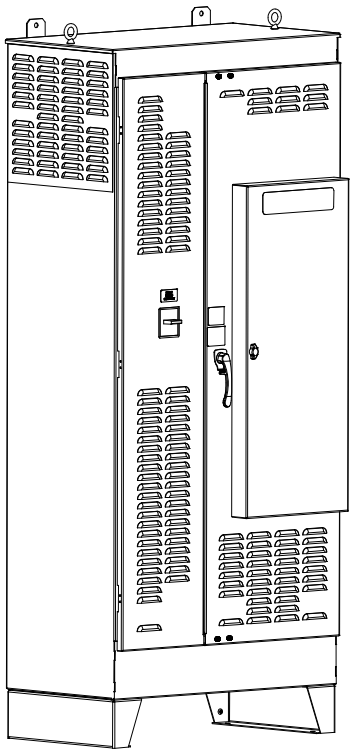
GENERAC®

Owner's Manual

Automatic Transfer Switch

Emergency Rated, Service Entrance, Open and Closed Transition, 800 - 1600 Amp, Single-Phase 208 (Wye and Delta) - 600 VAC (Wye and Delta)



Register your Generac product at:
WWW.REGISTER.GENERAC.COM
1–888–9ACTIVATE
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SAVE THIS MANUAL FOR FUTURE REFERENCE

Model:	
Serial:	
Date Purchased:	

⚠ CALIFORNIA WARNING

This product can expose you to chemicals including cadmium, a carcinogen and reproductive toxicant, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to: www.p65warnings.ca.gov

(W000810)

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Section 1: Safety

Introduction

Thank you for purchasing a Generac Power Systems Inc. product. This unit has been designed to provide high performance, efficient operation, and years of use when maintained properly. This transfer switch is listed with ETL under the UL1008 standard.

Read This Manual Thoroughly



⚠WARNING

Consult Manual. Read and understand manual completely before using product. Failure to completely understand manual and product could result in death or serious injury.

(W000100)

If any section of this manual is not understood, contact the nearest Independent Authorized Service Dealer (IASD) or Generac Customer Service at 1-888-436-3722 (1-888-GENERAC), or visit ***www.generac.com*** for starting, operating, and servicing procedures. The owner is responsible for proper maintenance and safe use of the unit.

SAVE THESE INSTRUCTIONS for future reference. This manual contains important instructions that must be followed during placement, operation, and maintenance of the unit and its components. Always supply this manual to any individual that will use this unit, and instruct them on how to correctly start, operate, and stop the unit in case of emergency.

Safety Rules

The manufacturer cannot anticipate every possible circumstance that might involve a hazard. The alerts in this manual, and on tags and decals affixed to the unit, are not all inclusive. If using a procedure, work method, or operating technique that the manufacturer does not specifically recommend, verify that it is safe for others and does not render the equipment unsafe.

Throughout this publication, and on tags and decals affixed to the unit, DANGER, WARNING, CAUTION, and NOTE blocks are used to alert personnel to special instructions about a particular operation that may be hazardous if performed incorrectly or carelessly. Observe them carefully. Alert definitions are as follows:

⚠DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

(D000001)

⚠WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

(W000002)

⚠CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

(C000003)

NOTE: Notes contain additional information important to a procedure and will be found within the regular text of this manual.

These safety alerts cannot eliminate the hazards that they indicate. Common sense and strict compliance with the special instructions while performing the action or service are essential to preventing accidents.

Electrical Hazards



⚠DANGER

Electrocution. High voltage is present at transfer switch and terminals. Contact with live terminals will result in death or serious injury.

(D000129)



⚠DANGER

Electrocution. Water contact with a power source, if not avoided, will result in death or serious injury.

(D000104)



⚠DANGER

Electrocution. In the event of electrical accident, immediately shut power OFF. Use non-conductive implements to free victim from live conductor. Apply first aid and get medical help. Failure to do so will result in death or serious injury.

(D000145)



⚠DANGER

Electrical backfeed. Use only approved switchgear to isolate generator from the normal power source. Failure to do so will result in death, serious injury, and equipment damage.

(D000237)



⚠DANGER

Electrocution, equipment and property damage. Handle transfer switches carefully when installing. Never install a damaged transfer switch. Doing so could result in death or serious injury, equipment and property damage.

(D000195)



⚠DANGER

Electrocution. Turn utility supply OFF before working on utility connections of the transfer switch. Failure to do so will result in death or serious injury.

(D000123)



⚠DANGER

Electrocution. Do not disable or modify the connection box door safety switch. Doing so will result in death or serious injury.

(D000157)

⚠DANGER

Automatic start-up. Disconnect utility power and render unit inoperable before working on unit. Failure to do so will result in death or serious injury.

(D000191)

⚠DANGER

Equipment Malfunction. Installing a dirty or damaged transfer switch will cause equipment malfunction and will result in death or serious injury.

(D000119)



⚠DANGER

Electrocution. Do not wear jewelry while working on this equipment. Doing so will result in death or serious injury.

(D000188)



⚠DANGER

Electrocution. Only authorized personnel should access transfer switch interior. Transfer switch doors should be kept closed and locked. Failure to do so will result in death or serious injury.

(D000213)



⚠DANGER

Electrocution. In the event of electrical accident, immediately shut power OFF. Use non-conductive implements to free victim from live conductor. Apply first aid and get medical help. Failure to do so will result in death or serious injury.

(D000145)

⚠WARNING

Electric Shock. Only a trained and licensed electrician should perform wiring and connections to unit. Failure to follow proper installation requirements could result in death, serious injury, and equipment or property damage.

(W000155)



⚠WARNING

Loss of life. This product is not intended to be used in a critical life support application. Failure to adhere to this warning could result in death or serious injury.

(W000209)

⚠WARNING

Equipment damage. This unit is not intended for use as a prime power source. It is intended for use as an intermediate power supply in the event of temporary power outage only. Doing so could result in death, serious injury, and equipment damage.

(W000247)



⚠WARNING

Hearing loss. Hearing protection is recommended when transferring load. Failure to wear hearing protection could result in permanent hearing loss.

(W000766)

⚠CAUTION

Equipment damage. Verify all conductors are tightened to the factory specified torque value. Failure to do so could result in damage to the switch base.

(C000120)

⚠CAUTION

Equipment damage. Perform functional tests in the exact order they are presented in the manual. Failure to do so could result in equipment damage.

(C000121)

⚠CAUTION

Equipment damage. Verify that voltage and current are within specification before energizing this equipment. Exceeding rated voltage and current will damage the auxiliary contacts.

(C000134)

- Competent, qualified personnel should install, operate and service this equipment. Adhere strictly to local, state and national electrical and building codes. When using this equipment, comply with regulations established by the National Electrical Code (NEC), CSA Standard; the Occupational Safety and Health Administration (OSHA), or the local agency for workplace health and safety.
- If working on this equipment while standing on metal or concrete, place insulative mats over a dry wood platform. Work on this equipment only while standing on such insulative mats.
- Never work on this equipment while physically or mentally fatigued.
- Any voltage measurements should be performed with a meter that meets UL3111 safety standards, and meets or exceeds overvoltage class CAT III.

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Section 2: General Information

Equipment Description

Automatic Transfer Switch

The commercial transfer switch range (TX) is designed to operate independently with any standard generator utilizing 2-wire start. The transfer switch is programmed locally using the integrated display and touchpad.

The TX switch controller dictates all operation of transfer switch operation, generator function, and setpoint/timing considerations. The control monitors voltages and frequencies against setpoints, initiates generator function, controls inphase or time delay transfers, manages generator shutdown, performs exercise operations, and logs events. An integrated display is used to change setpoint values, perform desired operational changes, and monitor status.

A simple dry contact (Form C) is provided as a 2-Wire Start (2WS) for generator control. This allows for control of nearly any generator with a simple 2-wire system. An additional communications link is provided for RS-485 communication, allowing external query of transfer switch status and remote voltage and optional power and current monitoring.

The automatic transfer switch is used for transferring critical electrical load from a normal (utility) power source to a standby (emergency) power source. Such a transfer of electrical loads occurs automatically when the normal power source has failed or is substantially reduced and the standby source voltage and frequency have reached an acceptable level. The transfer switch prevents electrical feedback between two different power sources (such as the normal and standby sources) and, for that reason, codes require it in all standby electric system installations.

Communications

Operation of the TX transfer switch is fully functional without communications with a Generator or other external device. An RS-485 communications port is available for remote monitoring of the transfer switch via a Modbus client.

For communication hardware installation, see ***Installation***.

For configuration and operation of communication protocols, see ***Communications***.

Remote Annunciator

An optional Remote Annunciator is available (G0070080) to provide remote status indication of switch position, alarm status, exercise status, and loadshed indication to comply with NFPA 110 or other code requirements. Only one remote annunciator may be associated with a TX control and it requires a dedicated RS-485 port. See associated documentation for installation and operating instructions.

Generator Connection

This switch is provided with a “2-wire start” output. The 2-wire start output is for the remote start and stop of generator. The 2-wire start connection is J3, pins 8, 9, and 10, wire numbers 178 and 183.

The 2-wire start output allows the Automatic Transfer Switch (ATS) to start and stop the generator automatically.

NOTE: Some emergency applications may use 3-wire start (Normally Open and Normally Closed contacts) for continuous monitoring purposes. This feature is standard.

Transfer Switch Labels

A Withstand Ratings label is permanently affixed to the transfer switch enclosure and duplicated on the front cover. Use this transfer switch only with the specific limits shown on the label and on other decals and labels that may be affixed to the switch. This will prevent damage to equipment and property.

When requesting information or ordering parts for this equipment, make sure to include all information from the data label located on the subplate inside the transfer switch.

Transfer Switch Enclosure

The standard switch enclosure is a National Electrical Manufacturer’s Association (NEMA) 1 type. NEMA 1 type enclosures primarily provide protection against contact with the enclosed equipment and provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids. NEMA 1 type enclosures are for indoor use only. The enclosure is ventilated on either side and the front.

An optional NEMA 3R type steel enclosure version is available and easily recognizable by the addition of seals around the cover and lockable enclosures over the controller and circuit breaker (if applicable). The NEMA 3R type enclosure provides additional protection against rain and snow. NEMA 3R type enclosures are for indoor or outdoor use.

Safe Use of Transfer Switch



⚠WARNING

Consult Manual. Read and understand manual completely before using product. Failure to completely understand manual and product could result in death or serious injury.

(W000100)

Before installing, operating, or servicing this equipment, read the ***Safety Rules*** carefully. Comply strictly with all ***Safety Rules*** to prevent accidents and/or damage to the equipment. The manufacturer recommends that a copy of the ***Safety Rules*** be posted near the transfer switch. Also, be sure to read all instructions and information found on tags, labels and decals affixed to the equipment.

Publications that outline the safe use of transfer switches are the following:

- NFPA 70; National Electrical Code
- NFPA 70E; Standard for Electrical Safety in the Workplace
- UL 1008; Standard for Safety-Automatic Transfer Switches

NOTE: It is essential to use the latest version of any standard to ensure correct and current information.

Section 3: Installation

Introduction to Installation

Though this equipment has been wired and tested at the factory, the installer should verify all wiring connections are proper. Installing the switch includes the following procedures:

- Mounting the enclosure.
- Connecting power source and load leads.
- Connecting the generator connection.
- Programming setpoints, function options, and schedules within the TX switch controller.
- Installing and connecting any options or accessories.
- Testing functions.

Unpacking

⚠WARNING

Personal Injury. Excessive weight. Use only appropriate lifting eyes and lifting equipment to lift unit. Improper lifting techniques could result in equipment damage, death or serious injury.

(W000224)

Carefully unpack transfer switch. Inspect closely for any damage. Purchaser must file damage claim with carrier for noted shipping damage.

Verify all packing material is removed from switch before installation.

Attach any lifting device to the transfer switch mounting holes or brackets. Do not lift the switch at any other point.

Mounting



⚠DANGER

Electrocution, equipment and property damage. Handle transfer switches carefully when installing. Never install a damaged transfer switch. Doing so could result in death or serious injury, equipment and property damage.

(D000195)



⚠DANGER

Electrocution. Turn utility supply OFF before working on utility connections of the transfer switch. Failure to do so will result in death or serious injury.

(D000123)

⚠DANGER

Equipment Malfunction. Installing a dirty or damaged transfer switch will cause equipment malfunction and will result in death or serious injury.

(D000119)

⚠WARNING

Equipment damage. Only qualified service personnel may install, operate, and maintain this equipment. Failure to follow proper installation requirements could result in death, serious injury, and equipment or property damage.

(W000182)

Mounting dimensions for the transfer switch enclosure are in this manual. Enclosures are typically mounted to the wall. Components are generally mounted in a standard NEMA 1-type enclosure. A NEMA 3R and 4X is also available. See ***Transfer Switch Options***.

IMPORTANT NOTE: To maintain seismic rating, the enclosure must be mounted to a rigid wall using two 1/2 in bolts and flat washers and to the floor using four 1/2 in bolts and flat washers. If mounting to structural channel, channel nuts and 3x3x1/4 in plate washers or equal are required.

Install the transfer switch as close as possible to the electrical loads that are to be connected to it.

The transfer switch is a modular design. The front enclosure contains the control and customer connections. The controller is hinged for routing wiring behind it. It also has quick connect electrical connections and a quick release hinge for easy removal.

1. See ***Figure 3-1***. Remove the controller (A) from the transfer switch enclosure by gently lifting the latch release on the inside of the hinge while pulling the controller away from the enclosure.

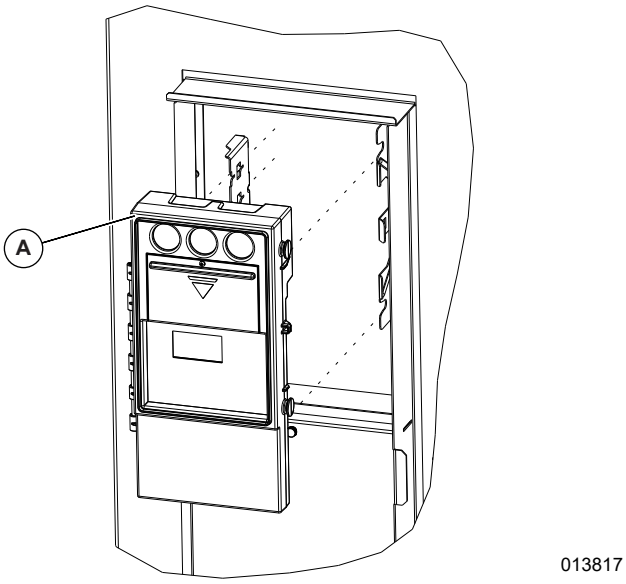


Figure 3-1. Remove Controller and Subplate Assembly

2. See ***Figure 3-2***. Secure the upper enclosure mounting brackets (C) to the wall.
3. Stand the enclosure on a flat surface. If the surface is not flat, add shims to make the enclosure level. Mount to a wall or support structure for vertical stability.
4. Secure the lower enclosure to the floor.

