

# O & M Manual for 40-400A (480 Vac) 3-Position Contactor Based Non-Automatic Transfer Switch

Instruction Booklet

Description	Page
Introduction	2
Receiving, Handling, and Storage	5
Equipment Description	6
Installation and Wiring	9
Operation	14
Testing and Problem Solving	15
Maintenance	17
Renewal Parts Guide	18



Page **2** 

Effective: June 2013

# 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 MAIN-TENANCE PROCEDURES TO AVOID THESE VOLTAGES.

TRANSFER SWITCH EQUIPMENT COVERED BY THIS INSTRUCTION BOOK IS DESIGNED AND TESTED TO OPERATE WITHIN ITS NAME-PLATE 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 Non-Automatic Transfer Switch 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 contactor based 3-position non-automatic transfer switch with ratings from 40 through 400 amperes (A). 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.



THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PRO-CEDURAL 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.



COMPLETELY READ AND UNDERSTAND THE MATERIAL PRESENTED IN THIS DOCUMENT BEFORE ATTEMPTING INSTALLATION, OPERA-TION, 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 FOL-LOWED PRECISELY. FAILURE TO DO SO COULD CAUSE PERMANENT EQUIPMENT DAMAGE. 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 nonautomatic (electronically operated). Once Source 1 power is restored, the transfer back to the Source 1 power source is nonautomatic (electrically operated) (see Figure 2).



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

In the event the Source 1 power source fails, the non-automatic transfer switch will remain connected to the Source 1 power source. When Source 2 power source with sufficient voltage and frequency appears, the transfer switch can be transferred to Source 2 non-automatically (electrical operation). Conversely, if connected to Source 2 and Source 2 power source fails, the non-automatic transfer switch will remain connected to the Source 2 power source. When Source 1 power source with sufficient voltage and frequency appears, the transfer switch can be transferred to Source 1 non-automatic transfer support to the source 1 power source with sufficient voltage and frequency appears, the transfer switch can be transferred to Source 1 non-automatically (electrical operation).

Effective: June 2013

Page 3

Non-automatic transfer switches perform the transfer function and include three 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. Supervisory circuits to constantly monitor sources available and source to which the transfer switch is connected.

#### 1.2.1 Design Configuration

The Eaton contactor based non-automatic transfer switch is a compact design that uses a power contactor to transfer essential loads from one power source to another (see Figure 3 [400A]).



Figure 3. Typical for a 400A Non-Automatic Transfer Switch.

The Eaton contactor based non-automatic transfer switch is designed with easy installation and simplified maintenance in mind. Three main panels comprise the contactor based nonautomatic transfer switch design:

- 1. Power panel;
- 2. Transformer panel;
- 3. Logic panel.

Page 4

Effective: June 2013

Each panel is independently mounted with interconnecting wiring terminated connector plugs to permit individual panel removal without disturbing critical connections.

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.

UL 1008 WITHSTAND AND CLOSE-ON RATINGS (kA)

	480	volts	600	volts
Switch Rating (Amps)	Any Breaker (Amps)	Specific Breaker Amps)	Any Breaker Amps)	Specific Breaker Amps)
100A	30,000	50,000	22,000	35,000
200A	30,000	50,000	22,000	35,000
260A	30,000	50,000		35,000
320A	30,000	50,000		35,000
400A	30,000	50,000		35,000

240 volts Single Phase 35,000 Any Breaker (amps)

## Table 2. Transfer Switch Catalog Number Explanation

## **1.3 Non-Automatic Transfer Switch 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)	$\bigcirc$	8	9to12	13	14	15
NT	С	Е	C3	Х	3	400	Х	R	U

The catalog number NTCEC3X30400XRU describes a non-automatic transfer switch with a 3 pole, 3 position Power Contactor mounted on a baseplate within the enclosure. The intelligence represented by the logic panel is electromechanical. The continuous current rating of this equipment is 400A and applicable at 480 Vac, 60 Hz. The transfer switch equipment is enclosed in a NEMA 3R enclosure and is listed for UL applications.

