

For transfer switches with a controller, refer to Figure 3-1 for component locations. For transfer switches without a controller, refer to Figure 3-2 for component locations.

⚠ WARNING

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

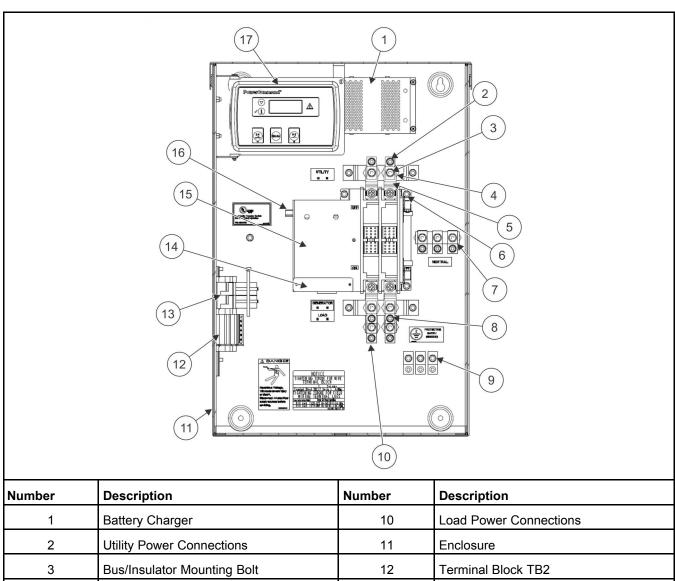
When installing conduit, observe the following precautions:

- The RSS transfer switch includes knockouts on the bottom of the cabinet for wiring. If you decide to drill your own holes in the top of the cabinet instead of using the knockouts provided, cover the transfer switch to prevent accidental entry of metal chips before beginning conduit installation.
- 2. If using solid conduit between the generator set and the transfer switch, 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 switch. Knockouts are available through the bottom of the cabinet. (Refer to the switch outline drawings included in the back of this manual.)

A 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 switch when mounting or connecting conduit. Screwdrivers should be used carefully to prevent damage to components.

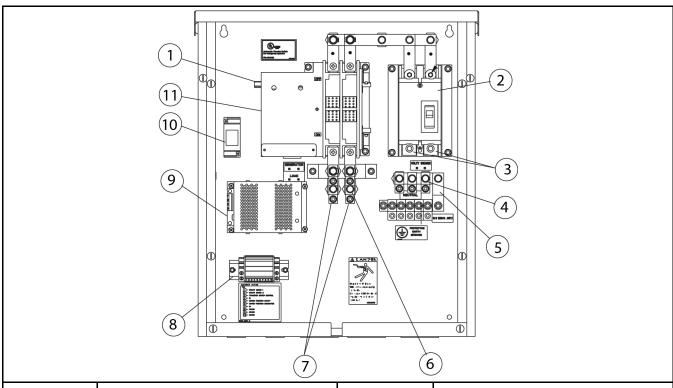
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4 Insulator Standoff 13 Relay Coils K1 and K2 5 14 Switch Mechanism Control Wiring Bus Bar Connection 15 Switch Mechanism 6 Mounting Screws 7 **Neutral Bar Assembly** 16 Manual Operation Shaft 8 **Generator Power Connections** 17 Control Panel 9 **Ground Lugs**

FIGURE 22. INTERIOR COMPONENTS FOR TRANSFER SWITCH WITH A CONTROLLER

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Number	Description	Number	Description
1	Manual Operation shaft	7	Load Power Connections
2	Circuit Breaker	8	Terminal Block (TB4)
3	Utility Power Connections	9	Battery Charger
4	Neutral Bar	10	Relay Coil K1
5	Main Bonding Jumper	11	Transfer Switch
6	Generator Power Connection		

FIGURE 23. INTERIOR COMPONENTS FOR TRANSFER SWITCH WITHOUT A CONTROLLER

5.2.1 AC Connections

RSS transfer switches are supplied with screw type terminals for the Utility, Generator, Load, and Neutral power connections. Either copper or aluminum cables can be used for AC connections.

Connect the Utility, Generator, Load, and Neutral conductors to the clearly-marked terminals on the transfer switch. Use a wire brush to remove any surface oxides from the cables. Verify that all connections are correct before tightening the lugs. All lug connections must be tightened to the proper torque values listed in Table 2 or Table 3.

Perform wiring in the following sequence:

1. Test the operation of the generator set from its own control.

⚠ 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. Disconnect generator battery (negative (-) terminal first) before proceeding.

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2. Stop the generator set and remove the negative lead from the cranking battery to prevent starting.

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.

- 3. Make sure that both AC power sources are disconnected.
- 4. Connect power cables of sufficient size (for lug size, see <u>Table 2</u> for transfer switches with a controller or <u>Table 3</u> for transfer switches without a controller) to carry rated current from the line, load, and generator directly to the transfer switch terminals or circuit breaker(s), which are marked A and B. A neutral bar is standard on the switches. Tighten the terminal lugs as indicated in <u>Table 2</u> or <u>Table 3</u>.

TABLE 2. SCREW TYPE TERMINALS AND TORQUE VALUES FOR EXTERNAL POWER GENERATION ON TRANSFER SWITCHES WITH A CONTROLLER

Switch	Terminal Description								
Size (Amps)	Utility, Generator, and Load Terminals		Neutral Bar Terminals		Ground Terminals				
	Cables Per Pole	Range of Wire Size	Tightenin g Torque	No. of Cables	Range of Wire Sizes	Tightenin g Torque	No. of Cables	Range of Wire Sizes	Tightenin g Torque
100 Amp	1	#14 to 2/0 AWG	120 In-lbs (14 N·m)	3	#14 to 2/0 AWG	120 In-lbs (14 N·m)	2	#14 to 1/0 AWG	120 In-lbs (14 N·m)
200 Amp	1	#6 AWG to 300 MCM	275 In-lbs (31 N·m)	3	#6 AWG to 300 MCM	275 In-lbs (31 N·m)	2	#14 to 1/0 AWG	120 In-lbs 14 N·m)

TABLE 3. SCREW TYPE TERMINALS AND TORQUE VALUES FOR EXTERNAL POWER GENERATION ON TRANSFER SWITCHES WITHOUT A CONTROLLER

Switch Size	Terminal Description							
(Amps)	Utility Circuit Breaker			Utility and Load Terminals				
	Cables Per Pole	Range of Wire Size	Tightening Torque	No. of Cables	Range of Wire Sizes	Tightening Torque		
100 Amp	1	#4 AWG to 300 MCM	250 In-lbs(28 N·m)	1	#14 to 2/0 AWG	120 In-lbs (14 N⋅m)		
200 Amp	1	#4 AWG to 300 MCM	250 In-lbs(28 N·m)	1	#6 AWG to 300 MCM	120 In-lbs (14 N⋅m)		

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Switch		Terminal Description								
Size (Amps)		Generator Terminals			or Neutral T	erminals	Gro	ound Termin	nals	
(* po)	Cables Per Pole	Range of Wire Size	Tightenin g Torque	No. of Cables	Range of Wire Sizes	Tightenin g Torque	No. of Cables	Range of Wire Sizes	Tightenin g Torque	
100 Amp	1	#14 to 2/0 AWG	120 In-lbs (14 N·m)	1	#14 to 2/0 AWG	120 In-lbs (14 N·m)	4	#14 to 1/0 AWG	120 In-lbs (14 N·m)	
200 Amp	1	#14 to 2/0 AWG	120 In-lbs (14 N·m)	1	#14 to 2/0 AWG	120 In-lbs (14 N·m)	4	#14 to 1/0 AWG	120 In-lbs (14 N·m)	

5.2.2 Low Voltage Signal Connections

5.2.2.1 Transfer Switches with a Controller

Control wiring connections are made at terminal block TB2, located on the lower left side of the enclosure for unit with a controller, see Figure 22.

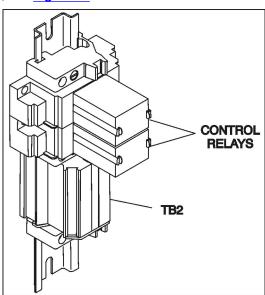


FIGURE 24. CONTROL WIRING CONNECTIONS

5.2.2.2 Connecting the Transfer Switch to the Generator

WARNING

AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Disconnect the AC power source.

Make sure the generator set is not running and cannot be started. Disconnect the batteries and make sure the generator set's control is in the Off position.

A minimum of three wires need to be run from the generator set to the terminal block in the transfer switch cabinet. The connections at the terminal block (TB2) need to be made at B+, Ground, and Remote Generator Start, refer to <u>Figure 48</u> through <u>Figure 55</u>. Do not exceed the maximum distance (ft) for the wire size chosen from <u>Table 4</u>. Make the following connections:

35

• Battery Positive (B+) to TB2-3

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- Battery Negative (GND) to TB2-1
- Remote Start to TB2-4

NOTICE

For GSAA generators, the terminal block on the generator set is not marked "Remote Start." Use the TB1-5 connection marked "Switch Position Utility" (see Figure 54).

TABLE 4. WIRE SPECIFICATIONS

Wire Size (AWG)	Distance in Feet (One Way)
16	125
14	200
12	300
10	500

Different generator sets require different start signal connections that may require the installation of a jumper to the TB2 terminal block in the transfer switch. When needed, the jumper is included inside the literature package shipped with the transfer switch. Refer to the interconnection wiring diagrams at the end of this manual for information on wiring connections for your generator set.

- If the generator set needs a ground (B-) start signal, connect a jumper from TB2-1 to TB2-2.
- If the generator set needs a positive (B+) start signal, connect a jumper from TB2-2 to TB2-3.

For all other generator sets where a jumper is not used, four wires must be connected between the generator set and the transfer switch. Refer to the interconnection diagrams at the end of this manual to determine what connections apply to your installation.

Wire resistance must not exceed 0.5 ohm per line. Use stranded or solid wire. For connection to the screw terminal, strip the insulation back 3/8 inch (10 mm).

5.2.2.3 Remote Test Input

To add remote test, connect a normally open, dry contact between terminals 1 and 5 of TB2 (see <u>Figure</u> 25). Closing the contact activates the feature and opening the contact deactivates it.

Use number 22 (0.4 mm2) to number 12 AWG (4 mm2) wire. For connection to the screw terminal, strip the insulation back 3/8 inch (10 mm).

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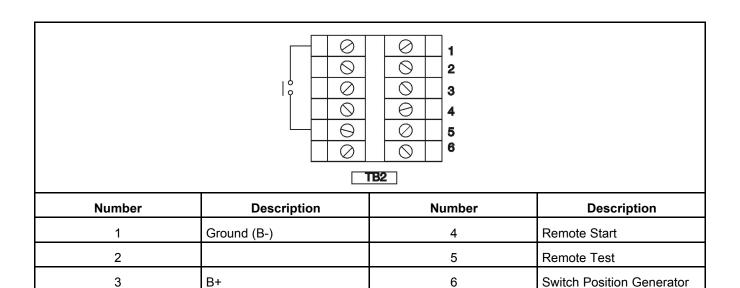


FIGURE 25. TB2 CONNECTIONS FOR REMOTE TEST TRANSFER

5.2.2.4 Transfer Switches without a Controller

Control wiring connections are made at terminal block TB4, located on the back of the enclosure in the lower left-hand corner (see <u>Figure 26</u>). Refer to <u>Figure 57</u> for wire connections between transfer switch and generator set terminals. Make sure that the wire selected does not exceed the maximum wire size and length listed in <u>Table 4</u>.

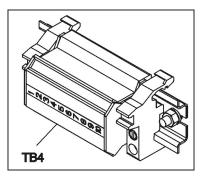


FIGURE 26. CONTROL WIRING CONNECTIONS

5.2.3 Final Inspection and Cleanup

Prior to energizing the transfer switch:

- 1. Inspect all wiring to be certain that:
 - · All cabled connections are correct
 - All generator start low voltage signal connections are correct (refer to <u>Section C.1 on page</u>
 115 or <u>Section C.2 on page 124</u> for transfer switches without a controller).
 - · Wiring does not interfere with switch operation
 - · Wiring is not damaged as the door opens and closes
 - · Wiring does not contact sharp or abrasive surfaces
 - · No wiring is left loose and unconnected

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A CAUTION

Debris lodged in the electrical and mechanical components may result in equipment damage. Do not use a blower to remove debris.

2. Use a vacuum cleaner to remove any dust, filings, chips, or debris from the cabinet interior and components.

3. Check the lug torque values of the power connections.

NOTICE

Lug torque values are specified on the label inside of the enclosure and in $\frac{\text{Table 2}}{\text{Table 3}}$ and $\frac{\text{Table 3}}{\text{Table 3}}$.

- 4. Double check the power supply voltages to make sure they match the voltages listed on the nameplate (see Section 2.4 on page 7.
- 5. Make sure that all covers and barriers are installed and properly fastened.

NOTICE

The mechanism is shipped in the Utility side position. For transfer switches without a controller, the circuit breaker is shipped in the Off position.

6 Transfer Switch Start-Up

This section applies only to transfer switches with a controller. For transfer switches without a controller, refer to the GSAA, GSBA, GSBB generator Operators Manual.

The RSS transfer switch is preset at the factory to operate using default settings. The basic control default settings are shown in <u>Table 5</u>. The control will operate the transfer switch when 12 VDC power is applied to the control.

TABLE 5. PRESET TRANSFER SWITCH SETTINGS

Function	Factory Setting
Non-Sync Transfer Time	Set to 0 (Disabled)
Elevator Delay	Set to 0 (Disabled)
System Nominal Voltage	Set to 240
System Nominal Frequency	Set to 60 Hz
Single Phase/Three Phase	Set to Single Phase
Return to Programmed Transition On/Off	Set to Off

TABLE 6. FRONT PANEL CONFIGURATION EDITOR ID NUMBERS

Configuration Parameters - Module (Page 1)				
101	Contrast	(%)		
102	Display mode	Icon only (1), English (0)		
103	S1 Option	Generator (1), Mains (0)		
104	S1 Summary screen phase display	1-3		
105	S2 Option	Generator (1), Mains (0)		
106	S2 Summary screen phase display	1-3		
107	Lamp test at power up	On (1), Off (0)		
108	Power up in auto	On (1), Off (0)		
109	Enable transfer by buttons	On (1), Off (0)		
110	Test mode	On Load (1), Off Load (0)		

Configuration Parameters - Application (Page 2)				
204	Elevator mode	Elevator Mode List		
205	Transfer Switch Retry Delay	(s)		
206	Transfer Switch Retires			

Configuration Parameters - Inputs (Page 3)				
301	Digital Input A Source	0 (Refer to Input Source List)		
302	Digital Input A Polarity	Close to Activate (0), Open to Activate (1)		
303	Digital Input B Source	0 (Refer to Input Source List)		
304	Digital Input B Polarity	Close to Activate (0), Open to Activate (1)		
305	Digital Input C Source	0 (Refer to Input Source List)		
306	Digital Input C Polarity	Close to Activate (0), Open to Activate (1)		
307	Digital Input D Source	0 (Refer to Input Source List)		
308	Digital Input D Polarity	Close to Activate (0), Open to Activate (1)		

	Configuration Outputs (Page 4)				
401	Digital Output A Source	0 (Refer to Output Source List)			
402	Digital Output A Polarity	Energize (0), De-energize (1)			
403	Digital Output B Source	0 (Refer to Output Source List)			
404	Digital Output B Polarity	Energize (0), De-energize (1)			
405	Digital Output C Source	0 (Refer to Output Source List)			
406	Digital Output C Polarity	Energize (0), De-energize (1)			
407	Digital Output D Source	0 (Refer to Output Source List)			
408	Digital Output D Polarity	Energize (0), De-energize (1)			
409	Digital Output E Source	0 (Refer to Output Source List)			
410	Digital Output E Polarity	Energize (0), De-energize (1)			
411	Digital Output F Source	0 (Refer to Output Source List)			
412	Digital Output F Polarity	Energize (0), De-energize (1)			
413	Digital Output G Source	0 (Refer to Output Source List)			
414	Digital Output G Polarity	Energize (0), De-energize (1)			
415	Digital Output H Source	0 (Refer to Output Source List)			
416	Digital Output H Polarity	Energize (0), De-energize (1)			

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	Configuration Decembers. Time	ove (Powe 5)	
	Configuration Parameters - Tim	ers (Page 5)	
501	S1 Transient Delay	mm:ss	
502	Start Delay	mm:ss	
503	Warming time	mm:ss	
504	S2 Fail delay	mm:ss	
505	Elevator Delay	mm:ss	
510	Return delay	mm:ss	
511	Cooling time	mm:ss	
512	S2 transient delay	mm:ss	
513	Fail to stop enable	mm:ss	
514	Fail to stop delay	mm:ss	
515	LCD Page timer	mm:ss	
516	LCD Scroll timer	mm:ss	

Configuration Parameters - S1 (Page 6)				
602	AC system	3 phase 4 wire (1), Single phase 2 wire (1), 3 phase 3 wire (2), 2 phase 3 wire (L1-L2) (3), 2 phase 3 wire (I1- L3) (4), 3 phase 4 wire (Delta) (5)		
603	Under voltage enable	On (1), Off (0)		
604	Under voltage trip	V		
605	Under voltage return	V		
606	Over voltage enable	On (1), Off (0)		
607	Over voltage return	V		
608	Over voltage trip	V		
609	Under frequency enable	On (1), Off (0)		
610	Under frequency trip	Hz		
611	Under frequency return	Hz		
612	Over frequency enable	On (1), Off (0)		
613	Over frequency return	Hz		
614	Over frequency trip	Hz		

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Configuration Parameters - S2 (Page 7)		
702	Under voltage enable (Generator Option)	On (1), Off (0)
703	Under voltage trip (Generator Option)	V
704	Loading voltage (Generator Option)	V
705	Over voltage enable (Generator Option)	On (1), Off (0)
706	Over voltage return (Generator Option)	V
707	Over voltage trip (Generator Option)	V
708	Under frequency enable (Generator Option)	On (1), Off (0)
709	Under frequency trip (Generator Option)	Hz
710	Loading frequency (Generator Option	Hz
711	Over frequency enable (Generator Option)	On (1), Off (0)
712	Over frequency return (Generator Option)	Hz
713	Over frequency trip (Generator Option)	Hz
714	Under voltage enable (Mains Option)	On (1), Off (0)
715	Under voltage (Mains Option)	V
716	Over voltage return (Mains Option)	V
717	Over voltage enable (Mains Option)	On (1), Off (0)
718	Over voltage return (Mains Option)	V
719	Over voltage trip (Mains Option)	V
720	Under frequency enable (Mains Option)	On (1), Off (0)
721	Under frequency (Mains Option)	Hz
722	Under frequency return (Mains Option)	Hz
723	Over frequency enable (Mains Option)	On (1), Off (0)
724	Over frequency return (Mains Option)	Hz
725	Over frequency trip (Mains Option)	Hz

Configuration Parameters - Plant Battery (Page 8)		
801	Under voltage enable	On (1), Off (0)
802	Under voltage	V
803	Under voltage return	v
804	Under voltage delay	h:mm:ss
805	Over voltage enable	On (1), Off (0)
806	Over voltage return	v
807	Over voltage trip	V
808	Over voltage delay	h:mm:ss

Configuration Parameters - Scheduler (Page 9)			
901 Enable scheduler On (1), Off (0)			
902	On or off load	On (1), Off (0)	
903	Start time	mm:ss	
904	Day	1-7 (Day, 1=Monday)	
905	Duration	mm:ss	

Configuration Parameters - Time (Page 10)			
Time of day mm:ss			
1002	Day of week	1-7 (Day, 1=Monday)	
Start time mm:ss			

Input Source Parameter Values		
0	Not used	
1	Alarm Reset	
2	Alarm Mute	
3	Auto Restore Inhibit	
4	Auto Start Inhibit	
5	Auxiliary S2 Available	
6	Auxiliary S1 Fail	
7	S2 Load Inhibit	
8	S2 Closed Auxiliary	
9	Inhibit Scheduled Run	
10	Lamp Test	
11	Load Shedding	
12	S1 Closed Auxiliary	
13	S1 Load Inhibit	
14	Open/Close S2	
15	Open/Close S1	
16	Panel Lock	
17	Remote Start off-load	
18	Remote Start on-load	
19	Simulated S1 available	
20	Simulated S2 available	

Output Source Parameter Values		
0	Not used	
1	Audible Alarm	
2	Battery High Voltage	
3	Battery Low Voltage	
4	Close S2 Output	
5	Close S2 Output Pulse	
6	Close S1 Output	
7	Close S1 Output Pulse	
8	Close to N Output	
9	Close to N Output Pulse	
10	Common Warning	

Output Source Parameter Values		
11	Cooling Down	
12	Digital Input A	
13	Digital Input B	
14	Digital Input C	
15	Digital Input D	
16	Elevator Control	
17	Fail to start	
18	Fail to stop	
19	Fail to reach loading voltage	
20	Fail to reach loading frequency	
21	S2 Available	
22	S2 Failure Latched	
23	S2 Failure Unlatched	
24	S2 In Limits	
25	S2 Load Inhibited	
26	S2 ready	
27	S1 Failure unlatched	
28	S1 Failure latched	
29	S1 High Frequency	
30	S1 Hight Voltage	
31	S1 In Limits	
32	S1 Load Inhibited	
33	S1 Low Frequency	
34	S1 Low Voltage	
35	Return Delay	
36	Open S2 Output	
37	Open S2 Output Pulse	
38	Open S1 Output	
39	Open S1 Output Pulse	
40	Scheduled Run	
41	Start and Run S2	
42	Start Delay	
43	Waiting for S2	
44	Waiting for Manual Restore	

Output Source Parameter Values		
45	Warming Up	
46	S1 Failed to Open	
47	S1 Failed to Close	
48	S2 Failed to Open	
49	S2 Failed to Close	
50	Charger AC Failure	

6.1 Start-Up and Test Procedure

MARNING

The failure to install the front panel on the transfer switch cabinet can result in severe personal injury or death. Always make sure the front panel is installed before applying power to the transfer switch.

