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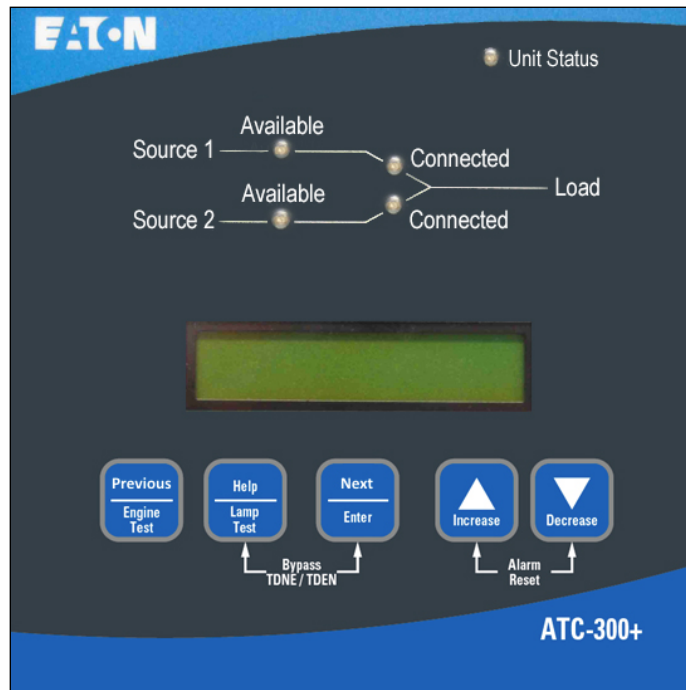
Automatic Transfer Switch Controller, ATC-300+ Operation and Maintenance Manual

Instruction Booklet

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 **CAUTION**

THE ATC-300+ CONTROLLER IS FACTORY PROGRAMMED FOR A SPECIFIC AUTOMATIC TRANSFER SWITCH. DO NOT ATTEMPT TO INTERCHANGE ATC-300+ CONTROL DEVICES WITHOUT CONSULTING EATON ELECTRICAL.

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 (ATC)-300 Controller. It is provided as a guide for authorized and qualified personnel only in the selection and application of the ATC-300+ Controller. 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 PERSONNEL 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.

1.2 Background

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 can be automatic or manual, depending upon the type of transfer switch equipment being used. Once Source 1 power is restored, the load is automatically or manually transferred back to the Source 1 power source, again depending upon the type of transfer equipment being used.

In automatic transfer switch (ATS) equipment, the switch's intelligence system initiates the transfer when the Source 1 power falls below or rises above a preset voltage or frequency. If the Source 2 power source is a standby generator, the ATS initiates generator start up then transfers to the Source 2 power source when sufficient generator voltage is available. When Source 1 power is restored, the ATS automatically transfers back to the Source 1 power source and initiates generator engine shutdown.

An ATS consist of three basic elements:

1. Main contacts to connect and disconnect the load to and from the power sources.
2. A mechanism to transfer 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.

This manual deals with the third basic element of the ATS, the required intelligence/supervisory circuits. Earlier ATSs were controlled by relay logic type or a solid-state, single board controllers. In either case, the control panel consisted of a number of individually mounted and wired devices offering a limited amount of system flexibility, especially in the case of the relay logic design. The ATC-300+ Controller advances the application of intelligence, supervisory, and programming capabilities for ATS equipment. The Eaton controllers are continuing to be enhanced, mainly through firmware for present real world applications. The smartEST (smart Eaton Switch Technology) brings a new standard in Automatic Transfer Switches.

1.3 Product Overview

The ATC-300+ Controller is a comprehensive, multi-function, microprocessor based ATS controller. It is a compact, self-contained, panel mounted device designed to replace traditional relay and solid-state logic panels.

Designed to meet the needs of markets worldwide, the ATC-300+ Controller:

- Is a UL Recognized Component
- Complies with UL 1008/ CSA 22.2-178
- Meets the Intent of UL 991
- Meets IEC 1000-4-2, 1000-4-3, 1000-4-4, 1000-4-5, 1000-4-6, and 1000-4-11
- Meets CISPR 11, Class A
- Complies with FCC Part 15, Class A
- Meets European Standards Conformance (CE mark)
- Seismic

The ATC-300+ Controller provides an unmatched degree of programmed flexibility to address the needs of any system. It operates from all system voltages between 120 and 600 Vac, single-phase and 3-phase, at 50 or 60 Hz. In addition, a period of no control power operation is provided. The ATC-300+ Controller monitors the condition of the 3-phase line-to-line voltage and frequency of both the Source 1 and Source 2 power sources. It can also be programmed for single-phase operation. The ATC-300+ Controller provides the necessary intelligence to insure that the switch operates properly through a series of programmed sensing and timing functions.

A standard ATC-300+ Controller will:

- Monitor Source 1 and Source 2 power source voltages and frequencies;
- Provide overvoltage/undervoltage monitoring of the Source 1 and Source 2 power sources;
- Permit customer programming;
- Display real-time and historical information;
- Permit system testing;
- Store customer/factory established parameters in nonvolatile memory; and
- Provide faceplate source status indications.

1.4 Glossary

With respect to their use within this document and as they relate to ATS 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.

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.

Note: The ATC-300+ controller is a newer version of the ATC-300.

Re-Transfer

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

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: Unavailable

Source 1 is defined as unavailable or “failed” when it is outside of its undervoltage/overvoltage/ underfrequency/overfrequency/voltage unbalance/phase reversal (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Source 2: Unavailable

Source 2 is defined as unavailable or “failed” when it is outside of its undervoltage/overvoltage/ underfrequency/overfrequency/voltage unbalance/phase reversal (if applicable) setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds after the TDEF time delay expires.

Transfer

Transfer is defined as a change of the load connection from the Source 1 to the Source 2 power source, except when specifically used as “Transfer to Neutral”.

Transfer to Neutral

Transfer to neutral (or Open, Trip) is defined as when the load circuits are disconnect from both the Source 1 and Source 2 power sources.

Unconnected

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

$V_{IN, RMS}$

Refers to the operating input voltage (Vac, RMS).

1.5 Functions/Features/Options

The primary function of ATC-300+ Controller is to accurately monitor power sources and provide the necessary intelligence to operate an ATS in an appropriate and timely manner. In addition, the ATC-300+ Controller provides programming through the device’s faceplate or communication option.

1.5.1 Operational Simplicity

From installation to programming to usage, the ATC-300+ Controller was designed with operational simplicity in mind. Only one style needs to be considered, regardless of input/output requirements or system voltages and frequencies. The ATC-300+ Controller provides the functionality of numerous other devices combined in one package that mounts in 6.5 by 8.5 inches of panel space.