POSITIONS 1 TO 2 BASIC DEVICE		POSITIONS 1 TO 2 SWITCHING DEVICE	POSITION 4 CONTROL PANEL	POSITIO SWITCHI	NS 5 TO 6 NG DEVICE
Non-Automatic Transfer Switch	NT	Contactor <b>C</b>	Electromechanical <b>E</b>	3 Position Po	ower Contactor C3
POSITION 7	POSITION 8	POSITIONS 9 TO 12	POSITION 13	POSITION 14	POSITION 15
SWITCHING DEVICE ARRANGEMENT	NUMBER OF POLES	AMPERE RATING	VOLTAGE/ FREQUENCY	ENCLOSURE	LISTING
Fixed Mount X	Two (2)	40A – <b>0040</b>	120 Vac/60 Hz 🛛 🗛	Type 1 <b>S</b>	UL/CSA Listing U
	Three ( <b>3</b> )	80A – <b>0080</b>	208 Vac/60 Hz B	Type 12 J	No Listing X
	Four ( <b>4</b> )	100A – <b>0100</b>	240 Vac/60 Hz 🛛 🛛 🛛 🛛 🛛 🖉	Type 3R 🛛 🛛 🔒 R	
		150A – <b>0150</b>	480 Vac/60 Hz X		
		200A – <b>0200</b>	600 Vac/60 Hz E		
		225A – <b>0225</b>	220 Vac/50 Hz G		
		260A – <b>0260</b>	230 Vac/50 Hz M		
		400A – <b>0400</b>	380 Vac/50 Hz H		
			415 Vac/50 Hz 0		

#### 1.4.1 Operational Conditions

Normally, a non-automatic transfer switch 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 ranges for the nominal voltage and frequency setting.

#### Connected

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

#### **Re-Transfer**

Re-transfer is defined as a change of the load connection from the Source 2 to Source1.

#### 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).

#### Transfer

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

#### Unconnected

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

# Section 2: Receiving, Handling, and Storage

#### 2.1 Receiving

Every effort is made to ensure that the non-automatic transfer switch 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 non-automatic transfer switch 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, and appropriate instruction leaflets, are enclosed within the bag and should be filed in a safe place.

#### 2.2 Handling

As previously mentioned, non-automatic transfer switch equipment is packaged for forklift movement. Protect the equipment from impact at all times and DO NOT double stack.

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  $85^{\circ}$ C (-22 to  $185^{\circ}$ F) and with a relative humidity of 80% or less. DO NOT, under any circumstance, stack other equipment on top of a transfer switch equipment enclosure, whether packaged or not.

Effective: June 2013

Page 5

Page **6** 

# Section 3: Equipment Description

# 3.1 General

The non-automatic transfer switch consists of three basic panels:

- 1. The power panel;
- 2. The transformer panel;
- 3. The logic panel.

These panels are interconnected via connector plugs and mounted in an enclosure (see Figure 4).



Figure 4. Three Basic Panels of the Non-Automatic Transfer Switch (400A).

# 3.2 Power Panel

The power panel is used for making load, power, and neutral connections. The power contactor is mounted on a steel baseplate (see Figure 4).

#### 3.2.1 Main Contacts

This non-automatic transfer switch incorporates a power contactor. The main contacts connect and disconnect the load to and from the different power sources. The power contactor is mechanically and electrically interlocked to prevent the two sets of main contacts from being closed simultaneously.

## 3.3 Voltage Selection

#### 3.3.1 Selection (208, 220, 240, 380, 415, 480, 600, 60 Hz)

The market voltage selection panel consists of multi-tap transformers, contained in a steel case mounted in the transfer switch enclosure (see Figure 4). There are two transformers in the enclosure, one for Source 1 and another for Source 2. The transformer unit is easily removed by removing the screws and disconnecting the plug.



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 SER-VICING. 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 5. Transformer (Normal and Emergency Sources).

Effective: June 2013

Page 7

#### 3.4 Logic Panel

The logic panel provides ability to transfer from Source 1 to Source 2 when Source 2 is at sufficient voltage and frequency. Conversely it also provides ability to transfer from Source 2 to Source 1 when Source 1 is at sufficient voltage and frequency. It also provides indication for source availability and switch position.



Figure 6. Logic Control Panel.

#### 3.5 Features

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

#### 3.5.1 Standard Features

The following is a list of the standard features of the non-automatic transfer switch.

#### 12. Power Source Annunciation

This feature provides light indication for switch position and power source availability.

#### **Switch Position**

Provides light to indicate the switch position.

12C. Source 1 - Source Connected

This feature provides a green light that, when lit, indicates the load is connected to Source 1.

