



Powering Business Worldwide

O&M Manual for 1200 & 1600A (480 Vac) 3-Position, Open, Service Entrance Contactor Based Transfer Switch

(100% Rated UL1008 Service Entrance Switch)
Instruction Booklet

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WARNING

READ AND UNDERSTAND THE INSTRUCTIONS CONTAINED HEREIN AFTER BEFORE ATTEMPTING TO UNPACK, ASSEMBLE, OPERATE, OR MAINTAIN THIS EQUIPMENT.

HAZARDOUS VOLTAGES ARE PRESENT INSIDE TRANSFER SWITCH ENCLOSURES THAT CAN CAUSE DEATH OR SEVERE PERSONAL INJURY. FOLLOW PROPER INSTALLATION, OPERATION, AND MAINTENANCE PROCEDURES TO AVOID THESE VOLTAGES.

TRANSFER SWITCH EQUIPMENT COVERED BY THIS INSTRUCTION BOOK IS DESIGNED AND TESTED TO OPERATE WITHIN ITS NAMEPLATE RATINGS. OPERATION OUTSIDE OF THESE RATINGS MAY CAUSE THE EQUIPMENT TO FAIL RESULTING IN DEATH, SERIOUS BODILY INJURY, AND/OR PROPERTY DAMAGE. ALL RESPONSIBLE PERSONNEL SHOULD LOCATE THE DOOR MOUNTED EQUIPMENT NAMEPLATE AND BE FAMILIAR WITH THE INFORMATION PROVIDED ON THE NAMEPLATE. A TYPICAL EQUIPMENT NAMEPLATE IS SHOWN IN FIGURE 1.

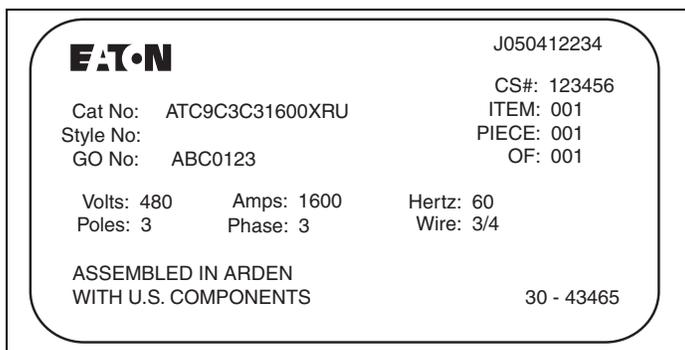


Figure 1. Typical Service Entrance Automatic Transfer Switch (ATS) Equipment Nameplate.

All possible contingencies that may arise during installation, operation, or maintenance, and all details and variations of this equipment do no purport to be covered by these instructions. If further information is desired by the purchaser regarding a particular installation, operation, or maintenance of particular equipment, please contact an authorized Eaton Sales Representative or the installing contractor.

Section 1: Introduction

1.1 Preliminary Comments and Safety Precautions

This technical document is intended to cover most aspects associated with the installation, application, operation, and maintenance of the Automatic Transfer Controller controlled contactor based ATS with ratings of 1200 and 1600 amperes (A). The Service Entrance Switch is a 100% rated UL1008 Service Entrance contactor switch. It is provided as a guide for authorized and qualified personnel only. Please refer to the specific WARNING and CAUTION in Section 1.1.2 before proceeding. If further information is required by the purchaser regarding a particular installation, application, or maintenance activity, please contact an authorized Eaton sales representative or the installing contractor.

1.1.1 Warranty and Liability Information

No warranties, expressed or implied, including warranties of fitness for a particular purpose of merchantability, or warranties arising from course of dealing or usage of trade, are made regarding the information, recommendations and descriptions contained herein. In no event will Eaton be responsible to the purchaser or user in contract, in tort (including negligence), strict liability or otherwise for any special, indirect, incidental or consequential damage or loss whatsoever, including but not limited to damage or loss of use of equipment, plant or power system, cost of capital, loss of power, additional expenses in the use of existing power facilities, or claims against the purchaser or user by its customers resulting from the use of the information and descriptions contained herein.

1.1.2 Safety Precautions

All safety codes, safety standards, and/or regulations must be strictly observed in the installation, operation, and maintenance of this device.



WARNING

THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS DOCUMENT ARE FOR PERSONAL SAFETY AND PROTECTION OF EQUIPMENT FROM DAMAGE. AN EXAMPLE OF A TYPICAL WARNING LABEL HEADING IS SHOWN ABOVE TO FAMILIARIZE PERSONNEL WITH THE STYLE OF PRESENTATION. THIS WILL HELP TO INSURE THAT PERSONNEL ARE ALERT TO WARNINGS, WHICH APPEAR THROUGHOUT THE DOCUMENT. IN ADDITION, WARNINGS AND CAUTIONS ARE ALL UPPER CASE AND BOLDFACE.



CAUTION

COMPLETELY READ AND UNDERSTAND THE MATERIAL PRESENTED IN THIS DOCUMENT BEFORE ATTEMPTING INSTALLATION, OPERATION, OR APPLICATION OF THE EQUIPMENT. IN ADDITION, ONLY QUALIFIED PERSONS SHOULD BE PERMITTED TO PERFORM ANY WORK ASSOCIATED WITH THIS EQUIPMENT. ANY WIRING INSTRUCTIONS PRESENTED IN THIS DOCUMENT MUST BE FOLLOWED PRECISELY. FAILURE TO DO SO COULD CAUSE PERMANENT EQUIPMENT DAMAGE.

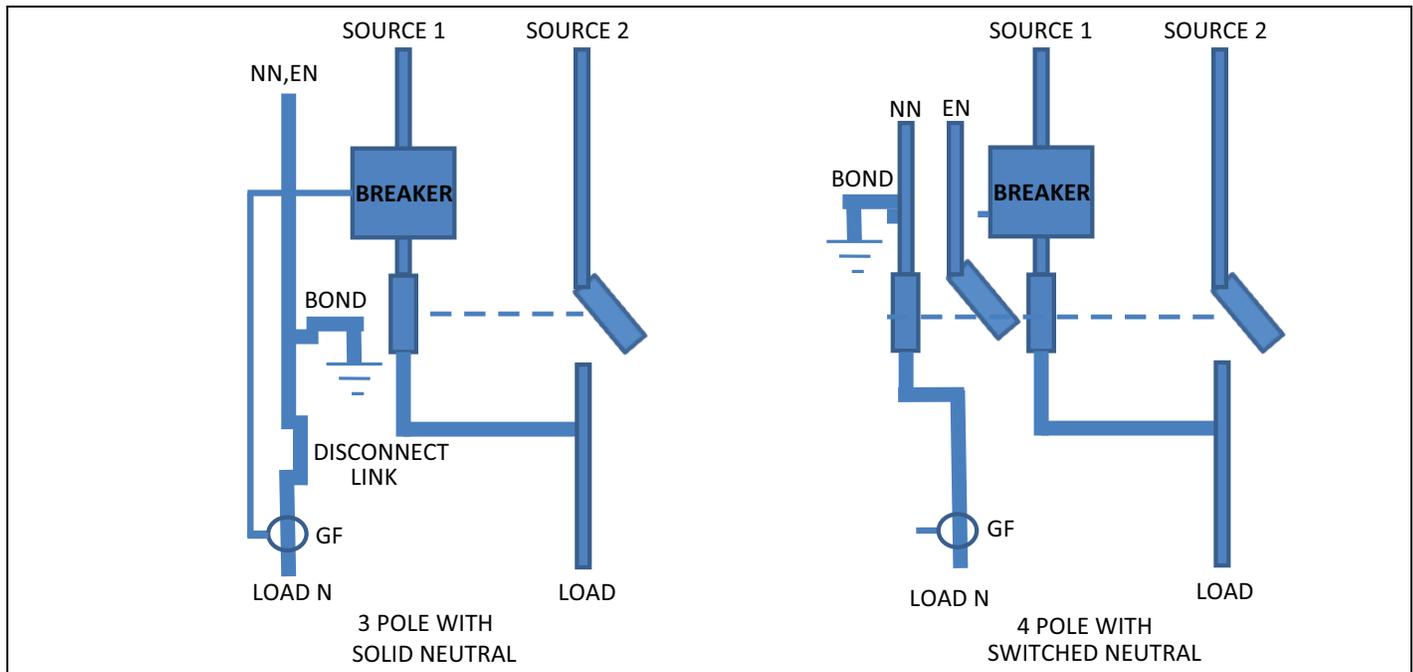


Figure 2. Typical Load Transfer Switch Diagram (Contactor Type).

1.2 General Information

Transfer switches are used to protect critical electrical loads against loss of power. The load’s Source 1 power source is backed up by a Source 2 power source. A transfer switch is connected to both the Source 1 and Source 2 power sources and supplies the load with power from one of the two sources. In the event that power is lost from Source 1, the transfer switch transfers the load to the Source 2 power source. This transfer is automatic. Once Source 1 power is restored, the load is automatically transferred back to the Source 1 power source. Figure 2 shows a diagram which also includes the Service Entrance Breaker, bond, and disconnect link.

In ATS equipment, the switch’s intelligence system initiates the transfer when the Source 1 power fails, falls below, or rises above a preset voltage. If the Source 2 power source is a standby generator, the ATS initiates generator startup and transfers to the Source 2 power source when sufficient generator voltage is available. When Source 1 power is restored, the ATS automatically transfers back and initiates generator shutdown. In the event the Source 1 power source fails and the Source 2 power source does not appear, the ATS remains connected to the Source 1 power source until the Source 2 power source does appear. Conversely, if connected to the Source 2 power source and the Source 2 power source fails while the Source 1 power source is still unavailable, the ATS remains connected to the Source 2 power source. In this switch, a breaker and neutral/ground bond is included.

ATSs automatically perform the transfer function and include four basic elements:

1. A power contactor to connect and disconnect the load to and from either power source.
2. Solenoids to make the transfer of the main contacts from source to source.
3. Intelligence/supervisory circuits to constantly monitor the condition of the power sources and thus provide the intelligence necessary for the switch and related circuit operation.
4. A breaker and control to allow for a Service Rated ATS.

1.2.1 Design Configuration

The Eaton contactor based ATS is a compact design that uses a power contactor to transfer essential loads from one power source to another (see Figure 3). The service entrance breaker is shown on the left side.