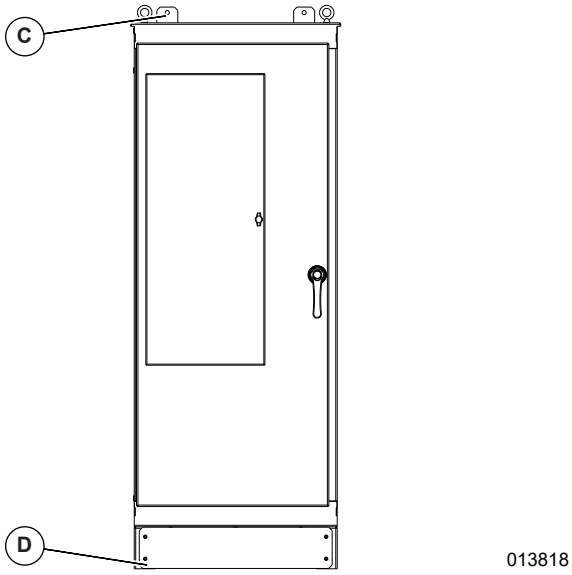


Figure 3-2. Secure Mounting Brackets

5. To prevent switch distortion, level all mounting points. If necessary, use washers behind mounting holes.
6. If any conduits are entering the enclosure, holes should be placed at this time to prevent contaminates from entering into the electrical components.
7. The kickplate (D) (optional on 800–1000A; required on 1200–1600A) at the lower front of the enclosure is removable, as the installation requires. The rear lower plate is removable, and the bottom of the enclosure has a gland plate (gland plate is not included on the 1600A).
8. High power connections can be made at the transfer switch contactor and circuit breaker.
9. See ***Configuring Controller for Nominal Voltage*** to verify it is set for your system voltage.

Connecting Power Source and Load Lines

⚠DANGER

Electrocution. Turn utility and emergency power supplies to OFF before connecting power source and load lines. Failure to do so will result in death or serious injury.

(D000116)

⚠DANGER

Electrocution. Turn utility supply OFF before working on utility connections of the transfer switch. Failure to do so will result in death or serious injury.

(D000123)

Wiring diagrams and electrical schematics are provided in this manual. Power source and load connections are made at a transfer mechanism inside the switch enclosure.

Follow torque requirements listed on the transfer switch for contactor lugs. Follow torque requirements on the main circuit breaker lugs (if equipped). All Switched Neutral applications require the Neutral connection furthest from A phase (far right when facing switch).

Closed Transition Variant Installation

Closed transition switches must be installed with caution as their proper function includes a short duration connection between the utility and generator sources. The transfer switch control ensures the safe transition between sources and ensures that the maximum time the generator and utility are paralleled is less than the requisite 0.5 seconds.

In the event of a failure to open the paralleled transfer switch, a latching relay will be activated. (CTTS Terminal Block 15-16, labeled “TO GEN SHUNT TRIP CB”). This output must be connected to a shunt trip circuit breaker to disconnect the generator from the utility source. This output must be connected to a shunt trip circuit breaker to disconnect the generator from the utility source.

Additional code requirements may be necessary to properly install and commission a Closed Transition Switch.

Transfer Mechanisms

⚠WARNING

Electric shock. Maintain correct electrical clearance between live metal parts and grounded metal according to local code requirements. Failure to do so could result in serious injury or equipment damage.

(W000743)

See *Figure 3-3*. The 3-pole switch shown is used with a single-phase system, when the single-phase neutral line is to be switched during transfer; or with a three-phase system, when neutral is not to be switched.

Preferred power cables entry to switch is at the top, left side, or bottom. Top entry should be avoided, when possible, for outdoor applications to avoid water ingress. A wireway on the contactor's left side is available as needed. Standard terminal lugs on the transfer mechanism are a solderless, screw type. Contactor is compatible with Aluminum or Copper Wire rated 75C or higher.

Connect power source and load conductors to clearly marked terminal lugs on transfer mechanism as follows:

- Load leads (C): Connect to terminals LA, LB, and LC.
- Normal (utility) Source Leads (A): To terminals S1A, S1B, and S1C.
- Standby (emergency) Source Leads (B): Connect to transfer mechanism terminal lugs S2A, S2B, and S2C.

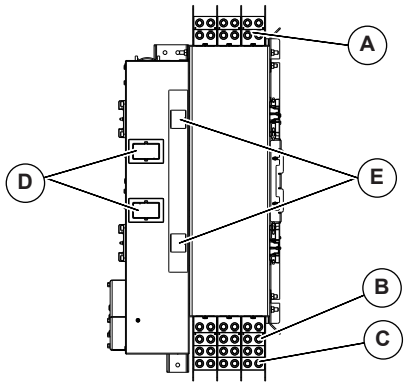


Figure 3-3. Typical 3-Pole Transfer Mechanism (1000 Amp Shown)

The transfer mechanism may be either a 2-pole, 3-pole, or 4-pole type. The switch enclosure includes a neutral block for connection of the neutral line. All Switched Neutral applications require the Neutral connection furthest from A phase (far right when facing switch).

Utilize Cable Roping Techniques to maintain the WCR rating of the switch.

Before connecting wiring cables to terminals, remove any surface oxides from the cable ends with wire brush. If aluminum conductors are used, apply appropriate No Oxide joint compound. Tighten terminal lugs to the torque values specified on the Transfer Switch Data Label.

Standard terminal lugs on the transfer mechanism are solderless, screw-type and are compatible with copper or aluminum cable.

GFCI Wiring (1000A and Larger Only)

⚠WARNING

Electric shock. GFCI protection is designed for equipment protection and does not offer human protection against shock hazards. Contact with energized equipment could result in death or serious injury.

(W000788)

IMPORTANT NOTE: See *Figure 3-4* (C). NEVER connect Grounding Wires to Neutral Wiring for all GFCI wiring and proper GFCI operation. Only the single Neutral to Ground Bus for Service Entrance connections is permitted.

2 & 3 Wire Applications

For residual ground fault, the trip unit built into the circuit breaker monitors all three phases of a 3-wire system. Eaton's PXR20 Trip Unit sums these inputs to resolve a ground fault current if ground current is present. If using a single-phase system, with only two phases connected, the GFCI system will perform as designed.

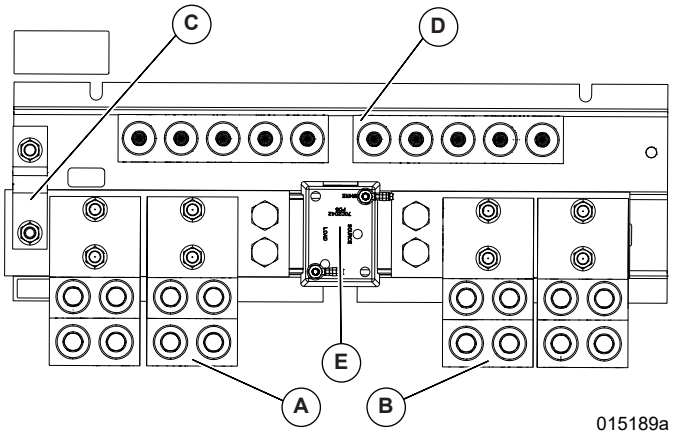


Figure 3-4. SE Neutral Assembly

A	Utility Source 1 Neutral Connections
B	Alternate Source 2 & Load Neutral Connections
C	Service Entrance Neutral Bonding Jumper
D	Ground Bus Bar
E	Neutral Current CT on 1000A Bus Bar Jumper on 800A

4 Wire Applications

For residual ground fault, the trip unit built into the circuit breaker monitors all three phases of a 3-wire system and the neutral in a 4-wire system. The trip unit sums these inputs to resolve a ground fault current if ground current is present. All 1000A and larger Transfer Switches include a Neutral Sensor on the Neutral Assembly with control wires, which are factory prewired to circuit breaker.

See ***Figure 3-5***. The Utility Neutral (A) must be connected to the left (nearest the door) of the Neutral Lug (Source side of Neutral Sensor). The Load and Generator (Source 2) Neutrals must be connected to the right (rear of the enclosure) side of the Neutral assembly.

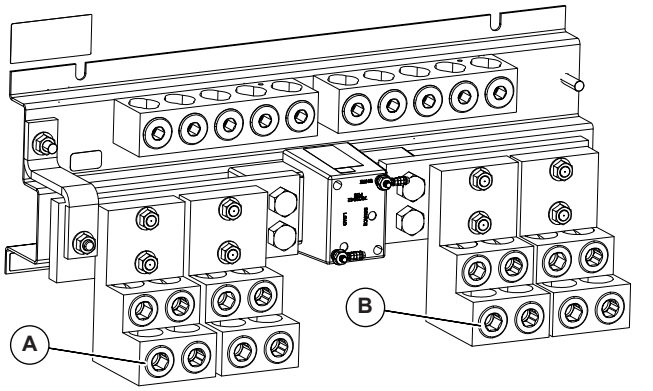


Figure 3-5. 800–1000A 3- and 4-Pole Neutral Assembly

A	Source 1 Neutral Connections
B	Source 2 and Load Neutral (for 3–Pole Switches) or Jumper to S1 Neutral of Contactor (for 4–Pole Switches [prewired at factory])

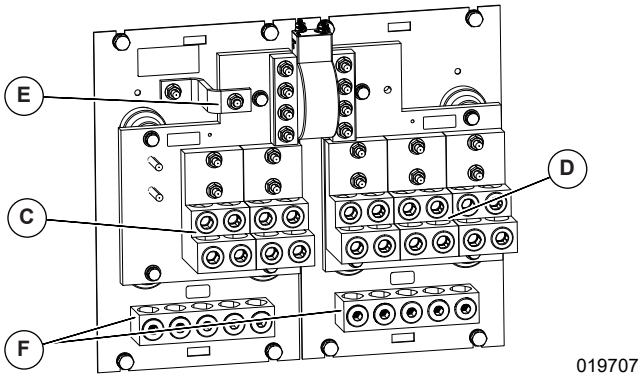


Figure 3-6. 1200-1600A 3-Pole Neutral Assembly

C	Utility Source 1 Neutral Connections
D	Source 2 & Load Neutral Connections
E	Service Entrance Neutral Bonding Jumper
F	Ground Lugs

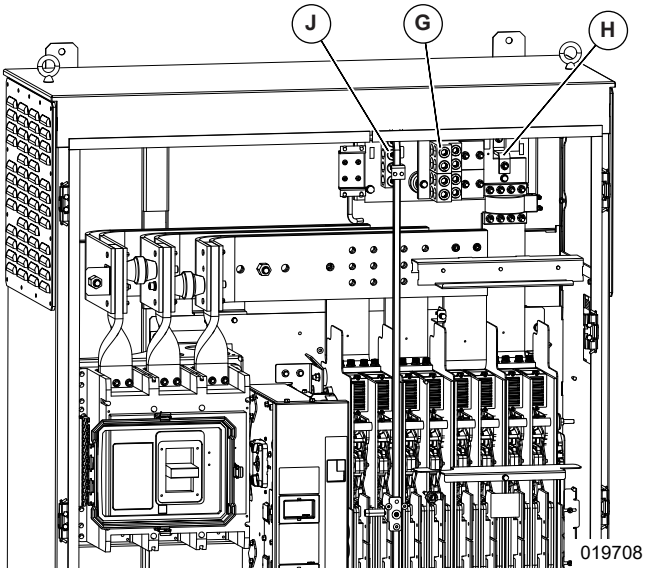


Figure 3-7. 1200-1600A 4-Pole Neutral Assembly

G	Utility Source 1 Neutral Connections
H	Service Entrance Neutral Bonding Jumper
J	Ground Lugs

4-Wire Applications with a Switched Neutral (4th Pole Contactor Option)

See ***Figure 3-5***. For 800-1000A 4-Pole contactor option with a 4-wire system: Factory provides wiring from the right side of the Neutral Bar Assembly (B) (Load Side of the Neutral Sensor provided) to the Neutral Source 1 Switching Pole of the contactor with wiring based on ampacity requirements.

See ***Figure 3-7***. For 1200-1600A 4-Pole contactor option with a 4-wire system: Factory pre-connects Neutral Assembly above the Neutral Source 4 Switching Pole of the contactor with wiring based on ampacity requirements. 1200A has one Utility Source Neutral Lugs; 1600A has two Utility Source Neutral Lugs.

See ***Figure 3-5***. Utility Neutral must be connected to the left (A) (nearest the door) of the Neutral Lug (Source side of Neutral Sensor).

Factory control wiring is provided from the Neutral Sensor to the circuit breaker.

The 4th pole is selected for the switched Neutral of the contactor.

Transfer Mechanism

See ***Figure 3-3***. The transfer mechanism houses the main, current carrying contacts, along with other mechanical and electrical components, required for operating the switch. The main contacts are electrically operated and mechanically latch in place.

Power for the operating actuators is taken from the source of supply that the Customer Load is being transferred to. Therefore, transfer to any power source cannot occur unless that power source is available to the switch.

Main contacts are actuated by an over center spring linkage charged by a high speed motor. A pair of electric motors charge both Source 1 and Source 2 Main Charge springs at once. If only one spring is depleted, it will only charge that spring after operation. The rotating shaft assembly contains contacts that transfer the load between Source 1 and Source 2. These contacts ensure all phases are actuated together and maintain safe electrical clearances. The use of a duel set of movable contacts allows for some applications with closed transition operation.

Transfer Mechanism Operation



⚠DANGER

Electrocution. Do not manually transfer under load. Disconnect transfer switch from all power sources prior to manual transfer. Failure to do so will result in death or serious injury, and equipment damage.

(D000132)

The primary driver of the mechanism is a Spring, which is initially charged by a high speed DC motor pair using a proportional control system allowing consistent operation regardless of system voltage. These motors are used to charge both main operator springs. The charged spring is released by either manual or electrical DC pulse (via solenoid). A solenoid is used to release the latch from either the latched (OFF) position or latched (ON) position, completing the transfer operation.

See ***Figure 3-3***. The main charge spring of the mechanism allows consistent opening or closing operation. To manually change the Source Position, first the Main Spring must be charged. The Source state (Open or Closed) and the Spring Charge/Discharged Indicator is on the contactor (E). Once the Spring is charged, Pressing either Source 1 or Source 2 Operation button (D) will change that Source State.

NOTE: For open transition switches, both Sources must be Open prior to Closing a Source due to mechanical interlock.

Main Contacts at Source 1 (Utility)

See ***Figure 3-8***. The illustration shows the load terminals connected to the Source 1 (utility) terminals. The indicator will display “S1.”

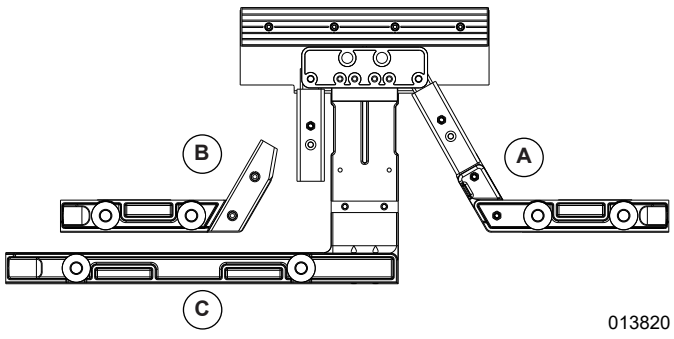


Figure 3-8. Main Contact at Source 1 (Utility)

A	Source 1 Position “ON”
B	Source 2 Position “OFF”
C	Load

Main Contacts at Neutral (Optional TDN)

See ***Figure 3-9***. Load terminals are disconnected from both power supply terminals. “0” will be displayed in the indicating window.