- 1. Make sure the front cover is installed on the transfer switch.
- 2. Make sure the generator set is installed as described in the generator's Installation Manual and that the operation selector switch on the generator control panel is in the Remote/Auto position. Make sure Auto mode is selected on the transfer switch control main display.
- 3. Turn on the breaker in the utility panel (see <u>Table 1</u> or <u>Figure 17</u>) or the service entrance panel (see <u>Figure 18</u> or <u>Figure 20</u>) that feeds the utility power connection of the transfer switch.
- 4. Open the controller security cover on the transfer switch front panel. The S1 breaker line will show to be closed on the main display.
- 5. Switch the main circuit breaker from the ON to the OFF position.
- 6. Make sure the following occurs.
 - a. The generator control receives a signal to start the generator set.
 - b. After the generator set starts and the Warming timer expires, the load is transferred from the utility to the generator set.
- 7. Switch the main circuit breaker from the OFF to the ON position.
- 8. Make sure the following occurs.
 - a. After Return Delay time delay, the load is transferred back to the utility.
 - b. Once the transfer switch is connected to utility power, the generator set receives a signal to cool down the generator set.
 - c. After Cooling time delay, the generator set stops.

7 Troubleshooting

This section includes a description of the control LED indicators and provides preliminary troubleshooting checks.

7.1 Control Panel Overview

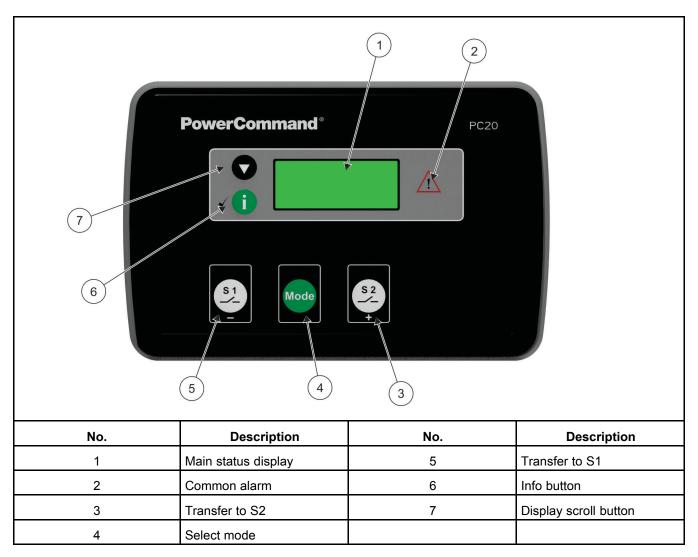


FIGURE 27. CONTROL PANEL

7.2 Troubleshooting the Transfer Switch

Use the troubleshooting guide, <u>Table 7</u>, to help diagnose transfer switch problems with transfer switches that include a control panel. Common problems are listed with their possible causes. Refer to the corrective action column for the appropriate corrective procedure.

MARNING

AC power within the cabinet presents a shock hazard that can cause severe personal injury or death. Do not remove the front panel under any circumstances.

MARNING

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

TABLE 7. TROUBLESHOOTING TRANSFER SWITCHES WITH AN OPERATOR PANEL

Problem	Possible Cause	Corrective Action
The generator set does not start when the utility fails.	There may be a generator set problem.	Move the generator set's operation selector switch to the Run/On position.
		 If the generator set starts and the transfer switch transfers, the generator may not have received the start signal from the controller. Contact your local Cummins distributor for service.
		If the generator set does not start, contact your local Cummins distributor for service.

Problem	Possible Cause	Corrective Action
The generator set is running but the transfer switch did not transfer the load to the generator set. S2 is displayed 0V and 0Hz on the operator panel.	The generator set circuit breaker has been tripped or is in the Off position.	Reset the circuit breaker on the generator set. If the problem still persists, contact your local Cummins distributor for service.
The generator set is running but the transfer switch did not transfer the load to the generator set. S2 is displaying the correct and voltage and frequency.	Warming delay timer may be running.	Wait until the time delay has expired or press the Mode button to select Manual mode and press Transfer to S2 button to override the time delay on the control panel. If the problem still persists, contact your local Cummins distributor for service.
The generator set is running but the transfer switch did not transfer the load to the generator set. S1 is displayed 0V and 0Hz on the operator panel.	The control was unsuccessful in its attempts to open the Utility side of the transfer switch. After 5 attempts to move the transfer switch. The S1 breaker line remains to be open ont he main display, indicating that it failed to open.	Press the Mode button to select Manual mode and press Transfer to S1 button to override the time delay on the control panel to reset the control so that it will attempt to open the Utility side of the transfer switch. If the problem still persists, contact your local Cummins distributor for service.

Problem	Possible Cause	Corrective Action
Utility power is restored but the transfer switch does not transfer to the utility. The S1 displaying 0V and 0Hz on the operator panel.	The main service circuit breaker has been tripped or is in the Off position.	Reset the circuit breaker on the main service panel. If the problem still persists, contact your local Cummins distributor for service.
Utility power is restored but the transfer switch does not transfer to the utility.	Return Delay timer may be running.	Wait until the time delay has expired or press the Mode button to select Manual mode and press Retransfer to S1 button to override the time delay on the control panel. If the problem still persists, contact your local Cummins distributor for service.
Utility power is restored but the transfer switch does not transfer to the utility. S1 is displaying the correct voltage and frequency.	The control was unsuccessful in its attempts to open the Generator side of the transfer switch. After 5 attempts to move the transfer switch, the Generator Connected LED flashes, indicating that it failed to open.	Press Mode button to select Manual mode and press Transfer to S2 button to override the time delay to reset the control so that it will attempt to open the Generator side of the transfer switch. If the problem still persists, contact your local Cummins distributor for service.

Problem	Possible Cause	Corrective Action
The generator set did not shut down after the transfer switch has transferred the load to the utility.	 Cooling delay timer may be running. The selector switch on the generator control panel may not be in the correct position. 	 Wait for the time delay to expire. The time delay may last up to 30 minutes. Make sure the generator control is set to the Remote position. If the problem persists, move the generator control selector switch to the Off position to shut down the generator. Contact your local Cummins distributor for service.

Problem	Possible Cause	Corrective Action
The generator set is running for no apparent reason.	 The selector switch on the generator control panel may not be in the correct position. There may be an active test or Exercise period. Check to see if the Test or Exercise is running. 	Make sure the generator control is set to the Remote position Wait for exercise or test period to expire or press the Override button to stop and exercise or the test button to stop a test. If the problem persists, move the generator control selector switch to the Off position to shut down the generator set. Contact your local Cummins distributor for service.

Problem	Possible Cause	Corrective Action
The generator set did not exercise when expected to.	 The selector switch on generator control panel may not be in the correct position. An exercise period may not be set or is set but not yet started. There may be generator problems. 	Verify that the Exercise Scheduler is enabled and set to the desired start time, duration, and test frequency.

7.3 Troubleshooting - Transfer Switches with a Controller

This section describes troubleshooting issues for installations that include a controller.

The first part of this section includes a description of the control displays and provides preliminary troubleshooting checks for operators and service personnel.

The second part of this section describes a typical transfer switch sequence of events, and provides detailed troubleshooting procedures for experienced service personnel. The troubleshooting procedures use conditional schematics and symptoms to diagnose possible problems.

7.3.1 Control Panel Functions that should not be Adjusted

The control used with the RSS transfer switch is also used on other models that have additional features. Please note that several of these functions are set at the factory and should not be adjusted. If some of these functions are modified, the transfer switch may not operate correctly.

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.

7.3.1.1 Elevator Delay

The Elevator Delay pretransfer feature is designed for use only with elevator control systems. This function should never be used in home installations.

If an Elevator delay is set and the control is in an active Test or Exercise sequence, the control adds the additional time delay prior to completing the transfer. **Make sure that the Elevator Delay is always set to zero seconds.**

7.3.1.2 Single Phase/Three Phase

The control's phase setting is set at the factory and must never be changed.

7.3.2 Preliminary Troubleshooting Procedures

The following procedures describe preliminary troubleshooting checks. These checks can be used by service personnel. If the trouble persists, call your dealer or distributor.

↑ WARNING

Some transfer switch 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.

Diagnosis of problems involves observing system operation. If you cannot determine the problem, contact Cummins Service.

⚠ WARNING

AC power within the cabinet presents a shock hazard that can cause severe personal injury or death. Whenever the cabinet door panel is removed, 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, remove the transfer switch door panel, unscrew the retaining screw, swing the control mounting bracket to access the selector switch, and slide the selector switch on the back on the control panel to the Configuration Mode position.

7.3.2.1 Power Outage Occurs, but Generator Set does not Start

⚠ WARNING

AC power within the cabinet presents a shock hazard that can cause severe personal injury or death. Whenever the cabinet door panel is removed, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothes, hair, etc.

1. Verify that the operation selector switch on the generator set control panel is set to the Remote/Auto position. Check for fault indicators on the generator set control.

⚠ WARNING

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

⚠ WARNING

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

- 2. Start the generator set using its start-stop (Run/Off) controls. If it does not crank, check the starting batteries. If it cranks but does not start, check the fuel supply.
- 3. Check the controller for the transfer switch start signal to the generator set. The start signal relay remains closed while sending the signal to the generator set. The start signal relay can be measured with a voltmeter at either P4-2 and P4-3 or at TB2-2 and TB2-4. If the start signal relay contact is open, reset the DC power of the controller by disconnecting the battery.

7.3.2.2 Generator Set Starts During Normal Power Service

⚠ WARNING

AC power within the cabinet presents a shock hazard that can cause severe personal injury or death. Whenever the cabinet panel is removed, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothes, hair, etc.

- 1. Verify that the operation selector switch on the generator set control panel is set to the Remote/Auto position.
- 2. Check if the utility power is available.

If the utility power is available, S1 will display the correct voltage and frequency on the main display.

- a. Check the Active Exercise LED to see if it is in an exercise period. If the Active Exercise LED is flashing, an exercise is enabled. If the Active Exercise LED is Off, no exercise period is set.
- b. Momentary voltage dips might cause voltage sensors to initiate generator starting. Check the utility undervoltage parameter settings on the control panel. Increase the Strat Delay setting

If the utility power is not available, S1 will display 0V and 0Hz on the main display.

- a. Check the control setting to verify that the system nominal voltage matches what is listed on the nameplate.
- b. Check the control setting to verify that the system frequency matches what is listed on the nameplate.
- c. Check the control setting to verify that the system phase setting matches what is listed on the nameplate.
- d. Check the control setting to verify that the utility undervoltage dropout point is set lower than the pickup set point.

7.3.2.3 Generator Set does not Exercise

WARNING

AC power within the cabinet presents a shock hazard that can cause severe personal injury or death. Whenever the cabinet panel is removed, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothes, hair, etc.

- 1. Verify that the operation selector switch on the generator set control panel is set to the Remote/Auto position.
- 2. Check the Exercise LED on the control panel to see if it is lit.
 - a. If the Exercise LED is not lit, no exercise period has been set. Refer to the exerciser programming procedure for information on setting an exercise.
 - b. If the Exercise LED is lit but not flashing, the exercise period has not yet started. The start and stop times are not displayed.
- 3. Start the generator set using its start-stop (Run/Off) controls. If it does not crank, check the starting batteries. If it cranks but does not start, check the fuel supply.
- 4. Check the controller for the transfer switch start signal to the generator set. The start signal relay remains closed while sending the signal to the generator set. The start signal relay can be measured with a voltmeter at either P4-2 and P4-3 or at TB2-2 and TB2-4. If the start signal relay contact is open, reset the DC power of the controller by disconnecting the battery.

⚠ 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.

7.3.2.4 After a Power Failure, the Generator Set Starts but does not Assume the 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. Whenever the cabinet door is open, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothing, hair, and etc.

1. Check to see if the generator set power is available.

If the generator set power is not available, S2 will display the 0V and 0Hz on the main display.

- a. Check the output voltage of the power source by observing the voltmeter on the generator set.
- b. Check the control setting to verify that the system nominal voltage matches what is listed on the nameplate.
- c. Check the control setting to verify that the system frequency matches what is listed on the nameplate.
- d. Check the control setting to verify that the system phase setting matches what is listed on the nameplate.

If the generator set power is available, S2 will display the correct voltage and frequency on the main display.

a. The Warming time delay may not have expired. The Warming time delay can be set for up to 1 hour. If you do not wish to wait until the time delay expires, press the Mode button to select Manual mode and press Transfer to S2 button to override the time delay.

If the switch does not transfer after pressing the Mode button to select Manual mode and press Transfer to S2 button to override the time delay, a Elevator Delay may not have expired due to a misconfiguration. Change the Elevator Delay to 0 seconds.

7.3.2.5 After Power Returns, the Transfer Switch does not Return to Normal Position

1. Check to see if the utility power is available.

If the utility power is avialable, S1 will display the correct voltage and frequency on the main display.

a. The Return Delay period may not have expired. The Return Delay can be set for up to 5 hours. If you do not wish to wait until the time delay expires, press the Mode button to select Manual mode and press Transfer to S1 button to override the time delay.

If the switch does not transfer after pressing the Mode button to select Manual mode and press Transfer to S1 button to override the time delay, a Elevator Delay may not have expired due to a misconfiguration. The Elevator Delay can be set up to 300 seconds. Change the Elevator Delay to 0 seconds.

b. Although it is not offered with this transfer switch, a check sync may be enabled. When the check sync function is enabled, the utility does not assume the load until both sources are within acceptable limits of the check sync sensor.

If the utility power is not available, S1 will display the 0V and 0Hz on the main display.

a. Check the control setting to verify that the utility under voltage dropout point is set lower than the pickup set point.

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

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, clothing, hair, and etc.

- 1. The engine cooldown time delay may not have expired. The Cooling time delay can be set for up to 60 minutes.
- 2. After the Cooling time delay expires but the start signal relay remains closed, the signal can measured with a voltmeter either at P4-2 and P4-3 or at TB2-2 and TB2-4. The generator set is still running.
 - a. Stop the generator set with its Start-Stop (Run/Off) switch.
 - b. Replace the controller.
- 3. After the Cooling time delay expires but the start signal relay remains open and the generator set continues to run, refer to the generator set Service Manual.

7.3.2.7 System does not Test with Load

The default setting for the RSS transfer switch is to test without load. This procedure only applies if you expect the unit to 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. Whenever the cabinet door is open, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothing, hair, and etc.

- 1. Check the control setting to verify that the Test mode function has been set to On Load.
- 2. Press the Mode button to select Test mode. If the switch does not Test on Load.
 - a. The Warming time delay may not have expired. The Warming time delay can be set for up to 1 hour. If you do not wish to wait until the time delay expires, press the Mode button to select Manual mode and press Transfer to S1 button to override the time delay.

If the switch does not transfer after pressing the Mode button to select Manual mode and pressing Transfer to S1 button to override the time delay, a Elevator delay may not have expired due to a misconfiguration. The Elevator delay can be set up to 300 seconds. Change the Elevator delay to 0 seconds.

b. Although it is not offered with this transfer switch, a check sync may be enabled. When the check sync function is enabled, the generator does not assume the load until both sources are within acceptable limits of the phase check sync.

7.3.2.8 System does not Exercise with Load

The default setting for the RSS transfer switch is to exercise without load. This procedure only applies if you expect the unit to 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. Whenever the cabinet door is open, use extreme caution to avoid touching electrical contacts with body, tools, jewelry, clothing, hair, and etc.

- Check the control setting to verify that the Exercise scheduler function has been set to scheduled run is On Load.
- 2. If the control has been set to Scheduled run is On Load.
 - a. The Warming time delay may not have expired. The elevator delay can be set for up to 1 hour. If you do not wish to wait until the time delay expires, press the Mode button to select Manual mode and press Transfer to S2 button to override the time delay.
 - If the switch does not transfer after pressing the Mode button to select Manual mode and press Transfer to S2 button to override the time delay, a elevator delay may not have expired due to a misconfiguration. The elevator delay can be set up to 300 seconds. Change the elevator delay to 0 seconds.
 - b. Although it is not offered with this transfer switch, a check sync may be enabled. When the check sync function is enabled, the generator does not assume the load until both sources are within acceptable limits of the check sync sensor.

7.3.2.9 Battery Charger Fails to Charge

- 1. Check the battery charger LED light.
 - a. If the LED is red, the charger is still charging.
 - b. If the LED is green but the battery has not charged, the battery is defective and needs to be replaced.
- 2. If the voltage between TB2-1 (GND) and TB2-3 (B+) for RSS transfer switches with a controller, or between TB4-4 (GND) and TB4-7 (B+) for RSS transfer switches without a controller, is less than 13.5 VDC, the charger is weak. Check the distance between the charger and the battery to see if it is too far. Wiring distances are listed in **Table 8**.
- 3. If the LED is flashing, the charger is defective. Replace the battery charger.

⚠ WARNING

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

TABLES	MUDE	DEALEL	0 A TIO	
TABLE 8.	WIRES	SPECIFI	CAHO	NS

Wire Size (AWG)	Distance in Feet (One Way)
16	125
14	200
12	300
10	500

7.3.2.10 Battery Loses Water

The battery charger may not be turning off when the battery is charged. Refer to battery manufacturer's maintenance recommendations.

7.3.2.11 Battery Loses Charge

There may be loose battery connections. Verify connections are okay. If they are okay, replace the battery.

7.3.2.12 Detailed Troubleshooting Procedures

This section describes a typical transfer switch sequence of events, and provides detailed troubleshooting procedures for experienced service personnel. The troubleshooting procedures use conditional schematics and symptoms to diagnose all possible problems.

⚠ WARNING

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

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, clothing, hair, and etc. The following procedures are to be performed only by technically trained and experienced personnel.

TABLE 9.

Troubleshooting	Page
Sequence of Events	Section 4.4
Troubleshooting with Symptoms	Section 7.4.1
Utility Power Failure	Section 7.3.4
Utility Power is Restored	Section 7.3.5
Miscellaneous Troubleshooting Issues	Section 7.3.6

NOTICE	
L3 Utility is not available on 2-pole transfer switches.	

7.3.2.12.1 About Customer Inputs

In applications with remote customer inputs, the generator set may start unexpectedly as a result of these inputs. These symptoms may appear to be caused by the transfer switch control. Verify that the remote input is not causing the symptom or isolate the control from these inputs before troubleshooting the control.

TABLE 10. CONTROL PANEL CONNECTIONS

Connector	Pin #	Function	Туре	Comments
P1	1	Ground Input (-Ve)	Battery Connections	0V - 35Volts DC
	2	B+ ve		
	3	Source 1 Close Signal	Output	Grounded internally to energize close normal K1 relay
	4	GND		
	5	Source 2 Close Signal		Grounded internally to energize close emergency K2 relay
	6	GND		
	7	Not Used		
	8	Not Used		
	9	Not Used		
	10	Not Used		
P2	1	Connect to Utility (Normal)	Input	Connect to GND to Activate when connected to utility power
	2	Connect to Genset (Emergency)		Connect to GND to Activate when connected to Genset power
	3	Not used		
	4	Remote Test		Connect to GND to activate

^{*} These features are not offered with the RSS transfer switch.

Connector	Pin #	Function	Туре	Comments
P3	1	L1 Generator	Voltage Sensor Inputs	15V to 333 VAC
	2	L2 Generator		(Phase to Neutral) 25V to 576VAC
	3	Not used		(Phase to Phase)
	4	Not used		
	5	L1 Utility		
	6	L2 Utility		
	7	Not used		
	8	Not used		
P4	1	Not used	Output	
	2	Genset Start Relay		Internal dry contact
	3	Genset Start Relay		closes (De-energizes) to start the genset and is held open (Energized) to stop the genset
	4	Not used		
	5	Not used		
	6	Not used		

7.3.3 Troubleshooting with Symptoms

Use the troubleshooting guide to help diagnose transfer switch problems. It is divided into sections based on the symptom. Common problems are listed with their possible causes. Refer to the corrective action column for the appropriate test or adjustment procedure.

Conditional schematics are used to highlight the circuit that is energized during the sequence of the events. These conditional schematics are for a typical transfer switch with options. Always refer to the schematic and wiring diagram package that was shipped with the transfer switch for specific information about its configuration.

Make a thorough inspection of the transfer switch wiring to make sure that good wire harness and ground connections are made. Correct wiring problems before performing any test or replacing any components.

7.3.3.1 Transfer Switch Operation

When troubleshooting the RSS transfer switch, it is important to remember the following:

- The control uses limit switches (ASW and BSW) on either side of the switch to determine if the switch has opened or closed. If the ASW limit switch is bad, after the load is transferred to the Utility after five attempts, the fault will be displayed on the screen. If the BSW limit switch is bad, after the load is transferred to the generator after five attempts, the fault will be displayed on the screen.
- This is a two position transfer switch. It can be connected only to one source. There is no neutral position.
- The control supplies a grounding signal to pick up the control relays (K1 and K2).
- · All inputs are activated by applying a ground to the signal input.
- The control operates over a DC voltage range of 8 to 35 volts but the 12 volt control relays are used with the RSS transfer switch because of the generator set start battery.

• If the controller is connected to a DC power source (for example, the generator set start battery) but there is no AC power available, the control panel display screen will still be lit.

- The transfer and retransfer relays (K1 and K2) are pulsed and are powered for only one second, or until a limit switch (ASW or BSW) changes state, and then the power is removed (the relays are deenergized). When a relay is being energized, there is an audible "click."
- The software includes a retry function. If the transfer switch fails to transfer within one second, power is removed and the software waits ten seconds before trying again. After five attempts, the software quits trying and the fault will be displayed on the screen, depending on which part of the switch circuit has failed.

7.3.4 Utility Power Failure

⚠ 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 with body, tools, jewelry, hair, clothes, and etc. Prior to working with live circuits, remove all sources of AC power and remove power to the door by removing the fuse from the FB fuse block. The following procedures are to be performed only by technically trained and experienced personnel.

⚠ WARNING

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

TABLE 11. UTILITY POWER FAILS BUT THE GENERATOR SET DOES NOT START

Problem	Possible Cause	Corrective Action
Generator set cranks but does not start Generator set does not crank	There may be a generator set problem 1. A Start Delay timer may be running. 2. There may not be a generator set start	Check the fuel system Refer to the generator set service manual 1. Wait until the time delay has expired, or press the Mode button to select Manual
	signal 3. The generator set may be waiting for a remote start command 4. There may be defective or loose wiring 5. There may be a defective battery or cables 6. The generator set control may not be functioning correctly	mode and press Transfer to S2 button to override the time delay. 2. Check for a generator start signal (closed contact either between P4-2/P4-3 or TB2-2/TB2-4). 3. Verify that the generator control is set for Remote/Auto Start. 4. a. Check, inspect, or replace defective wiring, see Section B.0 on page 105. b. Check the wiring between the transfer switch and the generator control. 5. Check the batteries and cable connections. 6. Check the generator control for proper operation.