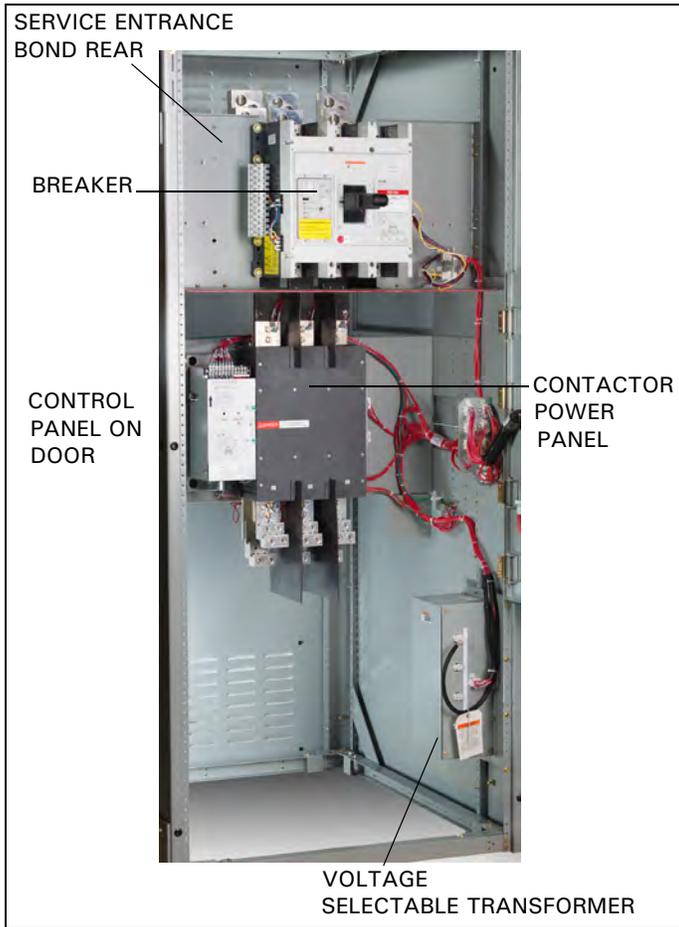


Figure 3. Typical Service Entrance Open Transition ATS.

The Eaton contactor based ATS is designed with easy installation and simplified maintenance in mind. Four main panels comprise the contactor based ATS design and are shown in Figure 3.

1. Power panel;
2. Voltage selection and transformer panel; and
3. Microprocessor-based logic panel.
4. Breaker Panel

Table 2. Transfer Switch Catalog Number Explanation

POSITIONS 1 TO 2 BASIC DEVICE		POSITION 3 SWITCHING DEVICE	POSITION 4 CONTROL PANEL	POSITIONS 5 TO 6 SWITCHING DEVICE	
Automatic Transfer Switch (Open Transition) AT		Contactor C	ATC-900 Controller 9 ATC-300+ Controller 3	3 Position Power Contactor C3 3 Position w In-Phase to TDN C5	
POSITION 7 SWITCHING DEVICE ARRANGEMENT	POSITION 8 NUMBER OF POLES	POSITIONS 9 TO 12 AMPERE RATING	POSITION 13 VOLTAGE/ FREQUENCY	POSITION 14 ENCLOSURE	POSITION 15 LISTING
Fixed Mount X	Two (2)		120 Vac/60 Hz A	Type 1 S	UL/CSA Listing U
SE on Source 1 C	Three (3)	1200A – 1200	208 Vac/60 Hz B		No Listing X
	Four (4)	1600A – 1600	220 Vac/50 Hz G	Type 3R R	
			240 Vac/60 Hz W		
			380 Vac/50 Hz H		
			415 Vac/50 Hz O		
			480 Vac/60 Hz X		

Each panel is independently mounted with interconnecting wiring terminated at the connector receptacles on the ATC-900 Controller.

For open transition contactor based transfer switch, enclosure mounting is simplified by utilizing mounting flanges with elongated (teardrop) mounting holes on top and floor mount (wall supported) flanges with two standard mounting holes on the bottom.

Refer to Section 4 for specific mounting and modification details.

Table 1. Withstand Ratings.

Switch Rating (Amps)	480 Vac	
	3 Cycle Breaker (Amps)	Specific Breaker (Amps)
1200A	50,000	65,000
1600A	50,000	65,000

Fuse Rating 200kA at 480V. Type L,R,J,T

1.3 ATS Catalog Number Identification

Transfer switch equipment catalog numbers provide a significant amount of relevant information that pertains to a particular piece of equipment. The Catalog Number Identification Table (Table 2) provides the required interpretation information. An example is offered here to initially simplify the process.

Example: Catalog Number (circled numbers correspond to position headings in Table 2).

① to ② ③ 4 ⑤ to ⑥ ⑦ ⑧ ⑨ to ⑫ ⑬ ⑭ ⑮
AT C 9 C3 C 3 1600 X S U

The catalog number ATC9C3C31600XRU describes an ATS with a 3 pole, 3 position Power Contactor mounted on a baseplate within the enclosure. The intelligence represented by the logic panel is ATC-900 controller. The continuous current rating of this equipment is 1600A and applicable at 480 Vac, 60 Hz. The transfer switch equipment is enclosed in a NEMA 1 enclosure and is listed for UL applications.

The SE breaker is an NGH type equipped with a 310+ trip unit and user Auxiliary (position) switches wired to a user terminal block. Options include Ground Fault Trip and alarm and ARMS. See Section 5 for operation and Section 9 for part numbers.

The breakers used are load sized to provide 100% rating.

1.4 Environmental Conditions

1.4.1 Operational Conditions

Normally, an ATS is applied indoors in an electrical equipment room. In the appropriate enclosure, it can be used for outdoor applications where the equipment is subject to falling rain, freezing temperatures, and no greater than 90% humidity (non-condensing). The ambient temperature range for operation is between -20 and 70°C (-4 to 158°F).

1.5 Glossary

With respect to their use within this document and as they relate to transfer switch and controller operation, the following terminology is defined.

Available

A source is defined as "available" when it is within its undervoltage/overvoltage/ underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Connected

Connected is defined as when the input is shorted by an external contact or connection.

Failed or Fails

A source is defined as "failed" when it is outside of the applicable voltage and frequency setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds after the time delay emergency fail (TDEF) time delays expires.

Failsafe

Failsafe is a feature that prevents disconnection from the only available power source and also forces a transfer or re-transfer operation to the only available power source.

Source 1

Source 1 is the primary source (normal source, normal power source, or normal).

Source 2

Source 2 is the secondary source (emergency source, emergency power source, emergency, standby, or backup source).

Source 1: Failed or Fails

Source 1 is defined as "failed" when it is outside of its undervoltage/overvoltage/ underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Source 2: Failed or Fails

Source 2 is defined as "failed" when it is outside of its undervoltage/overvoltage/ underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds after the Time Delay Emergency Fail (TDEF) time delay expires.

Service Entrance

The circuit breaker with some control in series with source 1, or source 2, or both sources near the point of entrance of the supply conductors intended to be the main cut-off of the electrical supply the the Transfer Switch

Transfer

Transfer is defined as a change of the load connection from the Source 1 to the Source 2 power source.

Re-Transfer

Re-transfer is defined as a change of the load connection from the Source 2 to the Source 1.

Unconnected

Unconnected is defined as when the input is not shorted by an external contact or connection.

Features

The ATC-900 (Figure 7) has many features that are available to the user. These features are standard and are available depending on the type of transfer switch used (i.e. Contactor, Power Case Switch/Breaker, or Molded Case Switch/Breaker, 2 or 3 position). Appendix A of the ATC-900 manual has a list of all of the features including any acronyms used along with a brief description. There are many new features in the ATC-900 that are shown in the ATC-900 manual.

The ATC-900 connections are shown in Figure 12A. Some connections, like engine start are wire to a separate terminal block.

There are three optional accessory items that also interface to the ATC-900, the DCT module, the I/O Module, and the Ethernet Module. See the ATC-900 manual for specific instructions on these modules. A small description of each follows:

The DCT (Direct Current-Current Transformer) Module is a current transformer interface to the ATC-900 allowing current to be metered along with voltage and frequency that is already integrated into the controller. The DCT Module simply secures to the ATC-900 back using four #8 x less than 1/2 inch screws. The ribbon cable then plugs into J14. When equipped with a DCT module, the ATC-900 serves as a multifunction power meter and provides multifunction measurement of most electrical parameters including voltage, current, power, frequency, energy, etc. The meter capabilities is specified as a 1% class energy meter. The information is displayed on the color display on the front of the ATC-900. Readings can also be monitored through the RS-485 modbus on the controller. The DCT is used to measure load current when selective load shed is enabled. The DCT Module also has a 24 Vdc input for powering the ATC-900 controller. If 120 VAC and 24 Vdc is supplied to the controller simultaneously, then the 120 Vac will be the powering supply.

The I/O Module (Figure 12B) is an extension of the ATC-900 controller's programmable inputs and outputs. Each I/O Module has four inputs and four outputs. The inputs are DC wetted (50 Volts at 10 ma) connections for various functional inputs. Up to four modules can be used with the ATC-900 giving the user up to 20 inputs or 20 outputs (including the controller's standard I/Os). Depending on the options selected with the transfer switch, some of the I/Os may be required to be fixed from the factory so that the user cannot change that particular input or output.

The Ethernet Communications Module is an accessory that operates as a communicating device in conjunction with a the ATC-900 via an Ethernet network. The Ethernet Module provides Ethernet TCP/IP.

Section 2: Receiving, Handling, and Storage

2.1 Receiving

Every effort is made to ensure that the ATS equipment arrives at its destination undamaged and ready for installation. Packing is designed to protect internal components as well as the enclosure. Care should be exercised, however, to protect the equipment from impact at all times. Do not remove the protective packaging until the equipment is ready for installation.

When the ATS equipment reaches its destination, the customer should inspect the shipping container for any obvious signs of rough handling and/or external damage that occurred during transportation. Record any external and internal damage for reporting to the transportation carrier and Eaton, once a thorough inspection is complete. All claims should be as specific as possible and include the catalog and General Order numbers.

A shipping label affixed to the shipping container includes a variety of equipment and customer information, such as General Order Number and catalog numbers. Make certain that this information matches other shipping paper information.

Each transfer switch is packed securely with appropriate shipping materials to prevent damage during shipment. Do not remove or discard the packing material until the equipment is ready for installation.

Once the top packaging is removed from the shipment, the enclosure door can be opened. A plastic bag of documents will be found in the enclosure, usually attached to the inside of the enclosure. Important documents, such as test reports, wiring diagrams, instruction booklets, and appropriate instruction leaflets, are enclosed within the bag and should be filed in a safe place.

2.2 Handling

As previously mentioned, ATS equipment is packaged for forklift movement. Protect the equipment from impact at all times.

Once the equipment is at the installation location and ready to be installed, packaging material can be removed and discarded. Once the enclosure is unbolted from the wooden pallet, it can be hand moved to its installation position. Be careful not to damage the top or bottom enclosure mounting flanges. Refer to Section 4 of this manual for specific installation instructions.

2.3 Storage

Although well packaged, this equipment is not suitable for outdoor storage. The equipment warranty will not be applicable if there is evidence of outdoor storage. If the equipment is to be stored indoors for any period of time, it should be stored with its protective packaging material in place. Protect the equipment at all times from excessive moisture, construction dirt, corrosive conditions, and other contaminants.

It is strongly suggested that the package-protected equipment be stored in a climate-controlled environment with temperatures from -30 to 85°C (-22 to 185°F) and with a relative humidity of 80% or less.