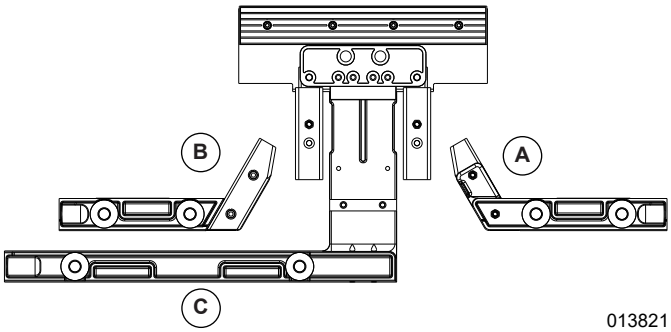


Figure 3-9. Main Contacts at Neutral

A	Source 1 Position “OFF”
B	Source 2 Position “OFF”
C	Load

Main Contacts at Standby (Emergency)

See ***Figure 3-10***. Load terminals are connected to the Source 2 (emergency) power supply. The indicating window will display “S2.”

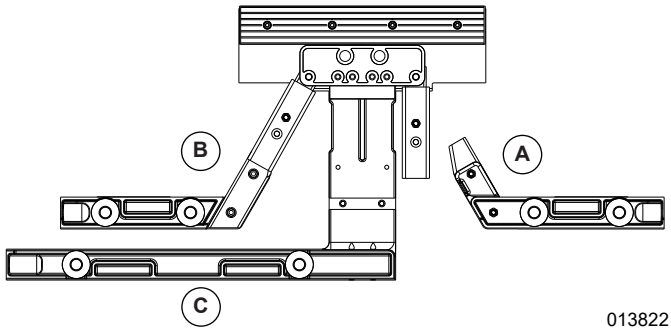


Figure 3-10. Main Contacts at Source 2 (Emergency)

A	Source 1 Position “OFF”
B	Source 2 Position “ON”
C	Load

Configuring Controller for Nominal Voltage

⚠DANGER

Electrocution. High voltage is present at transfer switch and terminals. Contact with live terminals will result in death or serious injury.

(D000129)

⚠WARNING

Electric Shock. Only a trained and licensed electrician should perform wiring and connections to unit. Failure to follow proper installation requirements could result in death, serious injury, and equipment or property damage.

(W000155)

⚠CAUTION

Equipment damage. Verify that voltage and current are within specification before energizing this equipment. Exceeding rated voltage and current will damage the auxiliary contacts.

(C000134)

The transfer switch control is compatible with various voltage sources without additional hardware, but must be properly configured to provide nominal 208-277 VAC to the power control circuit and the correct parallel/series load setting to the anti-condensation heater (if equipped). Connectors J5/J6 on the main harness (A0001724185) and J23/J24 on the heater harness (A0000405404) are used to make the appropriate connections to allow the transfer switch to be connected to the system voltages as listed in the table below. J5/J6 and J23/J24 are connected by the factory for the voltage selected during product selection. The harness connections must be configured if the product is to be installed at an alternate voltage. To change selections:

1. See ***Figure 3-11***. Remove the screw and interlock plate (A).
2. Move connectors J5/J6 (B) and J23/J24 (C) to their specified location.
3. Install the interlock plate and screw.

IMPORTANT NOTE: The interlock plate MUST be installed after selection to protect against potentially hazardous voltages and to ensure both heater and control power are correctly configured.

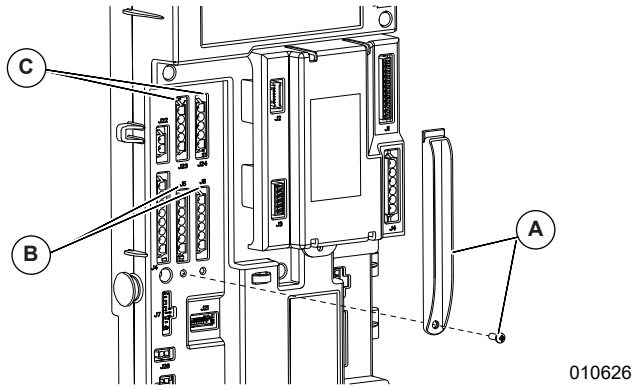


Figure 3-11. Remove and Install Interlock Plate

IMPORTANT NOTE: In applications where the Neutral Block is not connected to a wired Neutral, the control power supply connectors MUST be connected to J6/J24 (voltage is 208/240VAC), or a 480V or 600V Delta Kit MUST be utilized. The control power supply source, when configured for 480 VAC GRD-Y (J5/J23), is from Phase A to the Neutral Block. An unconnected Neutral Block and J5 connection will result in hazardous voltages existing on the otherwise unconnected Neutral Block and may pose a shock hazard.

IMPORTANT NOTE: Only the voltages and wiring specified in the table below are acceptable for use with this transfer switch. Voltages such as 120 VAC, 480V Corner Grounded Delta, 480V V-Delta, 480V Ungrounded, 600V systems, and anything other than listed in the table below are not acceptable without additional hardware. If factory configured for 480V or 600V Delta, additional transformers are included and wired as shown in the schematic diagram.

Connectors	System Voltages
J5/J23	480 VAC GRD-Y*
J6/J24	208/240 VAC

*See Important Notes above for all 3-wire applications

Connecting Generator 2-Wire Start Signals

See ***Figure 3-12***. The customer connections are accessible through the front sliding door of the control. A connection label is located on the backside of the sliding door. Connect suitable, approved wiring to transfer switch terminals J:3:8 (COM) and J:3:9 (2WS NO). Route these wires through suitable, approved conduit (separate from power leads) and connect corresponding 2-wire start input terminals in the AC connection (lower) panel of the engine-generator set.

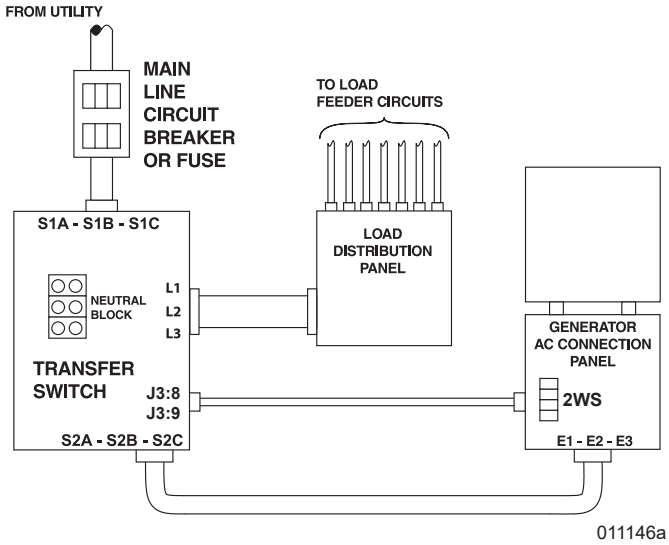


Figure 3-12. Connection Diagram - Three Phase with Neutral Shown (Typical)

NOTE: In the standard 2-wire start system, closure of Wire J3:8 and J3:9 circuit by switch circuit action must result in generator engine cranking and startup.

If the control is not powered by any sources, the 2-wire start system is active (closed). This allows the genset to start in the event of all power loss to the control.

An additional normally Closed contact (J3:10) is provided for 3-wire start systems to intended to meet applications which require continuous monitoring of the 2-wire start system.

Recommended wire gauge sizes for this wiring depends on the length of the wire, as recommended in the following chart.

Maximum Wire Length	Recommended Wire Size
460 ft (140 m)	No. 18 AWG.
461 to 730 ft (223 m)	No. 16 AWG.
731 to 1,160 ft (354 m)	No. 14 AWG.
1,161 to 1,850 ft (565 m)	No. 12 AWG.

Connecting Controller Communication Wires

Use shielded 2-wire communications cable (such as Belden #9460) to make the communications line connection to the TX transfer switch. This cable must be routed in a separate conduit between the TX transfer switch and the power cables. The cable must be connected as follows:

- TX transfer switch J11:1 A-, J11:2 B+, and J11:3 Ground located in the customer connection compartment within the TX switch controller.

- TX transfer switch J13:1 A-, J13:2 B+, and J13:3 Ground located in the customer connection compartment within the TX switch controller.

NOTE: The RS-485 port connected to J13 is an electrically isolated port designed to handle differences in ground voltages between the TX control and the associated communication device.

Setting RS-485 Terminator Resistor

See ***Figure 3-9***. The RS-485 wiring standards require a terminating resistor to be installed on the last component in a string of parallel connected devices. This resistor is located within the TX switch controller in the rear of the customer connection access area. To activate the resistor associated with J11, remove the jumper from between J12:1 and J12:2, and install the jumper between J12:2 and J12:3. To activate the resistor, for the port connected to J13, remove the jumper from between J14:1 and J14:2, and install the jumper between J14:2 and J14:3.

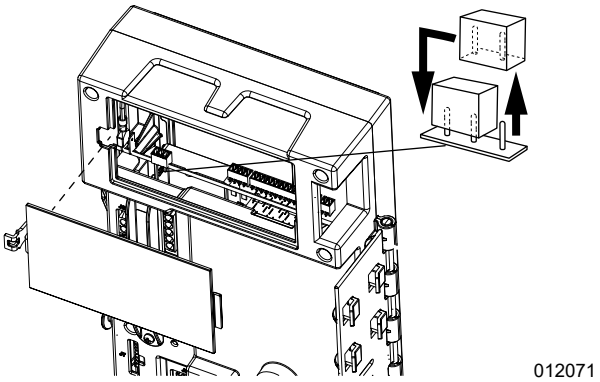


Figure 3-13. Terminator Resistor

Programming

Synchronization Limits

Synchronization requirements are:

- Generator frequency within 1Hz
- Voltage within +/- 5% of Nominal (based on controller settings)
- Phase angle difference within +/- 10 degrees

Voltage Limits

The following criteria are used for a local determination of proper Utility.

Dropout — any phase outside 85% to 110% of nominal (not the average voltage).

Pickup — all phases 90% to 105% of nominal (programmable).

Auxiliary Contacts

See ***Figure 3-14***. Four auxiliary switches are offered as standard on the TX switch. All switches are Form C, with two switched actuated when in Source 1 position and the other switch actuated when in Source 2 position. All switches are wired to terminal blocks (A) located in the control cabinet for convenient wiring.

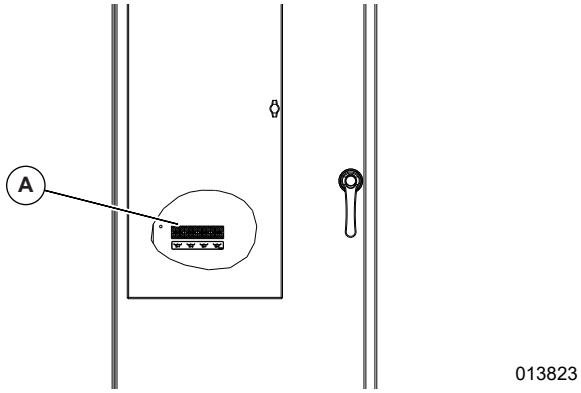


Figure 3-14. Terminal Block Location

See ***Figure 3-15***. Additionally, there are two switches used for the TX switch controller to determine position. SW1 and SW2 are for the TX controller. SW3 and SW4 are customer auxiliary 3 and 4 respectively.

NOTE: The SW1 and SW2 microswitches are rated specifically for signal wiring with low current gold plated contacts.

Contact operation is shown in the following chart:

	Switch Position		
	Source 1	**Neutral**	**Source 2**
Customer Auxiliary 3 and 4 - Common to Normally Open	Closed	Open	Open
Customer Auxiliary 3 and 4 - Common to Normally Closed	Open	Closed	Closed
Customer Auxiliary 5 and 6 - Common to Normally Open	Open	Open	Closed
Customer Auxiliary 5 and 6 - Common to Normally Closed	Closed	Closed	Open

NOTE: SW3 through SW6 Customer Auxiliary Contacts are rated 10 amps at 125 or 250 volts AC. Do not exceed the rated voltage or current of the contacts.

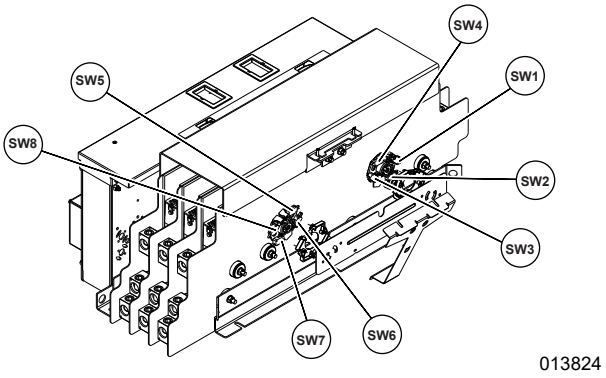


Figure 3-15. 800-1600 amp Switches

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Section 4: Operation

Functional Tests and Adjustments

⚠CAUTION

Equipment damage. Perform functional tests in the exact order they are presented in the manual. Failure to do so could result in equipment damage.

(C000121)

Following transfer switch installation and interconnection, inspect the entire installation carefully. A competent, qualified electrician should inspect it. The installation should comply strictly with all applicable codes, standards, and regulations. When absolutely certain the installation is proper and correct, complete a functional test of the system.

IMPORTANT NOTE: Before proceeding with functional tests, read and make sure all instructions and information in this section is understood. Also read the information and instructions of labels and decals affixed to the switch. Note any options or accessories that might be installed and review their operation.

Manual Operation



⚠DANGER

Electrocution. Do not manually transfer under load. Disconnect transfer switch from all power sources prior to manual transfer. Failure to do so will result in death or serious injury, and equipment damage.

(D000132)

⚠WARNING

Sudden start-up. Always set the switch control to MAINTENANCE MODE before working on equipment. Failure to do so could result in death or serious injury.

(W000683)



⚠WARNING

Hearing loss. Hearing protection is recommended when transferring load. Failure to wear hearing protection could result in permanent hearing loss.

(W000766)

Preparing for Manual Operation

IMPORTANT NOTE: During automatic operation, the mechanism is always charged to enable a fast transition between sources. When approaching the switch, assume the springs are charged. Check both windows to verify each spring state before taking any action on the mechanism.

IMPORTANT NOTE: Closed Transition variant switches have electrical interlocks preventing both S1 and S2 from being connected to LOAD. These interlocks do NOT prevent the switch from being manually operated into a closed transition state. Use caution when manually operating a Closed Transition Switch.