TABLE 12. GENERATOR SET IS RUNNING BUT THE TRANSFER SWITCH DID NOT TRANSFER TO THE GENERATOR SET

Problem	Possible Cause	Corrective Action
Generator power available is not indicated by the control display	 There may be improper voltage at the voltage sensor inputs. There may be improper voltage between the transfer switch power terminals. There may be improper voltage at the generator set output terminals. 	 a. Check for proper generator voltage between P3-1 and P3-2 of the controller connector. The voltage must be higher than the generator voltage sensor pickup point. b. Check voltage sensing wiring between the control and the transfer switch. 2. Check for proper generator voltage between transfer switch power terminals EA and EB (line-to-line) or between EA and EN (line-to-neutral). Voltage must be higher than the generator voltage sensor pickup point. Voltage must be higher than the generator set voltage sensor pickup point. a. Check for proper voltage at generator output terminals. Voltage must be higher than the generator voltage sensor pickup point. b. Check the power circuit wiring between the transfer switch and
Generator power available is indicated by the control display	A Warming time delay timer may be running.	the generator. 1. Wait until the time delay (up to 300 seconds) has expired, or press the Mode button to select Manual mode and press Transfer to S2 button to override the time delay.

Problem	Possible Cause	Corrective Action
Utility power connected is indicated by the control display	The control was unsuccessful in its attempts to open the Utility side of the transfer switch. After 5 attempts to move the transfer switch, the fault is displayed on the screen, indicating that it failed to open. To close to the generator, the control grounds P1-3 to energize K2 for 1 second and monitors the Utility position input (P2-1) to see if limit switch ASW opens. If ASW doesn't open, the control de-energizes K2, waits 10 seconds, and tries again. If ASW doesn't open after the fifth try, fault is displayed on the screen and the control quits trying. If the switch mechanism is stuck or the solenoids are burnt out, the switch will not transfer the load.	 Check the Close Generator circuit for a bad connection, open wire, or a faulty part. Check K2 or the continuity through B1 and B2 of the transfer switch. Press the Transfer to S1 button so it will try to open the Utility side of the transfer switch. Observe what happens and verify that the relay coils are energizing. If the coils are energizing, Check the wiring between the relays and the transfer switch. Check to see if the transfer switch is faulty. The coils are not energizing, Check the wiring between the relay and the control. Check to see if the K2 relay is faulty. Use the manual operation handle to manually operate the transfer switch. If the switch will not allow manual operation, it must be replaced. If the switch will allow manual operation but the solenoids are burnt out, replace the transfer switch.

7.3.5 Utility Power is Restored

⚠ 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 with body, tools, jewelry, hair, clothes, and etc. Prior to working with live circuits, remove all sources of AC power and remove power to the door by removing the fuse from the FB fuse block. The following procedures are to be performed only by technically trained and experienced personnel.

⚠ WARNING

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

TABLE 13. UTILITY POWER IS RESTORED BUT THE SWITCH DOES NOT TRANSFER TO UTILITY

Indicator	Possible Cause	Corrective Action
Utility power available is not indicated by the control display	 There may be improper voltage at the voltage sensor inputs There may be improper utility voltage between the ATS power terminals 	Check for proper utility voltage between P3-5, and P3-6 (line-to-line) of the controller connector. Voltage must be higher than the utility voltage sensor pickup point. Check voltage sensing wiring
		between the control and the transfer switch.
		 b. Make sure the utility voltage sensing pickup setting and dropout setting aren't both set at 90%.
	2.	2. Check
		a. for proper utility power between transfer switch power terminals NA and NB. Voltage must be higher than the utility voltage sensor pickup point.
		b. power circuit wiring between the transfer switch and the upstream circuit breaker. If the circuit breaker is tripped, rest the upstream circuit breaker.

Indicator	Possible Cause	Corrective Action
Utility power available is indicated by the control display	 Return Delay timer may be running. Although it is not offered with this transfer switch, a Phase Check may be enabled and the sources are not in phase. 	 Wait until the time delay (up to 30 minutes) has expired, or press the Mode button to select Manual mode and press Transfer to S2 button to override the time delay. Check a. phase rotation b. frequency differences between the two sources. Frequency differences must be 1 Hz or less.

Indicator	Possible Cause	Corrective Action
Generator power connected is indicated by the control display	The control was unsuccessful in its attempts to open the Generator side of the transfer switch. After 5 attempts to move the transfer switch, the fault is displayed on the screen, indicating that it failed to open. To close Utility, the control grounds P1-3 to energize K1 for 1 second and monitors the Generator position input (P2-2) to see if limit switch BSW opens. If BSW doesn't open, the control de-energizes K1, waits 10 seconds, and tries again. If BSW doesn't open after the fifth try, the fault is displayed on the screen and the control quits trying. If the switch mechanism is stuck or the solenoids are burnt out, the switch will not transfer the load.	 Check the Open Generator circuit for a bad connection, open wire, or a faulty part. Check K1 or the continuity through A1 and A2 of the transfer switch. Press the Override pushbutton to reset the control so it will try to open the Generator side of the transfer switch. Observe what happens and verify that the relay coils are energizing. If the coils are energizing, Check the wiring between the relays and the transfer switch. Check to see if the transfer switch is faulty. If the coils are not energizing, Check the wiring between the relay and the control. Check to see if the relay is faulty. Use the manual operation handle to manually operate the transfer switch. If the switch will not allow manual operation, it must be replaced. If the switch will allow manual operation but the solenoids are burnt out, replace the transfer switch.

TABLE 14. SWITCH TRANSFERRED TO UTILITY BUT THE GENERATOR SET CONTINUES TO RUN

Problem	Possible Cause	Corrective Action
Generator did not shut down after the transfer switch has transferred to the Utility	 A Cooling time delay timer may be running. The generator set may not have received a stop signal. The selector switch on generator set control panel may not be in the correct position. There may be defective wiring. The generator set control may not be operating correctly. 	 Wait for the time delay (up to 30 minutes) to expire. Check for a generator stop signal (open contact between P4-2 and P4-3). Check to see if the generator control is set for Remote Start. Check, inspect, or replace defective wiring, see Section B.0 on page 105. Check the generator control for proper operation.

7.3.6 Miscellaneous Troubleshooting Issues

⚠ 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 with body, tools, jewelry, hair, clothes, and etc. Prior to working with live circuits, remove all sources of AC power and remove power to the door by removing the fuse from the FB fuse block. The following procedures are to be performed only by technically trained and experienced personnel.

⚠ WARNING

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

TABLE 15. MISCELLANEOUS

Problem	Possible Cause	Corrective Action
Generator set running for no apparent reason Front panel test does	 The generator set may not have received a stop signal. The selector switch on generator set control panel may not be in the correct position. There may be defective wiring. The generator set control may not be operating correctly. 	 Check for a generator set stop signal (open contact between P4-2 and P4-3). Check to see if the generator set control is set for Remote Start. Check, inspect, or replace defective wiring, see Section B.0 on page 105. Check the generator set control for proper operation.
not transfer the load	 The control is not set to Test With Load. The control is set to Test With Load but one of the following has occurred: The Warming time delay may not have expired. Although it is not offered with this transfer switch, a phase check may be enabled. 	 Check the control setting to verify that the Test mode function has been set to On Load. If the control has been set to Test With Load, The Warming time can be set for up to 1 hour. If you do not wish to wait until the time delay expires, press the Mode button to select Manual Mode and press Transfer to S2 button to override the time delay. When the check sync function is enabled, the generator does not assume the load until both sources are within acceptable limits of the check sync sensor.
Remote test does not function	There is no contact between TB2-5 and TB2-1.	Close the contact to start a test.

Problem	Possible Cause	Corrective Action
Unit did not exercise.	 The operation selector switch on the generator may not be in the correct position. An exercise period may not be set or is set but not yet started. There may be generator set problems. 	 Verify that the operation selector switch on the generator control panel is set to the Remote/Auto position. Verify that the Exercise Scheduler is enabled and set to the desired start time, duration, and test frequency. Try starting the generator using its start-stop (Run/Off) controls. If it does not crank, check the starting batteries and cable connections. If it cranks but does not start, check the fuel supply.

7.4 Troubleshooting - Transfer Switches without a Controller

This section describes troubleshooting issues for installations that include a GSAA generator. With this type of installation, the RSS transfer switch does not include a controller and is suitable for use with service equipment.

This section also describes the sequence of events for transfer switch operations that do not include a controller.

7.4.1 Troubleshooting with Symptoms

Use the troubleshooting guide to help diagnose transfer switch problems. It is divided into sections based on the symptom. Common problems are listed with their possible causes. Refer to the corrective action column for the appropriate test or adjustment procedure.

Conditional schematics are used to highlight the circuit that is energized during the sequence of the events. These conditional schematics are for a typical transfer switch with options. Always refer to the schematic and wiring diagram package that was shipped with the transfer switch for specific information about its configuration.

Make a thorough inspection of the transfer switch wiring to make sure that good wire harness and ground connections are made. Correct wiring problems before performing any test or replacing any components.

7.4.1.1 Transfer Switch Operation for Transfer Switches without a Controller

When troubleshooting the RSS transfer switch, it is important to remember the following:

- The generator set control uses limit switches (ASW and BSW) on either side of the transfer switch to determine if the switch has opened or closed. If either the ASW or BSW limit switches are bad, the generator set control displays a transfer switch signal failure.
- This is a two position transfer switch. It can be connected only to either one source. There is no neutral position.
- The control supplies a B+ signal to energize the relay coil (K1)
- · All inputs are activated by applying a ground to the signal input.
- The software includes a retry function. If the transfer switch fails to transfer within one second, power is removed and the software waits ten seconds before trying again. After three times, the software quits trying.

7.4.1.2 Troubleshooting for Transfer Switches without a Controller

For information on the controller indicator fault signals, refer to the GSAA, GSBA, or GSBB generator service manual. **Table 16** 10lists troubleshooting issues for transfer switches without a controller.

⚠ 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 with body, tools, jewelry, hair, clothes, and etc. Prior to working with live circuits, remove all sources of AC power and remove power to the door by removing the fuse from the FB fuse block. The following procedures are to be performed only by technically trained and experienced personnel.

⚠ WARNING

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

TABLE 16. TROUBLESHOOTING THE TRANSFER SWITCH

Problem	Possible Cause	Corrective Action
The transfer switch failed to transfer to the generator set	 The K1 relay coil may not have received a 12 VDC signal from controller. K1 relay may malfunction. There may be a defective wire. The switch mechanism solenoid may be burnt out. There may be loose or broken parts within the switch mechanism. 	 Check for a relay coil signal (12 VDC) between TB4-3 and TB4-4. Verify the relay coils are energizing.
		 a. If the coils are energizing, Check the wiring between the relays and the transfer switch (B1 and B2). It should be 240 VAC.
		 Check to see if the transfer switch is faulty.
		b. The coils are not energizing,
		 Check to see if the K1 relay is faulty.
		 If faulty, replace the K1 relay. 3. Check, inspect, or replace the defective wire.
		 Manually operate the switch by using the operator handle to manually transfer the switch. If the switch manually transfers, the solenoids are burnt out, replace the switch mechanism.
		 Manually operate the switch by using the operator handle to manually transfer the switch. If the switch does not manually transfer, replace the switch mechanism.

Problem	Possible Cause	Corrective Action
The transfer switch failed to transfer to the utility	 The Utility source may not be present. The step-down transformer is faulty (240 VAC to 18 VAC) - used to detect if utility voltage is present. The K1 relay coil may not have received a 12 VDC signal K1 relay may malfunction. There may be a defective wire. The switch mechanism solenoid may be burnt out. There may be loose or broken parts within the switch mechanism. 	 Check a. to see that the Utility service disconnect (circuit breaker) is in the ON position. b. for a transformer signal between TB4-1 and TB4-2. The output reading should be 18 VAC +/- 3%. Replace the transformer. Check for a relay coil signal (12 VDC) between TB4-3 and TB4-4. Verify the relay coils are energizing. a. If the coils are energizing, between the relays and the transfer switch (A1 and A2). It should be 240 VAC. Check to see if the transfer switch is faulty. b. The coils are not energizing, check to see if the K1 relay is faulty. If faulty, replace the K1 relay. Check, inspect, or replace the defective wire. Manually operate the switch by using the operator handle to manually transfers, the solenoids are burnt out, replace the switch mechanism. Manually operate the switch by using the operator handle to manually transfer the switch. If the switch does not manually transfer, replace the switch mechanism.

Problem	Possible Cause	Corrective Action
Transfer switch signal failure	 No feedback to indicate switch position either on Utility or Generator side. The ASW or BSW limit switch may be faulty. 	 Check the wiring connection and verify the signal. Replace the limit switch.

This section covers the removal and replacement procedures for RSS transfer switch components.

8.1 Hardware Torque Specifications

Unless otherwise stated, use the following recommendations when torquing hardware:

TABLE 17. HARDWARE TORQUE SPECIFICATIONS

Models	Description	Recommended Torque
All	M3 Nut, Screw, or Bolt	5 - 6 in-lb (0.6 - 0.72 Nm)
	M4 Nut, Screw, or Bolt	13 - 17 in-lb (1.5 - 1.9 Nm)
	M5 Nut, Screw, or Bolt	24 - 30 in-lb (2.7 - 3.4 Nm)
	M6 Nut, Screw, or Bolt	40 - 50 in-lb (4.6 - 5.7 Nm)
	1/4-20 Nut, Screw, or Bolt	70 - 80 in-lb (7.9 - 9.0 Nm)
RA112N3, RA212N3,	Source A, B, and Load Power Terminal Screws Securing Busbar to Mechanism Housing:	
RA112S3, and	100A	62.0 - 70.8 in-lb (7.0 - 8.0 Nm)
RA212S3	200A	70 - 80 in-lb (7.9 - 9.0 Nm)
Only	SE Models Only: Stainless Steel Inner and Outer Door Panel Screws	62 - 77 in-lb (7.0 - 8.7 Nm)
	SE Models Only: Source A Power Terminal Screws Securing Busbar to Circuit Breaker	70 - 80 in-lb (7.9 - 9.0 Nm)

8.2 Switch Assembly Removal and Replacement Procedure

For servicing purposes, each transfer switch assembly is removed and replaced as a unit. There are no serviceable components.

⚠ WARNING

The transfer switch presents a shock hazard that can cause severe personal injury or death. Before beginning installation, remove all sources of AC power. If a generator provides emergency power, move the generator 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).

- 1. Remove all sources of power from the transfer switch in the following order.
 - a. Move the operation selector switch on the generator to Stop (Off).

A CAUTION

Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits.

b. If there is an external battery charger, disconnect the battery charger from its AC power source.

⚠ WARNING

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

⚠ WARNING

Accidental starting of the generator can cause severe personal injury or death due to electrocution or contact with moving parts. Disconnect the starting battery cables, before performing service. Batteries emit hydrogen, a highly explosive gas. Thoroughly ventilate the battery compartment before removing battery cables. Remove the negative (-) cable (s) first to reduce the risk of arcing.

c. Disconnect the generator starting battery (negative [-] lead first).

⚠ WARNING

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

- d. Remove all AC power to the automatic transfer switch.
- 2. For transfer switches with a controller, remove the transfer switch cabinet door panel. For transfer switches without a controller, remove the outer and inner door panels.
- 3. Remove all control and power wiring from the switch terminals.
- 4. Loosen the six 1/4-20 bolts (item 1 in Figure 28 or Figure 29) securing the mechanical lugs.
- 5. For transfer switches with a controller or with one circuit breaker, loosen and remove the two screws, nuts, and washers (items 2 in <u>Figure 28</u> or <u>Figure 29</u>) securing the bracket at the load and emergency side (bottom) of the switch.
- 6. Loosen and remove all M6 nuts and lock washers (item 3 in Figure 28 or Figure 29) securing the switch to the rear wall of the cabinet.
- 7. Remove the switch and bottom bracket from the cabinet.
- 8. Mark the bus bar of each phase of the Utility/Generator and Load. Then remove all of the bus bars from the old switch.

A CAUTION

Mounting the bus bar in the wrong direction may increase the risk of a short to ground. Mount the bus bar with the long end toward the breaker.

- 9. Install the bus bars on the new switch in accordance to the markings. Making sure the long end of the bus bar is connected to the breaker.
- 10. Use the hardware removed in step 6 to install the new switch in the cabinet. Torque the M6 nuts to 50 in-lbs (5.6 N·m) and torque the 1/2-20 screws to 80 in-lbs (9 N·m).

11. For transfer switches with a controller or with one circuit breaker, use the hardware removed in step 5 to install the bracket at the Load and Emergency side of the switch. Torque the M6 nuts to 50 inlbs (5.6 N·m).

- 12. Tighten the 1/4-20 bolts securing the mechanical lugs. Torque the bolts to 80 in-lbs (9 N·m).
- 13. Reinstall the cabinet door panel(s).
- 14. Restore power.
 - a. Reconnect the generator starting battery (negative [+] lead first).
 - b. If there is an external battery charger, reconnect the battery charger to its AC power source.
 - c. Restore AC power to the automatic transfer switch.
 - d. Move the operation selector switch on the generator to the Remote (or Auto) position.

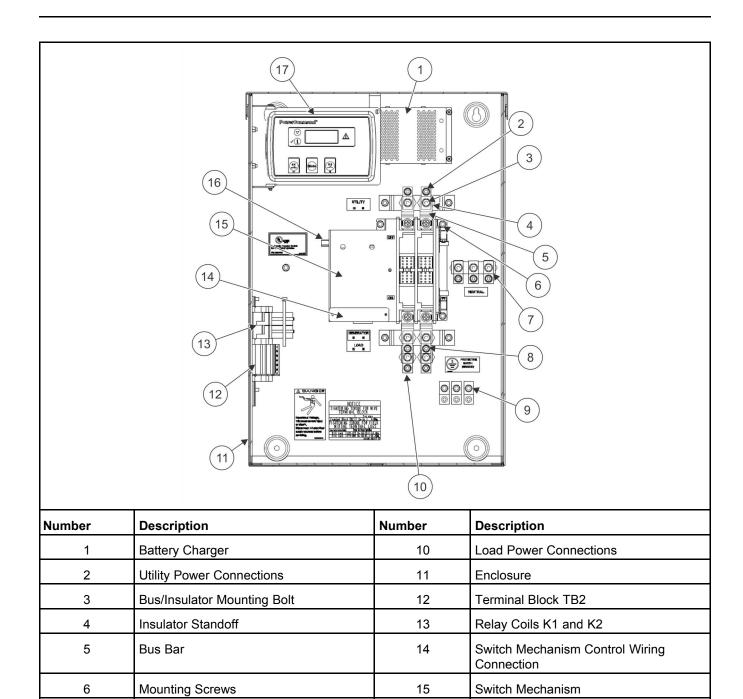


FIGURE 28. INTERIOR COMPONENTS FOR TRANSFER SWITCH WITH A CONTROLLER

16

17

Manual Operation Shaft

Control Panel

Neutral Bar Assembly

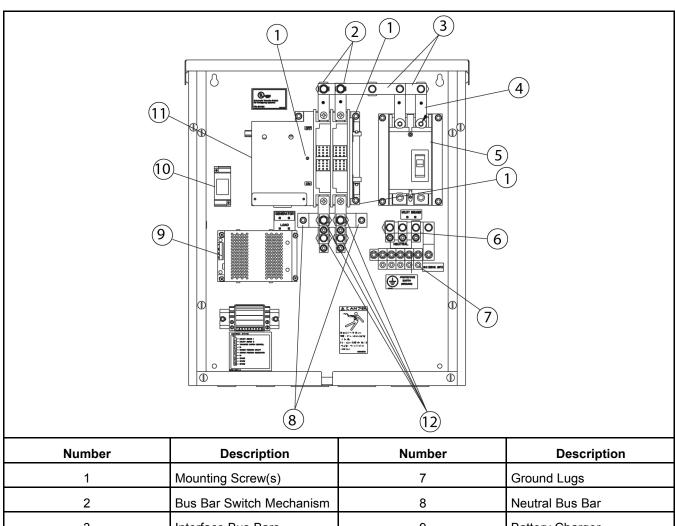
Ground Lugs

Generator Power Connections

7

8

9



3 Interface Bus Bars 9 **Battery Charger** 4 Bus Bar Mounted Long End 10 Relay Coil (K1) to Breaker 5 Circuit Breaker 11 Switch Mechanism 6 12 **Neutral Bar Assembly** Insulated Standoff

FIGURE 29. INTERIOR COMPONENTS FOR TRANSFER SWITCH WITHOUT CONTROLLER (ONE CIRCUIT BREAKER)

8.3 Limit Switch Replacement Procedure

⚠ WARNING

The transfer switch presents a shock hazard that can cause severe personal injury or death. Before beginning installation, remove all sources of AC power. If a generator provides emergency power, move the generator 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.

- 1. Remove all sources of power from the transfer switch in the following order.
 - a. Move the operation selector switch on the generator to Stop (Off).

⚠ CAUTION

Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits.

b. If there is an external battery charger, disconnect the battery charger from its AC power source.

⚠ WARNING

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

⚠ WARNING

Accidental starting of the generator can cause severe personal injury or death due to electrocution or contact with moving parts. Disconnect the starting battery cables, before performing service. Batteries emit hydrogen, a highly explosive gas. Thoroughly ventilate the battery compartment before removing battery cables. Remove the negative (–) cable(s) first to reduce the risk of arcing.

c. Disconnect the generator starting battery, negative (–) lead first.

⚠ WARNING

- d. Remove AC power to the automatic transfer switch.
- 2. Remove the transfer switch cabinet door panel.
- 3. Mark and disconnect all wires connected to the limit switches; see Figure 31.
- 4. Remove the faulty limit switch.
- 5. Install the new limit switches. Use the manual operation handle; see <u>Figure 33</u> to rotate the shaft so that the limit switches are installed as shown in <u>Figure 31</u>.
- 6. Restore power.
 - a. Reconnect the generator starting battery (negative [-] lead first).
 - b. If there is an external battery charger, reconnect the battery charger to its AC power source.

- c. Restore AC power to the automatic transfer switch.
- d. Move the operation selector switch on the generator to the Remote (or Auto) position.