Section 3: Equipment Description

3.1 General

The ATS consists of four basic panels:

1. The power panel
2. The voltage selectable transformer
3. The Controller and logic panel
4. Breaker

These panels are interconnected via connector plugs and mounted in an enclosure as shown in Figure 4.

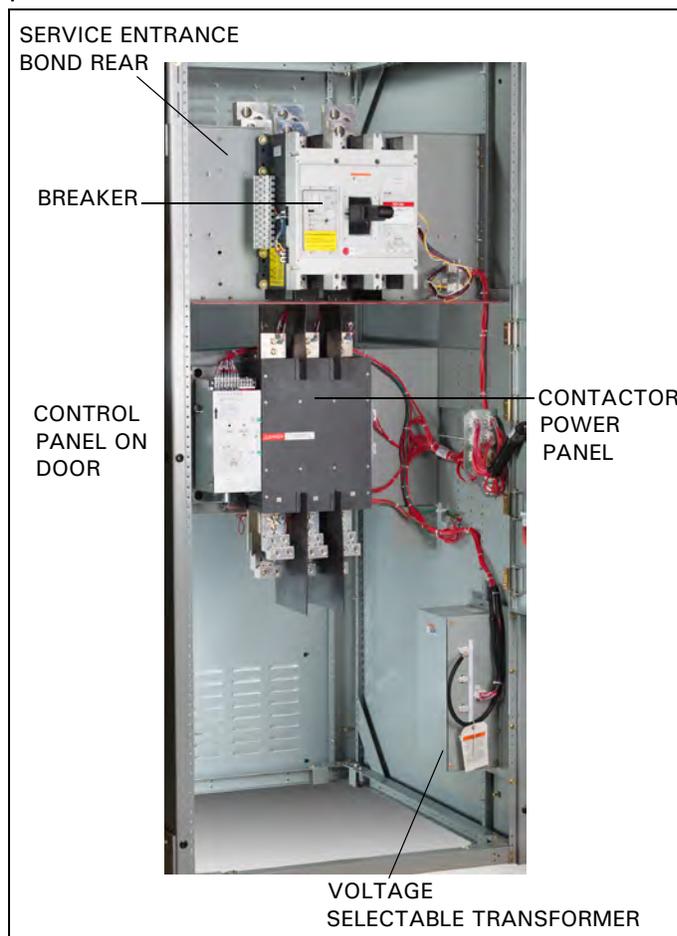


Figure 4. Four Basic Panels of a Transition ATS.

3.2 Power Panel

The power panel is used for making load, power, and neutral connections. The power contactor is mounted on a steel base-plate (Figure 5A). The Service Entrance breaker is shown in Figure 5B.

3.2.1 Main Contacts

This ATS incorporates a power contactor. The main contacts connect and disconnect the load to and from the different power sources (depending on the service entrance required). The power contactor is mechanically and electrically interlocked to prevent the two sets of main contacts from being closed simultaneously.

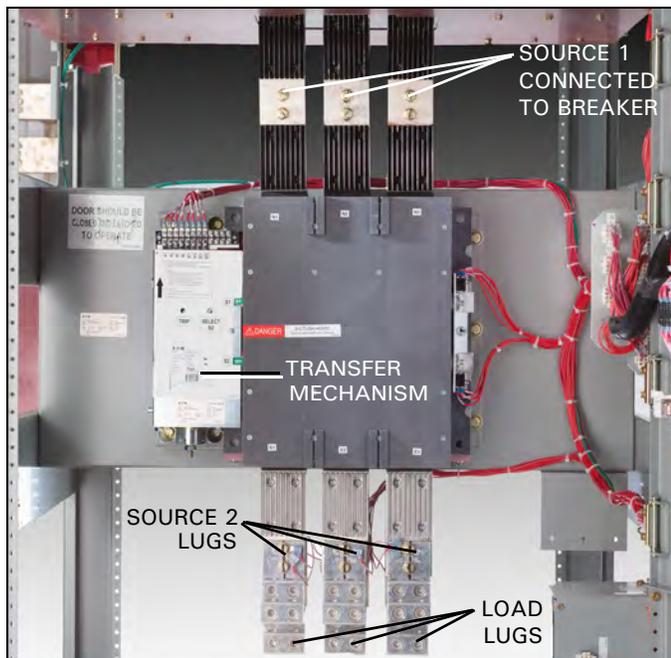


Figure 5A. ATS 1600 AMP Contactor Shown.

3.3 Service Entrance Rated Transfer Switch

This feature (37) provides the label “Suitable for use as Service Equipment” and the features necessary to meet the requirements for the label. It includes the service disconnect with visible indication and neutral assembly with removable link (neutral bond, neutral to ground connection). The two ground fault features are described below. The breakers used are load sized to provide 100% rating on the 100% rated, UL1008 transfer switch..

37A. Service Equipment Rated Transfer Switch Without Ground Fault Protection (1200, 1600 A)

This feature provides Service Equipment rating for an application that does not require ground fault protection.

37B. Service Equipment Rated Transfer Switch With Ground Fault Protection (1200, 1600 A)

This feature provides Service Equipment rating for an application that requires ground fault protection.

The breaker(s) will provide integral overcurrent protection. This feature provides thermal-magnetic overcurrent protection integral to the power switching device(s). If the power switching breaker trips on an overcurrent condition, then “Lockout” is displayed on the Automatic Controller display and automatic operation is prevented until the appropriate source is manually reset and the ATC controller is simply reset.

See also sections 5.3.3 and 5.3.4 for more information.

3.4 Voltage Selection

3.4.1 PT Voltage Selection 60 Hz

The North American market voltage selection panel consists of multi-tap transformers, contained in a steel case mounted in the transfer switch enclosure (Figure 6). The cover has two connectors on it, with the one on the right being selectable depending on the voltage applied to S1 and S2. The transformer unit is easily removed by removing the two front screws and disconnecting the two plugs. The rear of the transformer enclosure has two flanges that are inserted into two slots. The voltage is selected by simply removing the plug from the default selected voltage on the cover plate and installing the plug to the desired available voltage. Plugs are provided for 120 to 480 Vac (or up to 600V) to satisfy any required North American market application voltage. The factory default position is 480 Vac. There is a similar selection panel for international voltages 220, 230, 380, & 415 volts at 60 Hz.



Figure 5B. ATS with Service Entrance Breaker.

⚠ DANGER

WHEN CHANGING THE VOLTAGE SELECTION, THE POWER MUST BE REMOVED FROM THE TRANSFER SWITCH. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT ON EQUIPMENT PRIOR TO SERVICING. FAILURE TO FOLLOW THIS WARNING COULD LEAD TO DEATH OR SEVERE INJURY. WHILE ENERGIZED, AN ARC FLASH AND SHOCK HAZARD EXISTS. CONSULT NFPA 70E AND OSHA GUIDELINES FOR OPERATOR SAFETY PRIOR TO SERVICING, INSPECTING OR OPERATING EQUIPMENT.



Figure 6. Voltage Selection Terminals.

3.5 ATC-900 Controller

The ATC-900 is a microprocessor-based transfer switch logic control package. The hardware and software of the controller contain the intelligence/supervisory circuits that constantly monitor the condition of the power sources. It provides the intelligence necessary for the operation of the ATS (Figure 7). It has user friendly menus and a color TFT display for easy verification and feature user settings. There is a separate Instruction Booklet in the switch packet for the ATC-900 or the ATC-300 controller.



Figure 7. ATC-900 Logic Controller.

The ATC-900 controller has an operating temperature of -20 to 70°C (-4 to 158°F).

The controller circuit board is protected by an insulating conformal coating.

The specifications, under normal operating conditions, are as follows:

- Tolerance for voltage sensing function: ± 1% of full scale.
- Tolerance for frequency sensing function: ± 0.3 Hz of setting.

Please see the ATC-900 controller's Instruction Booklet for new features and instructions.

3.6 Features and Glossary of Terms

A variety of standard and optional features are available for Eaton ATSS. **All features or combinations of features may not be available on specific ATSS.** All features and/or accessories are Underwriters Laboratories (UL) listed unless noted.

3.6.1 Operational Simplicity

From installation, to programming, to usage, the ATC-900 was designed with operational simplicity in mind. Only one style needs to be considered, regardless of input/output requirements or system voltages and frequencies. ATC-900 provides the functionality of numerous other devices combined in one package that mounts in less than 7 by 11 inches of panel space.

The user friendly front panel interface simplifies routine operation, programming, data presentation and setting adjustments. A large color display provides flexibility and ease of use. The operation of front panel membrane pushbuttons moves the ATC-900 display from function to function or step to step within menus. A single LED at the top of the faceplate provides an immediate indication as to the device's operational mode. An integrated Help Mode provides immediate user assistance in the form of English language message displays through the use of a front panel Help pushbutton.

The ATC-900 is communications ready, including Modbus 485, Ethernet (External), and USB for thumb drives (memory sticks).

3.6.2 Features and Glossary of Terms

A variety of programmable features are available to meet a wide array of application requirements. Individual features or feature combinations provide the information required to tailor switches to individual needs.

Unlike earlier controllers, the ATC-900 comes with standard features that are ready to use, In-Phase, Current metering, and Ethernet. Another advancement is that there are four (4) standard inputs and four (4) standard outputs that the operator can easily program by choosing from a wide array of predefined functions. Additional inputs and outputs can be added in groups of four (4) up to sixteen (16) for a maximum of twenty (20) in total. The inputs are DC wetted (50 Volts at 10 ma) connections for various functional inputs.

NOTICE

WITH RESPECT TO THEIR USE IN THIS DOCUMENT AND AS THEY RELATE TO AUTOMATIC TRANSFER SWITCH OPERATION, THE FOLLOWING WORDS OR PHRASES ARE DEFINED:

Options

There are many switch options available, these shown are some of the more popular ones. The only item that is optional for the transfer switch is the closed transition optional feature. This Service Entrance switch is open type transition. The switch type also dictates what can be programmed. For example, a two position contactor switch cannot have feature TDN (Time Delay Neutral), as it has no neutral position available. A motor MCS/MCCB type transfer switch with motor operator cannot have closed transition as the switching mechanism is not fast enough and will not meet the time line.

Standard Feature: In-Phase Type Operation

As shown in the feature list of Appendix A for In-Phase, there are three scenarios for In-Phase:

32C = In-Phase default to Load Voltage Decay

32D = In-Phase default to Time Delay Neutral

32F = In-Phase

There is a setpoint that allows changes to the In-Phase operation:

In-Phase = 0 Disables In-Phase (open transition)

In-Phase = 1 Enables In-Phase Defaults to Alarm
(no Transfer)

In-Phase = 2 Enables In-Phase Defaults to Open
(Time Delay Neutral for 3 position switches)

With the setpoint at "2", a two position contactor, the switch will transfer, if no synchronisation occurs, to the other source. The three position will allow the use of TDN.

In-phase transition is a feature that will allow a transfer between two live sources only when the phase difference between the two sources is near zero. This is an open transition transfer that prevents in-rush currents from exceeding normal starting currents in the case where motor loads are being transferred.