#### 12D. Source 2 - Source Connected

This feature provides a red light that, when lit, indicates the load is connected to Source 2.

#### **Power Source Availability**

Provides light to indicate if a power source is available.

#### 12G. Source 1 - Available (Present)

This feature provides a white light that, when lit, indicates Source 1 is available. It is a Source 1 Present indication as there is no controller to measure the voltage and frequency of the source.

#### 12H. Source 2 - Available (Present)

This feature provides an amber light that, when lit, indicates Source 2 is available. It is a Source 2 Present indication as there is no controller to measure the voltage and frequency of the source.

- 14. Relay Auxiliary Contacts: This feature provides form "C" relay auxiliary contacts
- **14G.** Source 1 Present: Provides two (2) normally open and two (2) normally closed contacts. The relay is energized when Source 1 is available.
- 14H. Source 2 Present: Provides two (2) normally open and two (2) normally closed contacts. The relay is energized when Source 2 is available.

#### 15. Switch Position Indication Contact

This feature provides a contact that indicates if the powerswitching device is in the "Open" or "Closed" position.

- **15E.** Source 1 Position Indication Contact This feature provides 1 Dry Form "C" contact that indicates the position of the Source 1 power-switching device.
- 15F. Source 2 Position Indication Contact This feature provides 1 Dry Form "C" contact that indicates the position of the Source 2 power-switching device.

#### 42. Seismic Withstand Capability

Provides transfer switch with seismic capability exceeding the worst case Zone 4 required per both the Uniform Building Code and the California Building Code.

Page **8** 

Effective: June 2013

## 3.5.2 Optional Features

The following is a list of the optional features for the non-automatic transfer switch. All features or combinations of features may not be available on specific non-automatic transfer switches

#### 14. Relay Auxiliary Contacts

This feature provides form "C" relay auxiliary contacts.

#### 14C. Source 1 Present

Provides four (4) normally open and four (4) normally closed contacts. The relay is energized when source 1 is available.

#### 14D. Source 2 Present

Provides four (4) normally open and four (4) normally closed contacts. The relay is energized when source 2 is available.

#### 15. Switch Position Indication Contact

This feature provides a contact that indicates if the power switching device is in the "Open" or "Closed" position.

## 15G. Source 1 Position Indication Contact

This feature provides 3 Dry Form "C" contacts that indicate the position of the Source 1 power-switching device.

#### 15H. Source 2 Position Indication Contact

This feature provides 3 Dry Form "C" contacts that indicate the position of the Source 2 power-switching device.

#### 38. Stainless Steel Logic Cover

## 38A. Stainless Steel Cover for Device Panel

Provides an added level of security by providing a pad lockable stainless steel cover for use with standard transfer switch device panel. The cover is designed for NEMA 1, 3R, 4X, and 12 applications.

## 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.

#### 41. Space Heater With Thermostat

This feature provides a space heater and non-adjustable thermostat. External control power is not required.

## 41A. Space Heater With Thermostat - 100 Watt

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

## 51D1. 50kA CVX Surge Device

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

## 51F1. 100kA CVX Surge Device

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

## 3.6 Enclosure

The rugged steel non-automatic transfer switch enclosure is supplied with three door hinges, regardless of enclosure size. They ensure proper support of the door and door mounted devices (see Figure 7). 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 pad-lockable latches.



Figure 7. Typical Type 1 Enclosure (Door Closed).

The door is used to mount a variety of lights, switches, and pushbuttons, depending upon the options required for a particular nonautomatic transfer switch. All lights and switches are mounted in the plastic door-mounted 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.

Non-automatic transfer switch 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 non-automatic transfer switch 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	S

NEMA TYPE	DESIGN	PROTECTION
Open	Indoor	
1	Indoor	Enclosed Equipment
3R	Outdoor	Rain, Ice Formation
12	Indoor	Dust, Dirt, and Non-Corrosive Liquids

## 3.7 Standards

Eaton non-automatic transfer switch equipment, enclosed in any of the enclosures listed in Table 3, is listed for application by UL and ULC. In addition, Eaton non-automatic transfer switches are listed in File E38116 by Underwriters Laboratories, Inc. under Standard UL 1008. This standard covers requirements for automatic and non-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 non-automatic transfer switches 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 automatic and non-automatic transfer switches 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 ATS.

Locate the wiring schematic, review it, and keep it readily available for reference purposes during installation and testing. Once an ATS 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.