A manual switch handle is shipped with the transfer switch. Manual operation must be checked before the transfer switch is operated electrically. To check manual operation, proceed as follows:

1. In the transfer switch enclosure, set the Maintenance Mode setting on the TX Switch Control to MAINTENANCE MODE. This prevents the generator from starting automatically as soon as the utility power source is turned OFF. If actuating prior to initial energization of control, isolate connector J3 of the customer interconnections to ensure generator start command is inhibited.
2. If so equipped, turn the generator's AUTO/OFF/MANUAL switch to OFF.
3. Turn OFF both normal and standby power supplies to the transfer switch, with whatever means provided, such as the main line circuit breaker(s).
4. See ***Figure 4-1***. Note position of transfer mechanism main contacts by observing the Source 1 (A) and Source 2 (B) windows to see:
   - If the source opened or closed.
   - If the spring charged or discharged.
   - What direction to rotate the manual handle (C) to charge the spring.

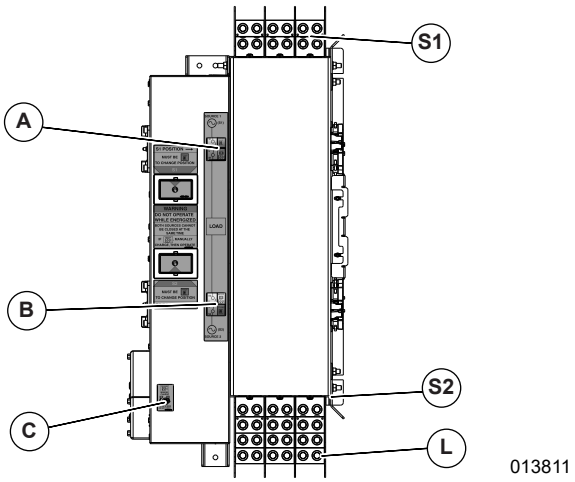


Figure 4-1. Transfer Switch Mechanism

NOTE: The mechanism has two springs, one for each source. There is a gear box which charges or discharges both springs at the same time. Each source has a button to open or close the source.

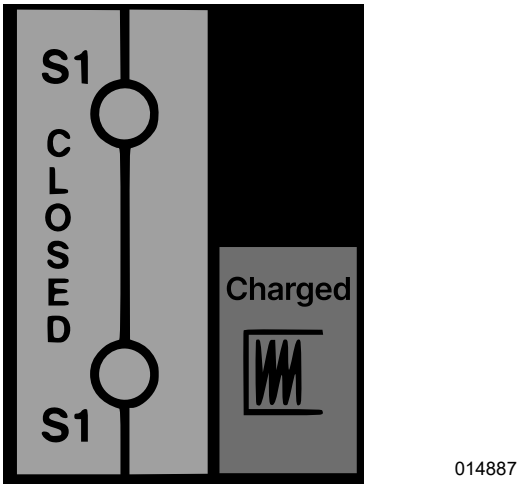


Figure 4-2. Source 1 Closed, Spring Charged

See ***Figure 4-2***. Source 1 is closed, and the Source 1 spring is charged. Press the manual press paddle to open Source 1.

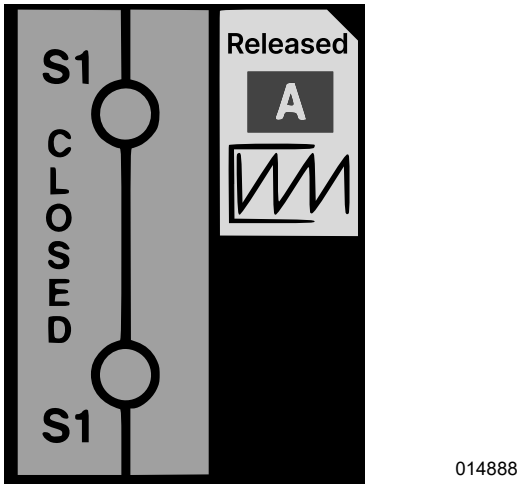


Figure 4-3. Source 1 Closed, Spring Released

See ***Figure 4-3***. Source 1 is closed, and the Source 1 spring is released. Source 1 spring will need to be charged to open Source 1. Charge the spring by rotating in the clockwise (A) direction.

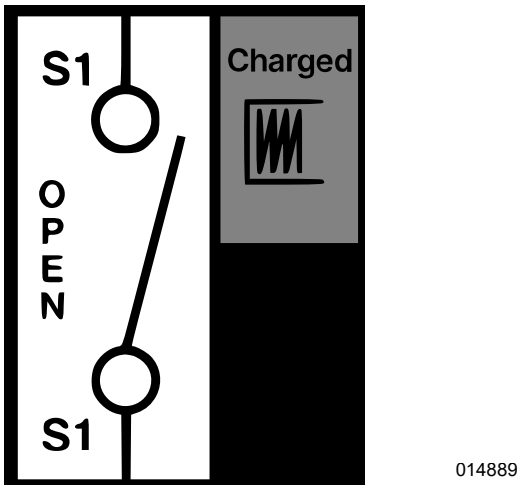


Figure 4-4. Source 1 Open, Spring Charged

See ***Figure 4-4***. Source 1 is open, and the spring for Source 1 is charged. Press the manual press paddle to close Source 1.

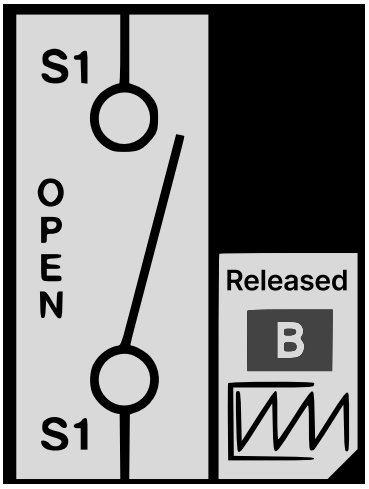


Figure 4-5. Source 1 Open, Spring Released

See ***Figure 4-5***. Source 1 is open, and the Source 1 spring is released. Source 1 spring will need to be charged to close Source 1. Charge the spring by rotating in the counterclockwise (B) direction.

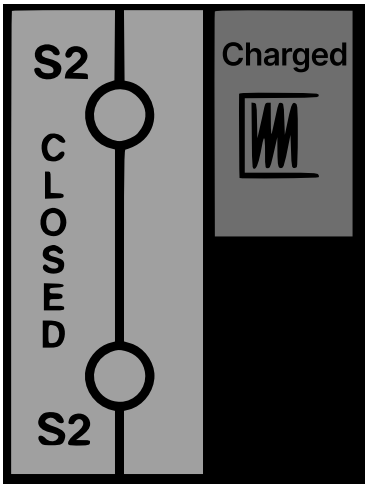


Figure 4-6. Source 2 Closed, Spring Charged

See ***Figure 4-6***. Source 2 is closed, and the Source 2 spring is charged. Press the manual press paddle to open Source 2.

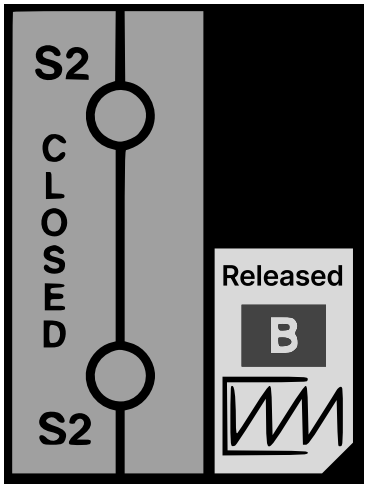


Figure 4-7. Source 2 Closed, Spring Released

See ***Figure 4-7***. Source 2 is closed, and the Source 2 spring is released. Source 2 spring will need to be charged to open Source 2. Charge the spring by rotating in the counterclockwise (B) direction.

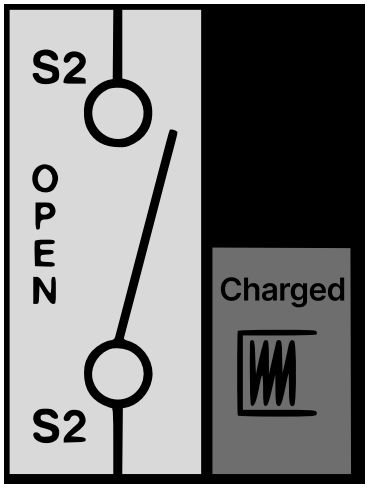
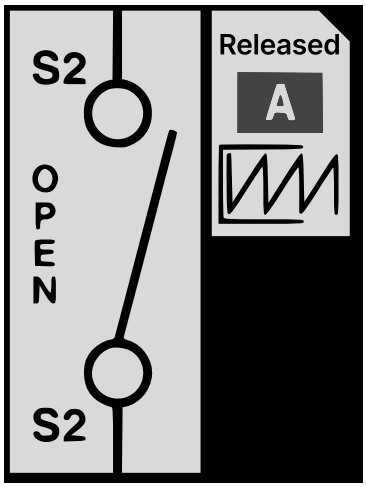


Figure 4-8. Source 2 Open, Spring Charged

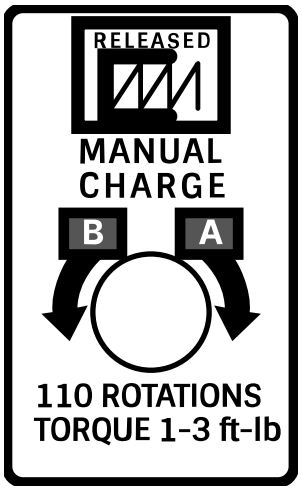
See ***Figure 4-8***. Source 2 is open, and the Source 2 spring is charged. Press the manual press paddle to close Source 2.



014894

Figure 4-9. Source 2 Open, Spring Released

See ***Figure 4-9***. Source 2 is open, and the Source 2 spring is released. Press the manual press paddle to close Source 2. Charge the spring by rotating in the clockwise (A) direction.



014895

Figure 4-10. Manual Charge Decal

See ***Figure 4-10***. This is the manual charge decal. Place the manual handle inside the hole and press all the way down. Check the indicator window to verify if the springs need to be charged and determine which direction the handle should be turned.

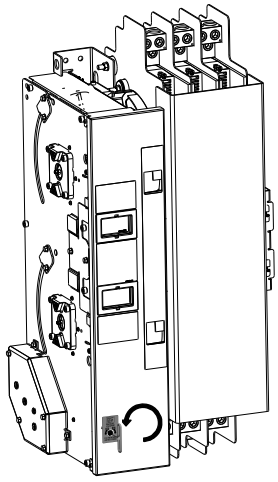
IMPORTANT NOTE: Do not use a drill or impact driver to charge mechanism.

Performing Manual Operation

The contactor has three positions. Connected to Source 1, connected to Source 2, or connected to no source. The closed-transition switches have a fourth state, connected to both Source 1 and Source 2.

When changing which source is connected to load, proceed as follows:

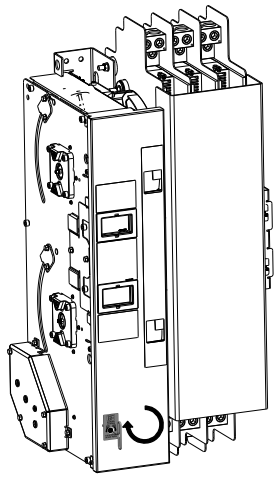
1. Verify no power is on the contactor.
2. See ***Figure 4-2*** through ***Figure 4-9***. Check source windows to see if mechanism needs to be charged.
3. See ***Figure 4-11*** and ***Figure 4-12***. Insert manual handle into the lower receptacle to charge a discharged main spring prior to manual change of switch state. Turn manual handle 110 times in the direction according to Source window if charging is needed.



013812

Figure 4-11. Rotate Manual Operator Counter-Clockwise

NOTE: Rotate handle 110 turns counterclockwise to Charge Main Spring to Open S2 or Close S1 when the main spring indicator shows discharged on the appropriate source.



013813

Figure 4-12. Rotate Manual Operator Clockwise

NOTE: Rotate handle 110 turns clockwise to Open S1 or Close S2 when the main spring indicator shows discharged on the appropriate source.

4. Remove manual handle.
5. See ***Figure 4-1***. Press “S1” or “S2” manual button to open one source.
6. See ***Figure 4-1***. Press “S1” or “S2” manual button to close the other source.

NOTE: Remove manual operating handle after use and return it to its storage location.

Voltage Checks

DANGER

Electrocution. High voltage is present at transfer switch and terminals. Contact with live terminals will result in death or serious injury.

(D000129)

IMPORTANT NOTE: Any voltage measurements should be performed with a meter that meets UL3111 safety standards, and meets or exceeds overvoltage class CAT III.

Before performing voltage checks, verify the following:

1. Disconnect all loads from transfer switch until all voltage checks and phase rotation checks have been completed.
2. Set the Maintenance Mode setting on the TX Switch Control to MAINTENANCE MODE. If actuating prior to initial energization of control, isolate connector J3 of the customer interconnections to ensure generator start command is inhibited.
3. Check the transfer switch data label for rated voltage. Verify voltage is compatible with normal and standby power source voltages. Verify the Transfer Switch Control is properly configured for the system voltage by performing the procedure in ***Configuring Controller for Nominal Voltage*** and ensuring voltage selection connectors are in the specified locations.

Perform voltage checks as follows:

1. Inside the transfer switch enclosure, verify the control is in MAINTENANCE MODE or connector J18 of the customer interconnections is removed.
2. If generator is so equipped, set the AUTO/OFF/MANUAL switch to OFF.
3. Verify "1" is visible in the observation window. See ***Manual Operation*** for location of position indication window.

   IMPORTANT NOTE: Before proceeding, manually connect the load to Source 1 power supply. Observation window must indicate "1."
4. See ***Controller Operation***. Remove battery isolation tab (A) to energize the transfer switch controller.

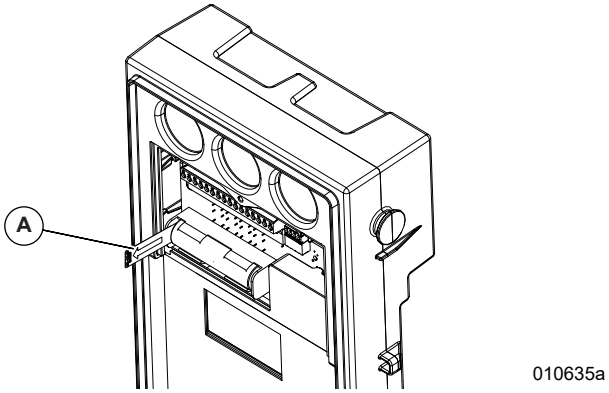


Figure 4-13. Remove Battery Isolation Tab

NOTE: If the battery isolation tab has been removed and both utility and generator sources are unavailable for more than one hour, the internal battery will be depleted and power from Source 1 or Source 2 will be required to activate the controller and charge the battery.