The user-friendly front panel interface simplifies routine operation, programming, data presentation, and setting adjustments. An LCD-based display provides the flexibility of a back-lit display for enhanced visibility. The operation of the front panel membrane pushbuttons move the ATC-300+ Controller display from function to function or step to step within a function, forward and backwards on the display.

1.5.2 Standard and Optional Features

A variety of programmable features are available with the ATC 300+ Controller to meet a wide variety of application requirements. The majority of features can be enabled or disabled via setpoint or by specific wiring connections. Some features may not be available based on transfer switch product type or in combination with other features. For example Time Delay Neutral (TDN) is only available for open delayed transition (load disconnect) product types. The transfer switch product type is typically factory set to match the transfer switch that the ATC-300+ controller is installed in, but may be changed via the front panel "Change Setpoints" function in the event field replacement is required.

1.5.2.1 Standard Features List

The following is a list of some of the standard features of the ATC-300 Controller.

1. Time Delay Normal to Emergency (TDNE)

This feature provides a time delay when transferring from the Source 1 to the Source 2 power source. Timing begins when Source 2 becomes available. It permits controlled transfer of the load circuit to Source 2.

Adjustable 0 - 1800 Seconds

2. Time Delay on Engine Starting (TDES)

This feature provides a time delay of the signal to initiate the engine/generator start cycle in order to override momentary power outages or voltage fluctuations of Source 1.

Adjustable 0 - 120 Seconds

3. Time Delay Emergency to Normal (TDEN)

This feature provides a time delay of the re-transfer operation to permit stabilization of Source 1. Timing begins when Source 1 becomes available. If Source 2 fails during timing, then re-transfer is immediate, overriding the time delay.

Adjustable 0 - 1800 Seconds

4. Time Delay for Engine Cool-down (TDEC)

This feature provides a time delay of the signal to initiate the engine/generator stop cycle after the re-transfer operation. This allows the engine/generator to cool down by running unloaded. Timing begins on completion of the re-transfer cycle.

Adjustable 0 - 1800 Seconds

5. Time Delay Neutral (TDN)

This feature provides a time delay for a three position switch in the neutral or open position.

6. Source 2 Monitoring and Protection

This feature provides monitoring and protection based on the Source 2 voltage and/or frequency setpoints. All feature 5 functions are "failsafe" operations.

5H/26H. Phase Reversal Protection

For a 3-phase wye source, this feature monitors the phase sequence of the sources. If a source does not have the same ABC or CBA sequence as the setpoint value, that source will be considered "Unavailable".

For a 3-phase delta source, this feature should be turned off via the PHASE REV setpoint.

5J/26J. 3-Phase Undervoltage and Underfrequency Protection

Adjustable Undervoltage:

Dropout: 70 - 97% of nominal (0 = Disabled)

Pickup: (Dropout + 2%) - 99% of nominal (0 = Disabled)

Adjustable Underfrequency:

Dropout: 90 - 97% of nominal (0 = Disabled)

Pickup: (Dropout + 1Hz) - 99% of nominal (0 = Disabled)

5K/26K. 3-Phase Overvoltage/Overfrequency

Adjustable Overvoltage:

Dropout: 105 - 120% of nominal (0 = Disabled)

Pickup: 103% - (Dropout - 2%) of nominal (0 = Disabled)

Adjustable Overfrequency:

Dropout: 103 - 110% of nominal (0 = Disabled)

Pickup: 101% - (Dropout - 1Hz) of nominal (0 = Disabled)

5L/26L. 3-Phase Voltage Unbalance

For a 3-phase wye source, this feature monitors phase voltage ratios. Voltage unbalance (%) is calculated using the NEMA line voltage unbalance rate (LVUR) definition which is maximum voltage deviation from average line voltage divided by average line voltage. User-selectable setpoints are available for dropout and pickup unbalance settings (minimum 2% differential). Dropout is adjustable from 5 to 20%. Pickup is adjustable from 3% to (Dropout - 2%). A setpoint for user-selectable time delay from 10 to 30 seconds is provided. A user-selectable setpoint for enable and disable is provided.

When an unbalance condition is detected on the Source, the Unbalance Timer (TD UNBAL) starts timing. If the voltage unbalance is not resolved before the TD UNBAL times out, that source will be declared unavailable.

For a 3-phase delta source or HRG (High Resistance Grounding), this feature should be turned off via the VOLT UNBAL setpoint.

6. Test Operators

Eaton ATCs are provided with a Test Pushbutton on the front panel of the controller that simulates a loss of the Source 1 power source as standard (Feature 6B). All programmed time delays (TDNE, TDEN, etc.) will be performed as part of the Test. Engine run time of the Test is equal to the Plant Exerciser programmed setpoint. All Tests are Failsafe protected.

6B. Test Pushbutton

Programmable setpoints include:

1. Load, No Load Testing, or Disabled and
2. Engine run time is equal to the Plant Exerciser setting.

7. Time Delay Emergency Fail (TDEF)

This feature provides a time delay that prevents a connected emergency source from being declared "failed" in order to override momentary generator fluctuations. If the Source 2 power source remains in the failed state then, 0.5 seconds after the TDEF timer expires, the transfer switch will proceed with the programmed sequence for re-transfer. This time delay is only implemented when the Source 2 power source is a generator.

Adjustable 0 - 6 Seconds

8. Time Delay Bypass Pushbutton

This feature provides a way (by pushing the Help and Step pushbutton simultaneously) to bypass the TDNE (Feature 1) and/or TDEN time delays. The Time Delay Bypass function, when activated by pushing the Help and Step pushbutton simultaneously, will reduce any or all of the programmed time delay to zero.

8C. Bypass TDEN

This feature provides a membrane pushbutton to bypass the TDEN time delay.

8D. Bypass TDNE

This feature provides a membrane pushbutton to bypass the TDNE time delay.

12. Power Source Annunciation

This feature provides LEDs to give switch position and power source availability indications.

Switch Position

Provides LEDs to indicate the switch position. The auxiliary switches on the switching device are used for the switch position.

12C. Source 1 - Source Connected

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

12D. Source 2 - Source Connected

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

Power Source Availability

Provides LEDs to indicate if a power source is available. LEDs may be integral or separate from the controller.

12G. Source 1 - Available

This feature provides a white LED that, when lit, indicates Source 1 is available.

12H. Source 2 - Available

This feature provides an amber LED that, when lit, indicates Source 2 is available.

23. Plant Exerciser (PE)

This feature provides a means for automatic testing of the engine/generator set or standby power system. All programmed time delays will be performed during plant exerciser operations.

23K. Plant Exerciser Selectable – Disabled/1/7/14/28 Day Interval

This feature provides for automatic test operation of the generator. Available test cycles are daily, 7, 14, or 28 days with duration equal to the programmed engine test time.

Programmable setpoints allow for selection of three test cycles:

- Engine Start/Run Only (No Load);
- Exercise with Load Transfer; or Disabled
- This is a "Failsafe" operation.