BE CERTAIN THAT THE SOLID STEEL DOOR IS PROPERLY INSTALLED BEFORE THE TRANSFER SWITCH EQUIPMENT IS PUT INTO SERVICE. THE DOOR PROVIDES PROTECTION FROM DAN-GEROUS VOLTAGES AT THE LINE AND LOAD TERMINALS WHEN THE EQUIPMENT IS IN OPERATION. 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 ATS 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 ATS 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 ATS components as the packing material is removed and the enclosure readied for mounting. Be especially alert for distorted metal, loose wires, or damaged components.

Page 10

## 4.3 Mounting Procedure



#### SINCE THE ENCLOSED ATS 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 the same design. Only the overall physical dimensions change. Note that the enclosure is provided with four teardrop (elongated) mounting holes, two in the top mounting flange and two 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.



EXTREME CARE SHOULD BE TAKEN TO PROTECT THE TRANSFER SWITCH FROM DRILL CHIPS, FILINGS, AND OTHER CONTAMI-NANTS WHEN MAKING THE CABLE ENTRY HOLES. EXTREME CARE SHOULD ALSO BE TAKEN WHEN MOUNTING THE ENCLO-SURE TO PREVENT COMPONENT DAMAGE OR A FUTURE MAL-FUNCTION. With the enclosed ATS equipment unpacked and ready for mounting, proceed with the following steps.

- Step 1: The ATS enclosure door is hinge mounted with removable hinge pins. To simplify the mounting procedure and avoid damaging the door-mounted logic panel, it is strongly suggested that the door be carefully removed and put it in a safe place until mounting is complete. To remove the door, open the door and disconnect the connectors at the back of the ATC-300 + logic panel. Remove the wire ties securing the harness to the inside of the door. Carefully remove the hinge pins then the door from the enclosure.
- **Step 2:** Install the required upper and lower mounting bolt anchors and the two upper mounting bolts in the mounting surface.
- Step 3: Gently lift the enclosure and guide the teardrop holes in the upper mounting flange over the upper mounting bolts. Do not completely tighten the bolts at this time (see Figure 9).
- Step 4: 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 5:** Tighten all four mounting bolts after any required shimming is completed.



Figure 8. Typical (40A-400A) Contactor Based Non-Automatic Transfer Switch Equipment (Door Open).



Figure 9. Typical Mounting of the ATS to a Mounting Surface.

**Step 6:** Double check to ensure that all packing and shipping materials have been removed.

#### 4.4 Power Cable Connections



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.



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



TO HELP PREVENT COMPONENT DAMAGE OR FUTURE MALFUNC-TIONS, USE EXTREME CARE TO KEEP CONTAMINANTS OUT OF THE ATS EQUIPMENT WHEN MAKING POWER CABLE CONNEC-TIONS.



RUN THE POWER CABLE THROUGH THE GUTTER SPACE PROVIDED TO THE RIGHT OR LEFT 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 Booklet 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 wire sizes shown in Table 4.

#### Table 4. Transfer Switch Equipment Wire Sizes

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.



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



POWER CONDUCTORS AND CONTROL WIRING MAY HAVE VOLT-AGE PRESENT THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. DEENERGIZE ALL POWER OR CONTROL CIRCUIT CON-DUCTORS BEFORE BEGINNING TO PERFORM ANY WIRING ACTIV-ITY TO OR WITHIN THE ATS EQUIPMENT.

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



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

There are no Engine Start Contacts since this is a Non-Automatic switch (no controller).

TRANSFER SWITCH AMPERE RATING	WIRE SIZE RANGES	NUMBER OF CABLES PER PHASE	TERMINAL TEMPERATURE RATING °C (°F)
100	#14-3/0	1	90 (194)
200	#6-300KCMIL	1	90 (194)
400	#1/0-750	1	90 (194)
400	#1/0-250	2	90 (194)

Effective: June 2013

Page 11

Page **12** 

Effective: June 2013

## 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.



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

# 4.7.1 Standard Voltage Selection Panels (208, 240, 480, 600 V, - 60 Hz & 220, 380, 415 V, -50 Hz)

The Standard voltage selection panel consists of multi-tap transformers, contained in a steel case mounted in the enclosure. To change the voltage from the factory default 600 Vac, follow the steps detailed below.