5. Turn ON the normal (utility) power supply to the transfer switch, with whatever means provided (such as the main line circuit breaker).
6. With utility voltage available to the transfer switch, verify the switch position LED for Source 1 on the transfer switch controller is ON. If the switch position LED is OFF, turn OFF the utility power supply to the transfer switch by whatever means provided (such as the main line circuit breaker), then return to Step 1 of ***Voltage Checks***.
7. On the transfer switch controller, verify the Source 1 Available LED is ON.
8. With an accurate AC voltmeter, check the phase-to-phase (line-to-line) and phase-to-neutral (line-to-neutral) voltages present at transfer mechanism terminals S1A, S1B, S1C, and neutral. supplied voltages must be fully compatible with transfer switch rated voltage.

   IMPORTANT NOTE: Verify the phase rotation of power lines and transfer switch load power lines are compatible. The control has configurable phase rotation settings, see *Phase Rotation* for details.
9. Refer to the standby generator owner's manual. Make sure the generator engine has been properly serviced and prepared for use, as outlined in that manual. Then start the generator engine manually. Let the engine stabilize and warm up for a few minutes.
10. Turn ON the standby (emergency) power supply to the transfer switch by whatever means provided (such as the main line circuit breaker).
11. With the generator running, check that the Source 2 Available LED on the switch enclosure door is ON.

12. With an accurate AC voltmeter, check phase-to-phase (line-to-line) and phase-to-neutral (line-to-neutral) voltages present at transfer mechanism terminals S2A, S2B, and S2C. Also check AC frequency at those terminals. Generator AC output voltage and frequency must be compatible with transfer switch rated voltage and frequency.

    IMPORTANT NOTE: Verify the phase rotation of Source 2 power lines and transfer switch Source 1 and load power lines are compatible.

13. If supplied voltage or frequency is incorrect, refer to standby generator Owner's Manual. If AC frequency is incorrect, adjust engine governed speed. If voltage is incorrect, adjust generator's voltage regulator or correct the problem.

14. When supplied voltage and frequency is correct, shut down the engine manually.

    IMPORTANT NOTE: Supplied voltages from both Source 1 and Source 2 power sources must be compatible with transfer switch rated voltage before proceeding.

15. Connect the transfer switch load to the transfer switch after completion of ***Voltage Checks***. Connect the load to the transfer switch by whatever means provided, such as circuit breaker (s), then proceed to ***Electrical Operation***.

Electrical Operation

Test transfer system electrical operation as follows:

1. On the enclosure door, check that the Source 1 available LED is ON.
2. On the enclosure door, check that the switch position Source 1 (utility) LED is ON.
   IMPORTANT NOTE: The Source 1 (utility) available LED and the switch position-Source 1 (utility) LED (on enclosure door) must both be ON before proceeding to Step 3.
3. Refer to the appropriate owner's manual. Verify the standby generator is prepared for automatic operation.
4. Set TEST MODE on the TX switch controller to NORMAL. Generator startup and transfer to the standby power source should occur. See ***Sequence of Operation***.
5. Set TEST MODE on the TX switch controller to OFF to initiate the re-transfer sequence. The customer load will be transferred back to the Source 1 (utility) power source, using the preset times. The generator will shut down once the engine cool down timer has expired.

Controller Operation

See ***Figure 4-14***. This section will familiarize the reader with the Human Machine Interface (HMI) and indicators on the TX Switch Control mounted in the switch, visible through the door.

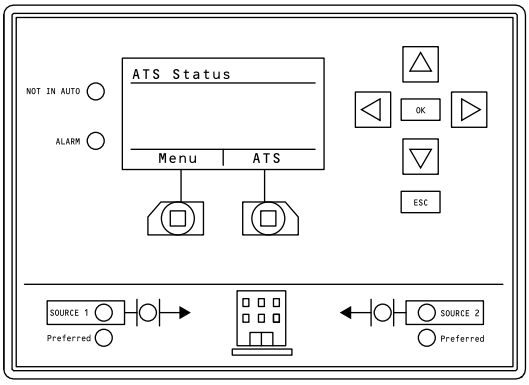


Figure 4-14. TX Switch Controller

Controller Power Supply

The normal power for operating the controller and the transfer switch contactor is provided by factory wired leads to Source 1, Source 2, and the Neutral Block or Switched Neutral Pole. Completion of the steps in Configuring Controller for Nominal Voltage provides the controller with the requisite 208-277 VAC nominal power inputs from S1 and S2 at J1 of the controller. If the voltage at these terminals is below 150 VAC, the controller will transition to an auxiliary power source if available. If the voltage exceeds 350 VAC, the message "Plug J5/J6 connector into J5" should appear, indicating an over voltage condition to the controller. Correct this condition immediately by reconfiguring the controller for nominal voltage. Extended overvoltage operation will cause damage to the controller, even if switching is not attempted.

Normal power source functionality is indicated by the LCD display backlight. The controller can provide power to the contactor, when the backlight is ON, to transition and provide power to the optional I/O module.

All processor functions and the inputs/outputs within the customer wiring area of controller are functional on battery or auxiliary power.

Switch Position LEDs

The transfer switch position is monitored by two auxiliary contacts mounted on the transfer switch mechanism. These LEDs display the position of the main contacts.

If there is a transfer switch error (failure to close or open) the Alarm LED will illuminate. See ***Fault Indication***.

Source 1 Available LED

This LED indicates Source 1 voltage is present and the source is within tolerances set in the TX Switch Control.

Source 2 Available LED

This LED indicates Source 2 voltage is present and the source is within tolerances set in the TX Switch Control.

Source Loss Timer

Both Test Modes are failsafe. If secondary source goes out of tolerances while Primary Source is acceptable, the Source Loss Timer will activate. Once timed-out, the control will initiate transfer back to primary, observing Timer Delay Neutral (if equipped).

Test Mode: Normal

Test Mode is used to simulate a power loss condition on the primary source. Setting the Test Mode setting in the TX Switch Control to Normal will command a transfer to Source 2 (standby) using all the pre-programmed timers and settings associated with a power loss with the exception of Signal Before Transfer, which is active during test modes. The unit will transfer back to Source 1 (utility) after the Test Mode setting of OFF is selected and the Return to Source 1 timer expires. If the secondary source fails while in Test Mode, the unit will transfer back to the primary source if available.

Test Mode: Fast Test

Fast Test Mode is used to simulate a power loss condition on the primary source, but reduce the duration of the test time while maintaining critical transfer and generator timers. Setting the Test Mode setting in the TX Switch Control to Fast Test will cause a transfer to Source 2 (standby) using the same settings as Normal Test Mode, but with the following timers are reduced to five seconds:

- Line Interrupt Delay Timer
- Return to Utility Timer

Turning Test Mode OFF

Turning OFF the test mode will return the controller to the preferred source using normal sequence of operations with programmed time delays.

Maintenance Mode

Setting the Maintenance mode to ON from the ATS menu screen disables all automatic operation of the transfer switch controller. The 2WS and all other outputs associated with transfer logic are removed until Maintenance mode is set to OFF. At this point, the controller will reset the contactor position based upon the position feedback and resume automatic functions. Maintenance mode is to be enabled whenever a manual operation is performed and/or to prevent unintended 2WS, contactor operation, or any other automatic transfer function.

Timer Skip

Navigate right of ATS Status screen to skip view and skip active timers. Active Timers on the ATS status screen can be skipped by pressing”OK” and ”ESC” at the same time.

Exercise Timer

The ATS control contains an integrated Exercise timer to periodically verify proper functioning of the emergency backup system. The settings for Exercise may be accessed under the Exercise screen. Exercise will attempt to start (and transfer to if selected) the secondary source. The Exercise Duration Timer starts when the secondary source is called for and completes when the Exercise Duration Timer expires. If successful, at the expiration of the Exercise Timer, the Exercise is logged as completed. If the secondary source fails or if the transfer is unsuccessful, a Fault Indication is triggered and the fault is logged. At the conclusion of the Exercise, if applicable, the load is transferred back to the preferred source with all of the settings of Normal Test.

Sequence of Operation

When acceptable Source 1 source voltage is available and the Maintenance setting in the TX Switch Controller is set to OFF, observe the following:

- Source 1 Available LED is ON
- Source 1 Switch Position LED is ON

Sequence 1 - Source 1 Voltage Dropout

- Source 1 voltage goes outside of the value set in the TX Switch Controller (range is 50-90% of nominal voltage, factory default setting is 85%).
- Voltage dropout triggers Sequence 2.

Sequence 2 - Line Interrupt Delay

- Line Interrupt Delay, called Loss Delay in the TX Switch Controller, can be set between zero and 120 seconds. Factory default setting is three seconds.
- If voltage dropout lasts longer than the Loss Delay setting, the generator start sequence is activated.
- Once the Generator voltage reaches Load Accept Voltage and Load Accept Frequency, this will trigger Sequence 3.

Sequence 3 - Engine Minimum Run and Engine Warmup Timers

- Engine Warmup timer starts. The Engine Warmup timer can be set from zero to 1,800 seconds. Factory default is three seconds.
- Engine Minimum Run timer starts after Engine Warmup timer. The Engine Minimum Run timer can

be set from five to 30 minutes. Factory default setting is five minutes.

- The expiration of the Engine Warmup timer triggers Sequence 4.

Sequence 4 - Signal Before Transfer

- Signal Before Transfer timer does not operate in a Source 1 fail sequence, Sequence 5 starts immediately.
- In Test or Demand Response modes, the Signal Before Transfer timer starts. The Signal Before Transfer relay is energized for the duration of the timer. The Signal Before Transfer timer can be set from zero to 120 seconds. Factory default is 30 seconds.
- The expiration of the Signal Before Transfer timer triggers Sequence 5; however, the Signal Before Transfer output is held until the transfer is complete.

Sequence 5 - ATS Transfer to Source 2 Position

- ATS transfer mechanism operates to connect the Customer Load to the Source 2 supply. Customer Load will be supplied from Source 2 until Sequence 6 is initiated.
- If inphase operation is selected, the timing of the close operation will occur when the generator's voltage and frequency is synced to the utility's parameters.
- If inphase conditions are not met within the programmed time period, one of the following actions will be taken:
  - The inphase switch will show an alarm and remain trying to sync until either Source 1 or Source 2 is turned OFF.
  - If switch has neutral mechanism, switch will transfer to neutral and wait until Timer Delay Neutral times out. Then it will complete transfer to Source 1 or Source 2.

NOTE: The default Sync timeout is 60 seconds.

- Once transfer is completed, Source 2 Switch Position LED will turn ON.

Sequence 6 - Source 1 Voltage Pickup

- The TX Switch Controller continues to monitor the Source 1 source voltage. When the Source 1 voltage and frequency is above the voltage pickup setting, Sequence 7 will be initiated.

Sequence 6a - Return to Source 1 (Utility)

- If the Secondary Source has failed and the Primary Source is good, the control will start at the Secondary loss timer with the value of the Loss Delay. Once timed out, the control will initiate transfer to primary source.

Sequence 7 - Return to Source 1 Timer

- Return to Source 1 timer, called Return Delay in the TX Switch Controller, starts. The Source 1 voltage must stay above the pickup level. If the Source 1 voltage falls below the pickup value, the Return Delay timer is reset. The Return Delay timer can be set from zero to 1,800 seconds. Factory default is 1,200 seconds.
- The expiration of the Return Delay timer triggers Sequence 8.
- If Manual Return to Primary setting is set to “Yes” the ATS Screen will display "Ret to Pri Press OK” Once OK is pressed on this screen, the control will go to Sequence 8.

Sequence 8 - Signal Before Transfer

- Signal Before Transfer timer starts. The Signal Before Transfer relay is energized for the duration of the timer. The Signal Before Transfer timer can be set from zero to 120 seconds. Factory default is 30 seconds.
- The expiration of the Signal Before Transfer timer triggers Sequence 9; however, the Signal Before Transfer output is held until the transfer is complete.

Sequence 9 - ATS Transfer to Source 1 Position

- ATS transfer mechanism operates to connect the Customer Load to the Source 1 supply. Customer Load will be supplied from Source 1.
- If inphase operation is selected, the timing of the close operation will occur when the generator's voltage and frequency is synced to the utility's parameters.
- If inphase conditions are not met within the programmed time period, one of the following actions will be taken:
  - The inphase switch will show an alarm and remain trying to sync until either Source 1 or Source 2 is turned off.
  - If switch has neutral mechanism, switch will transfer to neutral and wait until Timer Delay Neutral times out. Then it will complete transfer to Source 1 or Source 2.

NOTE: The default Sync timeout is 60 seconds.

- Once transfer is completed, Source 2 Switch Position LED will turn OFF.
- The connection of the Customer Load to Source 1 triggers Sequence 10.
- Source 1 Switch Position LED is ON.

Sequence 10 - Engine Cooldown Timer

- Engine Cooldown timer starts. The Engine Cooldown timer can be set from zero to 1,800 seconds. Factory default is 1,800 seconds.
- The engine generator will shut down when the Engine Cooldown timer and the Engine Minimum Run Timer expires.

NOTE: At the conclusion of Sequence 10 the system is armed and ready for the next Source 1 failure or exercise sequence. The switch is factory set so Source 1 is Preferred.

Permissive & Loadshed

On a 2-position switch, if an input is programmed to permissive, the permissive signal must be asserted in order to initiate transfer to secondary. On a 3-position switch, if the Permissive Signal is removed, a loadshed function will be performed. The ATS transfer mechanism operates to move to Neutral position during loadshed. It will remain in Neutral for a minimum of the Time Delay Neutral (TDN) programmed duration. After the expiration of the TDN timer, the Neutral position is maintained until one of the following events occurs:

- The permissive input is reasserted and the ATS transfer mechanism immediately operates to connect the Customer Load to Source 2 supply.
- Source 1 is deemed within tolerances as acceptable and the ATS transfer mechanism operates to connect the Customer Load to Source 1 supply.

Demand Response

If an input is programmed for Demand Response, and the signal is asserted, the ATS will attempt to start and transfer to the Secondary Source utilizing TDN or Inphase operation functions. It will remain in Secondary Source until the signal is deasserted. If the Secondary Source fails while Demand Response is asserted, the ATS will attempt to transfer back to the Primary Source and attempt to start the Secondary Source.

Timers

Access a list of active timers by using the right or left arrows to toggle to the Timers screen. The expiration of an active timer will automatically remove it from the screen.

To bypass timers:

1. Use the up or down arrows to select the timer
2. Press the right hotkey below the screen labeled “Skip.”

This bypasses the selected timer.

IMPORTANT NOTE: Bypassing timers may result in equipment damage. Please exercise caution when using this function.

See ***List of Faults*** for additional faults.

2 Wire Start (2WS)

The control will issue a 2WS command to the generator by closing J3:9 (NO) and J3:8 (COM).

NOTE: The 2WS command will issue for the source whose Type is Generator. If both sources are set as Generator, then the 2WS command will issue for Source 2 (S2) by default.

NOTE: The 2WS command is also initiated in the event of all power losses to the control, including loss of battery power. During a 2WS command from the control, J3:10 (NC) and J3:8 (COM) will open.

Fault Indication

The control has an LED on the front face that indicates when a fault condition occurs. Fault conditions are recognized when:

- There is a controller or transfer switch fault.
- The control senses the genset or transfer switch fails.
- The transfer switch fails to perform as expected.

For customer remote monitoring, J3:4 (NO) and J3:2 (COM) will be asserted (closed) during Fault Indication.