26. Source 1 - Monitoring and Protection

This feature provides Source 1 monitoring and protection functions. If the Source 1 power supply fails, then the ATC-300+ will begin the sequence of operations necessary to transfer the load circuit to the Source 2 power source. All Feature 26 monitoring and protection functions are "failsafe" operations.

26D. Go to Source 2

This feature provides the capability for an external contact opening to initiate a load power transfer to the Source 2 power source. This includes starting the engine/generator, performing the programmed time delays, and the transfer operation. Re-transfer will occur when the external contact is closed or under a "failsafe" condition. A connection point on the controller for the connection of an external contact is included.

See Table 2 in section 6.5 for all the setpoints in order for the ATC-300.

29. Alternate Transfer Modes of Operation

Provides standard or optional transfer modes, mode selection devices, and operational methods for ATSS.

29J. Type of Operation Manual Retransfer (MANTR) Operation (new feature)

This feature provides for a selection between an automatic transfer and re-transfer mode or a manual pushbutton re-transfer to Normal from the Emergency Source mode. If this option is not selected the factory default selection is automatic.

32. Delayed Transition Transfer Modes for Open Transition Transfer Switches

This feature provides delayed transition transfer modes for an open transition transfer switch. Often used in systems with inductive loads, a delayed transition transfer switch may prevent or reduce in-rush currents due to out of phase switching of inductive loads.

32A. Time Delay Neutral

This feature provides a time delay in the neutral position during the transfer and re-transfer operations during which both Source 1 and Source 2 are disconnected from the load circuit. The time delay is programmable and is the same for both transfer and re-transfer operations.

Adjustable 0 - 120 Seconds

32D. In-Phase/Time Delay Neutral (load disconnect capable devices)

Provides In-phase transition, which is a feature that will permit a transfer or re-transfer between 2 available sources that have a minimal phase angle difference (synchronized). 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. In the event that the In-Phase does not occur in the time allowed, then the unit will transfer using the TDN setting.

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.

32F. In-Phase Transition (load disconnect capable devices)

Provides In-phase transition, which is a feature that will permit a transfer or re-transfer between 2 available sources that have a minimal phase angle difference (synchronized). The In-phase transition feature includes permissible frequency difference and synchronization time setpoints. In the event source 1 and source 2 fail to synchronize within a specified amount of time, due to excessive phase angle difference or frequency difference, then the transfer will take place without regard to phase angle and frequency difference. Devices that do not have load disconnect capability cannot provide TDN functionality. Alarm relay will energize and failure will be logged into the transfer history as either "Sync Fail - Freq" or "Sync Fail - Phase" depending on whether the frequency difference or the phase difference was excessive. The adjustable frequency difference is 0.0 to 3.0 Hz.

35. Pre-Transfer Signal

This feature provides a signal to a remote device prior to a transfer when both sources are available. If either source is unavailable this signal and delay do not apply. It provides one Form "C" contact (NO/NC) for interface with other equipment (typically elevator controls). The contacts close/open on a timed basis prior to transfer in either direction. After TDNE/TDEN times out, this relay closes and the Pre-transfer Timer (TPRE) starts timing. After the TPRE times out, the transfer proceeds by starting the TDN timer if enabled. The pre-transfer relay opens after the transfer is complete.

Adjustable 0 - 120 Seconds

35A. Pre-transfer Signal with 1 N.O. and 1 N.C. Contacts

This feature provides pre-transfer signal and includes 1 N.O. and 1 N.C. contact.

36. Emergency Inhibit

This feature enables the Emergency inhibit control input to inhibit transfers to the Emergency Source. See Control Inputs section 5.4 for information.

48F. RS-485 with Modbus

Provides communications for the ATC-300+ via Modbus through an integrated RS-485 port. Registers are available to read status, voltages, frequencies, and historical data. Registers are also available for transfer switch control. Setpoints and date/time may be read and/or programmed. See the ATC-300+ Modbus Communication Guide pn: 66A7787. Includes a Real Time Clock read/set to Modbus, with the ability to set the date/time on a specific controller based on that controller's address or as a broadcast message to all controllers using address 0. There are Modbus function codes 6 and 15 support to allow writing to individual and multiple registers/coils for added flexibility. There is a Modbus "Clear Alarm" command for remote alarm clear along with a Modbus enable/disable. Includes a Time Sync Enable and a Time Zone Offset: -720 to +840 minutes so that time read/written via Modbus is in UTC format.

1.5.2.2 Optional Features

The following is a list of a few of the optional features of the ATC-300+ Controller.

HMI

An HMI is available for viewing up to 8 switches.

Overcurrent Trip Indication

Available only with integral Overcurrent Protection (Feature 16). (Shown on Automatic Transfer Controller Display.)

12L. Source 1 Tripped (Requires Feature 16) Via ATC-300+ LDC-Based Display

The Automatic Transfer Controller LCD display will read "Lockout" if the Source 1 circuit breaker is in the "tripped" position.

12M. Source 2 Tripped (Requires Feature 16) Via ATC-300+ LDC-Based Display

The Automatic Transfer Controller LCD display will read "Lockout" if the Source 2 circuit breaker is in the "tripped" position.

Section 2: Hardware Description

2.1 General

The purpose of this section is to familiarize the reader with the ATC-300+ Controller hardware, its nomenclature, and to list the unit's specifications. The information presented is divided into the following three parts:

- Operator Panel;
- Rear Access Area; and
- Specification Summary.

2.2 Front (Operator) Panel

The front panel, depending on the installation, is normally accessible from the outside of a panel or door. The front panel provides a means to:

- Alert the user to specific conditions;
- Program the controller; and
- Set and monitor the operating parameters.

The ATC-300+ Controller front panel serves two primary functions: output and input. The output function consists of:

- A two-line, 16 character LCD display module
- Five LED outputs
 - 1 Unit Status
 - 2 Source 1 Available
 - 3 Source 1 Connected
 - 4 Source 2 Available
 - 5 Source 2 Connected

There are seven input functions accessible through the pushbuttons:

- 1 Help/Lamp Test
- 2 Previous / Engine Test
- 3 Next/Enter
- 4 Increase
- 5 Decrease
- 6 Alarm Reset
- 7 Bypass Time Delay (TDNE, TDEN)