Time Delay Load Voltage Decay utilizes the load voltage measurements to sense back EMF that is generated when the transfer switch is in the neutral position. It provides a delay in transfer in either direction if an unacceptable level is sensed as established by a customer programmed level. The transfer will not take place until the back EMF decays below the acceptable programmed level. This feature has a separate setting of enabling or disabling the operation. If disabled, the transfer switch will not delay in the neutral position and will transfer between the sources as fast as possible.

Time delay neutral provides a time delay in the transfer switch neutral position when both breakers are open. This delay takes place when the load is transferred in either direction to prevent excessive in-rush currents due to out of phase switching of large motor loads.

Time Delay Emergency to Normal (TDEN)

TDEN delays the transfer to the Normal Source to permit stabilization of the Normal power source before the transfer is made. This timer will begin the countdown from its setting value when the Normal Source becomes available. During the countdown of this timer, if the Normal Source should become unavailable, the timer will be aborted. If the Preferred Source is available and the Emergency Source fails while the TDEN timer is counting down, the TDEN timer will be bypassed.

Time Delay for Engine Cool-Off (TDEC)

TDEC permits the generator to run under a no-load condition after a transfer from the generator source has been made. Countdown timing begins when the transfer is completed. In applications where two generators are selected, the same cool-off timer setting value is used for both.

Display

There are two displays used on the ATC-900. There is the familiar MIMIC display using LEDs (see below) and the color display using the push buttons below the display for menu operation.

Source 1 Connected - Status LED

This LED is lit green if Source 1 is connected. This is accomplished by sensing the Source 1 breaker via the S1 closed auxiliary contact.

Source 2 Connected - Status LED

This LED is lit red if Source 2 is connected. This is accomplished by sensing the Source 2 breaker via the S2 closed auxiliary contact.

Source 1 Available - Status LED

This LED is lit amber if Source 1 meets the criteria for programmed Source 1 setpoints.

Source 2 Available - Status LED

This LED is lit amber if Source 2 meets the criteria for programmed Source 2 setpoints.

Source 1 Preferred - Status LED

This LED is lit red if Source 1 is the preferred source choice.

Source 2 Preferred - Status LED

This LED is lit red if Source 2 is the preferred source choice.

Load Energized - Status LED

This LED is lit red if the load is connected to a source that is available.

Status LED

This LED at the top right of the controller's panel simply blinks when power is on and shows that the controller is active.

CAUTION

LOAD ENERGIZE LED IS NOT A POSITIVE INDICATION THAT VOLTAGE IS NOT PRESENT ON THE LOAD TERMINALS.

CAUTION

CHANGING THE SYSTEM NOMINAL VOLTAGE OR FREQUENCY SETPOINTS WILL CAUSE PICKUP AND DROPOUT SETPOINTS TO CHANGE AUTOMATICALLY TO NEW DEFAULT VALUES.

Optional Feature 29G: Auto/Manual Operation (Available for 3-Position ATS only)

This feature provides 2-position auto/manual selector switch marked "Auto/Manual" which permits the selection of automatic or manual operation. Once the selector switch is transferred to manual mode, manual transfer between Normal (S1), Neutral and Emergency (S2) can be achieved by operating 3-position selector switch marked "Normal-OFF-Emergency".

Optional Feature 38B: Stainless Steel Cover for Controller

Provides an added level of security by providing a pad lockable stainless steel cover for use with standard transfer switch logic controllers and/or associated device panels. These covers function with Eaton's ATC series logic controllers and device panels. The covers are designed for NEMA 1, 3R, 4X, and 12 applications.

Optional Feature 41a: Space Heater With Thermostat-100 Watt

This feature provides a 100 watt (W) space heater with a non-adjustable thermostat.

Optional Feature 48D: PXG200 Gateway

This Feature provides communication by using Modbus 485 on the back of ATC-900 controller. The PXG200 Gateway serves as a communication protocol translator –taking in MODBUS RTU—and present data via Ethernet TCP/IP or Modbus TCP/IP. The data can then be accessed via the built-in web server, Power Xpert software or 3rd party building management systems. PXG200 Gateway has a limit of 32 INCOM devices. 24VDC is provided to PXG200 Gateway via ELC-PS02 power supply.

Optional Feature 48RAC: Remote Annunciator Control

This feature displays status information of a remotely located ATC-900 controller. The HMI type Remote Annunciator will serially communicate with the ATC-900 over the Modbus 485 or Ethernet using a twisted shielded pair cable. The remote annunciator is a user friendly color display that is also a touch screen. One can interface with up to eight transfer switches with one annunciator. External 120VAC power supply is required for operating ATC Remote Annunciator.

Optional Feature 49B: Sensing Isolation Transformer (Up to 480 VAC only)

This feature provides 3-phase, 4-wire for Source-1 and Source-2 sensing input on ATC controller for a high resistance grounded delta system.

Optional Feature 51D1: 50kA CVX Surge Device

This feature gives protection for surge current capacity rating 50kA, upto 480VAC by providing a low impedance surge path to ground while supporting rated voltage. It provides LED indication.

Optional Feature: 51F1:100kA CVX Surge Device

This feature gives protection for surge current capacity rating 100kA, upto 480VAC by providing a low impedance surge path to ground while supporting rated voltage. It provides LED indication.

3.7 Enclosure

The rugged steel ATS enclosure is supplied with three door hinges, regardless of enclosure size. They ensure proper support of the door and door mounted devices (Figure 8). The hinges have removable hinge pins to facilitate door removal. Certain procedures, such as switch mounting, are simplified with the door removed. The doors are supplied as standard with padlockable latches/ handles.



Figure 8. Typical 1200 & 1600 amp Open Transition Service Entrance ATS Enclosure.

The door is used to mount a variety of lights, switches, and push-buttons, depending upon the options required for a particular ATS. All lights and switches are mounted in the plastic door-mounted panel (device panel).

The rear of the enclosure is supplied with teardrop shaped holes in the top and two standard holes on the bottom mounting flanges to facilitate mounting. Cable entry holes are the responsibility of the customer.

ATS enclosures and all internal steel mounting plates, such as the power panel mounting plate, go through a pretreatment cleaning system prior to painting to ensure a durable finish.

The standard ATS enclosure is NEMA 1 Type for general use. However, a variety of enclosures are available to address almost any environmental circumstance (see Table 3).

Table 3. Transfer Switch Equipment Enclosures

NEMA TYPE	DESIGN	PROTECTION
Open	Indoor	
1	Indoor	Enclosed Equipment
3R	Outdoor	Rain, Ice Formation

3.8 Standards

Eaton ATS equipment, enclosed in any of the enclosures listed in Table 3, is listed for application by UL and ULC. In addition, Eaton ATSS are listed in File E38116 by Underwriters Laboratories, Inc. under Standard UL 1008. It is a 100% rated UL1008 Service Entrance Switch. This standard covers requirements for automatic transfer switches intended for use in ordinary locations to provide lighting and power as follows:

- a. In emergency systems, in accordance with articles 517 and 700 in the National Electrical Code, ANSI/ NFPA 70, and the National Fire Protection Association No. 76A; and/or
- b. In standby systems, in accordance with article 702 of the National Electrical Code; and/or
- c. In legally required standby systems in accordance with article 701 of the National Electrical Code.

Eaton ATSS are available to meet NFPA 110 for emergency and standby power systems, and NFPA 99 for health care facilities when ordered with the appropriate options.

Standard UL 1008 for ATSS lists devices under the reexamination program which only require a continual physical reexamination of the components used in the product to ensure consistency with the originally submitted device. Follow-up testing is not required by UL 1008.

Section 4: Installation and Wiring

4.1 General

Eaton ATSS are factory wired and tested. Installation requires solidly mounting the enclosed unit and connecting power cables and auxiliary pilot circuits. Physical mounting procedures and power cable connections are covered in this section. All other required wiring or electrical connection references are covered in a separate Customer Wiring Booklet packaged with the ATSS.

Locate the wiring schematic, review it, and keep it readily available for reference purposes during installation and testing. Once an ATSS is properly installed and wired, it should be mechanically and electrically checked for proper installation and operation. The procedures for these initial mechanical and electrical checks are outlined in Section 6 of this instruction manual.

WARNING

BE CERTAIN THAT THE SOLID STEEL DOOR IS PROPERLY INSTALLED BEFORE THE TRANSFER SWITCH EQUIPMENT IS PUT INTO SERVICE. THE DOOR PROVIDES PROTECTION FROM DANGEROUS VOLTAGES AT THE LINE AND LOAD TERMINALS WHEN THE EQUIPMENT IS IN OPERATION. FAILURE TO DO SO COULD RESULT IN PERSONAL INJURY OR DEATH.

WARNING

BE CERTAIN THAT THE PLASTIC COVER ON THE CONTACTOR POWER ASSEMBLY IS PROPERLY INSTALLED BEFORE THE TRANSFER SWITCH EQUIPMENT IS PUT INTO SERVICE. THE COVERS PROVIDE PROTECTION FROM DANGEROUS VOLTAGES AT THE CONTACTS. FAILURE TO DO SO COULD RESULT IN PERSONAL INJURY OR DEATH.

4.2 Mounting Location

Choose a location that offers a flat, rigid mounting surface capable of supporting the weight of the enclosed ATSS equipment. For standard ATSS, avoid locations that are moist, hot, or dusty. However, Eaton offers optional enclosure designs that can be used in special environments. If there are any doubts as to a location's suitability, discuss them with your Eaton representative.

Check to make certain that there are no pipes, wires, or other mounting hazards in the immediate mounting area that could create a problem.

Carefully remove all packing material from the ATSS at the mounting location. Even though an equipment inspection should have been made when the equipment was received, make another careful inspection of the enclosure and the enclosed ATSS components as the packing material is removed and the enclosure readied for mounting. Be especially alert for distorted metal, loose wires, or damaged components.

4.3 Mounting Procedure

CAUTION

SINCE THE ENCLOSED ATSS MUST BE LIFTED INTO PLACE FOR MOUNTING, BE CERTAIN THAT ADEQUATE RESOURCES ARE AVAILABLE FOR LIFTING TO AVOID PERSONNEL INJURIES OR EQUIPMENT DAMAGE.

All equipment enclosures and power panels are of a similar design. Only the overall physical dimensions change. Note that the enclosure is provided with two teardrop (elongated) mounting holes in the top mounting flange and two standard holes in the bottom.

Cable entry holes are not part of the enclosure when shipped from the factory and must be provided in the field, either before or after mounting the enclosure. Cable access may be from the top, bottom, and/or side.

CAUTION

EXTREME CARE SHOULD BE TAKEN TO PROTECT THE TRANSFER SWITCH FROM DRILL CHIPS, FILINGS, AND OTHER CONTAMINANTS WHEN MAKING THE CABLE ENTRY HOLES. EXTREME CARE SHOULD ALSO BE TAKEN WHEN MOUNTING THE ENCLOSURE TO PREVENT COMPONENT DAMAGE OR A FUTURE MALFUNCTION.