The Fault Indication State remains until all faults have been acknowledged.

Phase Rotation

The phase rotation is set by default to ABC or single phase monitoring. Phase rotation may be set to CBA or OFF.

IMPORTANT NOTE: Turning OFF Phase Rotation monitor, wiring phase rotation different between sources, and performing inphase operation will result in an open transition out-of-phase operation. It is not recommended to use the OFF setting for systems that attempt in-phase operations as damage to motor loads may result.

Manual Return to Primary

Manual Return to Primary function prevents the control from automatically initiating a transfer back to Primary Source once the Return Delay Timer expires. On the ATS Status screen, a message saying “Ret to Pri Press OK” will display. Pressing “OK” while on the ATS Status screen will initiate transfer back to primary. If the Primary Source loses power while waiting for input, the transfer switch returns to Secondary Source. The Primary Return Timer will restart once the Primary Source returns with power. If the Secondary Source loses power, the Source Loss Timer is initiated. When the timer expires, a transfer is initiated.

Closed Transitions

A closed transition contactor transitions between sources by closing the destination source before opening the current source.

Both the Genset and Utility will be connected to the load for a short amount of time. The control contactor keeps the mechanism for the contactor pre-charged to perform a transition (OPEN or CLOSED) in a normal state.

Programming the Control

To perform a closed transition, the controls need to be programmed for closed transition. The option for closed transition is located under the Program Menu. Setting this option to “ON” will also set the in-phase setting. If in-phase is not set, a screen confirming the in-phased setting will be prompted. Selecting “Yes” will activate the in-phase setting. Saying “No” will leave both “In Phase” and “Closed Xfer” on “No.”

Selecting in-phase will instruct the switch to wait for synchronization before transferring. If the “Closed Xfer” option is set to “Yes,” the switch will attempt to do a closed transfer between two live sources during test and retransfer. Leaving this option as “No” instructs the switch to perform an open transition.

Summary of Parameters

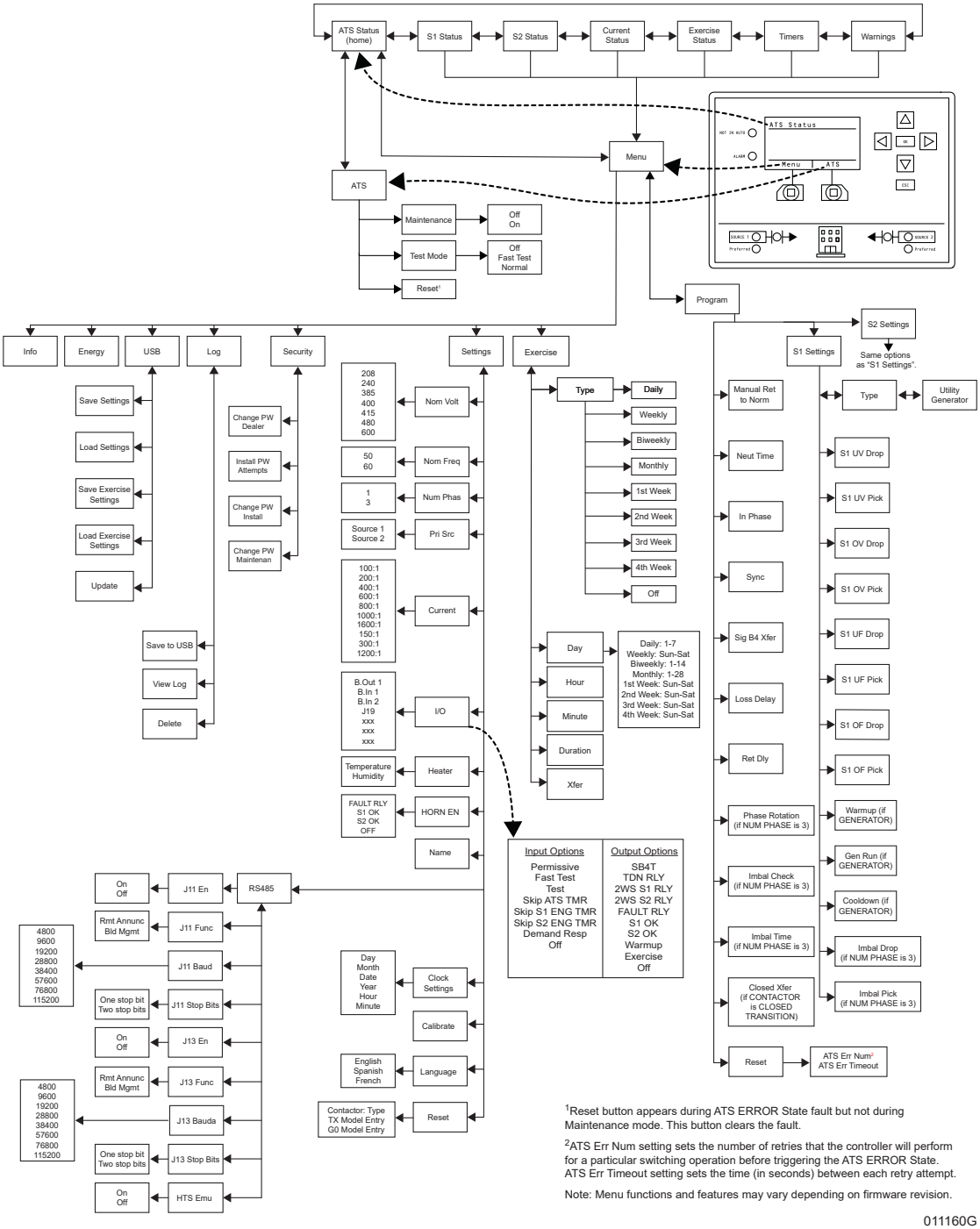
Voltage and Frequency Settings	Range	Default Value
Source 1 is Generator	Yes or No	No
Source 1 Undervoltage Dropout	50-97%	85%
Source 1 Undervoltage Pickup	52-99%	90%
Source 1 Overvoltage Dropout	105-120%	110%
Source 1 Overvoltage Pickup	103-118%	105%
Source 1 Underfrequency Dropout	90-97%	90%
Source 1 Underfrequency Pickup	91-99%	95%
Source 1 Overfrequency Dropout	103-110%	105%
Source 1 Overfrequency Pickup	101-109%	102%
Source 1 Voltage Imbalance Drop	5-20%	5%
Source 1 Voltage Imbalance Pickup	3-18%	3%
Source 1 Warmup Time	0-1800s	3s
Source 1 Cooldown Time	0-1800s	300s
Source 1 Minimum Run Time	300-1800s	1200s
Source 2 is Generator	Yes or No	Yes
Source 2 Undervoltage Dropout	50-97%	85%
Source 2 Undervoltage Pickup	52-99%	90%
Source 2 Overvoltage Dropout	105-120%	110%
Source 2 Overvoltage Pickup	103-118%	105%
Source 2 Underfrequency Dropout	90-97%	90%
Source 2 Underfrequency Pickup	91-99%	99%
Source 2 Overfrequency Dropout	103-110%	105%
Source 2 Overfrequency Pickup	101-109%	102%
Source 2 Voltage Imbalance Drop	5-20%	5%
Source 2 Voltage Imbalance Pickup	3-18%	3%
Source 2 Minimum Run Time	300-1800s	1200s
Source 2 Warmup Time	0-1800s	3s
Source 2 Cooldown Time	0-1800s	300s
Phase Rotation Check	ABC, CBA, OFF	ABC
Supply Overvoltage	350 VAC	Fixed
Manual Return to Normal	Yes or No	No
Time Delay Settings		
Transfer to Emergency	120s max	3s

Re-transfer to Normal	1,800s max	300s
Time Delay Neutral	120s max	5s
Elevator Signal	120s max	30s
In Phase Transfer	Yes or No	No
In Phase Synchronization Time	60-3600s	300s
Preferred Source	S1, S2	S1
Voltage Imbalance Enable	Yes or No	Yes
Voltage Imbalance Timeout	10-30s	20s
Exercise Settings		
Type	Daily, Weekly, Monthly, First Day, Second Day, Third Day, Fourth Day, Off	Weekly
Day	Daily: N/A, Weekly: 1-7, Monthly: 1-28, Day: 1-7, Off: N/A	Sun
Hour	0-23	9
Minutes	0-59	0
Duration (minutes)	5-600	30
Transfer on Exercise	Yes or No	No

Menu Map

Press the ESC button from any screen to go to a higher level screen. Navigate to the desired menu by pressing the arrow buttons. When the desired menu is selected, press the OK button. The MENU button is accessible from all screens. The ATS button is only accessible from the ATS Status screen.

NOTE: Some screens require a Maintenance Password, an Installer Password, or a Dealer Password to access. See ***Security*** for more information.



[1]Reset button appears during ATS ERROR State fault but not during Maintenance mode. This button clears the fault.

[2]ATS Err Num setting sets the number of retries that the controller will perform for a particular switching operation before triggering the ATS ERROR State. ATS Err Timeout setting sets the time (in seconds) between each retry attempt.

Note: Menu functions and features may vary depending on firmware revision.

011160G

ATS Status Icons

Icon	Definition
	Fast Test
	Test
	Maintenance
	Demand Response
	Permissive
	Exercise
	USB Connected
	IO Board Attached
	Dealer Unlock
	Maintenance Unlock
	Installer Unlock
	Generator Connect

Transfer Switch Options

The transfer switch may be equipped with one or more of the following options:

- Signal Before Transfer
- NEMA 1 or 3R
- Heater (Standard with 3R)
- TDN (Time Delay Neutral)
- Current Transformers
- Optional I/O Board with 4 Inputs and Outputs
- Service Entrance Rating (Equipped with Circuit Breaker)

Signal Before Transfer

See ***Figure 4-15***. The Signal Before Transfer operation includes a signal relay accessible at J3 on the controller (A).

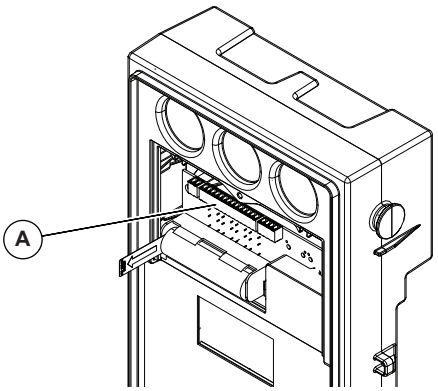
NOTE: See ***Figure 4-16***. The customer connection diagram is located under the sliding door of the control.

The logic for this operation is set in the TX Switch Controller. The delay time is adjustable from zero to 120 seconds. Set the timer to “0” when this option is not desired.

The basic operation of the option is to delay (for the period of time set) the transfer of the mechanism while a signal relay (SR) is energized. When the relay is energized, two sets of the dry contacts are closed. Reference the switch wiring diagram.

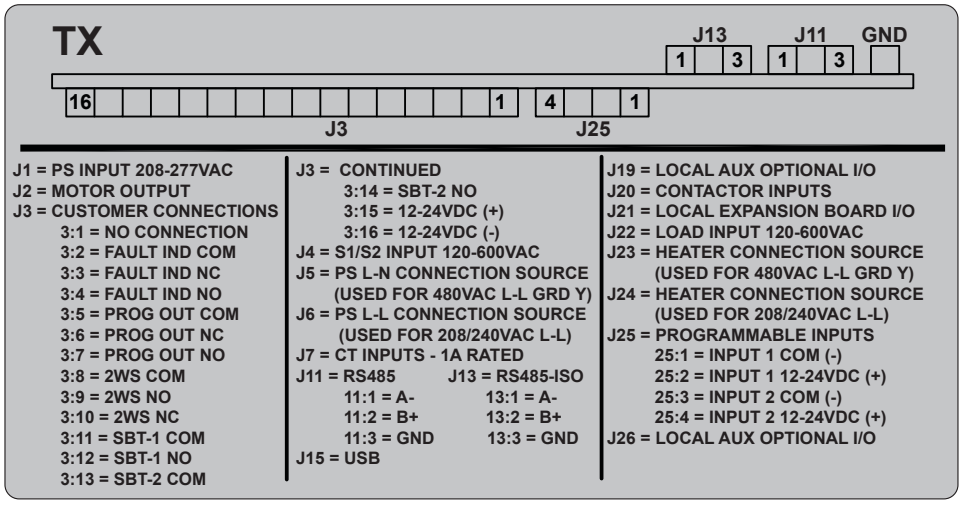
NOTE: This delay is not active on a Source 1 failure. Transfer during Source 1 failure is immediate.

NOTE: The Signal Before Transfer feature provides a time delay that allows elevators to continue operating before transfer to another power supply occurs.



010639

Figure 4-15. Signal Before Transfer



020005

Figure 4-16. Customer Connections Diagram

Customer Programmable Input/ Output (I/O) Parameters

NOTE: Optional I/O board needs to have one of the two voltage sources (S1 or S2) active for the output relays to be operational.

A signal relay and two input channels are available at J3 and additional channels are optionally available to be mapped to the following functions within the I/O menu screen. Relays will activate if controller enters the following states in operation and deactivate once the controller exits these states:

Outputs

- Signal Before Transfer (SB4T)
  - Signal to system that a transfer will take place.
- Time Delay Neutral (TDN)
  - Signal to indicate control is in neutral.
- 2-Wire Start for Source 1 (2WS1)
  - Start signal for Engine connected to Source 1. Polarity is reversed when the 2WS active closes Prog. IO N/C and Prog/IO Comm. IO Board not affected.
- 2-Wire Start for Source 2 (2WS2)
  - Start signal for Engine connected to Source 2. Polarity is reversed when the 2WS active closes Prog. IO N/C and Prog/IO Comm. IO Board not affected.
- Alarm
  - Warning indication to external systems that an active fault exists.
- Source 1 OK (S1OK)
  - Indicates that Source 1 Voltage is acceptable.
- Source 2 OK (S2OK)
  - Indicates that Source 2 Voltage is OK and acceptable.
- Secondary Warmup (WARMUP)
  - Indicates Secondary Source is in warmup. Signal is removed when warmup timer expires.
- Exercising (EXERCISING)
  - Indicates control is exercising. Signal is removed when exercise timer expires.

Inputs

- Permissive/Loadshed (PERMISSIVE)
  - Allows transfer to Secondary Source. In switches with Neutral mechanisms, removal of signal triggers loadshed operation
- Fast Test (FAST_TEST)
  - Simulates a power loss event, starting and transferring to Secondary Source. Fast test reduces loss time-out and delay timeout to five seconds.
- Test
  - Simulates a power loss event, starting and transferring to secondary.
- ATS Timer Bypass (ATS_BYPASS)
  - Expires the active timer in ATS Automatic Transfer, and moves to next ATS operation sequence. Active timer is bypassed on activation of signal and is a one shot operation.
- Source 1 Timer Bypass (S1 TIMER BYPASS)
  - Bypasses the warmup, cooldown, and minimum run timer for Source 1.
- Source 2 Timer Bypass (S2 TIMER BYPASS)
  - Bypasses the warmup, cooldown, and minimum run timer for Source 2.
- Demand Response
  - Takes loads off Primary Source and transfers them to Secondary Source. Attempts to start and transfer to Secondary Source when asserted. If Secondary Source fails, it will transfer back to Primary Source if available.