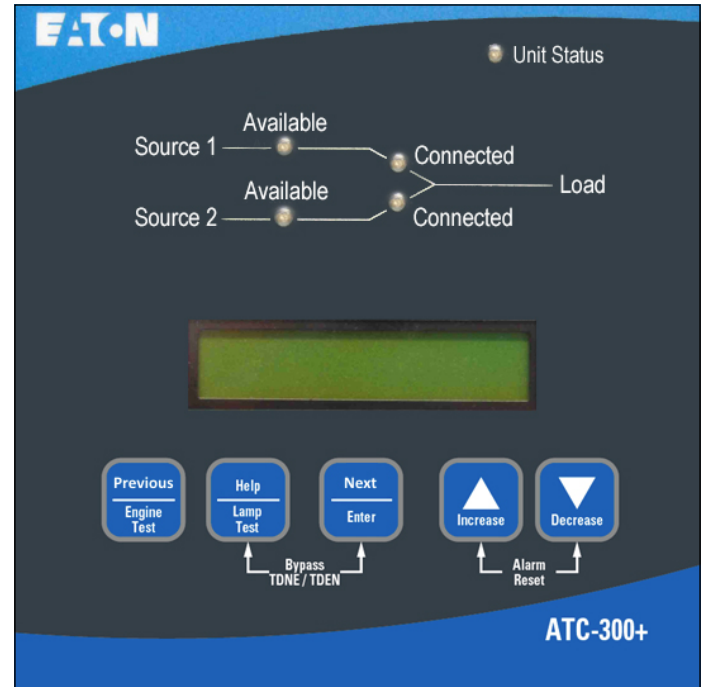


Figure 1. The ATC-300+ Controller Front Panel.

2.2.1 The Output Function Components

The Display

A 2-line, 16-character alphanumeric LCD Display module is used to display all ATC-300+ Controller monitored parameters, set-points, and messages in easy to read formats. The display has a green high contrast background that allows clear visibility of any information displayed. The display is continuously lit for clear visibility under poorly lit or no light conditions.

Six different displays can be presented via the LCD Display:

- Status Display
- Source 1 Display
- Source 2 Display
- Time/Date Display
- History Display
- Setpoints Display

As a default when there are no active commands or timers being displayed, the display shows information from the source that is connected to the load. This is referred to as the "Home" screen.

Line 1:	Source 1 or 2	Metered Voltage
Line 2:	Date	Time
Example:	Source 1	480V
	1/20/06	3:35PM

See Section 3 for more detailed information.

The LEDs

Unit Status

The green Unit Status LED blinks at a rate of once per second while in the ATC-300 Controller is in the “Run” Mode. This indicates that the ATC-300+ has completed a self-diagnostic and system diagnostic cycle. The self-diagnostic cycle checks include the:

- Microprocessor operation and
- Memory operation.

The system diagnostic cycle checks include the:

- Output relay operation;
- Control input operation; and
- Transfer switch operation.

The Unit Status LED blinks at an increased rate while the ATC-300+ Controller is in the “Program” Mode for setpoint programming.

Source 1 Available

The white Source 1 Available LED illuminates if the Source 1 power source meets the criteria to be considered “available”. That is, when it is within its undervoltage/overvoltage/underfrequency/overfrequency/voltage unbalance/phase reversal (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Source 1 Connected

The green Source 1 Connected LED illuminates when the Source 1 switching device and its associated position indicating auxiliary contact are closed.

Source 2 Available

The amber Source 2 Available LED illuminates if the Source 2 power source meets the criteria to be considered “available”. That is, when it is within its undervoltage/overvoltage/underfrequency/overfrequency/voltage unbalance/phase reversal (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Source 2 Connected

The red Source 2 Connected LED illuminates when the Source 2 switching device and its associated position indicating auxiliary contact are closed.

2.2.2 The Input Function Components

The Pushbuttons and Combinations

Help/Lamp Test Pushbutton

The Help/Lamp Test pushbutton serves two functions. If the Help/Lamp Test pushbutton is pressed when a message is present on the LCD Display, a detailed description of the message will appear. The detailed message description will scroll across the bottom of the display. The detailed description can be aborted by pressing Help/Lamp Test key a second time.

If the LCD Display is displaying the Home screen when the Help/Lamp Test key is pressed, all of the LED’s will momentarily illuminate, then the following information will scroll across the display:

- Serial number of the ATC-300+ Controller;
- Hardware revision number (= parts list revision number);
- Feature code – a decodable string listing all optional features programmed in the ATC-300+ Controller; and
- Firmware version.

Previous/Engine Test Pushbutton

When scrolling is being used, by pressing the Previous/Engine Test pushbutton, the LCD display will go to the previous screens. This new feature allows the user not to have to scroll all the way through anymore if a screen is missed. The Engine Test pushbutton allows the user to test the Source 2 (generator) engine. The engine test function can be set with the ATC-300+ Controller to one of three setpoint modes to allow flexibility in how the test is run:

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

The factory default is set to 1- Engine Load Test.

The controller will ask for the password to start the test. The factory set password is 0300. For complete information on the Engine Test function, see Section 5.7.

Next/Enter Pushbutton

The Step/Enter pushbutton allows the user to scroll through the information and setpoint displays. By pressing the Next/Enter pushbutton, the information on the LCD Display will advance through the voltage(s), frequency, and status condition of Source 1, then Source 2, then the time and date information, then the history information, then the setpoints. The information on the LCD Display advances one step through the displayed information cycle with each depression of the Next/Enter pushbutton.

Increase Pushbutton

The Increase pushbutton allows the user to increase the value of the setpoints. When ATC-300+ Controller is in the “Program” Mode (to change setpoint values), each time the Increase pushbutton is pressed, the value of the displayed item will increase by one.

Decrease Pushbutton

The Decrease pushbutton allows the user to decrease the value of the setpoints. When ATC-300+ Controller is in the “Program” Mode (to change setpoint values), each time the Decrease pushbutton is pressed, the value of the displayed item will decrease by one.

Alarm Reset Function (Increase + Decrease Pushbuttons)

Pressing the Increase and Decrease pushbuttons simultaneously will reset the Alarm function. In addition, if both pushbuttons are pressed simultaneously while viewing any of the historical logged values in the program mode, the value of the current item displayed resets to zero.

Bypass Time Delay Function (Next/Enter + Help/Lamp Test)

Pressing the Step/Enter and Help/Lamp Test pushbuttons simultaneously will bypass the TDNE or TDEN functions when they actively counting. The “Bypass TDNE/TDEN” function does not have a user accessible, programmable setpoint for enable or disable.

ATC-300+ Automatic Transfer Switch Controller

2.3 Rear Access Area

The rear access area of the ATC-300+ Controller is normally accessible from the rear of an open panel door (Figure 2).