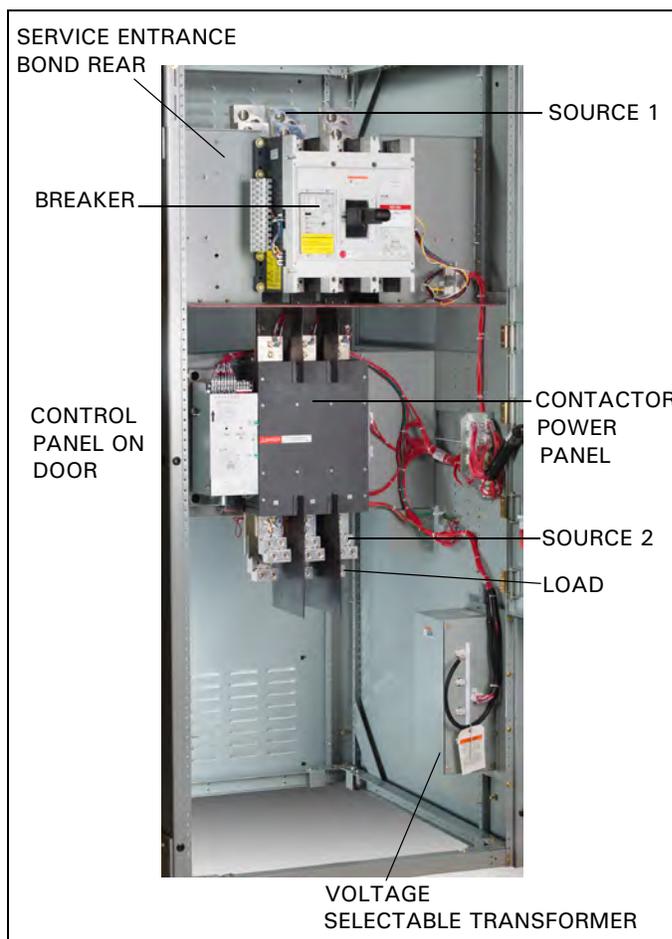


Figure 9. Service Entrance Automatic Transfer Switch.

With the enclosed ATS equipment unpacked and ready for mounting, proceed with the following steps (see Figure 10).

- Step 1:** Install the required upper and lower mounting bolt anchors and the two upper mounting bolts in the mounting surface.
- Step 2:** Gently lift the enclosure, if desired to be off the floor, and guide the teardrop holes in the upper mounting flange over the upper mounting bolts. Do not completely tighten the bolts at this time. If sitting on the floor, install the bolts without lifting.
- Step 3:** While still supporting the enclosure, install the two lower mounting bolts in the lower mounting flange. Again, do not completely tighten the bolts at this time. Use shims, if required, to prevent deformation of the enclosure if the mounting surface is distorted.
- Step 4:** Tighten all four mounting bolts after any required shimming is completed.
- Step 5:** Double check to ensure that all packing and shipping materials have been removed.
- Step 6:** Secure with (4) 5/16-13 UNC grade 5 or better head bolts and washers

4.4 Mounting Procedure

NOTICE

CABLE ENTRY HOLES ARE NOT PART OF THE ENCLOSURE WHEN SHIPPED FROM THE FACTORY AND MUST BE PROVIDED IN THE FIELD, EITHER BEFORE OR AFTER MOUNTING THE ENCLOSURE.

With the enclosed transfer switch equipment unpacked and ready for mounting, proceed with the following steps:

- Step 1:** Mounting and cabling access is best provided by removing side and rear covers (when applicable).
- Step 2:** Gently maneuver the switch into its location using all of the supplied lift brackets.
- Step 3:** Bolt the enclosure to the base. Use separate washers if desired (Figure 10B), and secure with 1/2-13 UNC Grade 5 hex bolts.
- Step 4:** Tighten bolts to 50 ft-lbs (68 Nm).
- Step 5:** Double check to ensure that all packing and shipping material has been removed

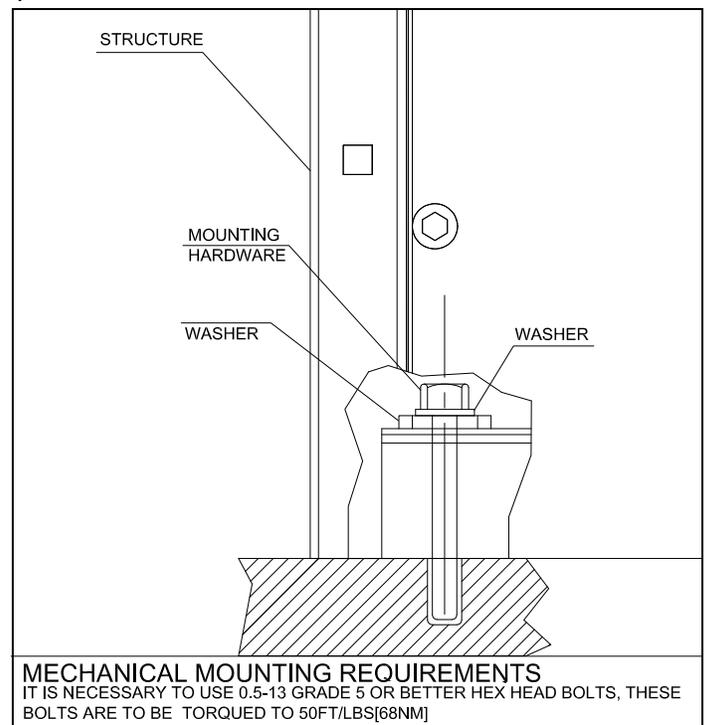


Figure 10. Mounting Instructions for Floor Mounting.

4.5 Power Cable Connections

! WARNING

POWER CONDUCTORS MAY HAVE VOLTAGE PRESENT THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. DE-ENERGIZE ALL POWER OR CONTROL CIRCUIT CONDUCTORS TO BE CONNECTED TO THE ATS EQUIPMENT BEFORE BEGINNING TO WORK WITH THE CONDUCTORS AND/OR TERMINATING THEM TO THE EQUIPMENT.

! CAUTION

USE OF CABLE LUGS NOT DESIGNED FOR THE ATS MAY CAUSE HEATING PROBLEMS.

! CAUTION

TO HELP PREVENT COMPONENT DAMAGE OR FUTURE MALFUNCTIONS, USE EXTREME CARE TO KEEP CONTAMINANTS OUT OF THE ATS EQUIPMENT WHEN MAKING POWER CABLE CONNECTIONS.

! CAUTION

RUN THE POWER CABLE THROUGH THE GUTTER SPACE PROVIDED IN THE REAR OF POWER PANEL.

Test all power cables prior to connection to the unit to ensure that the conductors or cable insulation have not been damaged while being pulled into position.

Power cables are to be connected to solderless screw type lugs located on the ATS switching devices. Refer to the separate customer wiring diagram supplied with the ATS equipment for power termination. Verify that the lugs supplied will accommodate the power cables being used. Also verify that the cables comply with local electrical codes. Standard ATS equipment, as supplied from the factory, will accommodate the terminal sizes shown in Table 4. The user must select the correct cabling for the application.

Table 4. Transfer Switch Equipment Wire Sizes

TERMINAL SIZE	MAX. NO. OF CONDUCTORS *	TERMINAL SIZE	TORQUE FT-LB (NM)
1200	4	1/0-750 CU/AL	32 (42)
1600	4	1/0-750 CU/AL	32 (42)

* Cable must be 90C rated but size shall be determined based on the ampacity of the wire rated at 75C.

Carefully strip the insulation from the power cables to avoid nicking or ringing of the conductor strands. Prepare the stripped conductor termination end by cleaning it with a wire brush. If aluminum conductors are used, apply an appropriate joint compound to the clean conductor surface area.

If desirable, wrap the line cables together with nominal 3/8 inch nylon rope or rope having tensile strength of 2,000 pounds.

Wrap at 4 inches and 15 inches from the line terminals with 8 and 18 wraps respectively or every 1 inch with 1 wrap.

Repeat the above for the load cables.

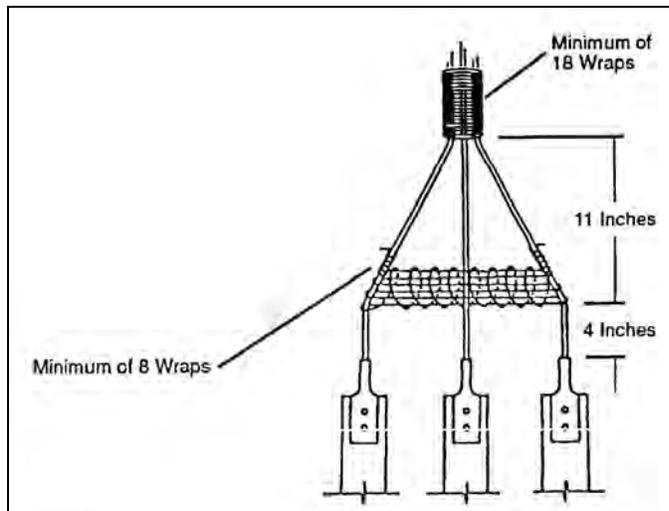


Figure 11. Cable Bracing.

! WARNING

IMPROPER POWER CABLE CONNECTIONS CAN CAUSE EXCESSIVE HEAT AND SUBSEQUENT EQUIPMENT FAILURE.

Tighten the cable lugs to the torque identified on the label affixed to the door of the unit.

4.5 Wiring



WARNING

POWER CONDUCTORS AND CONTROL WIRING MAY HAVE VOLTAGE PRESENT THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. DEENERGIZE ALL POWER OR CONTROL CIRCUIT CONDUCTORS BEFORE BEGINNING TO PERFORM ANY WIRING ACTIVITY TO OR WITHIN THE ATS EQUIPMENT.

Power sources, load conductors, and control wiring should be connected to locations as indicated in the customer wiring diagram supplied with the ATS equipment.



CAUTION

ENSURE THE ATS VOLTAGE IS SET CORRECTLY. IT SHOULD BE THE SAME AS THE SOURCE 1 AND SOURCE 2 LINE VOLTAGES. OPERATING THE EQUIPMENT ON IMPROPER VOLTAGE CAN CAUSE EQUIPMENT DAMAGE.

Once the ATS equipment has been installed and wired, perform the initial mechanical and electrical procedures as outlined in Section 6 to verify that the equipment is installed and operating properly.

4.6 Engine Start Connection

The engine control contact connections are located on the logic panel of the ATS. Connect the engine start wires to the red terminal blocks. See the drawings for the switch. A contact closes between these terminal when an engine start signal is provided by the ATS logic. The wiring diagram provides additional engine start connection information. Use the proper wire size as listed by the generator set (Genset) manufacturer. The Gen start contacts are red.

For the I/O connections, there are some switches that the Inputs are wired to a terminal block while others are not. When they are not wired to a terminal block, simply use the terminal blocks on the controller (see Figure 12A). The switch and listed terminal blocks are shown below for this switch.