Customer Optional I/O Parameters

See ***Figure 4-17***. The transfer switch may be equipped with an Optional (I/O) module to provide additional programmable inputs and outputs. This module is installed on the back side of the controller. These inputs and outputs are powered and functional when S1 or S2 are available and may be mapped to any of the customer programmable I/O parameters. Customer wiring may be landed directly onto the I/O module.

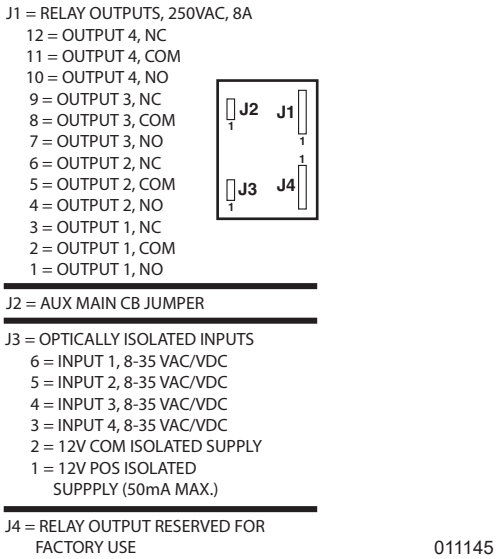


Figure 4-17. Customer Optional I/O

Security

The system utilizes the HMI mechanism to check security level and lock out access via navigation to windows. The Security levels are:

- **Maintenance** - for end user operation of ATS. Able to access and/or adjust:
  - Exercise Time and Duration
  - View Log
  - ATS Test
- **Installer** - for setup of ATS. Able to set:
  - Language
  - Date and Time
  - Exercise Time and Duration
  - Source 1 and Source 2 Tolerance
  - Neutral Timeout
  - Loss Delay
  - Return Delay
  - Generator Warmup Time
  - Generator Cool Down Time
  - Generator Minimum Run Time
  - Inphase Transition
  - Nominal Voltage and Frequency
  - Number of Phases
  - Primary Source
  - Programmable (I/O)
  - Heater Settings (if equipped)
- **Dealer** - for dealer access to all functional controls including nominal voltage and frequency of Control.

NOTE: Installer level has a factory set number of ten successful logins. After ten successful login attempts, the dealer password will be needed to regain access into the control levels. The dealer level can change the number of successful attempts remaining.

Default passwords are as follows:

Maintenance	7123
Installer	8123

Upon successful entry of a password, associated screens will be available for editing and/or viewing for 25 minutes.

The Passwords can be changed via the Security Menu. Each level can change the password of the lower levels.

Security Menu

This window gives HMI access to Security functions. Depending on what level password is entered, functions will be displayed on the HMI.

Option	Description	Seen at Unlock Level
Unlock	Gives a password window	Below Dealer
Password Dealer	Resets Dealer Password	Dealer
Installer Attempts	Sets number of installer password Successes	Dealer
Password Installer	Changes Installer Password	Installer or Higher
Password Maintenance	Changes Maintenance Password	Maintenance or Higher

Heater

The heater ensures operation in extreme environmental conditions and turns on below programmed temperature.

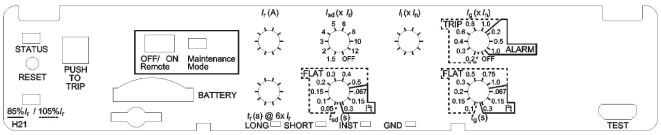
Logging

The logging function monitors source events and provides values for failures. It displays up to 200 events with dates and times of failures, and stores the violating values. The events can be downloaded to a flash drive via the USB port located on the control.

Voltage loss S1 Phase B.	Maintenance mode entered.
Voltage loss S1 Phase C.	Maintenance mode left.
Voltage Return S1 Phase A.	ATS entered Loss Delay State.
Voltage Return S1 Phase B.	ATS entered Time Delay Neutral State.
Voltage Return S1 Phase B.	ATS entered Synchronization State.
Voltage loss S2 Phase A.	ATS Operated to Primary Source.
Voltage loss S2 Phase B.	ATS Operated to Secondary Source.
Voltage loss S2 Phase C.	ATS Operated to Neutral.
Voltage Return S2 Phase A.	ATS entered Primary Return Delay State.
Voltage Return S2 Phase B.	ATS entered an error state.
Voltage Return S2 Phase C.	ATS on Primary Source.
S1A Freq loss.	ATS on Secondary Source.
S1A Freq return.	ATS Started Exercise.
S2A Freq loss.	Exercise was successful.
S2A Freq Return.	Exercise failed, no voltage for 1 minute on Secondary Source.
ATS Settings were saved.	Secondary engine started to warm up.
Heater Activated.	Secondary alternator started to cool warm up.
Heater Deactivated.	

GFCI Settings

See ***Figure 4-18*** for adjustment, status, and reset. Refer to an Eaton Power Defense Circuit Breaker Instruction Manual for the most detailed and current information. The Trip curve can be adjusted. Setting ground fault to ALM will turn OFF GFCI trip.



015194a

Figure 4-18. PXR20 Module

NOTE: Eaton may identify a Neutral Voltage Connection, it is not required for GFCI operation. Neutral Voltage Connection is utilized for voltage measurement.

IMPORTANT NOTE: This system only provides GFCI protection to Source 1. Source 2 offers NO GFCI protection.

Performance Testing for Ground Fault Circuit Breakers

NEC Requirements and UL Standards

⚠WARNING

Electric shock. Remove source power to the breaker before conducting tests. Failure to do so could result in death, serious injury, equipment or property damage.

(W000787)

The National Electric Code under Article 230-95-C requires that any ground-fault protection system be performance tested when first installed. The 2017 NEC requires the test process to be primary current injection for ground fault testing. UL Standard 489 & 1053 require that the minimum instructions contained in this document accompany each ground fault protection system. These instructions are provided to aid in testing the circuit breaker as a component of the ground fault protection system. The applicable codes and standards remain the governing documents.

IMPORTANT NOTE: Remove any temporary connections made for conducting tests and restore the circuit breaker to proper operating conditions before returning the breaker to service.

General Instructions

Field-testing is for functional assessment and not field calibration.

Qualified personnel shall evaluate the interconnected system in accordance with the equipment assembler's detailed instructions. Where a question on proper configuration or operation of the ground fault system exists, consult the specifying engineer and/or equipment assembly manufacturer.

Verify the grounding points of the system to determine that ground paths do not exist that would bypass sensors.

To verify proper ground fault operation, perform both trip and no trip type tests. The trip test confirms that magnitudes of test current above the ground fault pick-up setting (Ig) will cause the breaker to trip. The no trip test confirms that magnitudes of test current above the ground fault pick-up setting but routed through the breaker in a way to simulate normal phase and neutral return currents does not cause the breaker to trip.

Maintain a written record of the tests performed. Make it available to the authority having inspection jurisdiction. See ***Ground Fault Protection Testing Record***.

Required Testing Equipment

Use a low voltage (0-24 V), high current AC source to generate all test currents. When applying a test current (125% of the Ig setting) be sure that L, S, and I settings for phase currents (collectively Iph) will not cause the breaker to trip.

The included figures illustrate commonly used circuit breaker configurations and apply to most molded-case (MCCB), insulated-case circuit breakers (ICCB), and power circuit breakers (ACB) with electronic trip units with ground fault trip or ground fault alarm capability. Consult the specifying engineer and/or equipment assembler for other configurations.

Trip Unit “Self-Power” Capabilities

All testing is done with the Contactor Isolated from the Circuit Breaker while de-energized. The Contactor Should be placed in Source 2 or Neutral for electrical isolation from the circuit breaker.

The circuit breaker trip unit derives its operating power from the phase current (self-power) or an auxiliary source. For self-power, approximately 35% of the breaker’s frame rating (In) flowing in one pole or 20% flowing in 2 or 3 poles is sufficient. The status LED will blink (heartbeat) at approximately once per second as an indication of sufficient operating power.

An auxiliary source may be already wired to the trip unit to provide operating power. If that source is active during testing it can supply operating power to the trip unit.

Alternately, for PXR (Power Xpert Release) trip units, the USB port may be used to provide operating power to the trip unit. Either a commercial battery pack or a laptop can be connected via the micro-B USB connection. For Digitrip or PXR trip units, on insulated-case or power circuit breakers, an auxiliary power module may be used to provide operating power to the trip unit through the 2-pin connector on the front.

See ***Figure 4-19***. When testing low ground fault pick-up settings (Ig) without auxiliary power or when passing a test current only through the neutral or external sensor, the trip unit may not receive sufficient energy to self-power. To test under this condition, loop the test current through 2-poles in opposite directions, providing power and canceling each other with respect to ground fault. ***Figure 4-19*** shows 2-poles being used to provide operating power for the trip unit while testing another pole or sensor.

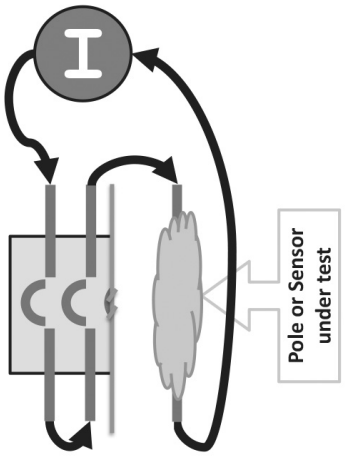


Figure 4-19. Circuit Breaker GFCI Testing

Circuit Breaker Ground Fault – Trip Test

1. Remove source power from system and isolate the circuit breaker and sensors.
2. Place Contactor in Neutral or Source 2 position for electrical isolation.
3. See ***Figure 4-20***. Apply a test current equal to 125% of the ground fault pick-up setting (Ig) through one pole of the circuit breaker or external sensors.

   NOTE: This will cause the breaker to trip or alarm (based on settings) on ground fault.
4. Reset the breaker and alarm indicator.

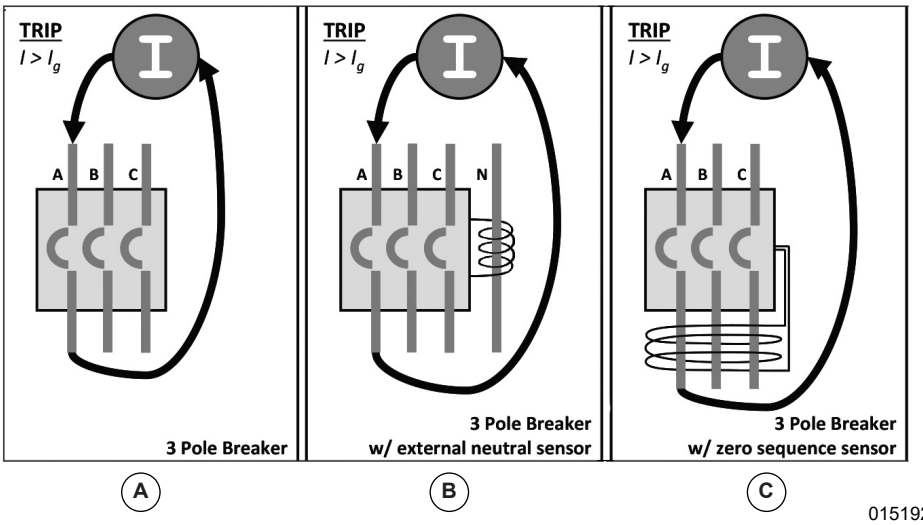


Figure 4-20. Circuit Breaker GFCI Trip Test

Circuit Breaker Ground Fault – No Trip Test

1. Remove source power from the system and isolate the circuit breaker and sensors.
2. Ensure Contactor is still in Neutral or Source 2 State for electrical isolation.
3. See ***Figure 4-21***. For a 3-pole, 3 pole with external neutral sensor, 4-pole or 3-pole with zero sequence sensor (A, B, C): Apply a test current equal to 125% of the ground fault pick-up setting (Ig) through one pole of the circuit breaker, returning the test current through another pole or the external neutral sensor.

IMPORTANT NOTE: Breaker should not trip or alarm on ground.

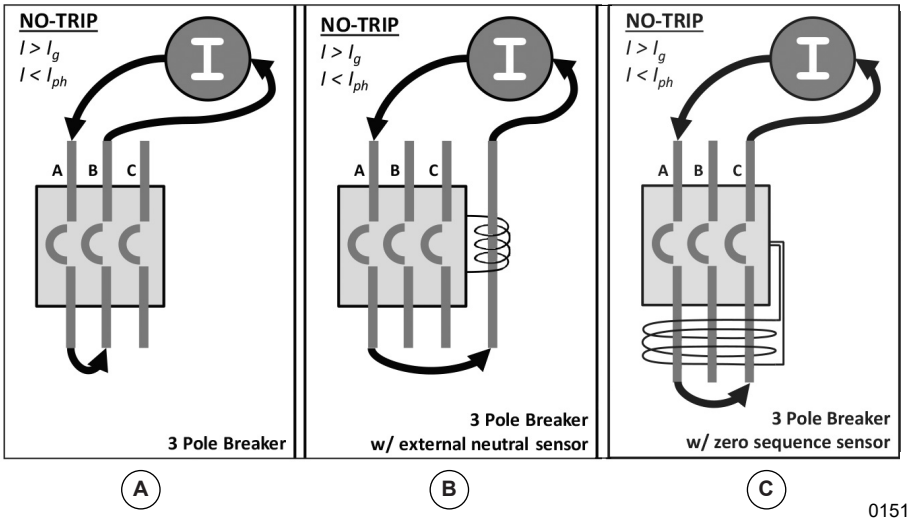


Figure 4-21. Circuit Breaker GFCI No Trip Test

Troubleshooting

Certain behavior of the ground fault performance can provide insight if there is a problem. Breakers which provide current metering (PXR 20/25) are valuable for troubleshooting. Cause of trip indicators, current magnitudes, and trip-logs can provide additional insight.

Breaker Configuration	Type of Test	Symptom	Possible Causes
Breakers with external neutral sensor	No-Trip Test	Breaker Trips	If breaker ground current indicated = 2x test current, external neutral sensor is wired backwards or mounted backwards. External neutral sensor polarity dot should be facing towards the source.
			If breaker ground current indicated = test current, check secondary connections from the external neutral sensor are landed on proper terminals on the breaker.
			If breaker ground current indicated = uneven multiple of the test current, check external neutral sensor ratio / rating. External neutral sensor rating must match the breaker frame.
	Trip Test	Breaker Does NOT Trip	Trip unit not getting auxiliary power or insufficient test current to "self-power" trip unit. See ***Trip Unit "Self-Power" Capabilities***. Check status LED indication. LED should blink approximately once per second indicating sufficient operating power.
			If breaker ground current indicated = 0 amps, external neutral sensor may be wired backwards or mounted backwards. External neutral sensor polarity dot should be facing towards the source.
			If breaker ground current indicated > 0 amps but less than test current, check external neutral sensor ratio or rating. External neutral sensor rating must match the breaker frame.