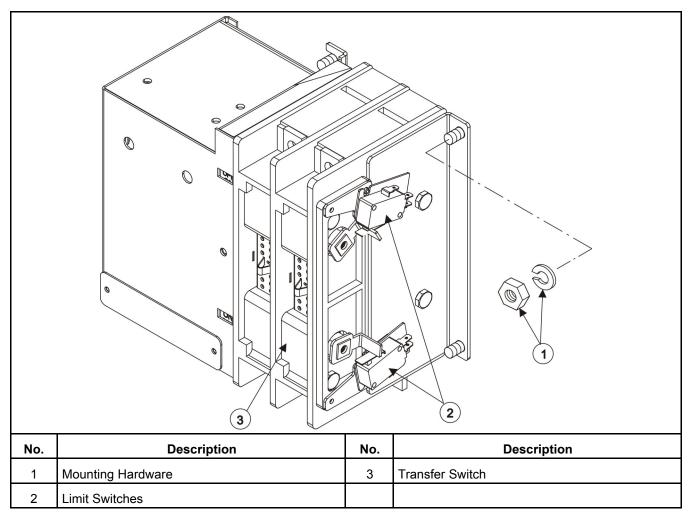


FIGURE 30. RA112N3, RA212N3, RA112S3, AND RA212S3 TRANSFER SWITCH REMOVAL

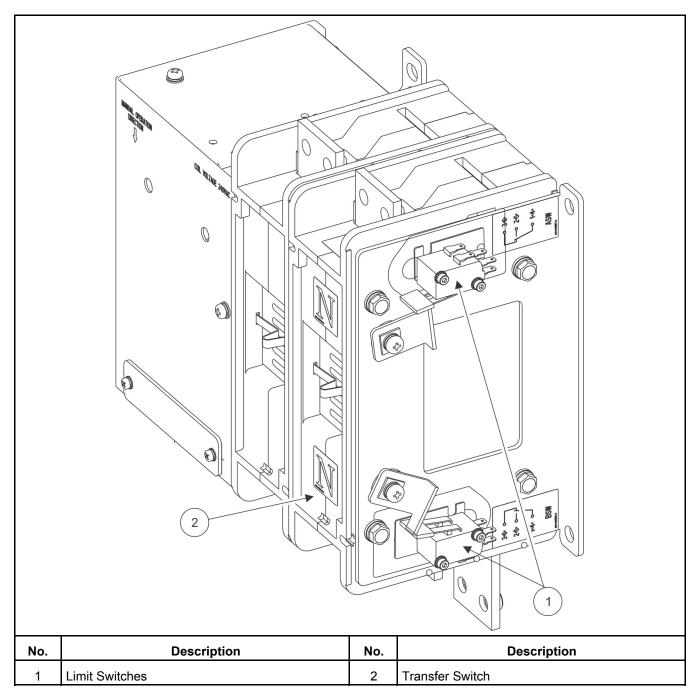


FIGURE 31. RA412N3 AND RA412S3 TRANSFER SWITCH REMOVAL

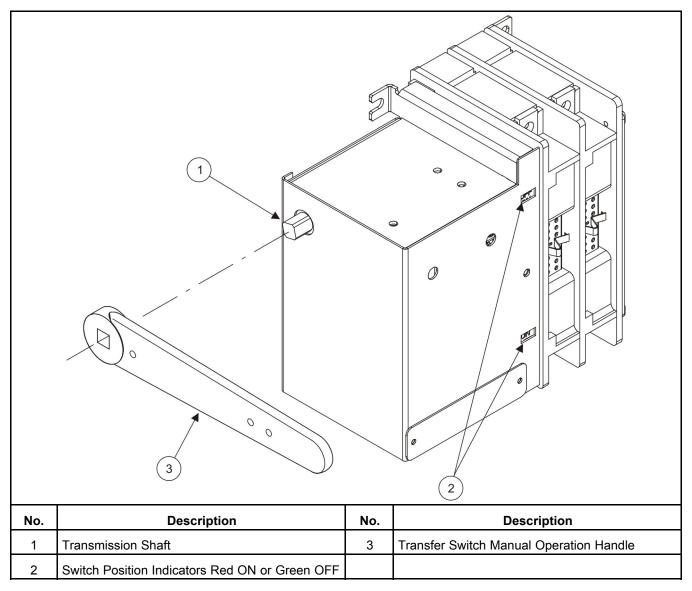


FIGURE 32. RA112N3, RA212N3, RA112S3, AND RA212S3 MANUAL OPERATION HANDLE

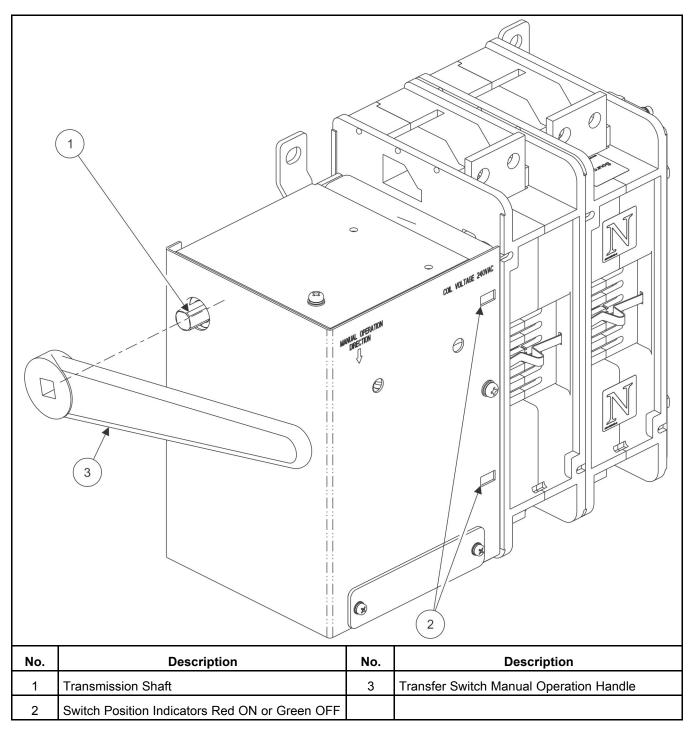


FIGURE 33. RA412N3 AND RA412S3 MANUAL OPERATION HANDLE

8.4 Control Replacement Procedure

This procedure is only for RSS transfer switches that include a controller.

↑ WARNING

The transfer switch presents a shock hazard that can cause severe personal injury or death. Before beginning installation, remove all sources of AC power. If a generator provides emergency power, move the generator 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).

- 1. Remove all sources of power from the transfer switch in the following order.
 - a. Move the operation selector switch on the generator to Stop (Off).

⚠ CAUTION

Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits.

b. If there is an external battery charger, disconnect the battery charger from its AC power source.

⚠ WARNING

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

⚠ WARNING

Accidental starting of the generator can cause severe personal injury or death due to electrocution or contact with moving parts. Disconnect the starting battery cables, before performing service. Batteries emit hydrogen, a highly explosive gas. Thoroughly ventilate the battery compartment before removing battery cables. Remove the negative (-) cable (s) first to reduce the risk of arcing.

c. Disconnect the generator starting battery (negative [-] lead first).

⚠ WARNING

- d. Remove AC power to the automatic transfer switch.
- 2. Remove the transfer switch cabinet door panel.
- 3. Unplug the P1, P2, P3, and P4 connectors from the back of the control, see Figure 34.
- 4. Loosen and remove the two retaining clips and the control from the control mounting bracket.
- 5. Insert the new control in the mounting bracket. Make sure the control gasket is installed between the control and the mounting bracket.
- 6. Use the two retaining clips to secure the control to the mounting bracket. The clips are installed on the sides of the control, see **Figure 34**.
- 7. Reconnect the P1, P2,P3, and P4 connectors to the control.
- 8. Reinstall the transfer switch cabinet door panel.

- 9. Restore power.
 - a. Reconnect the generator starting battery (negative [+] lead first).
 - b. If there is an external battery charger, reconnect the battery charger to its AC power source.
 - c. Restore AC power to the automatic transfer switch.
 - d. Move the operation selector switch on the generator to the Remote (or Auto) position.

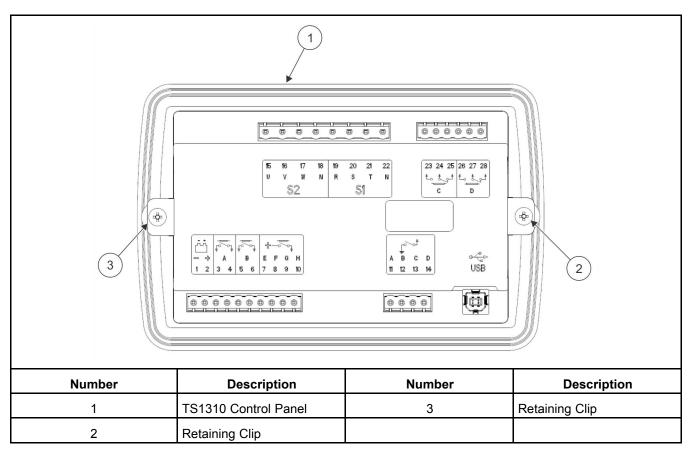


FIGURE 34. CONTROL CONNECTORS

8.5 Battery Charger Replacement Procedure

WARNING

The transfer switch presents a shock hazard that can cause severe personal injury or death. Before beginning installation, remove all sources of AC power. If a generator provides emergency power, move the generator 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).

- 1. Remove all sources of power from the transfer switch in the following order.
 - a. Move the operation selector switch on the generator to Stop (Off).

⚠ CAUTION

Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits.

b. If there is an external battery charger, disconnect the battery charger from its AC power source.

⚠ WARNING

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

⚠ WARNING

Accidental starting of the generator can cause severe personal injury or death due to electrocution or contact with moving parts. Disconnect the starting battery cables, before performing service. Batteries emit hydrogen, a highly explosive gas. Thoroughly ventilate the battery compartment before removing battery cables. Remove the negative (-) cable (s) first to reduce the risk of arcing.

c. Disconnect the generator starting battery (negative [-] lead first).

⚠ WARNING

- d. Remove AC power to the automatic transfer switch.
- 2. Remove the transfer switch cabinet door panel.
- 3. Disconnect the AC power cord from the battery charger.
- 4. Disconnect the two wires connecting the battery charger to TB 2 (transfer switches with a controller) or TB 4 (transfer switches without a controller).
- 5. Loosen and remove the hardware securing the battery charger mounting brackets.
- 6. Remove the brackets and the charger.
- 7. Use the hardware remove in step 5 to secure the mounting brackets and new changer to the inside of the transfer switch cabinet, see **Figure 28**.
- 8. Reconnect the two wires connecting either TB2 or TB4 to the battery charger.
- 9. Reconnect the AC power cord to the battery charger.
- 10. Reinstall the transfer switch cabinet door panel.
- 11. Restore power.
 - a. Reconnect the generator starting battery (negative [+] lead first).
 - b. If there is an external battery charger, reconnect the battery charger to its AC power source.
 - c. Restore AC power to the automatic transfer switch.
 - d. Move the operation selector switch on the generator to the Remote (or Auto) position.

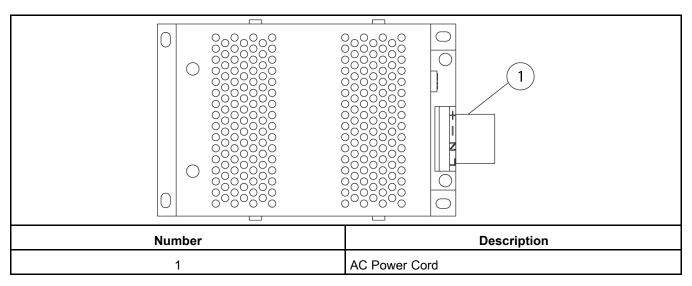


FIGURE 35. BATTERY CHARGER

8.6 Control Relay Replacement Procedure

NOTICE

Transfer switches with a controller include two control relays (K1 and K2). Transfer switches without a controller include only one control relay (K1).

WARNING

The transfer switch presents a shock hazard that can cause severe personal injury or death. Before beginning installation, remove all sources of AC power. If a generator provides emergency power, move the generator 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).

- 1. Remove all sources of power from the transfer switch in the following order.
 - a. Move the operation selector switch on the generator to Stop (Off).

A CAUTION

Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits.

b. If there is an external battery charger, disconnect the battery charger from its AC power source.

⚠ WARNING

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

⚠ WARNING

Accidental starting of the generator can cause severe personal injury or death due to electrocution or contact with moving parts. Disconnect the starting battery cables, before performing service. Batteries emit hydrogen, a highly explosive gas. Thoroughly ventilate the battery compartment before removing battery cables. Remove the negative (-) cable (s) first to reduce the risk of arcing.

c. Disconnect the generator starting battery (negative [-] lead first).

⚠ WARNING

- d. Remove AC power to the automatic transfer switch.
- 2. Remove the transfer switch cabinet door panel.
- 3. Spread the relay clips apart and remove the relay(s) from the relay base(s).
- 4. Install the new relay(s) on the relay base(s), making sure the screw head on the bottom of the relay matches up with the hole in the relay base.
- 5. Make sure the relay clips are securing the relay(s) to the base(s).
- 6. Restore power.

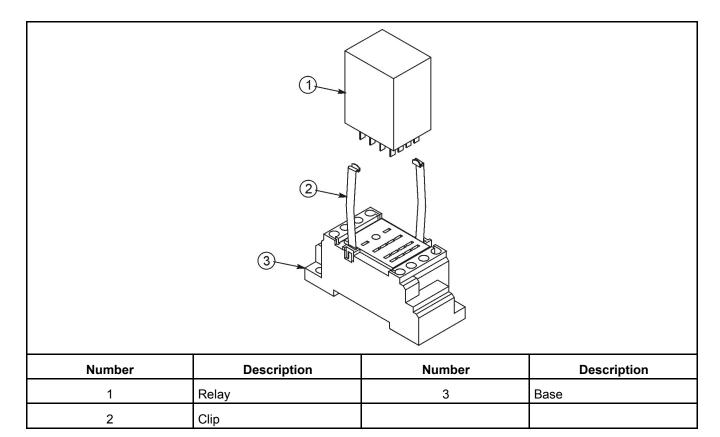


FIGURE 36. CONTROL RELAY INSTALLATION

8.7 Circuit Breaker Replacement Procedure

This procedure is only for RSS transfer switches without a controller.

WARNING

The transfer switch presents a shock hazard that can cause severe personal injury or death. Before beginning installation, remove all sources of AC power. If a generator provides emergency power, move the generator 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).

- 1. Remove all sources of power from the transfer switch in the following order.
 - a. Move the operation selector switch on the generator set to Stop (Off).

▲ CAUTION

Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits.

b. If there is an external battery charger, disconnect the battery charger from its AC power source.

⚠ WARNING

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

⚠ WARNING

Accidental starting of the generator set can cause severe personal injury or death due to electrocution or contact with moving parts. Disconnect the starting battery cables, before performing service. Batteries emit hydrogen, a highly explosive gas. Thoroughly ventilate the battery compartment before removing battery cables. Remove the negative (-) cable (s) first to reduce the risk of arcing.

c. Disconnect the generator set starting battery (negative [-] lead first).

⚠ WARNING

- d. Remove AC power to the automatic transfer switch.
- 2. Remove the transfer switch cabinet door panel.
- 3. Remove the hardware securing the bus bars to the circuit breaker.
- 4. Remove the two #8-32 screws securing the circuit breaker to the circuit breaker bracket.
- 5. Remove the circuit breaker.
- 6. Use the two #8-32 screws removed in step 4 to install the new circuit breaker.
- 7. Use the hardware removed in step 3 to reinstall the bus bars. Tighten the bolts to 80 in-lbs (9 N·m).

- 8. Restore power.
 - a. Reconnect the generator set starting battery (negative [+] lead first).
 - b. If there is an external battery charger, reconnect the battery charger to its AC power source.
 - c. Restore AC power to the automatic transfer switch.
 - d. Move the operation selector switch on the generator set to the Remote (or Auto) position.

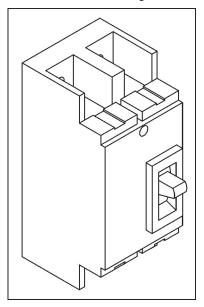


FIGURE 37. CIRCUIT BREAKER

8.8 Signal Transformer Replacement Procedure

This procedure is only for RSS transfer switches without a controller.

WARNING

The transfer switch presents a shock hazard that can cause severe personal injury or death. Before beginning installation, remove all sources of AC power. If a generator set provides emergency power, move 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).

- 1. Remove all sources of power from the transfer switch in the following order.
 - a. Move the operation selector switch on the generator to Stop (Off).

⚠ CAUTION

Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits.

b. If there is an external battery charger, disconnect the battery charger from its AC power source.

⚠ WARNING

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

⚠ WARNING

Accidental starting of the generator set can cause severe personal injury or death due to electrocution or contact with moving parts. Disconnect the starting battery cables, before performing service. Batteries emit hydrogen, a highly explosive gas. Thoroughly ventilate the battery compartment before removing battery cables. Remove the negative (-) cable (s) first to reduce the risk of arcing.

c. Disconnect the generator starting battery (negative [-] lead first).

⚠ WARNING

- d. Remove AC power to the automatic transfer switch.
- 2. Remove the transfer switch cabinet door panel.
- 3. Unplug the four connectors which connect to the transformer. Take note of how the transformer is installed.
- 4. Remove the two M3 nuts securing the transformer to the side of the cabinet.
- 5. Remove the transformer.
- 6. Use the nuts removed in step 4 to install the new transformer with the same orientation as the old one.
- 7. Plug the four connectors which connect to the transformer.
- 8. Restore power.
 - a. Reconnect the generator starting battery (negative [+] lead first).
 - b. If there is an external battery charger, reconnect the battery charger to its AC power source.
 - c. Restore AC power to the automatic transfer switch.
 - d. Move the operation selector switch on the generator to the Remote (or Auto) position.

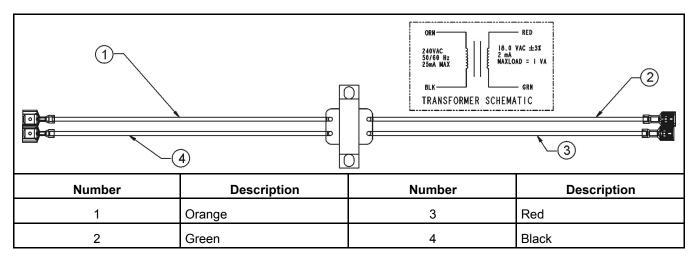


FIGURE 38. SIGNAL TRANSFORMER

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This section includes information on replaceable parts used with RSS transfer switches that include a controller and transfer switches that don't include a controller, see **Figure 39**.

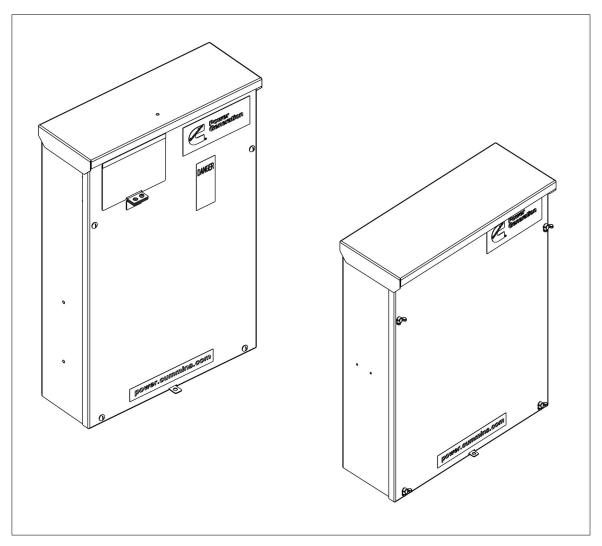
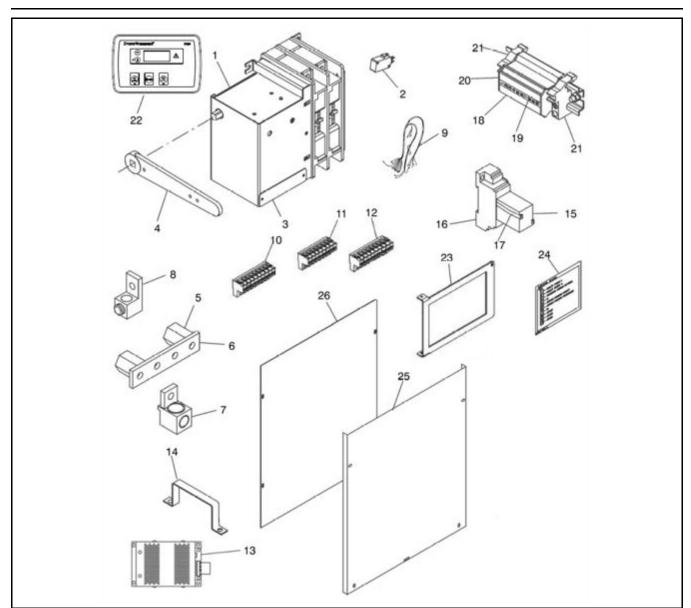


FIGURE 39. RSS TRANSFER SWITCH TYPES

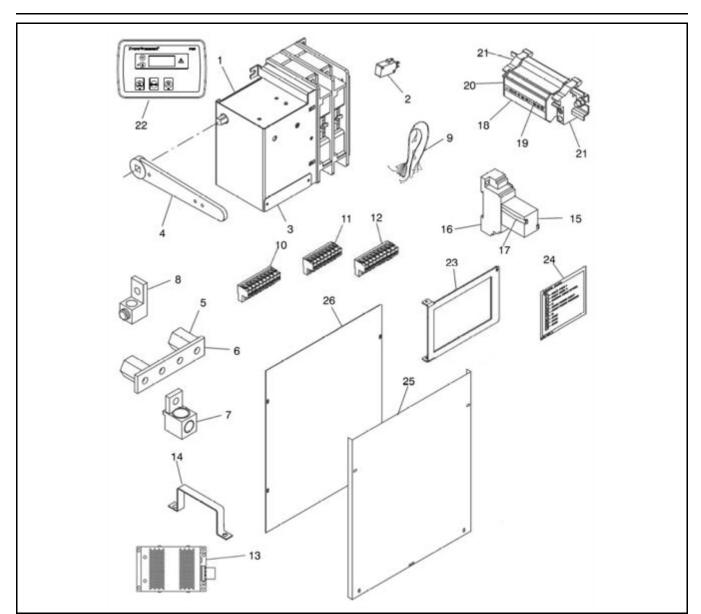
- 13

TABLE 19. RSS TRANSFER SWITCH WITH A CONTROLLER

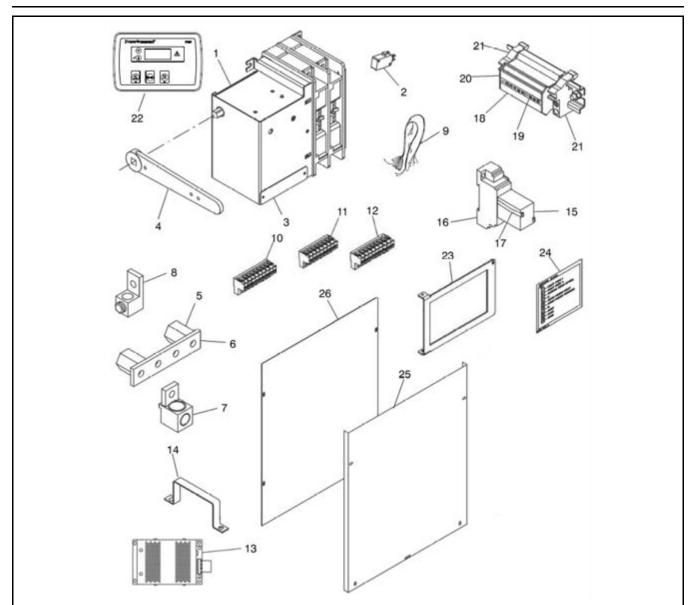
Ref No.	Part No.	Qty Used	Part Description	
1			Transfer Switch Mechanism (Includes Items 2 and 3)	
	306-5191	1	RSS100	
	306-5192	1	RSS200	
2	308-1235	2	Limit Switch (ASW and BSW) *(Not sold separately - Order item #1)*	
3	319-6882	1	Terminal Cover, Switch Mechanism	
4	306-5297	1	Handle, Manual Operation	
5	332-2370	2	Standoff, Isolated	