1200 & 1600A frame
blocks

Inputs/Gen Start to terminal

The I/O module is shown in Figure 12B. More on both devices can be found in the ATC-900 or the ATC-300 instruction booklet.

NOTICE

PRIOR TO MAKING THE ENGINE START CONNECTION TO THE SWITCH, SET THE ENGINE GENERATOR CONTROLS SELECTOR SWITCH IN THE OFF POSITION TO PREVENT AN UNWANTED ENGINE START. CONTROL WIRING, SUCH AS THE ENGINE START WIRES, MUST BE RUN IN A SEPARATE CONDUIT FROM THE POWER CABLES.

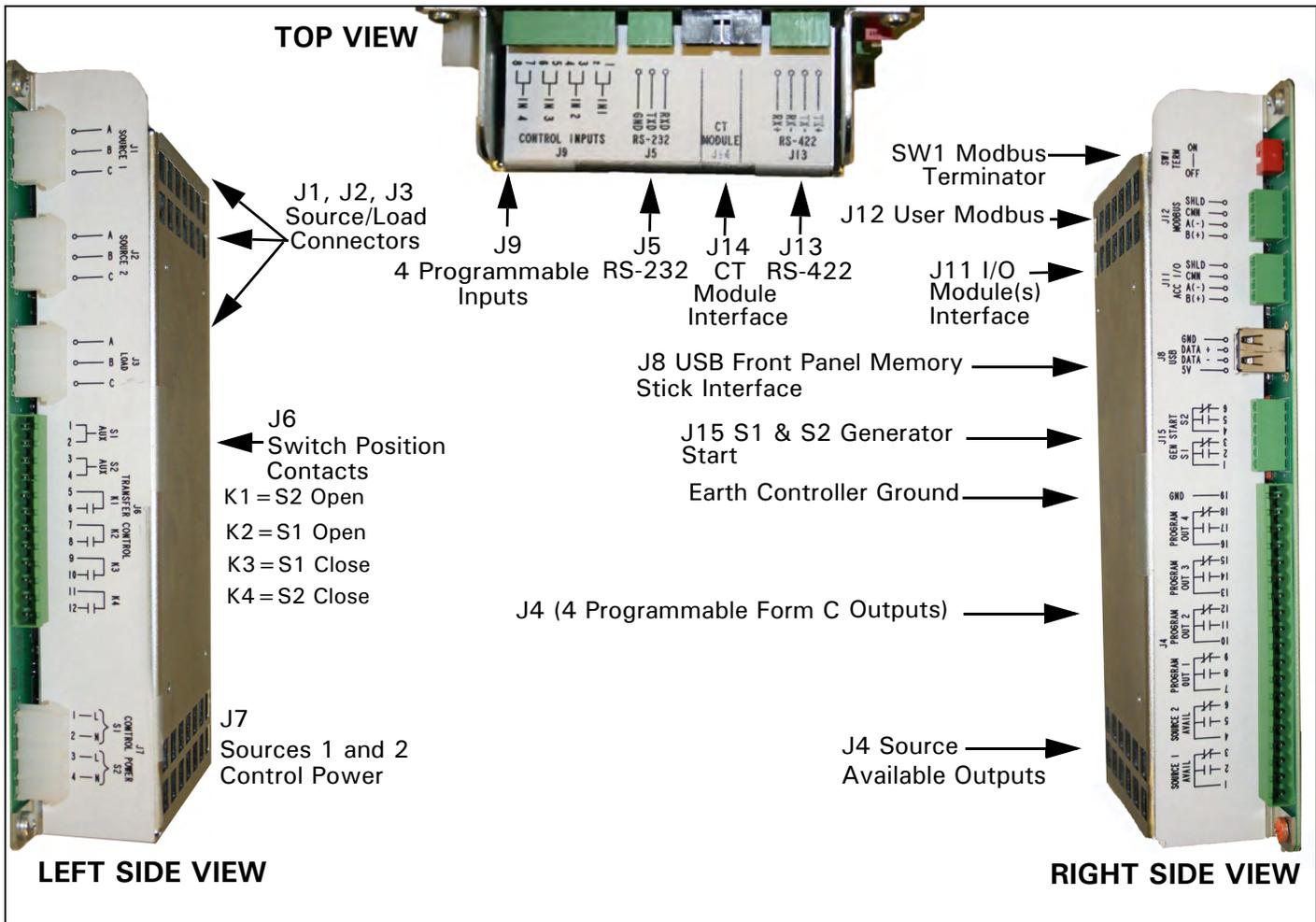


Figure 12a. ATC-900 (Top Left, and Right Side Views).



Figure 12b. I/O Module used with the ATC-900 Controller.

4.7 Voltage Selection Adjustments

Certain devices, such as the Voltage Selection Panel, sensing relays, and timers, need to be set and/or calibrated prior to placing the ATS equipment in service. Adjustments for logic devices are described in the separate instructional document dedicated to the specific logic being used. Voltage selection adjustments are described in this section.



CAUTION

BE SURE THAT THE CORRECT VOLTAGE IS SELECTED TO MATCH THE SYSTEM VOLTAGE. AN IMPROPER SELECTION AND/OR CONNECTION COULD RESULT IN EQUIPMENT DAMAGE.

4.7.1 Voltage Selection Panel 60 Hz)

The North American market voltage selection panel consists of multi-tap transformers, contained in a steel case mounted in the transfer switch enclosure (Figure 13). The cover has two connectors on it, with the one on the right being selectable depending on the voltage applied to S1 and S2. The transformer unit is easily removed by removing the two front screws and disconnecting the two plugs. The rear of the transformer enclosure has two flanges that are inserted into two slots. The voltage is selected by simply removing the plug from the default selected voltage on the cover plate and installing the plug to the desired available voltage. Plugs are provided for 120 to 480 Vac (or up to 600V) to satisfy any required North American market application voltage. The factory default position is 480 Vac. There is a similar selection panel for international voltages (220, 230, 380, & 415 volts 60 Hz).



DANGER

WHEN CHANGING THE VOLTAGE SELECTION, THE POWER MUST BE REMOVED FROM THE TRANSFER SWITCH. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT ON EQUIPMENT PRIOR TO SERVICING. FAILURE TO FOLLOW THIS WARNING COULD LEAD TO DEATH OR SEVERE INJURY. WHILE ENERGIZED, AN ARC FLASH AND SHOCK HAZARD EXISTS. CONSULT NFPA 70E AND OSHA GUIDELINES FOR OPERATOR SAFETY PRIOR TO SERVICING, INSPECTING OR OPERATING EQUIPMENT.



Figure 13. North American Market Voltage Selection Terminals.

Section 5: Operation

5.1 General

An ATS provides a power contactor to connect and disconnect the load to and from the Source 1 and Source 2 power sources (Section 3.2.1).

5.2 Manual Operation (Open Transition and Close Transition Transfer Switch)

WARNING

DO NOT ATTEMPT TO MANUALLY OPERATE THE ATS WITH SOURCE 1 OR SOURCE 2 AVAILABLE.

WARNING

HIGH VOLTAGES ARE PRESENT IN AND AROUND TRANSFER SWITCH EQUIPMENT. BEFORE ATTEMPTING TO MANUALLY TRANSFER, DISCONNECT THE LINE POWER FROM THE EQUIPMENT BEING SERVICED BY OPENING AND LOCKING OUT, IF POSSIBLE, THE NEXT HIGHEST DISCONNECT DEVICE. FAILURE TO FOLLOW THIS PROCEDURE COULD CAUSE SEVERE PERSONAL INJURY AND/OR DEATH.

ALWAYS TURN THE SOURCE 1 POWER OFF AND TURN THE SOURCE 2 (IF A GENERATOR) CONTROL SELECTOR SWITCH TO THE "OFF" POSITION BEFORE ATTEMPTING A MANUAL TRANSFER.

To manually operate:

1. Disconnect all sources of power. See section 5.3.3 for service entrance instructions.
2. Depress the "trip" button located on the operating mechanism of the contactor to bring the contactor to neutral (trip) position.
3. Locate the manual lever on the left side of the contactor.
4. Locate the handle used to manually transfer the switch.
5. Attach the handle to the manual lever (see Figure 14).
6. Rotate the lever up to go to Source 1.
7. Depress the "trip" button located on the operating mechanism of the contactor to bring the contactor to neutral (trip) position.
8. Depress the "select" button located on the operating mechanism of the contactor and rotate the lever up keeping the "select" button depressed to go to Source 2
9. Once the manual operation is complete and automatic operation is desired, connect the sources of power. See section 5.3.3 for service entrance instructions.
10. The controller's power input is 120 Vac at J7-2 to J7-1 for Source 1 and at J7-4 to J7-3 for Source 2.
11. Follow the testing procedure in Section 6 to ensure proper automatic operation.

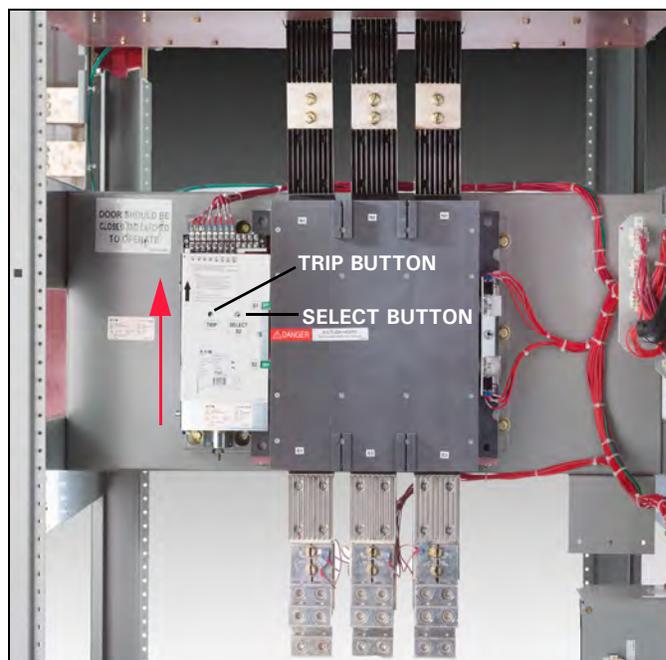


Figure 14. ATS Manual Operating Handle in Use.

5.3 Automatic Transfer

The operating sequence of an ATS is dictated by the switch's standard features and selected options. Operation of an ATS during Source 1 power source failure and Source 1 power source restoration will be described here with only standard options included on the switch. Additional options, as described in Section 3.5.2, can change sequences and timing, depending upon the options selected. It is strongly suggested that you become familiar with additional options selected with the particular ATS and their effect on the normal operation of an ATS.

5.3.1 Source 1 Power Source Failure

Standard Source 1 power source failure is defined as a reduction or loss of voltage. If this occurs, the sequence of operation is as follows.

1. Failure of Source 1 is detected by the controller intelligence.
2. When the controller detects a failure, the engine contacts close (after delay if programmed) and start the engine-driven generator usually on source 2.
3. When the Source 2 voltage reaches its operation rating, the K2 and K4 relays inside ATC-900 controller operate to start transfer operation to Source 2. This operating sequence causes the contactor to open Source 1 and close on Source 2.
4. The load is now transferred to the Source 2 power source.