Ground Fault Protection Testing Record

Circuit breaker identification: _____

Ground fault settings: GF pick-up: _____ GF time: _____

Breaker: __ 3-pole __ 3-pole w/external neutral sensor __ 4-pole

__ 3 pole w/zero sequence sensor __ 3 pole w/source ground sensor

Date	Breaker Setting	Test and Current	Notes	Tested By
	Ground fault (Ig):	__ Trip __No Trip	__Pass __Fail	
	Pick Up:	Current:		
	Time Delay:	Time:		
	Ground fault (Ig):	__ Trip __No Trip	__Pass __Fail	
	Pick Up:	Current:		
	Time Delay:	Time:		
	Ground fault (Ig):	__ Trip __No Trip	__Pass __Fail	
	Pick Up:	Current:		
	Time Delay:	Time:		
	Ground fault (Ig):	__ Trip __No Trip	__Pass __Fail	
	Pick Up:	Current:		
	Time Delay:	Time:		
	Ground fault (Ig):	__ Trip __No Trip	__Pass __Fail	
	Pick Up:	Current:		
	Time Delay:	Time:		
	Ground fault (Ig):	__ Trip __No Trip	__Pass __Fail	
	Pick Up:	Current:		
	Time Delay:	Time:		
	Ground fault (Ig):	__ Trip __No Trip	__Pass __Fail	
	Pick Up:	Current:		
	Time Delay:	Time:		
	Ground fault (Ig):	__ Trip __No Trip	__Pass __Fail	
	Pick Up:	Current:		
	Time Delay:	Time:		

ARMS Operation (Optional 800A and Larger Only)

If ARMS (Arcflash Reduction Maintenance System) Option was selected, it includes a PXR20 Module on the Eaton breaker.

See ***Figure 4-22***. When active, a Purple Maintenance Mode Indicator (A) will illuminate on PXR 20 Module.

To place circuit breaker in ARMS mode, turn on ARMs switch from the front control, above the TX100 controller. This switch is only available when the option has been selected. See the Wiring Diagram with Optional ARMS for factory switch wiring to the breaker.

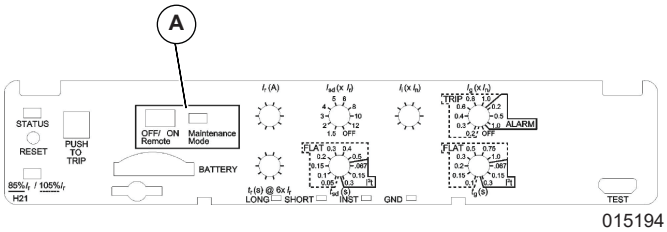


Figure 4-22. PXR20 Module

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Section 5: Maintenance

Operate Transfer Switch

Operate the transfer switch at least once each month. This can be done by performing a NORMAL TEST of the system. Because the System Test switch only simulates failure of the UTILITY power source, service is interrupted only during the actual transfer of the load.

Clean and Inspect Transfer Switch

Protect the transfer switch against construction grit, metal chips, excessive moisture and other harmful dirt at all times. At least once each year, turn OFF all power supplies to the switch, then brush and vacuum away dust and dirt that has accumulated inside the enclosure. After cleaning, inspect the transfer switch carefully. Look for evidence of arcing, burning, hot spots, charring, and other damage. If any of these are found, have the switch assembly checked by an authorized service technician.

Lubrication

Operating parts inside the transfer mechanism have been properly lubricated at the time of assembly. Under normal conditions no additional lubrication should be required. The service technician should lubricate all recommended points whenever major transfer mechanism components are replaced.

IMPORTANT NOTE: Use only specified greases to lubricate contactor parts. DO NOT USE ANY SUBSTITUTES.

Use the following lubricants for the Operating Mechanism (Between movable contact and busbars):

- Dow Corning (Molykote) BR2 Plus; (Mfg. by Dow Corning Co., USA)
- Liqui-Moly (Mfg. by DAI TO Co., Ltd., Japan)

Main Current Carrying Contacts

At least once annually, have an IASD check the main current carrying contacts in the transfer mechanism. They will repair or replace major components that have been found defective.

Battery

The battery in the transfer switch controller is of the lithium ion protected cell type. The battery is rechargeable. Contact Generac for replacement on an annual basis. The battery or an external 12-24 VDC power supply is required to retain the clock and exercise settings during any power loss to S1 and S2.

If an extended outage completely depletes the internal battery, the controller will shut down, which saves available battery power for the clock and exercise settings. Restoration of power will recharge battery. Replacing the battery with external power to control is preferred. The battery may only be replaced when the control is battery powered. The control will not lose clock and exercise settings if battery is replaced within two minutes.

Part Number	Description
A0000214872	3.6V type NCM18650 2600MAH Lithium Ion Rechargeable Battery

The controller circuitry will protect the battery in the event of extended power outages for up to one hour.

Fault Types (TX100 Controller)

When a fault is presented, the Alarm LED on the front panel is illuminated and the Fault Indicator Relay is closed. For all faults, except for Source Miswire and Source Voltage High, the ATS control will continue to attempt all functions while in the Fault Indication State. The system needs to be inspected for proper functionality when this occurs.

Faults are displayed on the Warnings screen. Fault can be acknowledgeable (ACKABLE) or unacknowledgeable (UNACKABLE). When a fault is acknowledged (ACKD), it may stay on the screen, but the fault light will turn OFF and the relay opens.

If multiple faults exist, all faults will need to be ACKD in order to clear the fault indication. Faults are removed from the screen if fault conditions are removed.

Fault types include:

- Acknowledged (ACKD)
  - The fault is present, the Alarm LED is not lit, and the relay is open.
- Acknowledgeable (ACKABLE)
  - Fault is present and fault is asserted until user acknowledges fault. Once acknowledged, the Alarm LED turns OFF and the relay opens.
- Unacknowledgeable (UNACKABLE)
  - Fault is displayed and cannot be acknowledged by the user.

List of Faults

Fault	Description	Fault Types
ATS ERROR State	Indicates the ATS failed to transfer within the set amount of retries. The ATS must be inspected and reset from the ATS menu.	Acknowledgeable
Exercise Fail	If secondary source is interrupted for more than 60 seconds during exercise, exercise stops and this fault is displayed.	Acknowledgeable
Secondary Source Failure	If the generator is called and does not present valid voltage for more than 30 seconds, this warning is presented. It is cleared upon detection of good secondary source voltage.	Acknowledgeable
Crank Failure	Indicates the engine failed at start. Voltage was not detected within tolerance after 90 seconds.	Acknowledgeable
IO Board Failure	Indicates the I/O Board is disconnected. This warning only appears if an I/O board is required to drive the contactor and is not detected.	Unacknowledgeable
Contactor Operation Failure	Contactor feedback indicates the previous operation did not succeed on the last attempt.	Acknowledgeable
Contactor Position Failure	Contactor position feedback is not correct for what the automatic operation dictates.	Unacknowledgeable
Supply Voltage High	Indicates that 480V is applied to the Control Power Circuit. The Control may be damaged with extended operation at 480V. Refer to ***Configuring Controller for Nominal Voltage*** to remedy.	Unacknowledgeable
S1 Miswire	This is the warning structure to indicate if S1 is wired with incorrect phase rotation. The warning comes up when Phase B is detected to be in the angle that C should be in.	Unacknowledgeable
S2 Miswire	This is the warning structure to indicate if S2 is wired with incorrect phase rotation. The warning comes up when Phase B is detected to be in the angle that C should be in.	Unacknowledgeable
Permissive Fault	This fault appears if the control is programmed for a permissive input signal and the signal does not appear after programmed time (11 seconds by default).	Acknowledgeable
Gen Shunt Fault	This appears if the control senses the paralleling relay has tripped. Acknowledge the fault to reset the relay. The Shunt trip on the generator can then be reset. Contact an IASD for maintenance.	Acknowledgeable
RA/H-100 Comms Loss	This warning appears when either the ATS Remote Annunciator (RA) loses communications for at least 30 seconds or the H-100 loses communications for at least 20 seconds when HTS Emulation mode is enabled.	Acknowledgeable

Section 6: Communications

Generac Digital Control Platform Generators

Communications parameters within the TX switch control are by default set to:

- Modbus Server Port
- 9,600 Baud
- No parity, 1 stop bit

The Network uses Modbus RTU protocol. Communications should be sent at a rate of one message per second.

Modbus write capability is accessible by writing the password to the security register on the map. If the control is unlocked via Modbus, values in the register are readable and writable. If not, the registers are not visible to Modbus. Only installer and dealer passwords are checked. Password duration for Modbus is five minutes.

HTS Emulation

HTS Emulation allows a TX transfer switch to be utilized in an application as a replacement for an HTS transfer switch, or in a system where multiple HTS transfer switches exist and an additional ATS is required. This emulation mode allows communication between the TX transfer switch and the H-Panel generator.

For full setup instructions, contact an IASD and reference Product Information Bulletin 23-06-Z.

Power Zone Gateway

The Power Zone Gateway is a user interface for applications where a TX transfer switch is installed with a Power Zone system that provides external communication via Ethernet to a connected device such as a computer, smart phone, or tablet. This external communication allows the user to configure or monitor generator and transfer switch parameters.

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Section 7: Modbus Map

Description

This section describes the transfer switch data available via the communication port on the control.

Communication Settings

Default Baud Rate	9600

Modbus Settings

Device Default Address	240

Data Map

Status (Viewable Locked)

Register	Function	Bit (if defined)
500	ATS Status	0: Source 1 OK
		1: Source 2 OK
		2: On Primary Source
		3: PS Loss Dleay
		4: Wait for Secondary Source OK
		5: Signal before transfer to Secondary Source
		6: Operate to Time Delay Neutral (destination Secondary Source)
		7: Syncing (destination to Secondary Source)
		8: Operating to Secondary Source
		9: On secondary Source
		10: Primary Return Delay
		11: Signal before transfer to Primary Source
		12: Operating to neutral (destination Primary Source)
		13: Syncing (destination to primary source)
		14: Operating contact to Primary Source
		15: Loadshed
501	ATS Timer	In seconds
502	Contactor Status	0: Contactor in S1
		1: Contactor in S2
		2: Contactor in Neutral
503	S1 Engine Status	11-0: Engine timer seconds
		12: Engine Warmup

Register	Function	Bit (if defined)
503	S1 Engine Status	13: Engine Minimum Run
		14: Engine Cooldown
504	S2 Engine Status	11-0: Engine timer seconds
		12: Engine Warmup
		13: Engine Minimum Run
		14: Engine Cooldown
505	ATS test status	1: Normal Test Asserted
		2: Fast Test Asserted
506	Exercise Timer (seconds)	–
507	ATS TVSS Status	Bit 5: TVSS failure
508	S1 AB Voltage * 100	–
509	S1 BC Voltage * 100	–
510	S1 AC Voltage * 100	–
511	S2 AB Voltage * 100	–
512	S2 BC Voltage * 100	–
513	S2 AC Voltage * 100	–
514	Load Current A * 10	–
515	Load Current B * 10	–
516	Load Current C * 10	–
517	Load Current N * 10	–
518	S1 kW * 10	–
519	S2 kW * 10	–
520	S1 kWh * 10	–
521	S2 kWh * 10	–
522	S1 Frequency * 10	–
523	S2 Frequency * 10	–
524	Temperature (°C) * 100	–
525	Humidity (%) * 100	–
526	S1AN Voltage * 100	–
527	S1BN Voltage * 100	–
528	S1CN Voltage * 100	–
529	S2AN Voltage * 100	–
530	S2BN Voltage * 100	–
531	S2CN Voltage * 100	–
532	NOT IN AUTO LED	–

ATS Program (Viewable Maintenance)

Register	Function	Notes
600	Primary Source Loss Time	–
601	Primary Source Return Time	–
602	Time Delay Neutral Value	–
603	In phase Transfer	1 for yes, 0 for no
604	Signal Before Transfer	–
605	Unbalance Check	–
606	Unbalance Time	–
607	Source 1 Is Engine	1 for yes, 0 for no
608	Source 1 Under Voltage Dropout	–
609	Source 1 Under Voltage Pickup	–
610	Source 1 Over Voltage Dropout	–
611	Source 1 Over Voltage Pickup	–
612	Source 1 Under Frequency Dropout	–
613	Source 1 Under Frequency Pickup	–
614	Source 1 Over Frequency Dropout	–
615	Source 1 Over Frequency Pickup	–
616	Source 1 Warmup	–
617	Source 1 Minimum Run	–
618	Source 1 Cooldown	–
619	Source 1 Unbalance Drop	–
620	Source 1 Unbalance Pickup	–
621	Source 2 Is Engine	1 for yes, 0 for no
622	Source 2 Under Voltage Dropout	–
623	Source 2 Under Voltage Pickup	–
624	Source 2 Over Voltage Dropout	–
625	Source 2 Over Voltage Pickup	–
626	Source 2 Under Frequency Dropout	–
627	Source 2 Under Frequency Pickup	–
628	Source 2 Over Frequency Dropout	–

Register	Function	Notes
629	Source 2 Over Frequency Pickup	–
630	Source 2 Warmup	–
631	Source 2 Minimum Run	–
632	Source 2 Cooldown	–
633	Source 2 Unbalance Drop	–
634	Source 2 Unbalance Pickup	–
635	Sync Timeout	–
636	Manual Return to Primary	–
637	ATS Error Number Retries	–
638	ATS Error Retry Timeout	–

ATS Settings (Writable: Dealer)

Register	Function	Notes
700	Nominal Voltage	0 = 208V, 1 = 240V, 2 = 380V, 3 = 400V, 4 = 415V, 5 = 480V, 6 = 600V
701	Nominal Frequency	0 = 50Hz, 1 = 60Hz
702	Number of Phases	0 = Single Phase, 1 = 3 phase
703	Primary Source	0 = Source 1, 1 = Source 2
704	CT Ratio	0 = 100:1, 1 = 200:1, 2 = 400:1, 3 = 600:1, 4 = 800:1, 5 = 1000:1, 6 =1600:1, 7 = 150:1, 8 = 300:1, 9 = 1200:1
705	Heater Temperature Setpoint	–
706	Heater Humidity Setpoint	–
707	Permissive Fault Enable	Security Access Level - Dealer
708	Permissive Fault Timeout	Security Access Level - Dealer

Security

Register	Function	Notes
100	Security Register	Accessible from write single register (0x6)
101	Security Level	Current Unlocked Security Level
102	FW Version	Major high byte, minor low byte

Exercise Settings (Viewable: Everyone Writable: Maintenance)

Register	Function	Notes
650	Exercise Seconds	Exercise Seconds
651	Exercise Type	0 = Daily, 1 = Weekly, 2 = Bi Weekly, 3 = Monthly, 4 = First Week, 5 = Second Week, 6 = Third Week, 7 = Fourth Week, 8 = Off
652	Exercise Day	1-7 is day for weekly and 1st-4th week types, 1-14 for biweekly, Date (1-28) for monthly

Register	Function	Notes
653	Exercise Hour	–
654	Exercise Minute	–
655	Exercise Duration	–
656	Exercise Xfer	0 for no exercise, 1 for yes

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