Ref No.	Part No.	Qty Used	Part Description
6			Neutral Bus Bar
	337-3927	1	RSS100
	337-3982	1	RSS200
7			Lug, Mechanical (Neutral and Mechanical)
	332-3084	9	RSS100
	332-3038	9	RSS200
8	332-3647	2	Lug, Ground
9	A064X544		Harness (Includes Items 10, 11, and 12)
10			
	0323-1678-10	1	Controller Connector, 10 Pin (P1)

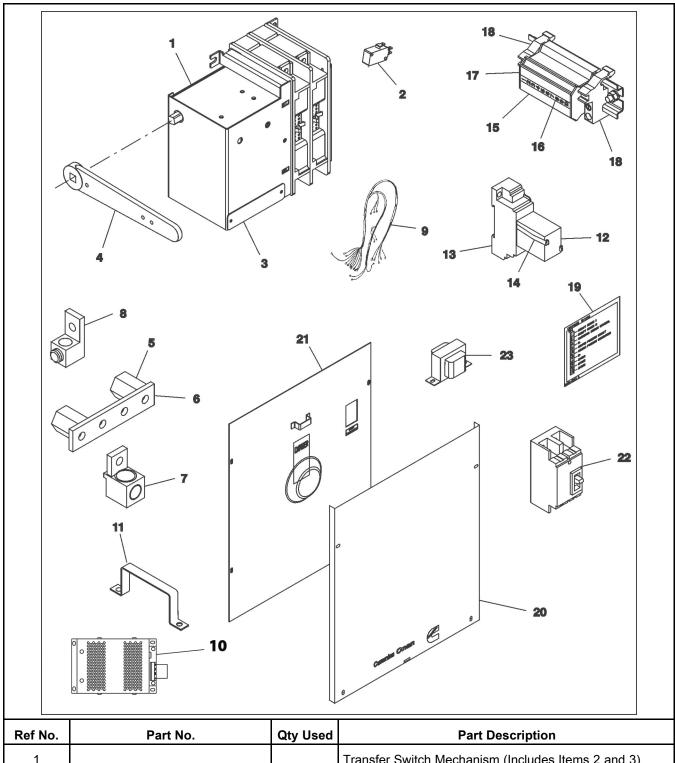


Ref No.	Part No.	Qty Used	Part Description
	0323-1678-06	1	Controller Connector, 6 Pin (P4)
11	A065D907	1	Controller Connector, 4 Pin (P2)
12	A065J117	1	Controller Connector, 8 Pin (P3)
13	A046Y535	1	Battery Charger *Adapter kit A048K877 also required for units built before 10/2013
14	319-6431	2	Bracket, Mounting - Battery Charger
15	307-3070	2	Relay, Control
16	307-3076	2	Base, Relay
17	307-3077	4	Bracket, Relay Clip
18	332-4373-02	1	Terminal Block, 6 Pole

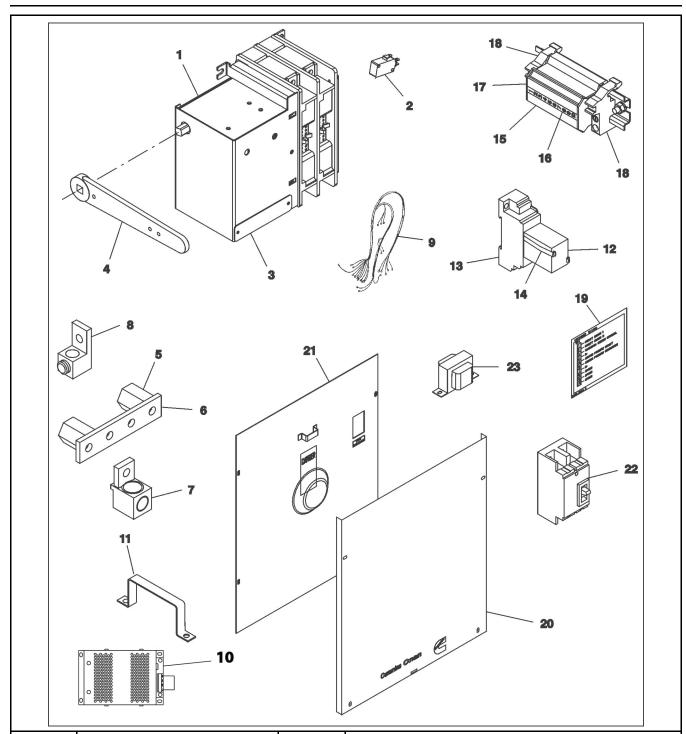


Ref No.	Part No.	Qty Used	Part Description
19	098-8422-04	1	Label, Terminal Block
20	332-4144	2	End Cap, Terminal Block
21	332-4145	3	End Bracket, Terminal
22	A064W811	1	Display Control
23	A064Y436	1	Bracket, Controller Mounting
24	098-8692	1	Label, Customer Connection
25	A064Y431	1	Door Panel - RSS100
26	A064Y448	1	Door Panel - RSS200

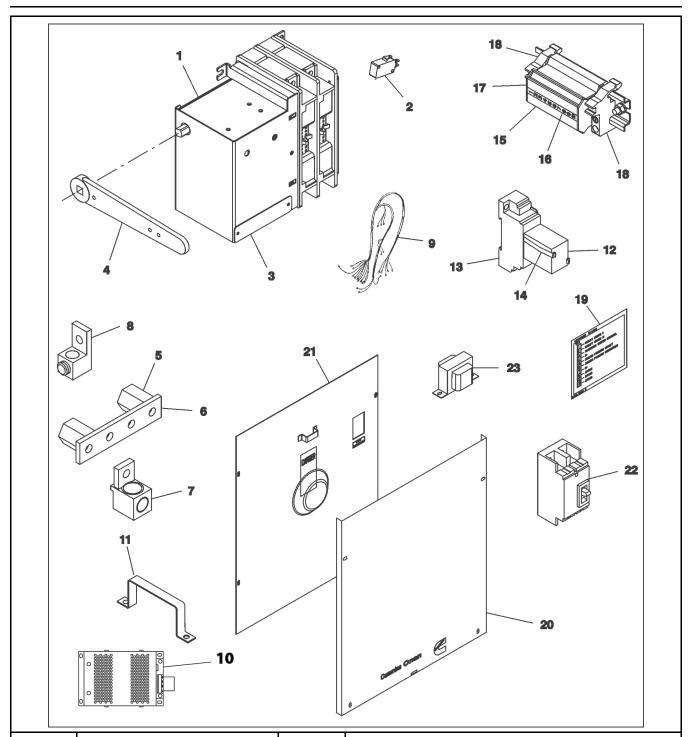
TABLE 21. RSS TRANSFER SWITCH WITHOUT A CONTROLLER



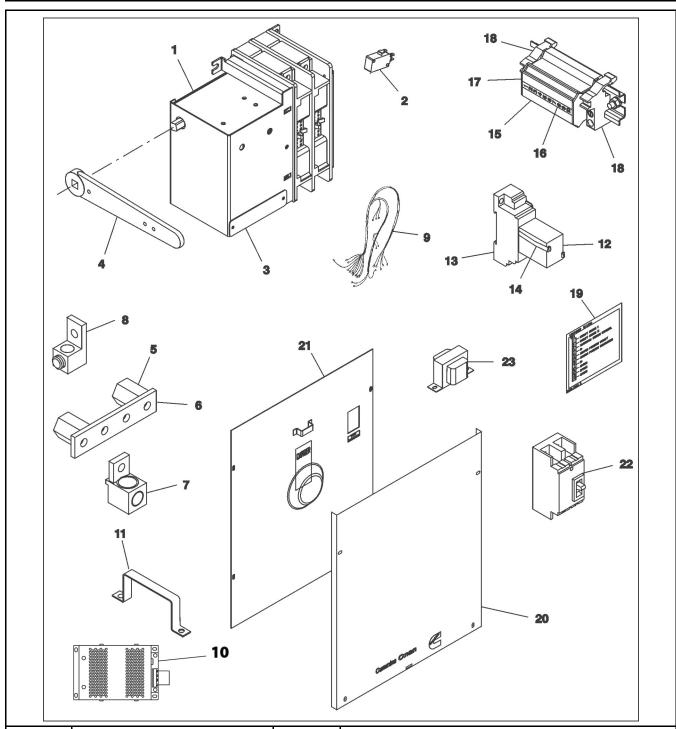
Ref No.	Part No.	Qty Used	Part Description
1			Transfer Switch Mechanism (Includes Items 2 and 3)
	306-5191	1	RSS100
	306-5192	1	RSS200
2	308-1235	2	Limit Switch



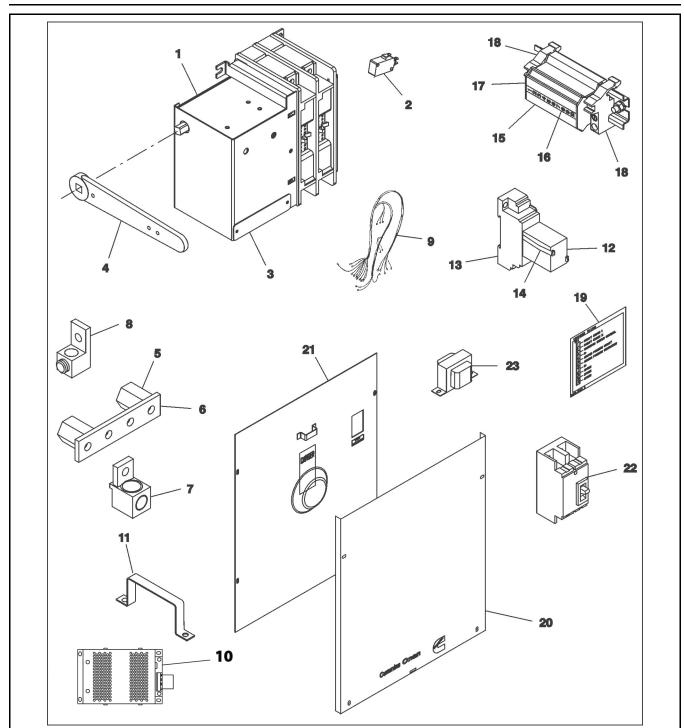
Ref No.	Part No.	Qty Used	Part Description
3	319-6882	1	Terminal Cover, Switch Mechanism
4	306-5297	1	Handle, Manual Operation
5	332-2370	2	Standoff, Insulated



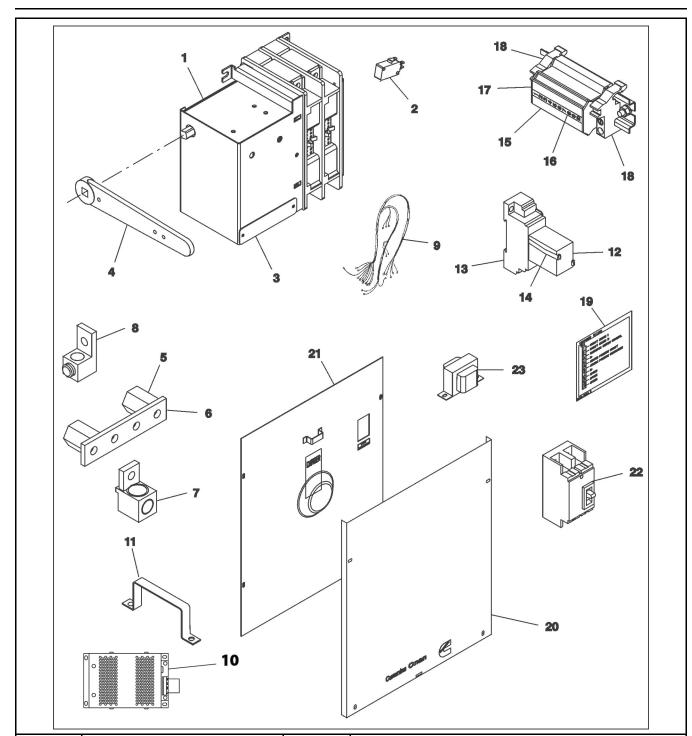
Ref No.	Part No.	Qty Used	Part Description
6			Neutral Bus Bar
	337-3942	1	RSS100
	337-3984	1	RSS200



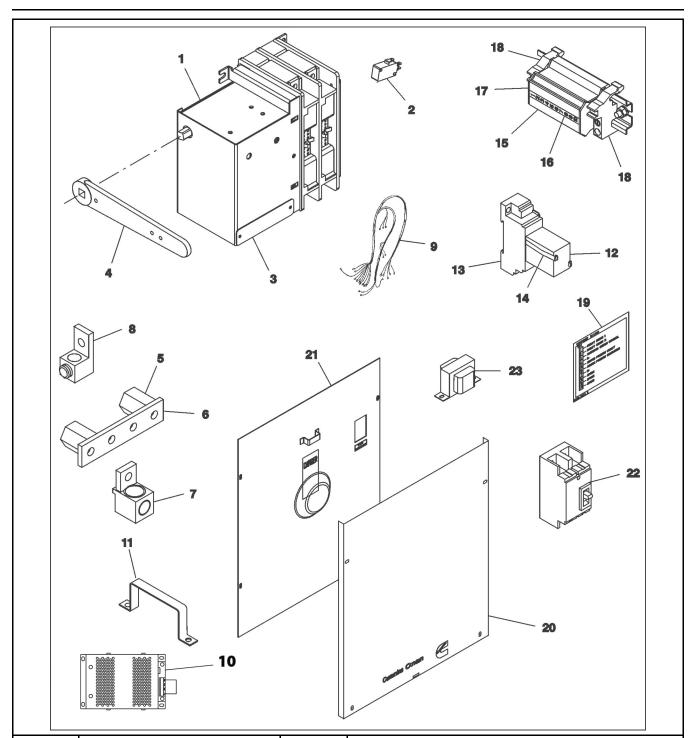
Ref No.	Part No.	Qty Used	Part Description
7			Lug, Mechanical (Neutral and Mechanical)
	332-3084	7	RSS100
	332-3038	4	RSS200
8	332-3647	5	Lug, Ground
9	338-5058	1	Harness



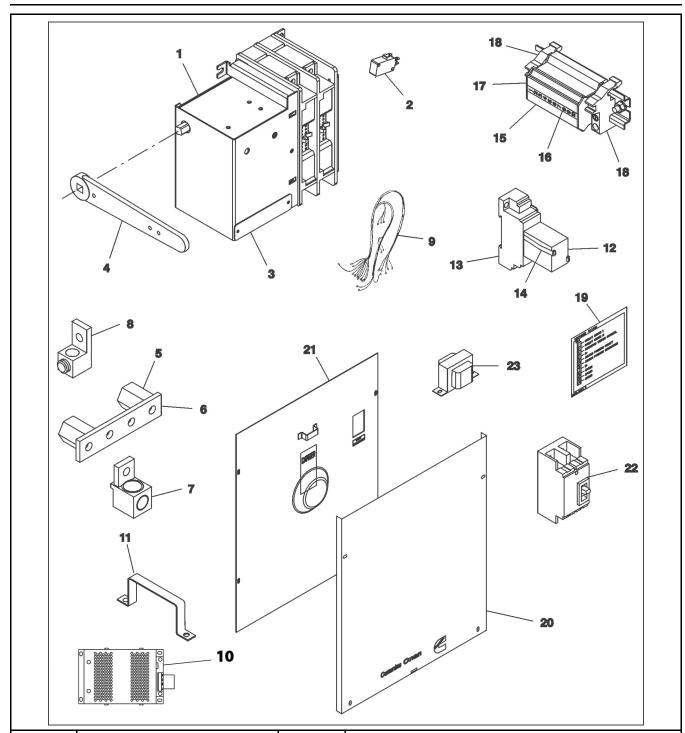
Ref No.	Part No.	Qty Used	Part Description
10	A046Y537	1	Battery Charger *Adapter kit A048K877 also required for units built before 10/2013
11	319-6431	2	Bracket, Mounting - Battery Charger
12	307-3146	1	Relay, Control
13	307-3147	1	Base, Relay



Ref No.	Part No.	Qty Used	Part Description
14	307-3077	2	Bracket, Relay Clip
15	332-4373-01	1	Terminal Block, 10 Pole
16	098-8422-01	1	Label, Terminal Block
17	332-4144	2	End Cap, Terminal Block
18	332-4145	2	End Bracket, Terminal



Ref No.	Part No.	Qty Used	Part Description
19	098-8803	1	Label, Customer Connection
20	319-7055	1	Door Panel, Outer
21	319-7056	1	Door Panel, Inner



Ref No.	Part No.	Qty Used	Part Description
22			Circuit Breaker
	320-2473-01	1	RSS100
	320-2473-02	1	RSS200
23	315-1731	1	Transformer

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Figure 43. Utility Power Returns, Transfer from the Generator Set to the Utility	108

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6-2021 Appendix B. Troubleshooting Reference Drawings

B.0 Typical Conditional Schematic

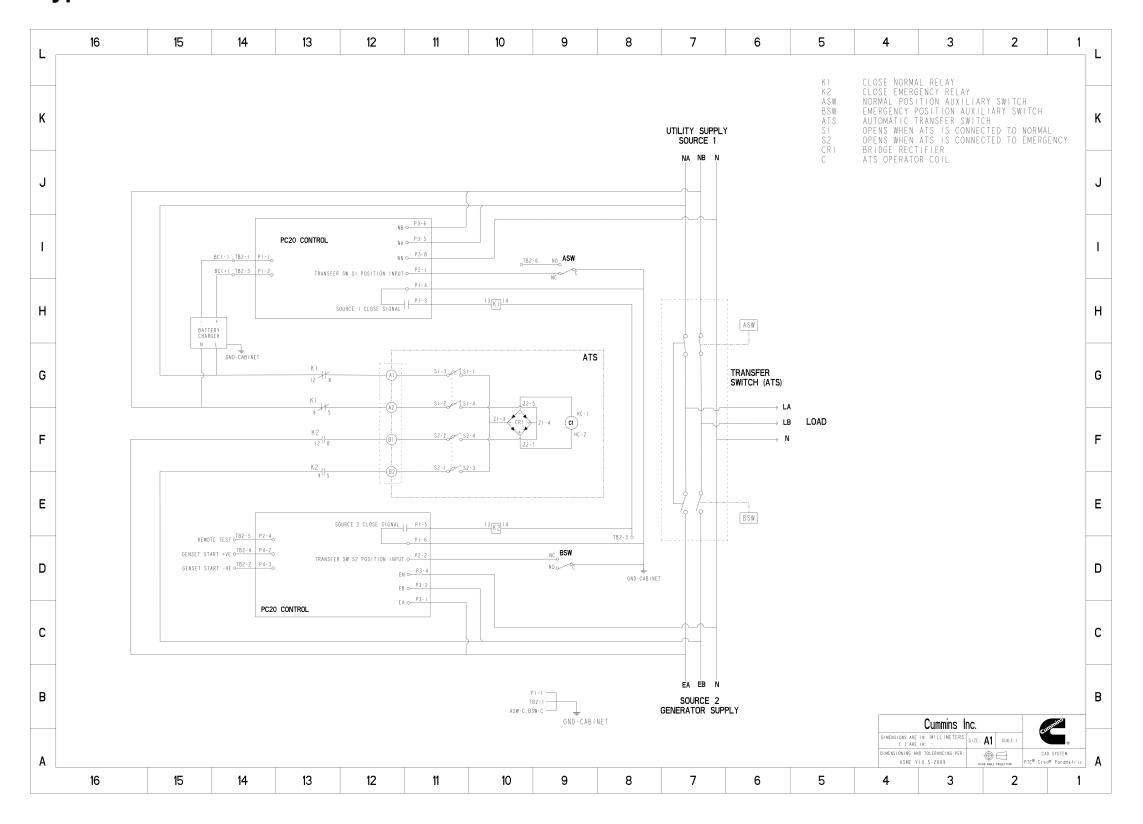


FIGURE 40. LOSS OF UTILITY POWER OCCURS, TRANSFER FROM THE UTILITY TO THE GENERATOR SET

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Appendix B. Troubleshooting Reference Drawings 6-2021