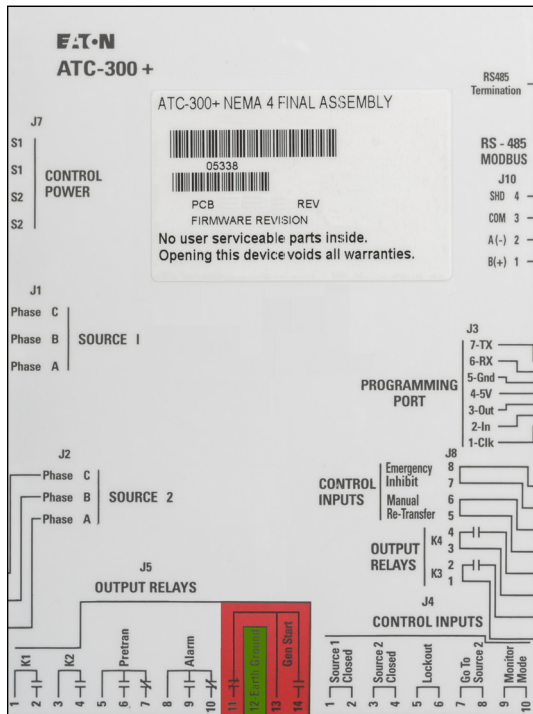


Figure 2. ATC-300+ Controller (Rear View).

All wiring connections to the ATC-300+ Controller are made at the rear of the chassis.

Note: To allow for uniform identification, the frame of reference when discussing the rear access area is with the panel door open and the User facing the back of the ATC-300+ Controller. See Figure 4 also.

Located at the left rear of the chassis are connectors J1, J2, and J7. J1 and J2 provide for voltage monitoring of Source 1 and Source 2 respectively. J7 is provided for Sources 1 and Source 2 control power input. Located at the right rear of the chassis is the J3 programming port connector for factory use only. The J4 and J5 connectors are located at the bottom of the controller. The J4 and J8 connectors provide DC wetted connections for various control inputs. The J5 and J8 connectors provide dry relay contacts for primary control outputs.

See table 1 for contact ratings.

Beginning with version 4.0 Firmware the transfer switch product type (SWITCH TYPE) can be changed through the front panel "Change Setpoints" function. This should only be required when installing a new controller into an existing switch, so to protect against accidental changes the SWITCH TYPE cannot be viewed or changed via Modbus. The available types are:

- BRKR - Molded case breaker/switch**
- CNT3 - Contactor, 3-position (1600A frame and below)**
- CNT2 - Contactor, 2-position (400A frame and below)**
- 3KC - Contactor, 3-position (3000A frame)**
- Magnum – Power Frame breaker/switch (future)**

2.4 Specification Summary

Table 1. ATC-300+ Controller Specifications

Input Control Voltage	65 to 145 Vac 50/60 Hz	
Power Consumption	18 VA	
Voltage Measurements of	Source 1 VAB Source 1 VBC Source 1 VCA	Source 2 VAB Source 2 VBC Source 2 VCA
Voltage Measurement Range	0 to 790 Vac RMS (50/60 Hz)	
Voltage Measurement Accuracy	± 1% of Full Scale	
Frequency Measurements of	Source 1 and Source 2	
Frequency Measurement Range	40 Hz to 70 Hz	
Frequency Measurement Accuracy	± 0.3 Hz Over the Measurement Range	
Operating Temperature Range	-20 to +70°C (-4 to +158°F)	
Storage Temperature Range	-30 to +85°C (-22 to +185°F)	
Operating Humidity	0 to 95% Relative Humidity (Non-condensing)	
Operating Environment	Resistant to Ammonia, Methane, Nitrogen, Hydrogen, and Hydrocarbons	
Generator Start Relay (Form C)	5 A, 1/6 HP @ 250 Vac 5 A @ 30 Vdc with a 150 W Maximum Load	
K1, K2, Pretransfer, Alarm Relays K3, K4. output contacts	10 A, 1-3 HP @ 250 Vac 10 A @ 30 Vdc	
Applicable Testing	UL Recognized Component Meets UL 1008 Meets Intent of UL 991, Meets IEC 1000-4-2, 1000-4-3, 1000-4-4, 1000-4-5, 1000-4-6, 1000-4-11 Meets CISPR 11, Class A Complies with FCC Part 15, Class A	
Enclosure Compatibility	NEMA 1, NEMA 3R, NEMA 4/4X and NEMA 12 UV Resistant ATC-300+ Faceplate	
Input Control Contacts	DC wetted (24 volts at 10 ma)	

Section 3: Status Monitoring and Setpoints

3.1 Status Display

NOTICE

ALTHOUGH A WIDE VARIETY OF PARAMETERS AND SETPOINTS CAN BE DISPLAYED, THEY ARE NOT DISPLAYED IF THEY WERE NOT ORIGINALLY ORDERED AND PROGRAMMED.

The Status Display provides messages regarding anything that is presently changing or happening to the ATS's status, including source information, timer countdown, and failure reports. Refer to Appendix A for a complete list of Status Display messages.

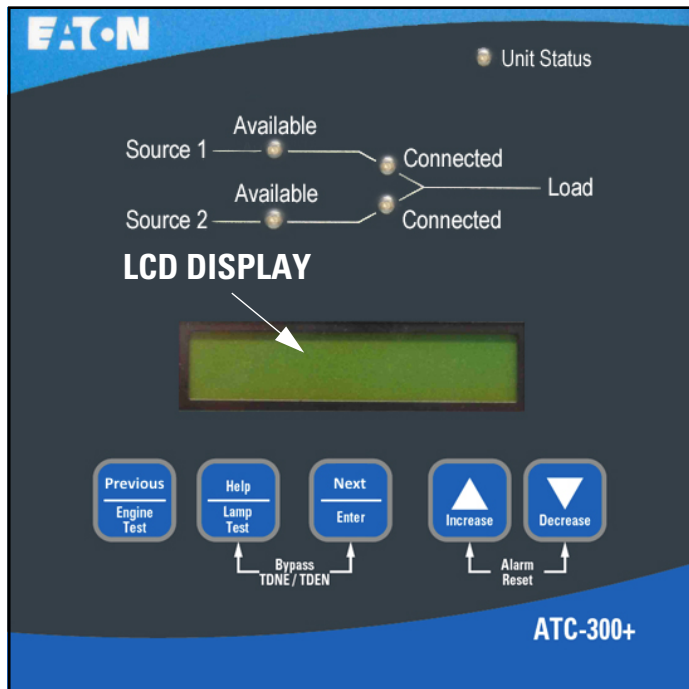


Figure 3. The LCD Display.

3.1.1 Source 1 and Source 2 Displays

The Source 1 and Source 2 displays indicate the present status of the sources in terms of voltage and frequency. If the source is available, the condition display will be "SOURCE 1 GOOD" or "SOURCE 2 GOOD". If it is unavailable, one of the following possible conditions will be shown:

SOURCE 1 U-V SOURCE 2 U-V

The source voltage has dropped below the dropout setting and not risen above the pickup setting.

SOURCE 1 O-V SOURCE 2 O-V

The source voltage has risen above the dropout setting and not dropped below the pickup setting.

SOURCE 1 U-F SOURCE 2 U-F

The source frequency has dropped below the dropout setting and not risen above the pickup setting.

SOURCE 1 O-F SOURCE 2 O-F

The source frequency has risen above the dropout setting and not dropped below the pickup setting.