- Step1: Loosen the six screws securing the cover of the Voltage Selection Transformer case. Slide the cover up, then away from the case (see Figure 11).
- Step 2: Remove the wires from the primary taps of both transformers and installed them on the taps for the desired voltage (see Figure 12). Note that only one wire per transformer is moved since the second wire is the zero reference.



WHEN CHANGING THE VOLTAGE, ONE WIRE MUST BE MOVED ON THE PRIMARY TAPS OF BOTH TRANSFORMERS.



Figure 10. Standard Voltage Selection Panel.



Figure 11. Standard Voltage Selection Panel.

Step 3: Reinstall the cover and tighten the four screws.

## 4.8 Terminal Block Wire Installation and Removal

Proceed with the following steps and associated figures to install or remove terminal block wiring.

Step 1: Figure 13 shows two tension clamp terminal blocks. There is a large one and small one, but the operation is the same for both. A small tool, such as a screwdriver, will be pushed into the square hole next to the wire hole and a wire will be inserted into the larger circular hole on the outer edge.



Figure 12. Tension Clamp Terminal Blocks.

Step 2: Begin by inserting a small, flathead screwdriver into the square (tool) hole with the flat surface of the screwdriver against the back wall of the hole. With a little bit of force, push the screwdriver in on a slight angle toward the center of the clamp. Be sure to slide it in until it clicks. You will then see the clamp open in the wire hole.



Figure 13. Screwdriver Inserted in the "Tool" Hole.

**Step 3:**Once the screwdriver is in place, obtain a stripped wire (strip about 1/4 in.) and insert it into the larger circular wire hole. Push the wire in until it can go no further.



Figure 14. Wire Inserted in the "Wire" Hole.

Step 4: While holding the wire in place, pull the screwdriver out. The wire will now be held securely in the terminal block. Pull on the wire to insure that it is correctly inserted into the clamp.



Figure 15. Wire Securely Installed in the Terminal Block.

# **Instruction Booklet**

Page 13

Effective: June 2013

Page 14

# Section 5: Operation

## 5.1 General

A non-automatic transfer switch 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



MATIC TRANSFER SWITCH WITH SOURCE 1 OR SOURCE 2 AVAIL-ABLE.



HIGH VOLTAGES ARE PRESENT IN AND AROUND TRANSFER SWITCH EQUIPMENT. BEFORE ATTEMPTING TO MANUALLY TRANSFER, DISCONNECT THE LINE POWER FROM THE EQUIP-MENT BEING SERVICED BY OPENING AND LOCKING OUT, IF POSSI-BLE, 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 TRANS-FER.

To manually operate:

- 1. Locate the manual lever on the left side of the contactor.
- 2. Locate the handle used to manually transfer the switch.
- 3. Attach the handle to the manual lever.
- Trip to Neutral: Rotate the lever down to open or Trip to Neu-4. tral the device. (See instructions on Mechanism).
- Close to S1: Depress the "Close" button on the operating 5. mechanism to close to Source 1. A Phillips screwdriver works well.
- 6 Close to S2: Depress the "select" button located on the operating mechanism of the contactor and the "close" button to close to Source 2. These will have to be done simultaneously.



Figure 16. Non-Automatic Transfer Switch Manual Operating Handle in Use.

- 7. Once the manual operation is complete and non-automatic (electrical) operation of the switch is desired, connect the sources of power.
- 8. Follow the testing procedure in Section 6 to ensure proper non-automatic (electrical) operation.

# 5.3 Non-Automatic Operation (Electrically Operated)

A non-automatic (electrically operated) transfer switch functions similarly to the non-automatic (manually operated) transfer switch except for the addition of an electrical operating device panel on the door. This permits the main contacts to be opened and closed electrically. There is, however, no intelligence associated with this design.

Electrical operation is accomplished by adding required indication lights and push buttons (located on the front device panel) to the operating mechanism of the 3-position contactor.

The switch's operating position and source availability can be visually indicated via. indication lights installed on the front device panel without opening the door (see Figure 18).

Since an intelligence circuit is not part of the non-automatic transfer switch design, operation of the push buttons mentioned above (see Figure 18) is required each time an electrical transfer is required. Source Available is Source Present since there is not a controller to measure voltage or frequency.



Figure 17. Electrical Operation Pushbuttons and Position Indication Lights Shown Mounted.

# Section 6: Testing and Problem Solving

## 6.1 Testing

After the non-automatic transfer switch 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.