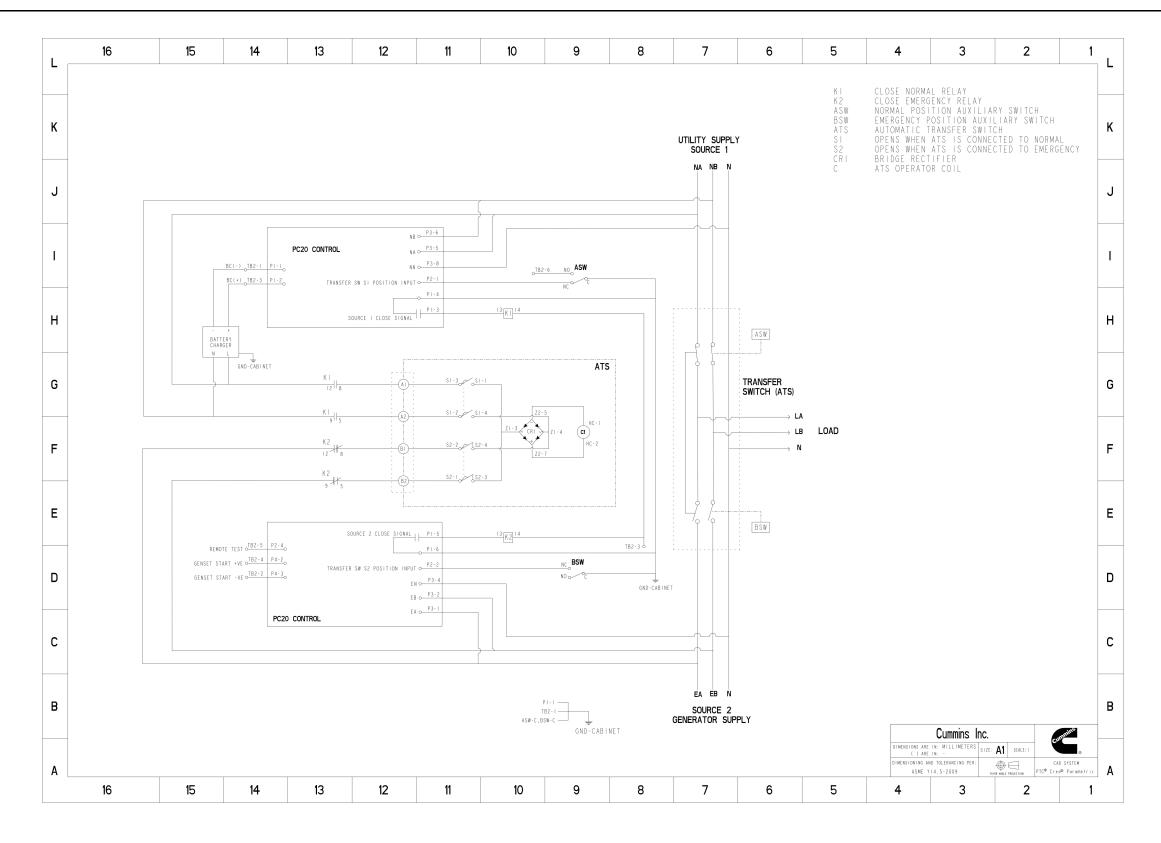


FIGURE 41. UTILITY POWER RETURNS, TRANSFER FROM THE GENERATOR SET TO THE UTILITY

6-2021 Appendix B. Troubleshooting Reference Drawings

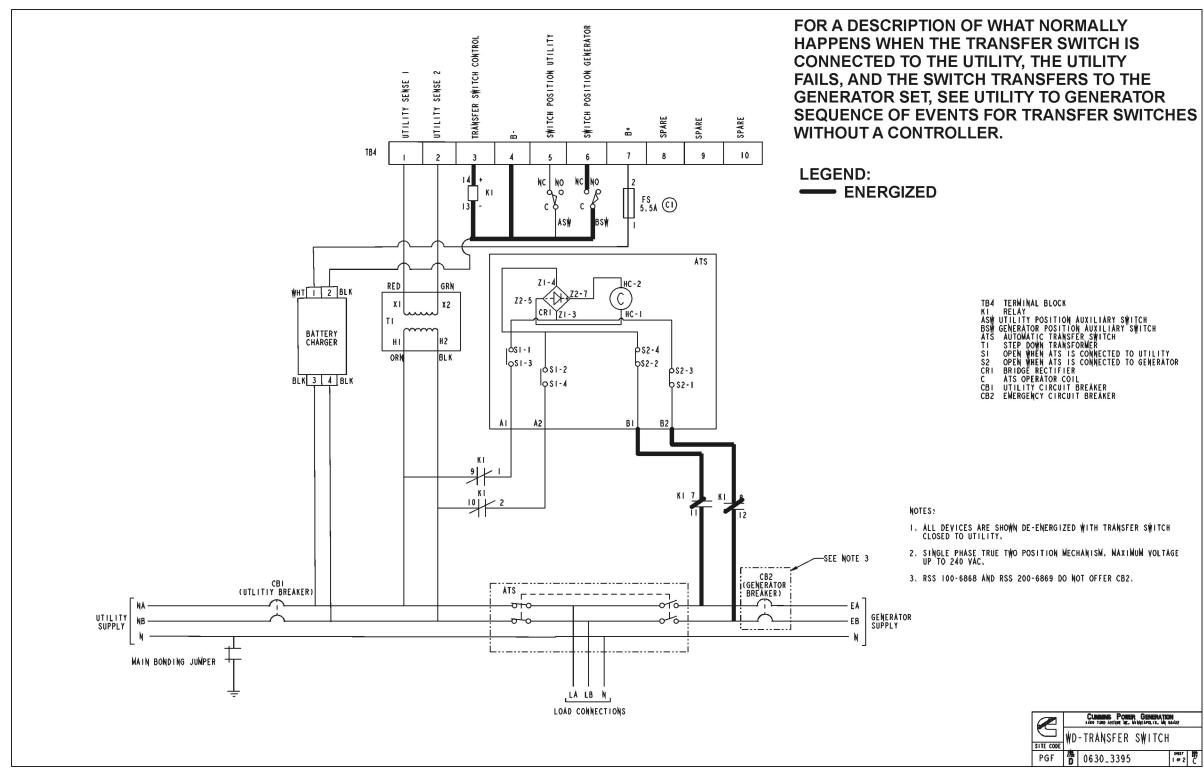


FIGURE 42. LOSS OF UTILITY POWER OCCURS, TRANSFER FROM THE UTILITY TO THE GENERATOR SET

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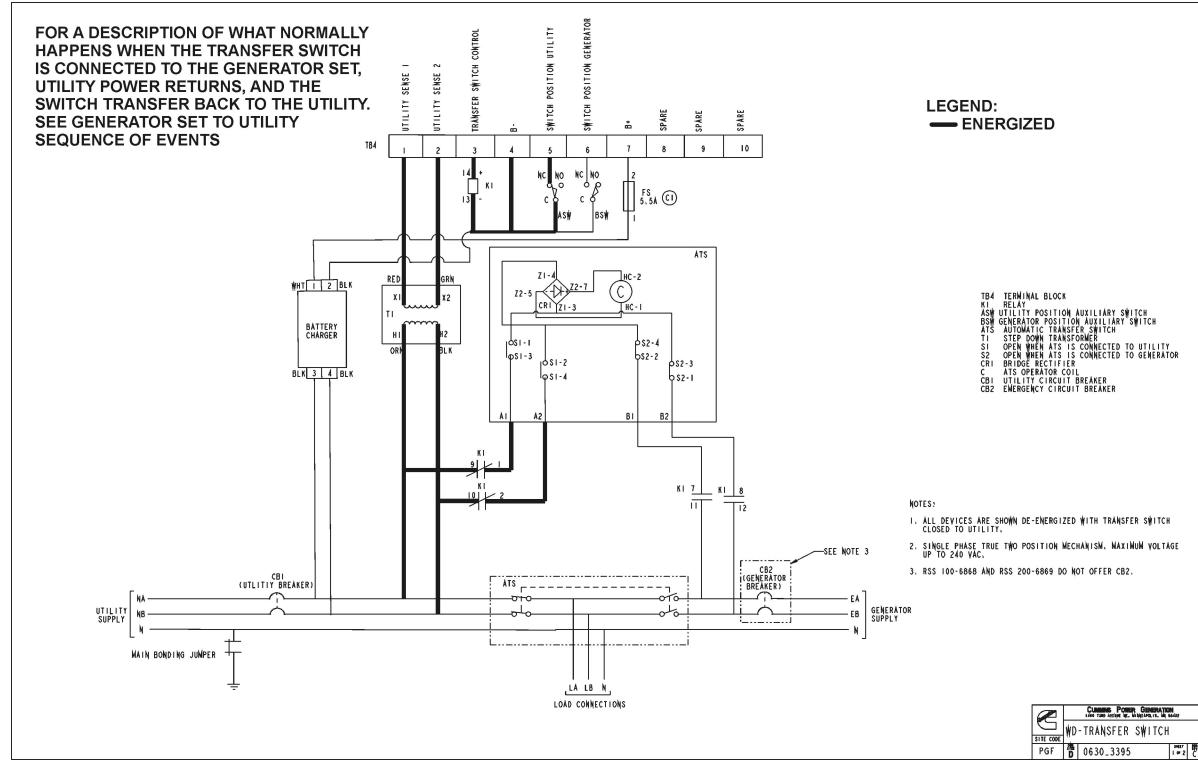


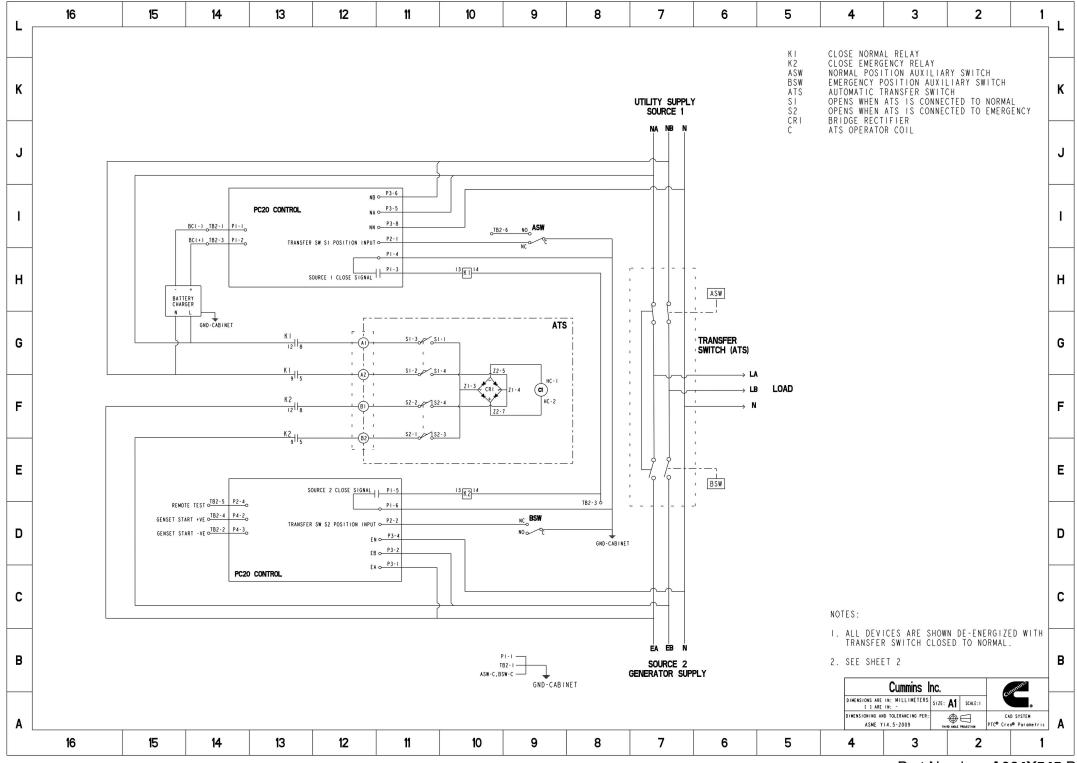
FIGURE 43. UTILITY POWER RETURNS, TRANSFER FROM THE GENERATOR SET TO THE UTILITY

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Figure 57. Interconnection Wiring Diagram without Controller for GS Series Generators (Sheet 1 of 2)
Figure 58. Interconnection Wiring Diagram without Controller for GS Series Generators (Sheet 2 of 2)

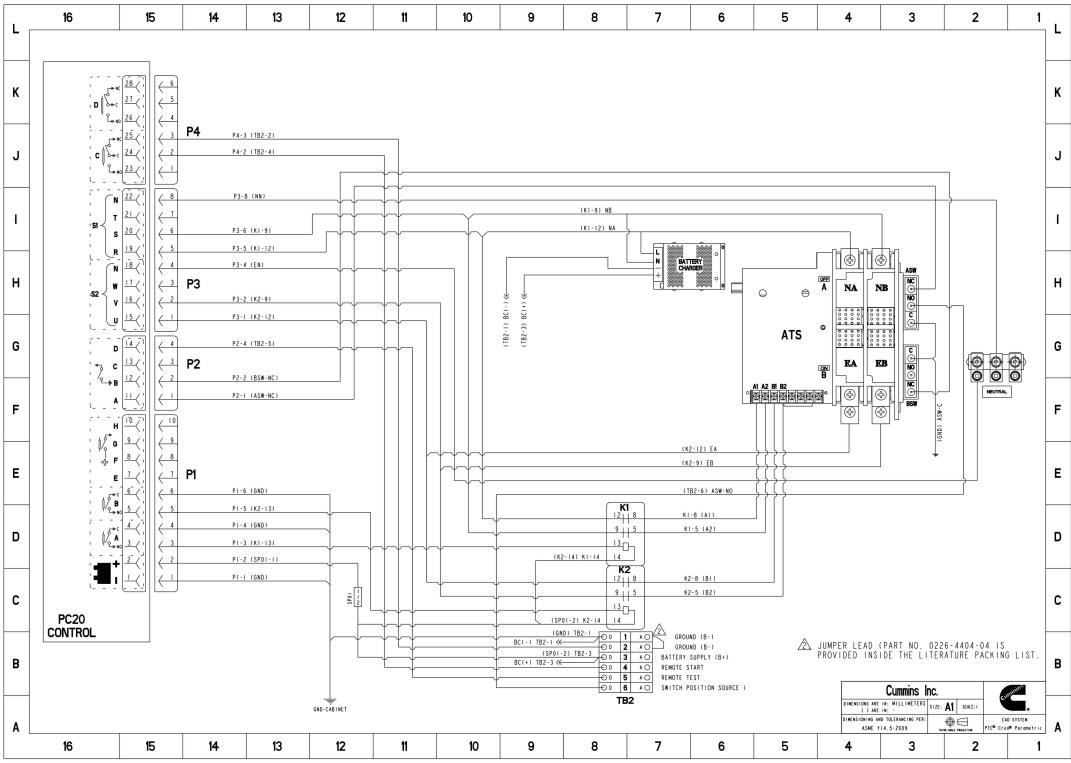
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C.0 RSS Transfer Switch Wire Diagram



Part Number: **A064X545** Part Revision: **E**Part Name: **DIAGRAM,SCHEMATIC**

FIGURE 44. RSS TRANSFER SWITCH WITH CONTROLLER WIRING DIAGRAM (SHEET 1 OF 2)



Part Number: **A064X545** Part Revision: **E**Part Name: **DIAGRAM,SCHEMATIC**

FIGURE 45. RSS TRANSFER SWITCH WITH CONTROLLER WIRING DIAGRAM (SHEET 2 OF 2)

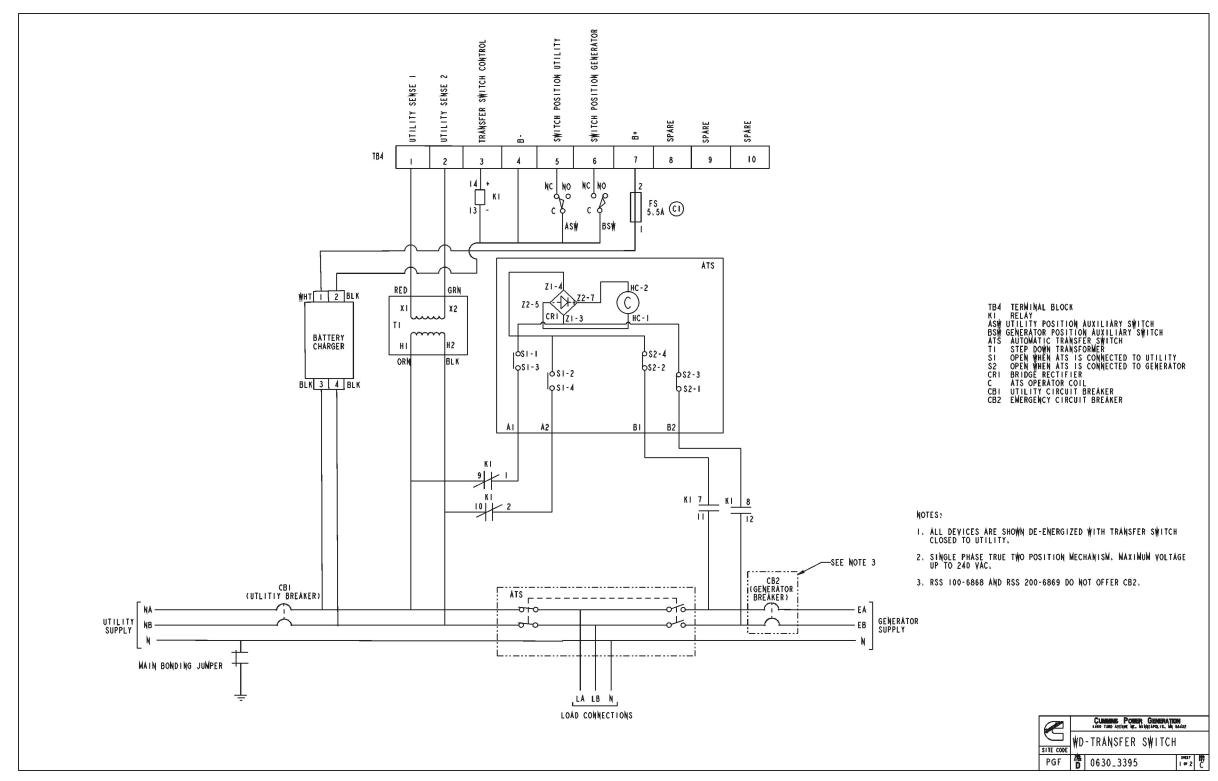


FIGURE 46. RSS TRANSFER SWITCH WITHOUT CONTROLLER WIRING DIAGRAM (SHEET 1 OF 2)

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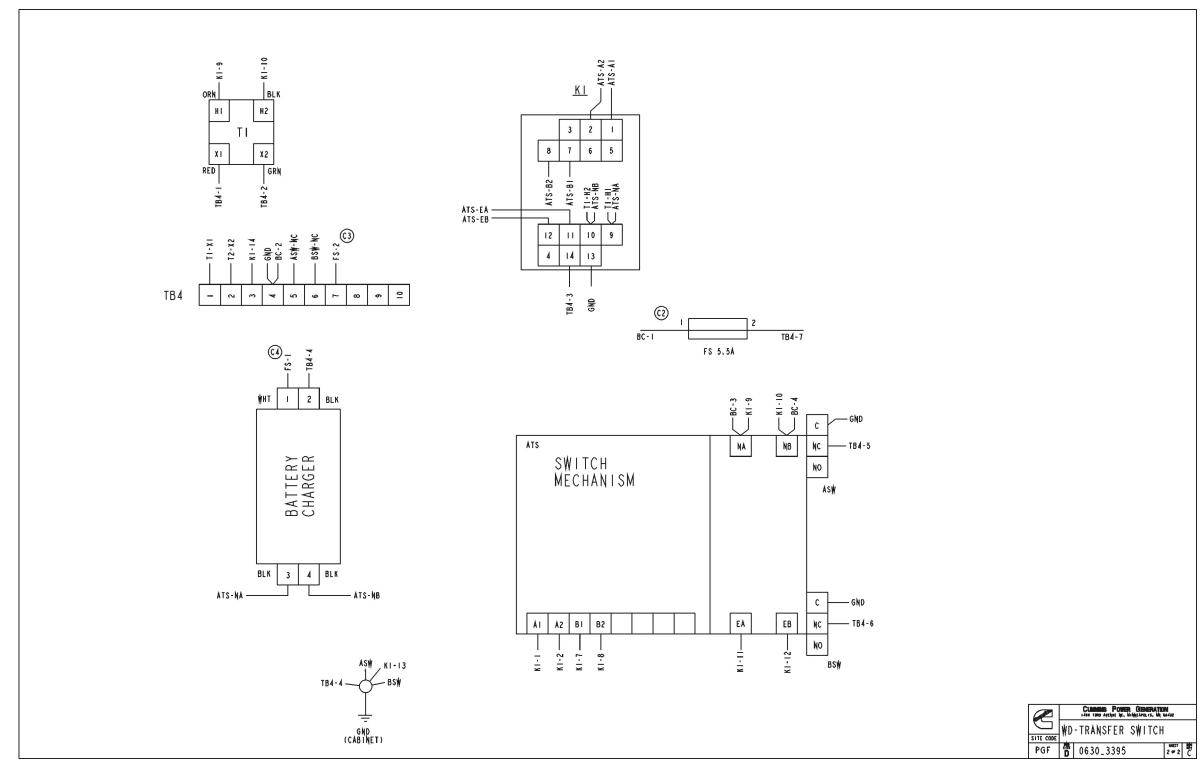


FIGURE 47. RSS TRANSFER SWITCH WITHOUT CONTROLLER WIRING DIAGRAM (SHEET 2 OF 2)

C.1 RSS Interconnection Wiring Diagram

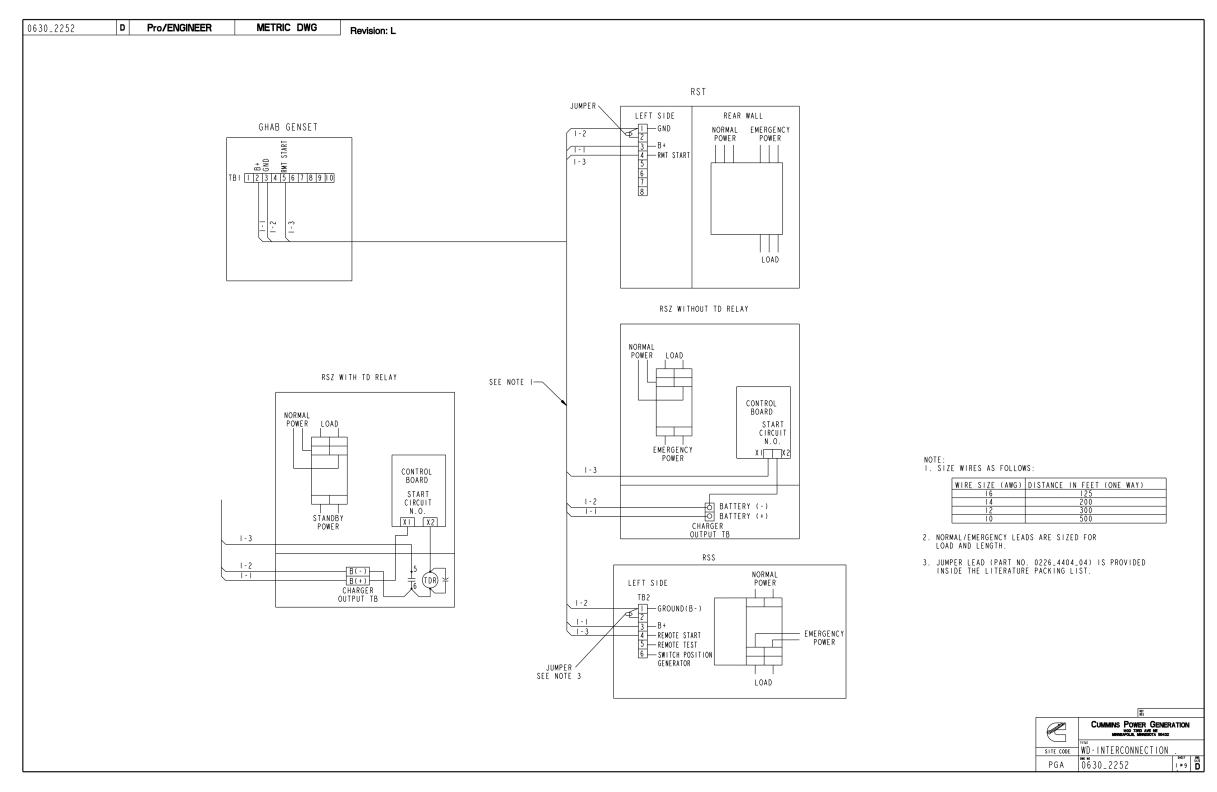


FIGURE 48. INTERCONNECTION WIRING DIAGRAM FOR GHAB GENERATOR (SHEET 1 OF 9)