SOURCE 1 UNBAL SOURCE 2 UNBAL

The voltage unbalance has risen above the dropout setting and not dropped below the pickup setting. (For a 3-phase delta source or HRG (High Resistance Grounding), this feature should be turned off via the VOLT UNBAL set-point.)

S1 PHASE REVERSE S2 PHASE REVERSE

The phase sequence does not agree with the setpoint value, indicating that the phase sequence is reversed.

3.1.2 Time/Date Display

The Time/Date Display indicates real time in terms of hours, minutes, and seconds; and month, day, and year. It also indicates individual time and date items for programming purposes. The day of the week can also be set with 1 = Sunday, 2 = Monday, etc. The time, date, and day of the week can be set in the Program Mode.

3.1.3 History Display

The History Display indicates historical and cumulative counter values as follows:

Engine Run Time

This counter will log the generator run time in hours. Time will start being logged at the time the GEN START contacts are closed, and it will stop as soon as they are opened. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero with the front panel or via Modbus.

Source 1 Connected Time

This counter logs the time in hours that Source 1 has been connected to the load. Time will be logged while the SOURCE 1 CLOSED control input is in the "connected" state. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero with the front panel or via Modbus.

Source 2 Connected Time

This counter logs the time in hours that Source 2 has been connected to the load. Time will be logged while the SOURCE 2 CLOSED control input is in the "connected" state. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero in the with the front panel or via Modbus.

Source 1 Available Time

When Source 1 meets the voltage and frequency setpoint criteria, this counter logs the time in hours. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero in the with the front panel or via Modbus.

Source 2 Available Time

When Source 2 meets the voltage and frequency setpoint criteria, this counter logs the time in hours. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero with the front panel or via Modbus.

Load Energized Time

When either of the two sources is connected to the load and the connected source is available, this counter will start logging the time in hours. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero with the front panel or via Modbus.

Total Number of Transfers

This counter logs the number of transfer cycles that occur. This counter will count up to 9999 cycles and then turn over to 0000. It can be reset to zero with the front panel or via Modbus.

Reason/Date/Time for the 16 Most Recent Transfers

The 16 most recent transfer events are stored in history and may be viewed at the LCD Display as follows:

- Use the Step/Enter pushbutton to step to the "TRANSFER HISTORY" message.
- Press the Increase pushbutton to display the most recent transfer event (T01) along with the type and cause of the event.
- Press the Decrease pushbutton to display the date and time of the event. Continually pressing the Decrease pushbutton will cycle the display between the event display and the date/time of event display.
- Press the Increase pushbutton to display the next most recent transfer event (T02).
- Pressing the Step/Enter pushbutton, while viewing any of the transfer history displays, will exit the Transfer History displays.

3.1.4 Setpoints Display

The Setpoints Display indicates presently programmed setpoints. The setpoints can be altered with valid password entry. Refer to Section 6 for more details on setpoints.

3.1.5 Help Display

This display presents moving language messages, explanations, and prompts to assist the operator. When the Help/Lamp Test Pushbutton is pressed and released a second time during the scrolling of a message, the message is aborted.

Section 4: Typical Function of the ATC-300+ Controller

This section describes typical functionality of the ATC-300+ controller in an Automatic Transfer Switch. To aid in understanding this section Figure 4 shows the connectors for the various input and output signals referenced, Section 5.4 describes the control inputs, Section 5.5 describes the output relays, and Appendix B provides operational flowcharts.

120 Vac, 50/60 Hz is required to power the ATC-300+ controller. Power is supplied to pins 1 and 2 or 3 and 4 on the J-7 connector. Source 1 (S1) sensing is supplied on the J-1 connector and Source 2 (S2) sensing is supplied on the J-2 connector.

The K1-K4 output relays in conjunction with the Source 1 Closed and Source 2 Closed inputs control operation of the transfer switch's main contacts. The appropriate "K" relay is turned on (closed) until the desired change in position of the main contact occurs as indicated by a change of the Source 1 or 2 Closed input. For in-phase transfers the main contacts are expected to operate in 100-150 milliseconds to ensure the transfer completes while the two sources are still in the desired phase relationship. All other open transfers allow 6 seconds for the main contact to reach its desired position. This provides enough time for any transfer switch product type to operate while limiting the power applied to the switching mechanisms.

If a main contact doesn't change position in the allotted time the Alarm relay is activated and the appropriate S1 or S2 Device Error is displayed on the front panel. The alarm must be cleared before the controller will attempt another transfer operation.

A typical transfer from the normal source (S1) occurs due to S1 becoming unavailable, or a Plant Exercise, Engine Test, or Go to Source 2 activation. The sequence begins with Time Delay Engine Start (TDES) counting down. In the case of S1 becoming unavailable, if S1 becomes available again before TDES reaches zero the countdown is aborted, and the controller returns to a normal operating state. When TDES reaches zero the Generator Start contact is closed to start the generator.

For Plant Exercise or Engine Test there is a 90 second time limit waiting for the generator to start and S2 to become available, after which if S2 has not become available the Generator Start contact is opened and the Alarm contact is closed. Although the alarm must be manually cleared, it does not hold off future generator start or transfer attempts. There is no time limit or alarm waiting for S2 to become available if the transfer sequence is due to S1 becoming unavailable.

Once the generator starts and S2 becomes available Time Delay Normal to Emergency (TDNE) begins counting down. If S2 becomes unavailable before TDNE reaches zero the countdown is aborted, then when S2 becomes available again TDNE is restarted at the original setpoint value.

Once TDNE reaches zero, if S1 is available the pretransfer contact is closed and Time Delay Pre-Transfer (TPRE) begins counting down. After TPRE reaches zero, or immediately if S1 is unavailable, transfer of the main contacts from Source 1 to Source 2 is initiated. The exact control sequence varies based on transfer switch product type and settings, and is best described in the flowcharts of Appendix B.

The transfer back to S1 typically occurs when S1 becomes available, the plant exercise or engine test completes, or Go to Source 2 is removed. The sequence begins with Time Delay Emergency to Normal (TDEN) counting down. Like TDNE, if S1 becomes unavailable before TDEN reaches zero the countdown is aborted, then when S1 becomes available again TDEN is restarted at the original setpoint value. If S2 becomes unavailable while TDEN is counting the countdown is aborted and a "failsafe" transfer to Source 1 begins immediately.

Once TDEN reaches zero, if S2 is available the pretransfer contact is closed and Time Delay Pre-Transfer (TPRE) begins counting down. After TPRE reaches zero, or immediately if S2 is unavailable, transfer of the main contacts from Source 2 to Source 1 is initiated. Again, the exact control sequence varies based on transfer switch product type and settings, and is best described in the flowcharts of Appendix B.