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.

For manual and non-automatic (electrical) operation of the transfer switch, refer to Section 5 in this instruction booklet.

## 6.2 Problem Solving



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



ONLY PROPERLY TRAINED PERSONNEL, FAMILIAR WITH THE NON-AUTOMATIC TRANSFER SWITCH EQUIPMENT AND ITS ASSOCI-ATED EQUIPMENT, SHOULD BE PERMITTED TO PERFORM THE PROBLEM SOLVING FUNCTION. IF AN INDIVIDUAL IS NOT QUALI-FIED TO PERFORM THE PROBLEM SOLVING FUNCTION, THE INDI-VIDUAL 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. In addition, several problem solving procedures are presented here which are specific to the type of switches or circuit breakers used in this equipment.

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

- 1. General Order Number (GO#) of transfer switch, plus related Item Number.
- 2. Catalog and/or Style Number of transfer switch.

Eaton Care for assistance 877-386-2273 option 2, option 4, and then option 3

Page **16** 

- 3. Name and position of individual representing company.
- 4. Basic description of situation as it exists.
- 5. Any results of problem solving steps taken and/or readings taken.

# 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 "Close" button located on the operating mechanism of the contactor to bring the contactor to Source 1 position.
- Step 3: Attach the handle to the manual lever (see Figure 19) and rotate the lever down to Trip (see instructions on mechanism).
- **Step 4:** Depress the Source Select and Close buttons located on the operating mechanism of the contactor to close the contactor on Source 2.

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



Figure 18. Troubleshooting Manual Operation of the Transfer Switch.

# 6.2.2 Transfer Switch Appears Inoperative (Non-Automatic Electrical Operation)

- Step 1: Initially verify that there is no voltage on any source (Source 1 or Source 2) inside the transfer switch.
- Step 2: Verify that all plugs and sockets are properly interconnected.
- Step 3: Apply sufficient voltage and frequency on Source 1 (or Source 2) and verify that correct system voltage appears on Source 1 (or Source 2) side of the transfer switch. Measure and confirm correct voltage at Source 1 (or Source 2) lugs.
- **Step 4:** Verify that the voltage selection plug is in proper position to match the system voltage.
- Step 5: Look for any obviously overheated components. Determine the cause and rectify, if possible. Replace defective components after the cause is determined.
- Step 6: Verify that correct source available (Present) light is "ON" on the front device panel.
- Step 7: Turn "Source 1 Close" switch (or "Source 2 Close" switch) and verify that correct position indication light is "ON".

Following above steps, if the transfer switch does not transfer, verify the wiring between the operating mechanism of the contactor and front device panel.

## Section 7: Maintenance

### 7.1 Introduction

WARNING

HIGH VOLTAGES ARE PRESENT IN AND AROUND NON-AUTOMATIC TRANSFER SWITCH EQUIPMENT. BEFORE INSPECTING OR MAIN-TAINING 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, non-automatic transfer switch 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

Instruction Booklet Effective: June 2013

Page 17

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.

#### 7.2 Procedures

A suggested maintenance procedure is outlined in Table 5.

#### Table 5. Periodic Maintenance Procedures

STEP	ACTION
<ul> <li>Make the non-automatic transfer switch equipment safe for inspection and/or maintenance.</li> </ul>	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 logic plugs.
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 Care (1-877-ETN-CARE, Option-2) 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, this step can be disregarded.
h. Return the non-automatic transfer switch equipment to service.	Make certain all barriers are in place and doors closed. Reapply secondary and primary power.

Page **18** 

# Section 8: Renewal Parts Guide

## 8.1 General

Refer to Figure 20 for assistance with selecting and ordering selected non-automatic transfer switch renewal parts. For more information please see Renewal Parts Publication (RP01603002E).

Example: To order the transformer pack for an NTCEC3X30400XRU transfer switch, order Catalog Number as shown in Figure 20.



Figure 20 Typical Non-Automatic 3-Position Contactor Type 40-400A Transfer Switch.