5.3.2 Source 1 Power Source Restoration

1. A return to the Source 1 power source begins when the voltage in all phases of a 3-phase sensing unit, or phase-to-phase in a single sensing unit, is restored to a preset value.
2. At the preset voltage, K1 and K3 relays inside ATC-900 controller operate to start transfer operation to Source 1.
3. During this sequence, the contactor opens Source 2 and closes on Source 1.
4. Simultaneously, the engine cool-down timer initiates the shut down of the engine driven generator.
5. Transfer of the load back to the Source 1 power source is now complete.

5.3.3 Service Entrance Disconnect

This transfer switch is suitable for use as a service entrance. The material (copper piece) for bonding the neutral and the ground is included in the kit, but not installed. The neutrals are available with a solid (3-pole type) or a switched (4-pole type) neutral. The components are in a box inside the switch and should be installed by the user per code. See figure 16 which shows the bond installed between the neutral and the ground for a 3-pole switch. For a 4-pole type switch, a cable is included in the kit so that the user can cut/strip and connect to the ground from source 1 or source 2's Neutral. See section 9 for kit part numbers but they are included with the switch.

Instructions to service entrance (directions on front of door) using the three position keyed switch on the device panel:

1. Turn SE switch to "ATS to Neutral." The transfer switch will open to neutral (Trip).
2. After the ATS is in the neutral position, turn the SE switch to "Disconnect." The breaker will trip and there is no power on the controller or Source 1 inside the ATS. The generator start contact is open to inhibit a start.
3. Verify that power is off.

Instructions to normal operation:

1. Turn SE switch to "ATS to Neutral." The transfer switch will remain without Source 1 power.
2. After the SE switch is in the center position, switch the breaker to the closed position. Power is now on Source 1 and the ATS will show not connected & Go To Neutral.
3. Turn SE switch to "Normal." The ATS will close onto Source 1 and is now in Automatic operation.

The three position switch (SE) on the device panel is keyed and the key may be removed in the Disconnect position. Figure 15 shows the two labels that are included in the kit. The user will determine which label to put onto the three position switch provided. Just unscrew the collar to add the label. The label "Suitable for use as Service Equipment" will require the service disconnect with visible indication and the neutral assembly with the removable link (neutral bond, neutral to ground connection). See Figure 16 for the 3-pole bond.

5.3.4 Service Entrance and Ground Fault Protection

The ground fault provides ground fault protect in the breaker(s). The two ground fault features are described below:

37A. Service Equipment Rated Transfer Switch Without Ground Fault Protection (1200 & 1600 A)

This feature provides Service Equipment rating for an application that does not require ground fault protection.

37B. Service Equipment Rated Transfer Switch With Ground Fault Protection (1200 & 1600A)

This feature provides Service Equipment rating for an application that requires ground fault protection.

The breaker(s) will provide integral overcurrent protection. This feature provides thermal-magnetic overcurrent protection integral to the power switching device(s). Anytime the power switching breaker trips on an overcurrent condition, then "Lockout" is displayed on the Automatic Controller display and automatic operation is prevented until the appropriate source is manually reset and the ATC controller is simply reset out of the Lockout condition.

The SE breaker is an Eaton NGH type equipped with a 310+ trip unit (Figure 17) and user Auxiliary (position) switches wired to a user terminal block. Options include Ground Fault Trip and alarm and ARMS. See Section 9 for part numbers. Trip settings are the responsibility of the user. More Breaker and trip curves are available on line at Eaton.com.



Figure 15. 3 Position Switch Labels Supplied with Kit.

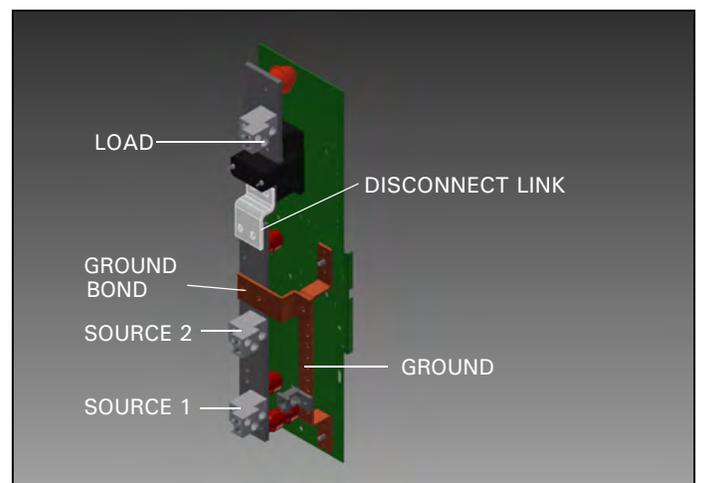


Figure 16. Neutral to Ground Bond Shown for Service Entrance Three Pole Switch.



Figure 17. 310+ Trip Unit.

Section 6: Testing and Problem Solving

6.1 Testing

After the ATS equipment is initially installed or during planned outages, the installation should be tested to ensure that all equipment operates properly. This attention to detail will help avoid unexpected malfunctions. Mechanical and/or electrical tests should be performed as described in this section.

The frequency of subsequent testing should be based on recommendations of the Genset manufacturer. Use the test pushbutton on the controller to check the electrical operation of the switch.



WARNING

HIGH VOLTAGES ASSOCIATED WITH OPERATIONAL TRANSFER SWITCH EQUIPMENT PRESENT A SHOCK HAZARD THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. USE EXTREME CAUTION TO AVOID TOUCHING ELECTRICAL CONNECTIONS WHENEVER INSPECTING OR TESTING THE EQUIPMENT.

IN ADDITION, IMPROPER OPERATION OF THE GENERATOR SET PRESENTS A HAZARD THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. OBSERVE ALL SAFETY PRECAUTIONS IN YOUR GENERATOR SET OPERATIONS AND INSTALLATION MANUALS.

6.1.1 Mechanical and/or Electrical Testing

NOTICE

SINCE FEATURE 4 (TIME DELAY ENGINE COOL-OFF), AS DESCRIBED IN SECTION 3, IS A STANDARD FEATURE, AN ENGINE START SIGNAL WILL BE PRESENT FOR A PERIOD OF TIME WHEN THE SWITCH IS FIRST ENERGIZED. THE PERIOD OF TIME IS EQUAL TO THE TIMER SETTING. TO AVOID STARTING THE ENGINE DURING THIS TIME PERIOD, TURN THE GENERATOR CONTROLS TO THE OFF POSITION.

Energize the ATS equipment as described in Sections 6.1.2 through 6.1.6. Insure that all safety precautions are taken and that all **WARNINGS** and **CAUTIONS** are observed.

6.1.2 No Voltage Steps

With no voltage available on either power source, proceed as follows.

- Step 1:** The generator engine start controls should be in the OFF position to prevent an undesired start.
- Step 2:** Ensure that the ATS has been set to the proper applied system voltage (See Section 4.7).
- Step 3:** Check all ATS loads to ensure that they are ready to be energized.

6.1.3 Connecting the Power Sources

- Step 1:** Close the Source 1 power source upstream protection device. Assure service entrance breaker is in the closed position.
- Step 2:** Connect the engine start battery cable.
- Step 3:** With the emergency generator in the OFF position, close the Source 2 power source upstream protective device, assuming such a device used.

NOTICE

AT THIS POINT, AND PRIOR TO MAKING ANY ATTEMPT TO ENERGIZE THE ATS EQUIPMENT, THE ENGINE-DRIVEN GENERATOR SHOULD BE OPERATED. IF NECESSARY, THE VOLTAGE REGULATOR ON THE GENERATOR SHOULD BE ADJUSTED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. THE ATS EQUIPMENT WILL RESPOND ONLY TO THE RATED VOLTAGE AND FREQUENCY PROGRAMMED INTO THE CONTROLLER.

- Step 4:** Close any generator engine-start controls opened as a result of actions taken in Step 1, Section 6.1.2.
- Step 5:** Where required, use an accurate voltmeter to check phase-to-phase and phase-to-neutral voltages present at the transfer switch Source 1, Source 2, and/or load terminals.

6.1.4 Operational Checks

- Step 1:** Check to ensure that Source 1 switching device is in the CLOSED position. This should have been done in Section 6.1.3, Step 1.
- Step 2:** Initiate an automatic transfer operation from the Source 1 to the Source 2 power source by pressing the **<Engine Test>** pushbutton on the Controller and follow instructions to add password to start the test.

Note: The Logic Controller provides the capability to set the Engine Test function to:

- 0. No Load Engine Test;
- 1. Load Engine Test; or
- 2. Disabled.

The factory default is set to:

- 1. Load Engine Test
 - a. After the Time Delay Engine Starting (TDES) has timed out, the engine should start, run, and build up to normal voltage and frequency.
 - b. The transfer switch will transfer to the Source 2 power source after the Time Delay Normal to Emergency (TDNE) times out.

- Step 3:** Initiate an automatic transfer operation back to the Source 1 power source by pressing the **<Engine Test>** pushbutton on the Controller one time.
 - 1. After the Time Delay Emergency to Normal timer (TDEN) has timed out, the transfer switch will transfer back to the Source 1 power source.
 - 2. The Time Delay for Engine Cool-Off (TDEC - Feature 4) will allow the engine to run unloaded for a preset time after transfer to the Source 1 power source is completed.

6.1.5 Alternate Tests

- 1. Alternate operational tests may be possible depending upon the options provided with any given ATS. Refer to the schematic diagram provided with the ATS equipment, along with the specification nameplate, to determine the exact options provided.

WARNING

DO NOT ATTEMPT TO MANUALLY OPERATE THE ATS WITH THE SOURCE 1 POWER SOURCE CONNECTED AND AVAILABLE.

DO NOT ATTEMPT TO MANUALLY OPERATE THE ATS WITH THE SOURCE 2 POWER SOURCE CONNECTED AND AVAILABLE.

6.2 Problem Solving**WARNING**

HAZARDOUS VOLTAGES IN AND AROUND ATS EQUIPMENT DURING THE PROBLEM SOLVING PROCESS CAN CAUSE SEVERE PERSONAL INJURY AND/OR DEATH. AVOID CONTACT WITH ANY VOLTAGE SOURCE WHILE PROBLEM SOLVING..

WARNING

ONLY PROPERLY TRAINED PERSONNEL, FAMILIAR WITH THE ATS EQUIPMENT AND ITS ASSOCIATED EQUIPMENT, SHOULD BE PERMITTED TO PERFORM THE PROBLEM SOLVING FUNCTION. IF AN INDIVIDUAL IS NOT QUALIFIED TO PERFORM THE PROBLEM SOLVING FUNCTION, THE INDIVIDUAL SHOULD NOT ATTEMPT ANY OF THESE PROCEDURES.