The above sequence shows "typical" operation with only a few possible deviations based on source availability at specific points in the sequence. The various control inputs such as Lockout, Monitor Mode, and Emergency Inhibit as well as changes of source availability at other times can alter this sequence at any point. A careful review of the remainder of this instruction booklet should address these special cases, but if questions remain additional information can be obtained from the web site and phone number on the last page of this booklet.

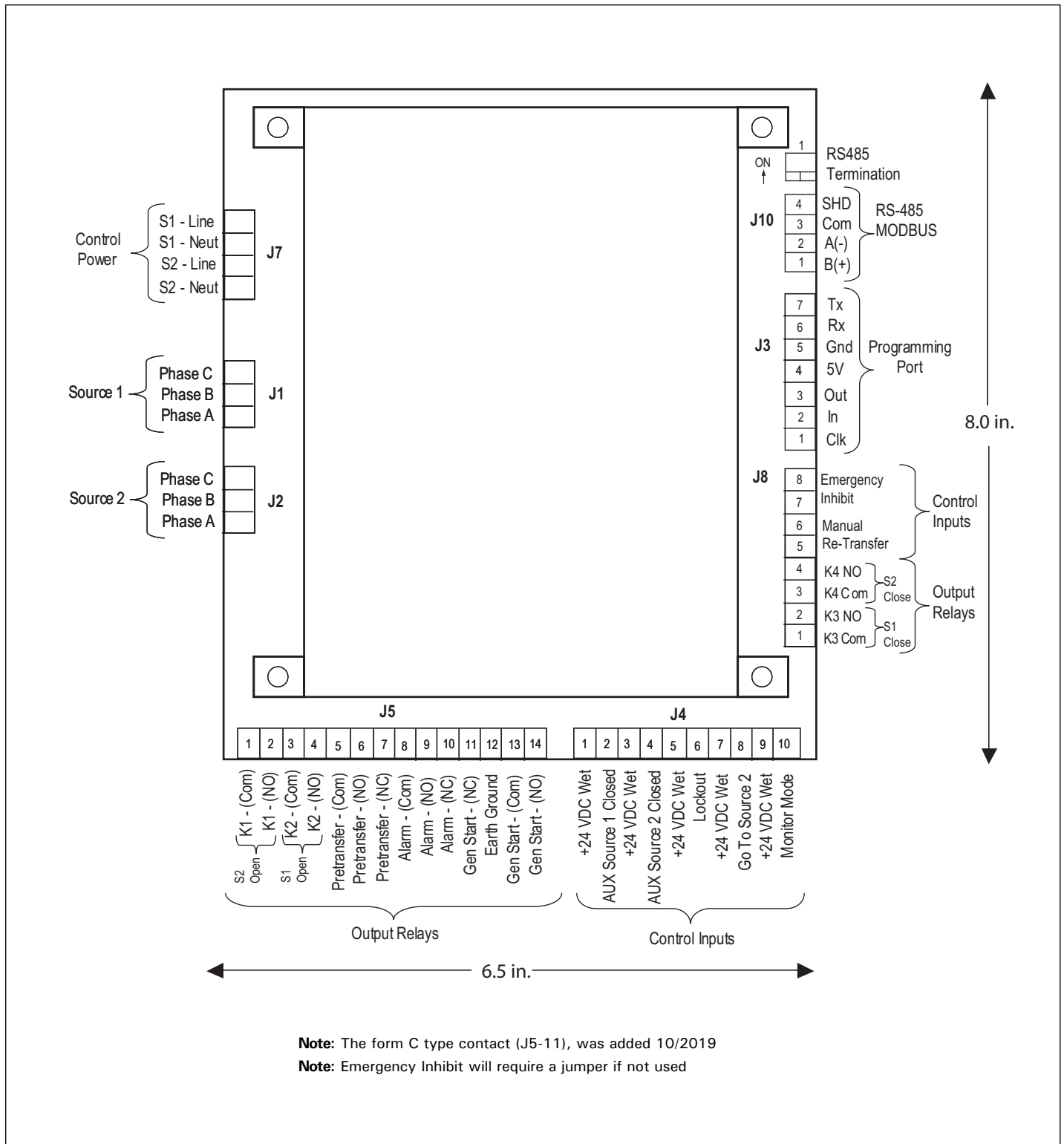


Figure 4. Connectors on the ATC-300+ Controller.

Section 5: Operation

5.1 General

This section specifically describes the operation and functional use of the ATC-300+ Controller. The practical use of and operation within each category will be discussed. In this section, it is assumed that prior sections of this manual were reviewed and that the operator has a basic understanding of the hardware.

5.2 Automatic Mode

The Automatic Mode of the ATC-300+ Controller provides for automatic transfer and re-transfer from Source to Source as dictated by the features supplied and their programmed setpoint values. It provides a summary of the ATC-300+ Controller intelligence and supervisory circuits that constantly monitor the condition of both the Source 1 and Source 2 power sources, thus providing the required intelligence for transfer operations. These circuits, for example, automatically initiate an immediate transfer of power when the power fails or the voltage level drops below a preset value. Exactly what the ATC-300+ Controller will initiate in response to a given system condition depends upon the combination of standard and selected optional features.

5.3 Monitor Mode

Monitor Mode is a special operating mode in which the ATC-300+ Controller does not provide control for transfer operations. The ATC-300+ will, however, continuously monitor both Source 1 and Source 2 voltages and frequencies.

The ATC-300+ will be in Monitor Mode when the "Monitor Mode" control input is in the "Connected" state as described in Section 5.4. While in the Monitor Mode of operation, the ATC-300+ LCD Display will display "ATS NOT IN AUTOMATIC".

5.4 Control Inputs

The ATC-300+ has five individual input control signals. The inputs are DC24 volts wetted contacts with the unregulated DC supply and appropriate current limiting to provide a nominal current of 10 mA per channel.

5.4.1 Control Input Descriptions

The Control Input "State" definitions are as follows.

Connected - When the input is shorted by an external contact or connection.

Unconnected - When the input is NOT shorted by an external contact or connection.

The Control Input operations are defined as follows.

Source 1 Closed

When this input is in the "Connected" state, it indicates to the ATC-300+ Controller that the Source 1 device is closed. When this input is in the "Unconnected" state, it indicates to the ATC-300+ that the Source 1 device is open. This input is typically wired to the Source 1 device auxiliary contact that is closed when the Source 1 device is closed. The "Source 1 Closed" input is always enabled.

Source 2 Closed

When this input is in the "Connected" state, it indicates to the ATC-300+ Controller that the Source 2 device is closed. When this input is in the "Unconnected" state, it indicates to the ATC-300+ that the Source 2 device is open. This input is typically wired to the Source 2 device auxiliary contact that is closed when the Source 2 device is closed. The Source 2 input is always enabled.