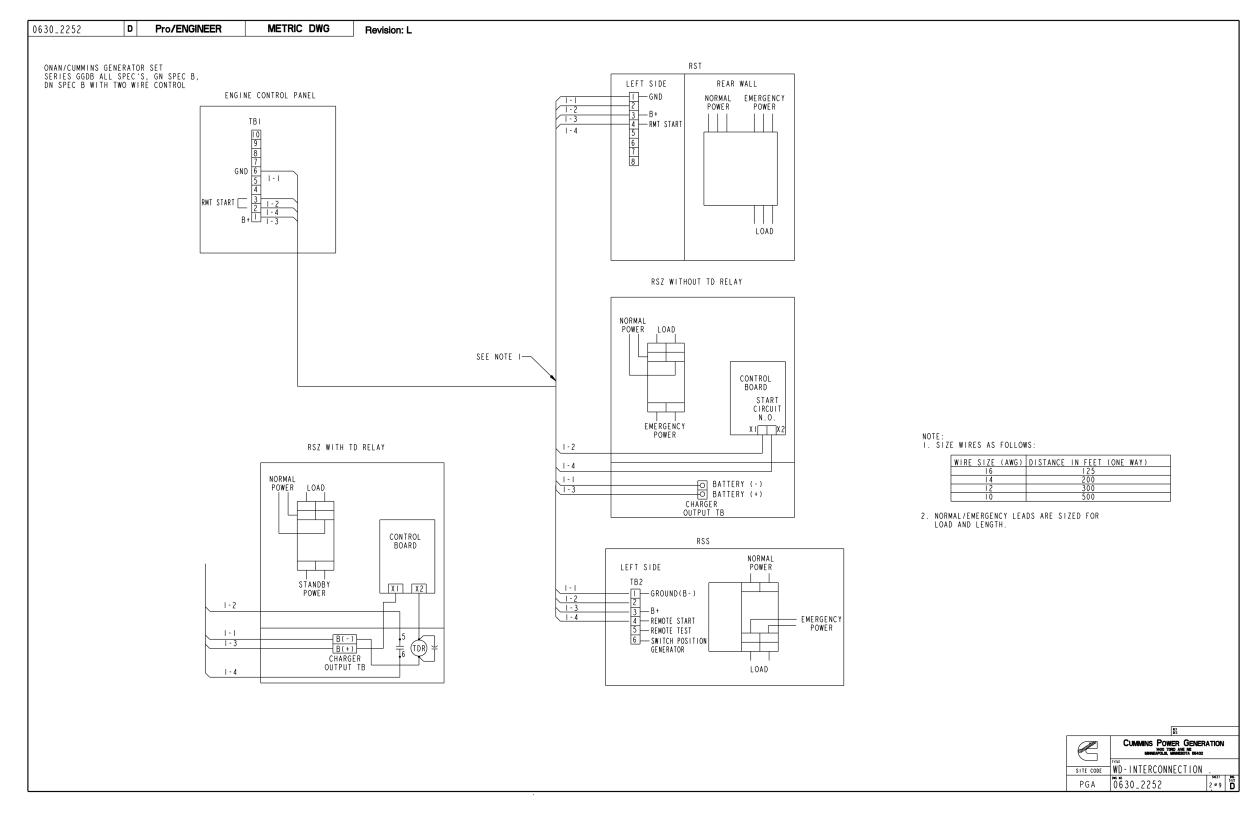


FIGURE 49. INTERCONNECTION WIRING DIAGRAM FOR GGDB (ALL SPECS), AND GN AND DN SPEC B GENERATORS WITH 2 WIRE CONTROL (SHEET 2 OF 9)

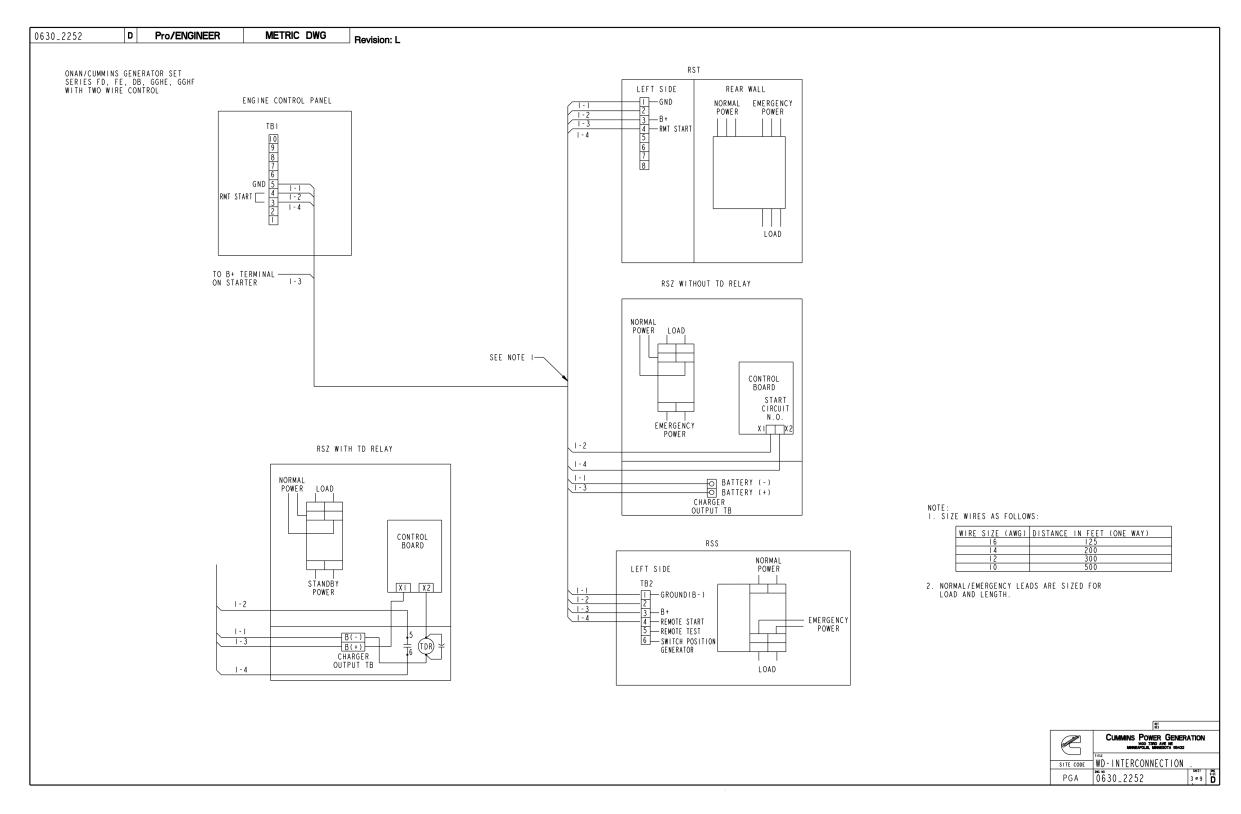


FIGURE 50. INTERCONNECTION WIRING DIAGRAM FOR SERIES FD, FE, DB, GGHE, AND GGHF GENERATORS WITH 2 WIRE CONTROL (SHEET 3 OF 9)

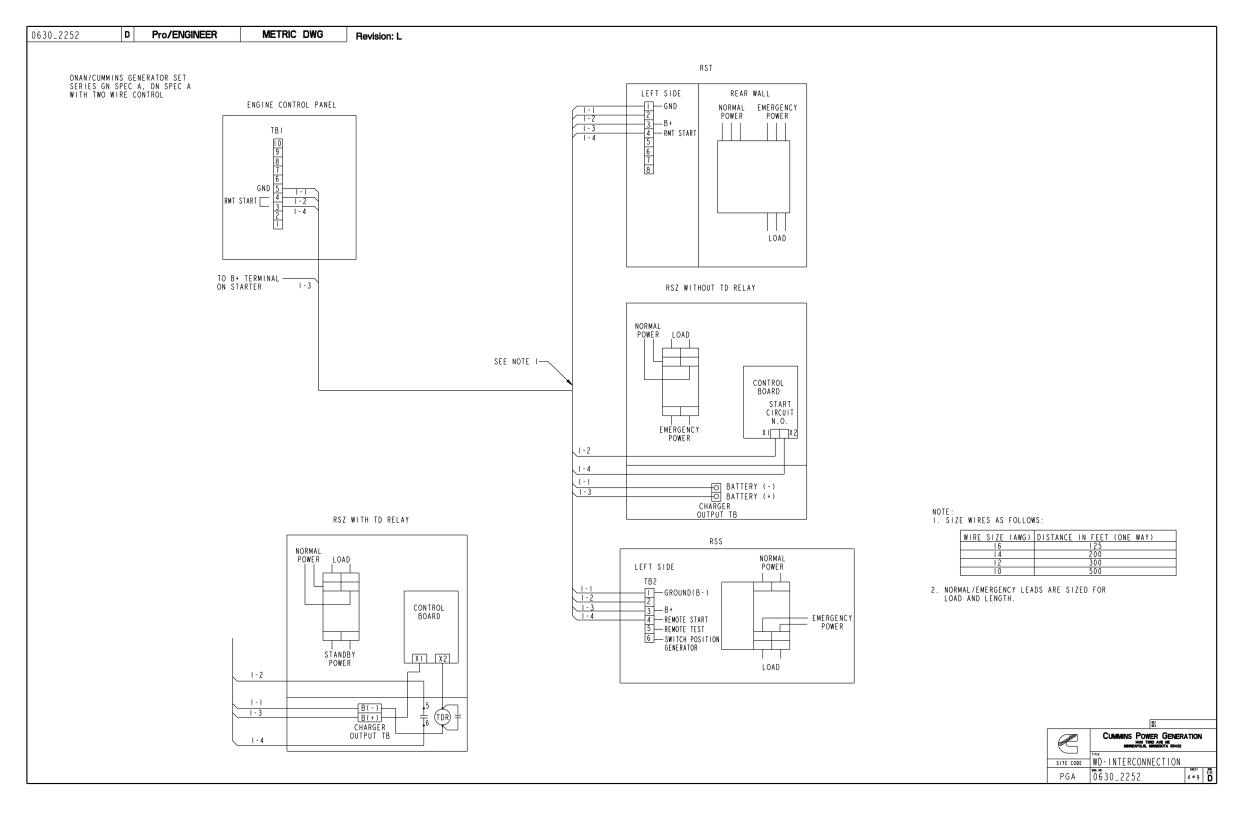


FIGURE 51. INTERCONNECTION WIRING DIAGRAM FOR SERIES GN SPEC A, AND DN SPEC A GENERATORS WITH 2 WIRE CONTROL (SHEET 4 OF 9)

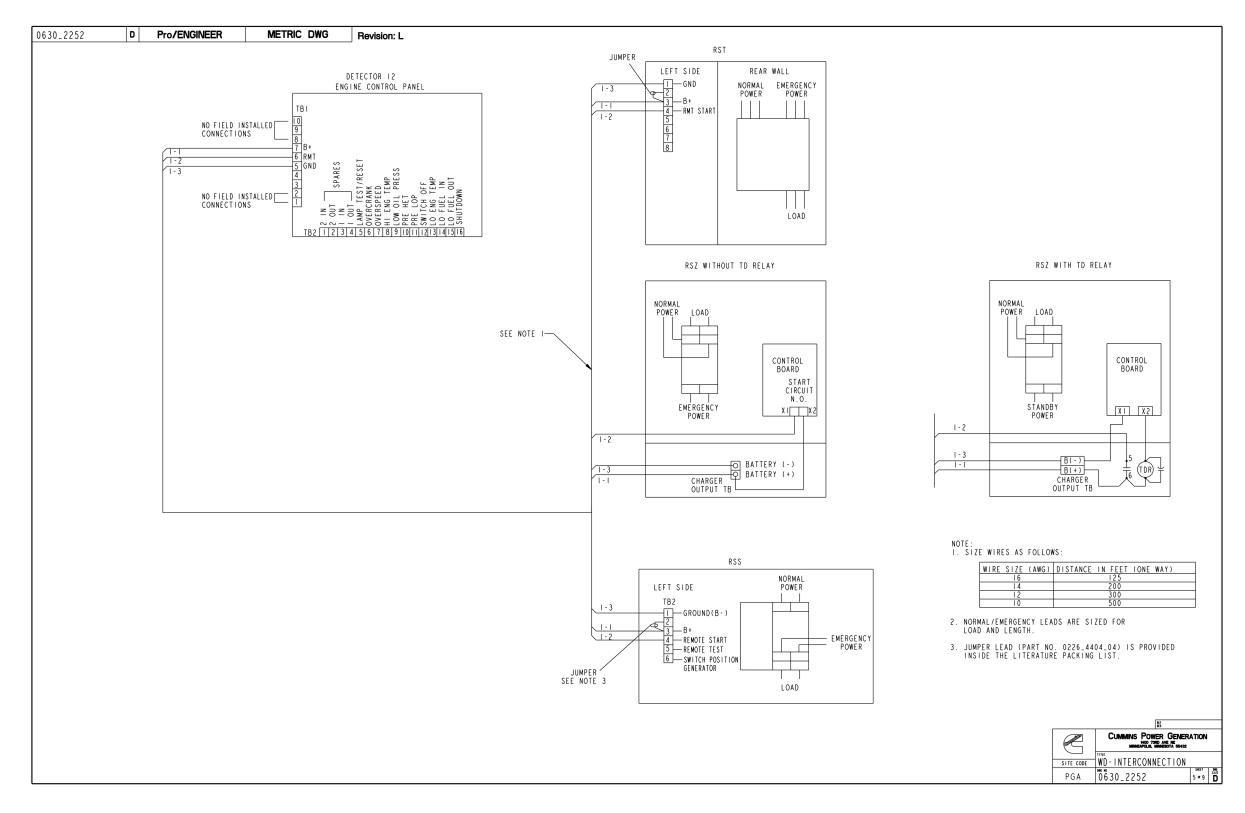


FIGURE 52. INTERCONNECTION WIRING DIAGRAM FOR DETECTOR 12 ENGINE CONTROL (SHEET 5 OF 9)

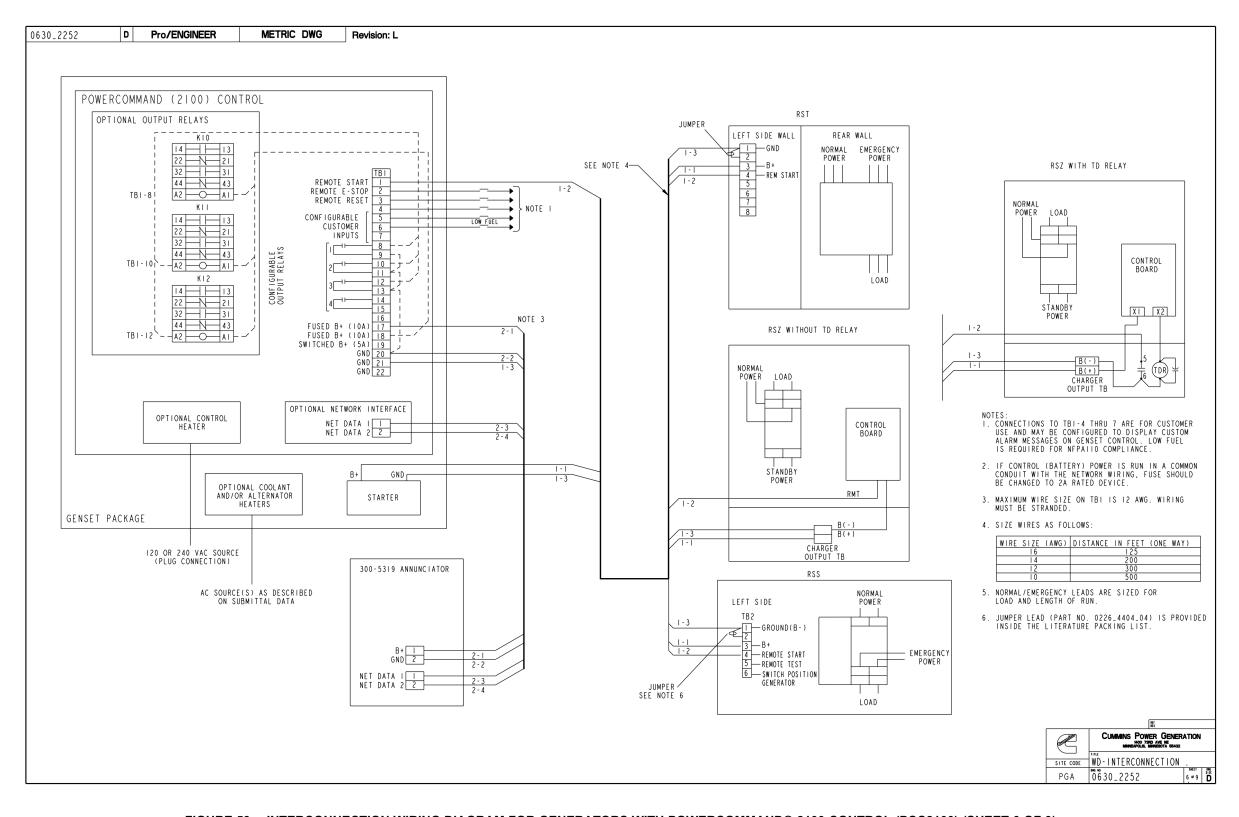


FIGURE 53. INTERCONNECTION WIRING DIAGRAM FOR GENERATORS WITH POWERCOMMAND® 2100 CONTROL (PCC2100) (SHEET 6 OF 9)

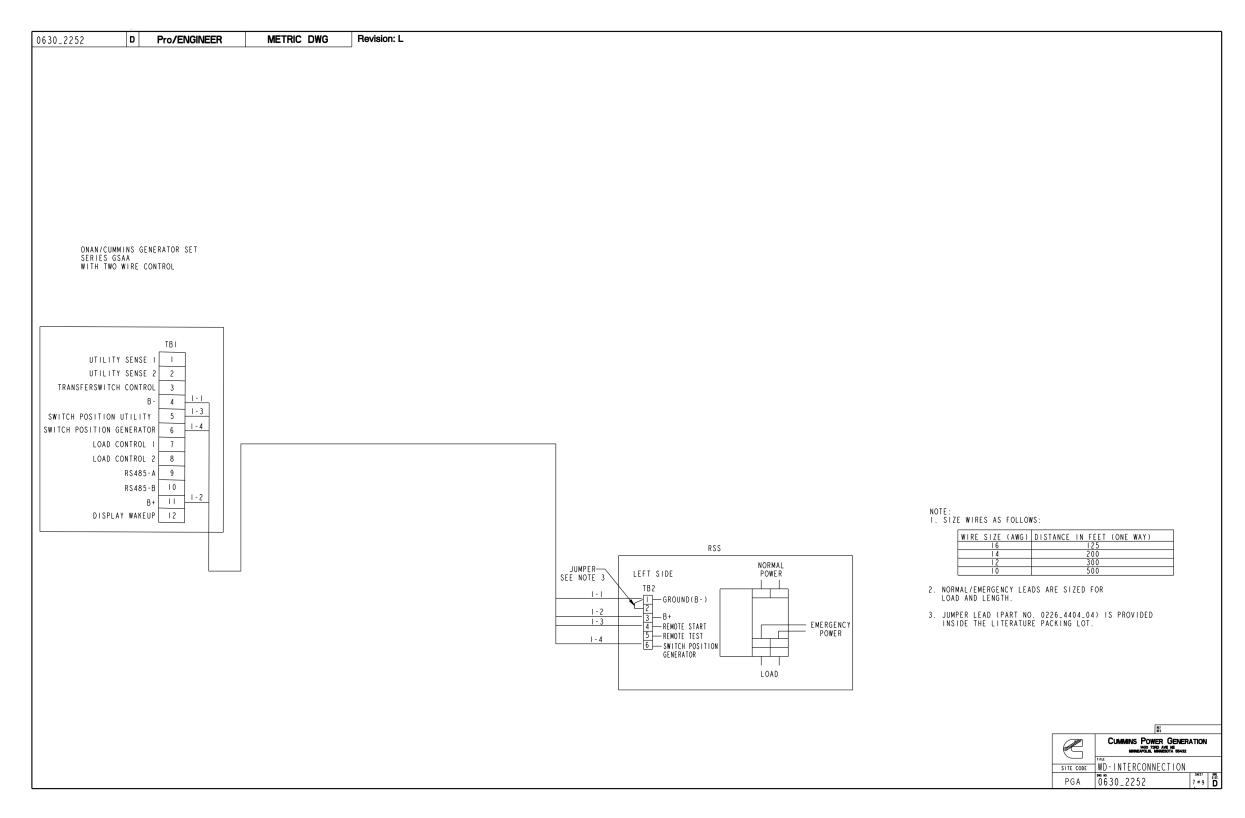


FIGURE 54. INTERCONNECTION WIRING DIAGRAM FOR SERIES GSAA GENERATORS WITH TWO WIRE CONTROL (SHEET 7 OF 9)