A basic problem-solving effort is the first step to take prior to calling for assistance. Frequently, the effort will successfully address most problems encountered. The problem solving procedure is presented in the Troubleshooting Guide (Table 6, Section 6 of ATC-900 Controller Instruction Booklet). Assure that the settings in the controller are correct especially the voltage supplied settings. Remember, only qualified individuals familiar with the ATS equipment and the system in which it is applied should attempt these problem solving procedures. This includes wearing the correct PPE for the job.

If a problem persists after having completed the problem solving procedure, contact a Eaton representative for further assistance. When calling for assistance, the following is the minimum information required to properly address the need:

1. Style number of ATS, if applicable;
2. Catalog number of ATS;
3. Actual location of the ATS (type of facility, address, etc.);
4. Company name and name and position of individual representing company;
5. Basic description of the situation as it exists; and
6. Any results of the problem solving steps taken and/or readings taken.

For ATS assistance, call Eaton Care at:
877-386-2273 option 2, option 4, and then option 3

6.2.1 Transfer Switch Appears Inoperative (Manual Operation)

- Step 1:** Initially verify that there is no voltage on any source (Source 1 or Source 2) inside the transfer switch.
- Step 2:** Depress the "TRIP" button located on the operating mechanism of the contactor to bring the contactor to neutral (trip) position.
- Step 3:** Attach the handle to the manual lever (see Figure 18) and rotate the lever up to go to Source 1.
- Step 4:** Depress the "TRIP" button located on the operating mechanism of the contactor to bring the contactor to neutral (trip) position.
- Step 5:** Depress the "SELECT" button located on the operating mechanism of the contactor and rotate the lever up keeping the "SELECT" button depressed to go to Source-2.

Following above steps, if the transfer switch does not transfer mechanically between the two sources, contact factory personnel

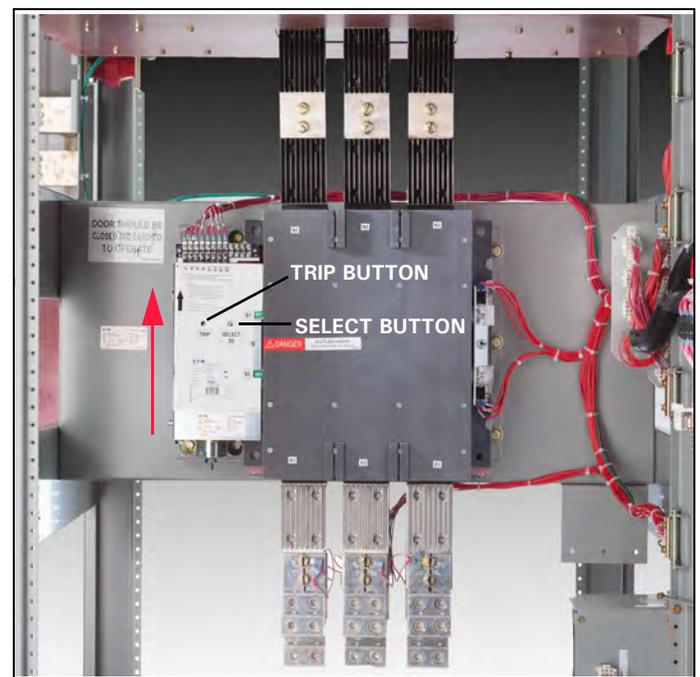


Figure 18. Troubleshooting Manual Operation of the Transfer Switch.

Section 7: Adjustments

WARNING

HAZARDOUS VOLTAGES IN AND AROUND ATS EQUIPMENT DURING THE PROBLEM SOLVING PROCESS CAN CAUSE SEVERE PERSONAL INJURY AND/OR DEATH. AVOID CONTACT WITH ANY VOLTAGE SOURCE WHILE PROBLEM SOLVING.

7.1 General

No Adjustments are required.

Section 8: Maintenance

8.1 Introduction

WARNING

HIGH VOLTAGES ARE PRESENT IN AND AROUND ATS EQUIPMENT. BEFORE INSPECTING OR MAINTAINING THIS EQUIPMENT, DISCONNECT THE LINE POWER FROM, THEN LOCK OUT, IF POSSIBLE, THE NEXT HIGHEST DISCONNECT DEVICE. FAILURE TO FOLLOW THIS PROCEDURE COULD CAUSE SEVERE PERSONAL INJURY AND/OR DEATH.

In general, ATS switch equipment is designed to be relatively maintenance free under normal usage. However, because of the variability of application conditions and the importance placed on dependable operation by this type of equipment, inspection and maintenance checks should be made on a regularly scheduled basis. Since equipment maintenance will consist mainly of keeping the equipment clean, the frequency of maintenance will depend to a large extent on the cleanliness of the equipment's surroundings. If a significant amount of dust or foreign matter is present, a more frequent maintenance schedule should be followed.

It is suggested that visual inspections of the equipment be made on a regular basis, not just during scheduled periods. Always be alert for an accumulation of dirt in and around the structure; loose parts; and/or hardware, cracks, and/or discoloration to insulation; and damaged or discolored components.

8.2 Procedures

A suggested maintenance procedure is outlined in Table 5.

Table 5. Periodic Maintenance Procedures

STEP	ACTION
a. Make the ATS equipment safe for inspection and/or maintenance.	Disconnect the line power from equipment being serviced by opening the next highest disconnect device. Make certain that any accessory control power is switched off by disconnecting all control plugs. Understand what service entrance breakers are part of the switch.
b. Inspect the structure area for safety hazards or potential maintenance problems.	Inspect the area, especially where switching device is installed, for any safety hazards, including personnel safety and fire hazards. Exposure to certain chemical vapors can cause deterioration of electrical connections. Inspect for accumulated dirt, loose hardware, or physical damage. Examine the primary insulation for evidence of cracking or overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. Inspect the secondary control connections for damage and the control wiring for insulation integrity.
c. Inspect the power contactor for dust, dirt, soot, grease, moisture, or corrosion.	Remove dust, dirt, soot, grease, moisture, and corrosion contamination from the surface of the switching device using a dry soft lint-free cloth, dry soft bristle brush, and vacuum cleaner. Do not blow debris into the power contactor. If contamination is found, look for the source and fix the problem.
d. Check for material integrity, uneven wear, discoloration, or loose hardware.	Severe material cracking will require replacement and loose hardware will need to be tightened.
e. Check the terminals and connectors for looseness or signs of overheating.	Overheating will show as discoloration, melting, or blistering of the conductor insulation. Connections that do not have signs of looseness or overheating should not be disturbed.
f. Contact Inspection Procedure	Remove all the screws on the molded cover over the power assembly. Inspect the contacts. Contact Eaton if the contacts have excessive wear. Reinstall the molded cover and tighten screws to 17 in-lbs.
g. Exercise the power contactor if it is not often exercised while in operation. This will permit a "wiping" action by the contacts.	If the power contactor is used for frequent switching during normal operation or monthly testing, this step can be disregarded.
h. Return the ATS equipment to service.	Make certain all barriers are in place and doors closed. Reapply secondary and primary power.
i. Exercise the Breaker and the Switch.	If the switch is not exercised including the breaker, use the three position switch on the front to exercise the breaker and the contactor. Note: The Load power will be removed.

Utility - Generator Transfer Switch Example

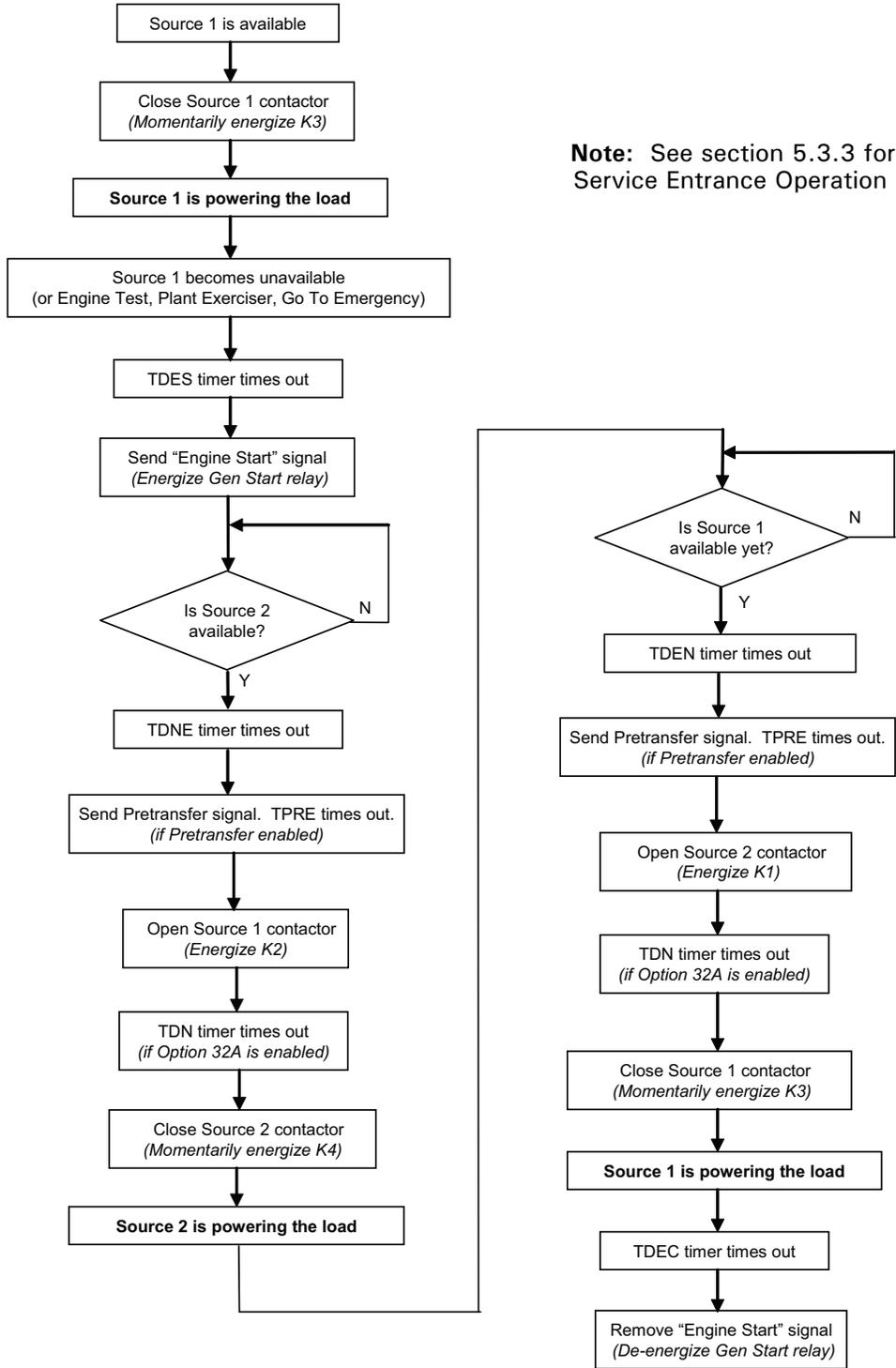


Figure 20. Utility - Generator Transfer Switch.



Notes:

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