FUNCTION / DEVICE	PART NUMBER	QTY. PER SWITCH	DESCRIPTION	
TRANSFORMER ASSEMBLY				
480V	68C8229G02	1	C-FRAME 300VA XFMR ASSY STANDEX (1268C19G07)	
600V	68C8241G01	1	D-FRAME XFMR BOX ASSY SINGLE	
CONTACTOR				
480V	69C2990G02		3 POS C-FRAME 3P CONTACTOR ASSEMBLY	
600V	67C5241G06	1	D-FRAME 3P CONTACTOR ASSEMBLY	
SPACE HEATER	8160A41G54	1	41A, SPACE HEATER 100W/120V	
WIRE HARNESS ASSEMBLIES				
480V	69D8307G05	1	NON-AUTO - 3-POS. DOMESTIC	
480V	69D8301G06	1	SHORT DOMESTIC HARNESS FOR 3 POS C	
600V	69D8307G03	1	D-FRAME LOGIC HARNESS NON-AUTO	
POWER PANEL				
3 POLE	68C8234H13	1	C-FRAME BASE PLATE	
LUGS				
4 80V	AB750-4	3	(2) 3/0-250 OR (1) 3/0-600 CU/AL NORM	
480V	AB750-4	3	(2) 3/0-250 OR (1) 3/0-600 CU/AL EMER	
480V	AB750-4	3	(2) 3/0-250 OR (1) 3/0-600 CU/AL LOAD	
480V	8165A68G02C	1	A/B/C-FRAME GROUND LUG	(Continued)

Effective: June 2013

Page **19** 

FUNCTION / DEVICE	PART NUMBER	QTY. PER SWITCH	DESCRIPTION
600V	AB750-4	3	(2) 3/0-250 OR (1) 3/0-600 CU/AL NORM
600V	68C8289H01	3	D FRAME LUG ADAPTER NORM
600V	AB750-4	3	(2) 3/0-250 OR (1) 3/0-600 CU/AL EMER
600V	68C8289H01	3	D FRAME LUG ADAPTER EMER
600V	AB750-4	3	(2) 3/0-250 OR (1) 3/0-600 CU/AL LOAD
600V	68C8289H01	3	D FRAME LUG ADAPTER LOAD
LOGIC RELAY			
480V (KV RELAY)	D7PAA	1	C-H D7 RELAY SOCKET
480V (KV RELAY)	D7PR2A	1	RELAY; PLUG-IN, 10A, 120VAC
600V (KV RELAY)	D7PAA	1	C-H D7 RELAY SOCKET
600V (KV RELAY)	D7PR2A	1	RELAY; PLUG-IN, 10A, 120VAC
	D9PR10BA	1	C-H, D9 POWER RELAY, 120 VAC 2
	D9PR8BA	1	4PST NO POWER RELAY 120 VAC
CONTROL / INDICATION COMPONENTS			
	67A2502H03	1	E34VHBK1; SEL SW; 3POS CAM3
	67A2503H04	1	10250T3 CONTACT BLOCK 2NC
	67A2503H05	1	10250T2 CONTACT BLOCK 2NO
	67A2505H13	1	LIGHT COVER WHITE
	67A2505H15	1	RED LIGHT
	67A2505H10	1	GREEN LIGHT
	67A2505H11	1	AMBER LIGHT
	E34TB120	3	120 VAC LIGHT

Figure 20 Typical Non-Automatic 3-Position Contactor Type 40-1200A Transfer Switch. (cont.)

Page 20

Effective: June 2013

This instruction booklet is published solely for information purposes and should not be considered all-inclusive. If further information is required, you should consult Eaton.

Sale of the product(s) shown in this literature is subject to terms and conditions outlined in appropriate Eaton selling policies or other contractual agreements between the parties. This literature is not intended to and does not enlarge or add to any such contract. The sole source governing the rights and remedies of any purchaser of this equipment is the contract between the purchaser and Eaton.

NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WAR-RANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MER-CHANTABILITY, 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, recommendations and description contained herein.

CSA is a registered trademark of the Canadian Standards Association. National Electrical Code and NEC are registered trademarks of the National Fire Protection Association, Quincy, Mass. NEMA is the registered trademark and service mark of the National Electrical Manufacturers Association. Uniform Building Code (UBC) is a trademark of the International Conference of Building Officials (ICBO). UL is a federally registered trademark of the Underwriters Laboratories Inc.

> Eaton Corporation Electrical Group 1000 Cherrington Parkway Moon Township, PA 15108 United States. 788-ETN CARE (877-386-2273) Eaton.com



© 2013 Eaton Corporation All Rights Reserved Printed in USA Publication No. IB140003EN/TBG01081 June 2013