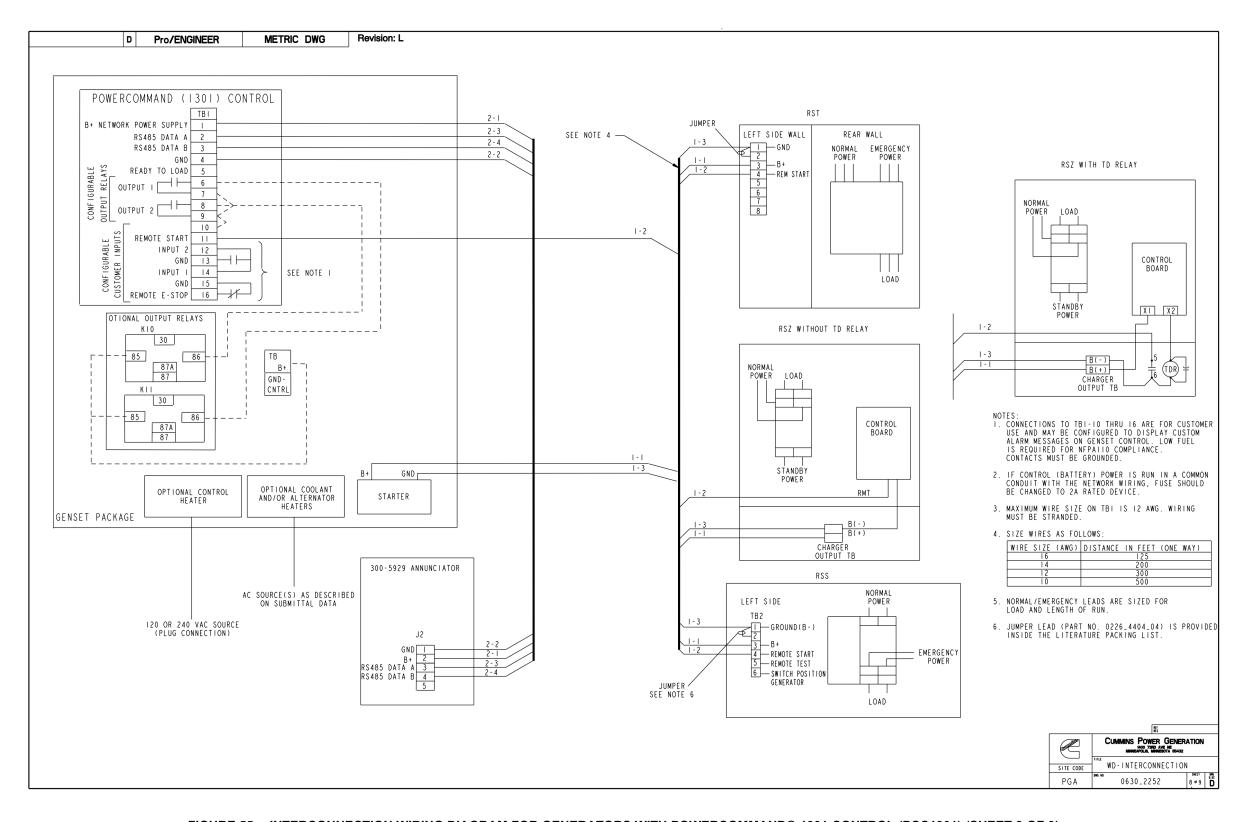


FIGURE 55. INTERCONNECTION WIRING DIAGRAM FOR GENERATORS WITH POWERCOMMAND® 1301 CONTROL (PCC1301) (SHEET 8 OF 9)

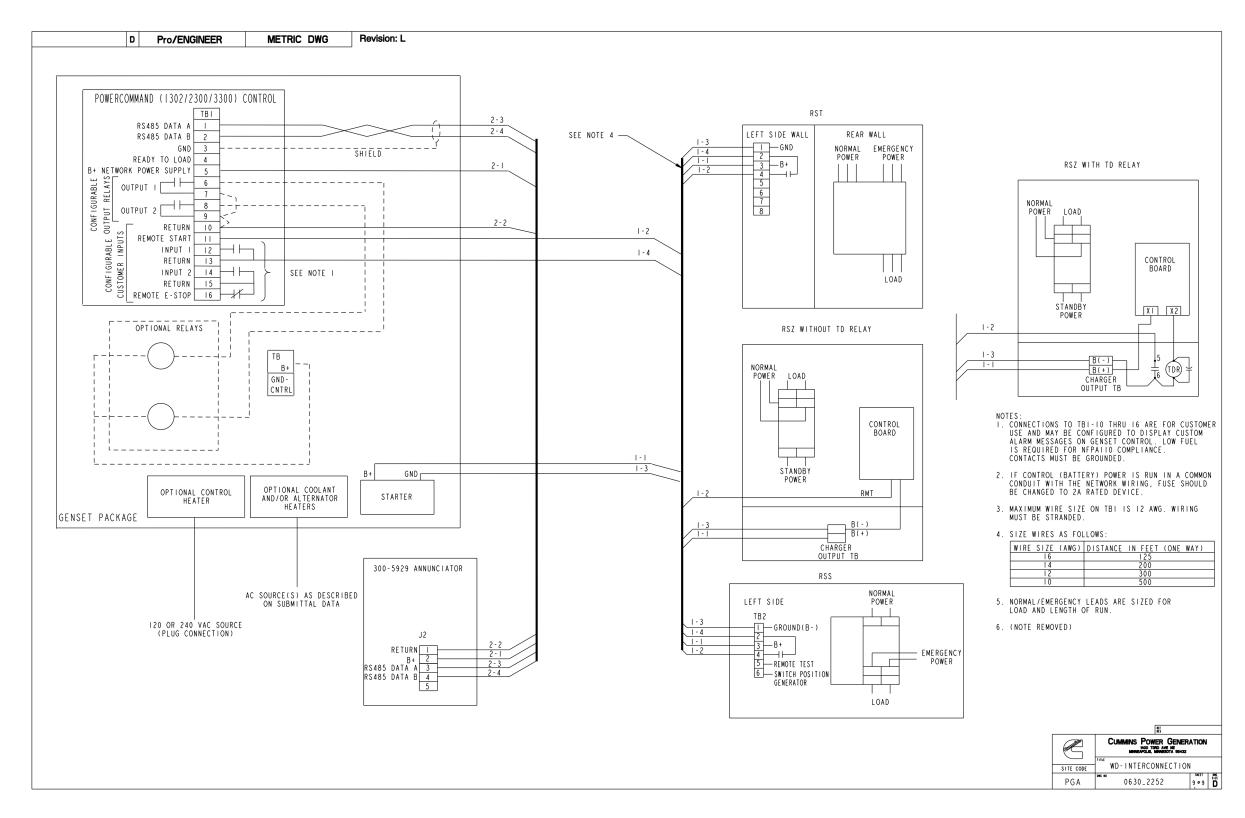


FIGURE 56. INTERCONNECTION WIRING DIAGRAMS FOR GENERATORS WITH POWERCOMMAND® 1302, 2300, 3300 CONTROLS (PCC1302, PCC2300, AND PCC3300) (SHEET 9 OF 9)

C.2 Interconnection Wiring Diagram without Controller

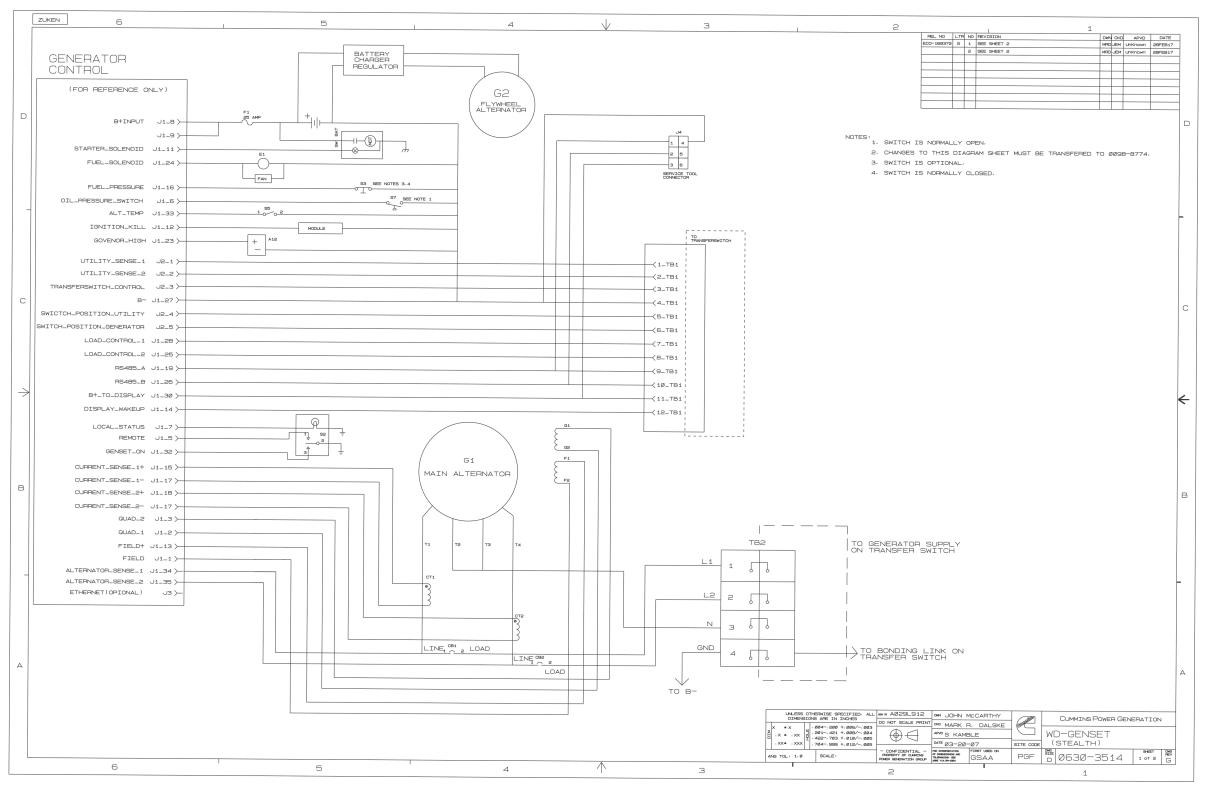


FIGURE 57. INTERCONNECTION WIRING DIAGRAM WITHOUT CONTROLLER FOR GS SERIES GENERATORS (SHEET 1 OF 2)

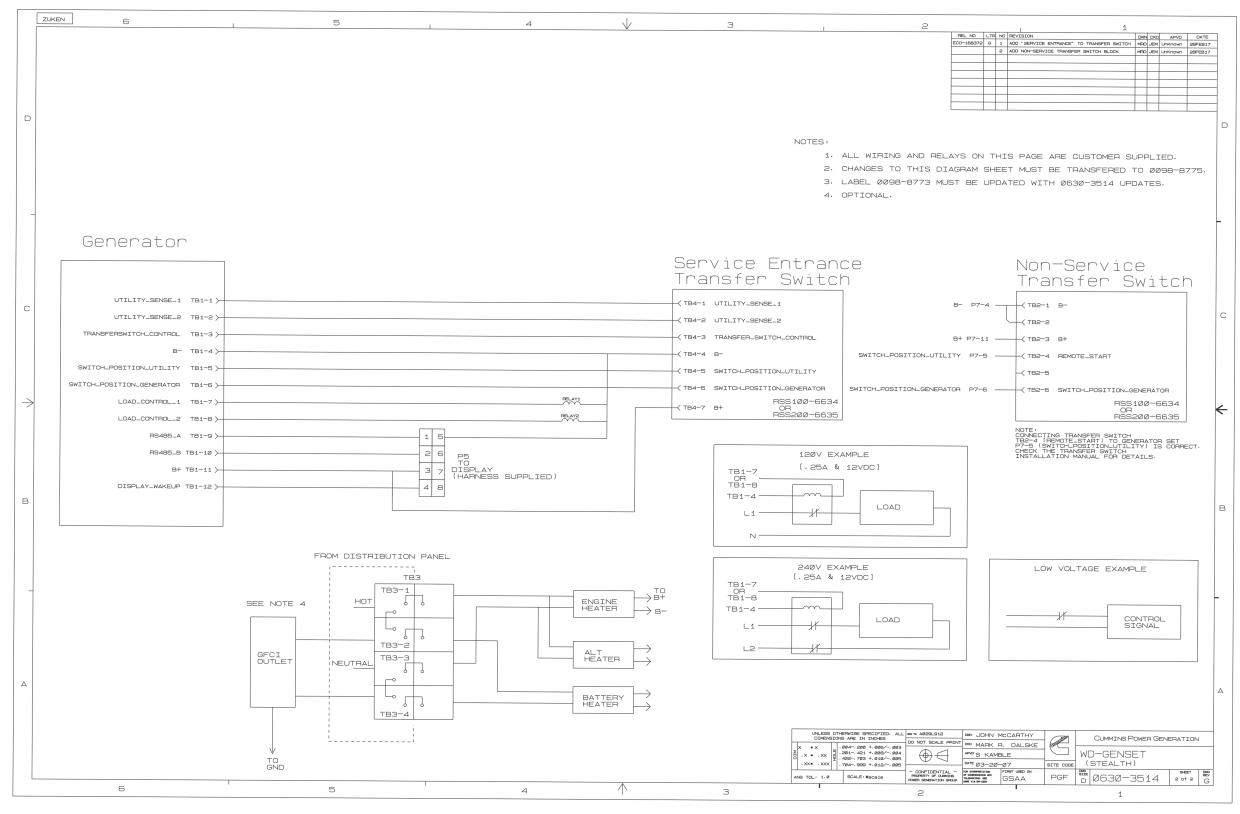


FIGURE 58. INTERCONNECTION WIRING DIAGRAM WITHOUT CONTROLLER FOR GS SERIES GENERATORS (SHEET 2 OF 2)

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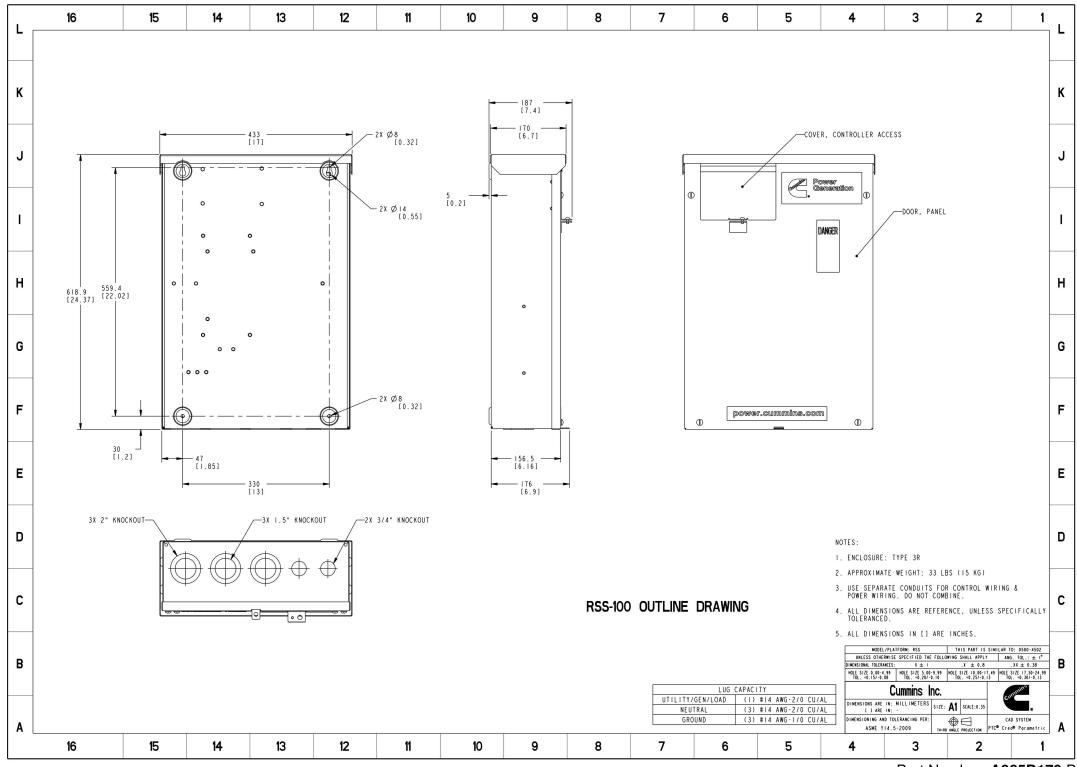
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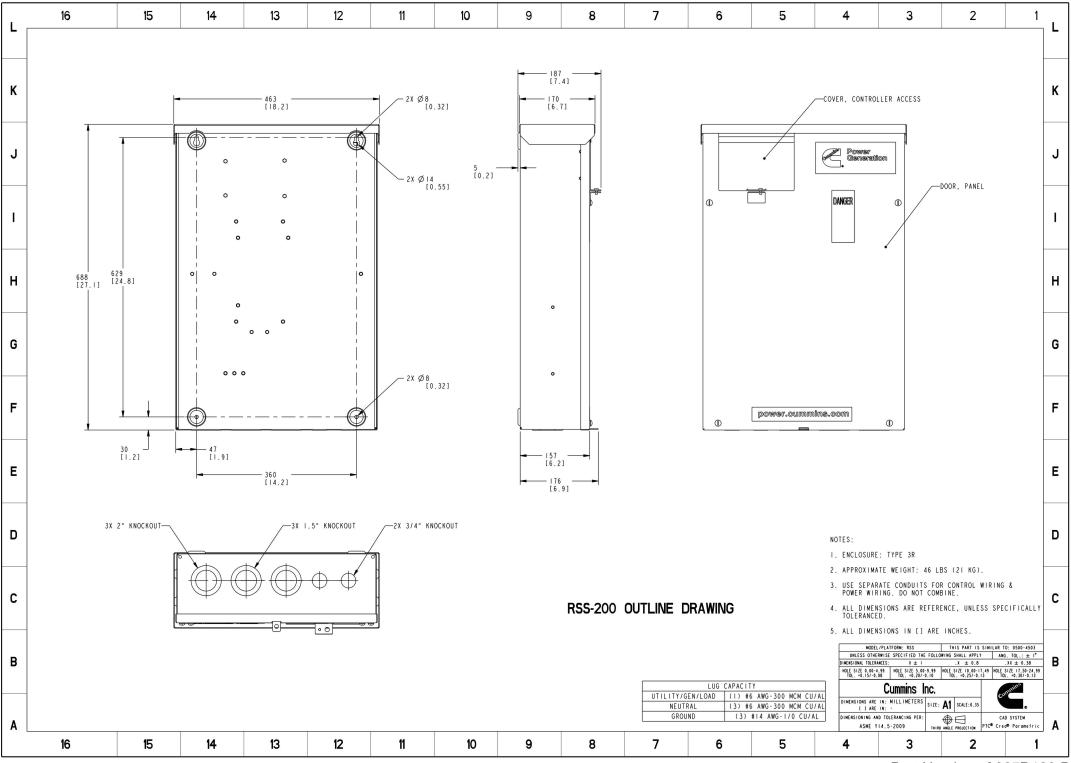
6-2021 Appendix D. Terminal Switch Outline Drawings



Part Number: **A065D179** Part Revision: **A**Part Name: **OUTLINE,ENCLOSURE**

FIGURE 59. RSS100 CONTROL BOX OUTLINE DRAWING WITH CONTROLLER

Appendix D. Terminal Switch Outline Drawings 6-2021



Part Number: **A065D180** Part Revision: **A**Part Name: **OUTLINE,ENCLOSURE**

FIGURE 60. RSS200 CONTROL BOX OUTLINE DRAWING WITH CONTROLLER

6-2021 Appendix D. Terminal Switch Outline Drawings

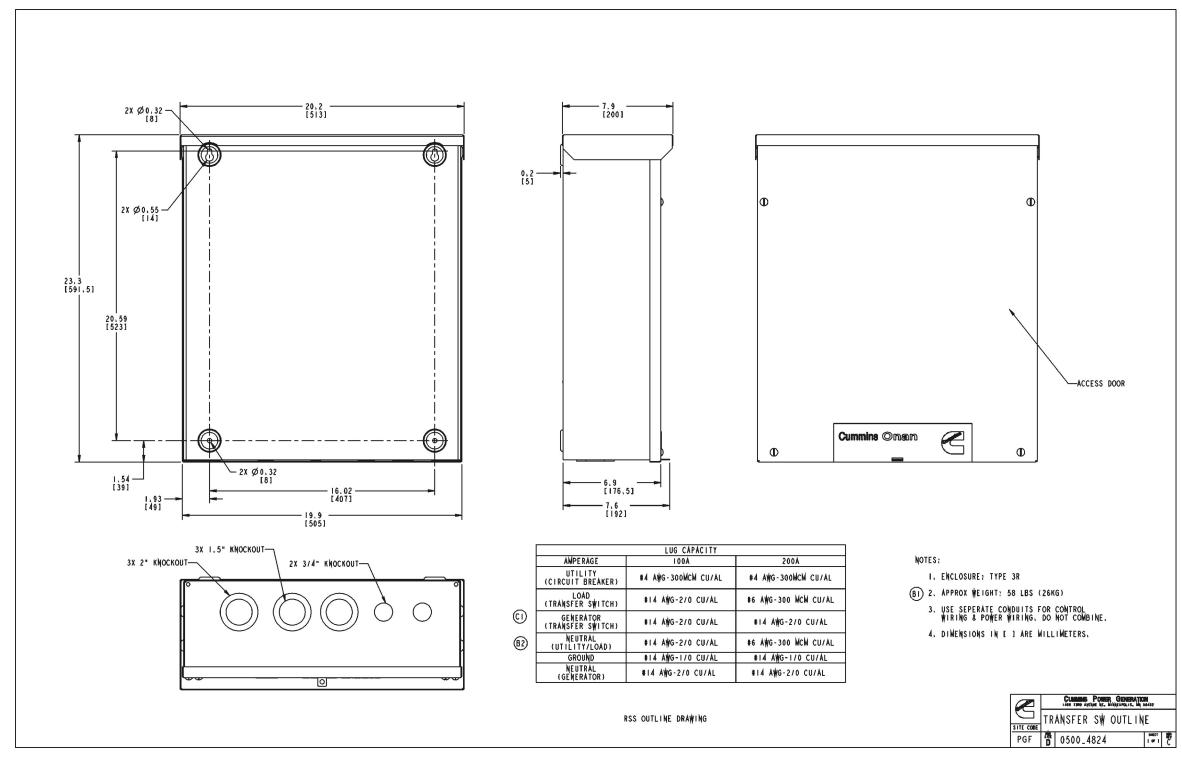


FIGURE 61. RSS100 AND RSS200 OUTLINE DRAWING - WITHOUT CONTROLLER

Appendix D. Terminal Switch Outline Drawings

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