Lockout

When the "Lockout" input is in the "Unconnected" state, the ATC-300+ Controller will not permit an automatic transfer operation. When the "Lockout" input is in the "Unconnected" state, the LCD Display will be active continuously. It will read "Lockout" on Line 2 of the LCD Display screen immediately, regardless of any controller or switching device operation. When the "Lockout" input is in the "Connected" state and the Alarm is manually reset (reset buttons on the front panel), the ATC-300+ will permit automatic transfer operation. This input is typically wired to the normally closed Source 1 and Source 2 device alarm contact that opens when one of the devices has tripped due to a fault current. If "Lockout" is not used jumper pins 5 and 6 of the J4 connector.

Go To Source 2

When the "Go to Source 2" input is in the "Connected" state, the ATC-300+ Controller is in a normal, automatic operation mode. When the "Go To Source 2" input is in the "Unconnected" state, the ATC-300+ controller will initiate a generator start and then transfer to the Source 2 power source. The ATC-300+ will maintain the connection to Source 2 until the input changes to the "Connected" state, upon which it will initiate a re-transfer to the Source 1 power source. When the "Go To Source 2" input is in the "Unconnected" state (no jumper or contact), the LCD Display will be active continuously. Active time delays will be constantly displayed on Line 1, with real-time remaining countdown to zero status. It will constantly read "Go To Source 2" on Line 2 of the LCD Display. This operation is "failsafe". If "Go to Source 2" is not used jumper pins 7 and 8 of the J4 connector.

Monitor Mode

When the "Monitor Mode" input is in the "Unconnected" state, operation of the ATC-300+ Controller will not be effected. When the "Monitor Mode" input is in the "Connected" state, the ATC-300+ will monitor the Source 1 and Source 2 voltages and frequencies but will not provide any control capabilities. When the "Monitor Mode" input is in the "Connected" state, the ATC-300+ LCD Display will be active continuously and will constantly read "ATS" on Line 1 and "NOT IN AUTOMATIC" on Line 2 of the LCD Display. If "Monitor Mode" is not used leave pins 9 and 10 of the J4 connector open.

Manual Re-Transfer

With manual operation set, momentary closure on Pins 5 and 6 of Connector J8 allows ATC-300+ to proceed with a re-transfer operation at the operators discretion. Should a failure of the emergency source occur while waiting for the manual return, the re-transfer proceeds automatically.

Emergency Inhibit

This input is located on Pins 7 and 8 of Connector J8. Opening this contact will activate the Emergency Inhibit input. Simply jumper Pins 7 and 8 if this function is not used.

If the Emergency Inhibit contact is opened when the load is connected to the an available Normal Source, no action will be taken (stays on the normal source). If the Normal Source is not available, the main contacts are capable of disconnecting the load, and there is sufficient control power available to operate the main contacts, an immediate load disconnect will occur.

If the Emergency Inhibit contact is opened when the load is connected to the Emergency Source, the ATC-300+ will transfer the load to the Normal Source if it is available. If the Normal Source is not available, the main contacts are capable of disconnecting the load, and there is sufficient control power available to operate the main contacts, an immediate load disconnect will occur.

When the Emergency Inhibit is active with both sources unavailable the controller will try to go to neutral but there must be sufficient control voltage available to operate the breaker or contactor.

The Emergency Inhibit input takes priority over the Go To Emergency input if both inputs are activated at the same time. In this case, the generator will start but a transfer to the Emergency Source will be inhibited until the Emergency Inhibit input is deactivated.

5.5 Output Relays

The primary control outputs of the ATC-300+ Controller are dry relay contacts. These relays are comprised of one latching "Form C" relay to provide the generator start contacts, and six conventional coil "Form C" relays (four of which implement only the Form A contact) necessary to complete the electrical control function. Since the outputs were tested per the UL 1008 Dielectric Test, the dielectric rating for each output is a minimum of 1500 Vac. The output relays are pulsed to eliminate error caused by software "races" between Lockout and Source 1 or Source 2 Closed inputs.

The latched coil relay is UL/CSA rated at 5 A, 1/6 HP, 250 Vac. The DC rating is 5 A, 30 Vdc, with a 150 W maximum load. The remaining conventional relays are UL/CSA rated at 10 A, 1/3 HP, 250 Vac. The DC rating is 10 A at 30 Vdc.

Note: The ATC-300+ Controller MUST BE properly grounded at J-5, Pin 12 for proper operation.

The Output Relay functions are divided into two categories:

- Customer Connections and
- Transfer Operation Contacts.

5.5.1 Output Relay Descriptions

Specifically the relay functions are as follows.

5.5.1.1 Customer Connections



THE ATC-300+ CONTROLLER MUST BE PROPERLY GROUNDED AT J-5, PIN 12 FOR PROPER OPERATION.

Generator Start Relay

This latching relay is the generator start relay for system configurations that employ a generator as the Source 2 power source. This relay provides a Form C contact of silver alloy with gold flashing for closure of the generator start circuit.

The Form C contact is implemented with the Common Pin (J5, Pin 13), the Normally Open Pin (J5, Pin 14), and the Normally Closed Pin (J5, pin 11). The states are reversed when the Gen start is active. See Figure 4. The generator start relay contacts are rated for 5 A, 1/6 HP @ 250 Vac. The DC rating is 5 A @ 30 Vdc with a 150 W maximum load.

Alarm Relay

The alarm relay is de-energized to indicate an absence of an alarm state and energized to indicate the presence of an alarm condition. Alarm conditions include the following.

1. Improper circuit breaker (or contactor) operation (breaker [or contactor] fails to open or close within six [6] seconds)
2. Motor operator failure (Breaker Type ATS only)
3. Lockout
4. Failsafe condition
5. Aborted engine test due to Source 2 unavailability
6. Aborted plant exerciser test due to Source 2 unavailability
7. Unsuccessful in-phase transition

The alarm relay will remain energized until “Alarm Reset” is pressed.

The full Form C contact of this relay may be wired to an alarm annunciator panel to indicate a problem with the ATS. The full Form C contact of this relay is implemented with the Common Pin (J-5, Pin 8), the Normally Closed Pin (J-5, Pin 10), and Normally Open Pin (J-5, Pin 9). The alarm relay contacts are rated for 10 A, 1-3 HP @ 250 Vac. The DC rating is 10A @ 30 Vdc.

Pre-transfer Relay

This Form C relay opens/closes on a timed basis (adjustable from 1 to 120 seconds) prior to the transfer operation between two available sources to allow the load to be de-energized prior to transfer in either direction. After TDNE/TDEN times out, this relay energizes and the Pre-transfer timer (TD PRE-TRAN) starts timing. After TD PRE-TRAN times out, the transfer proceeds. The pre-transfer relay de-energizes after the transfer is complete.

The full Form C contact of this relay is implemented with the Common Pin (J-5, Pin 5), the Normally Closed Pin (J-5, Pin 7), and the Normally Open Pin (J-5, Pin 6). The pre-transfer relay contacts are rated for 10 A, 1-3 HP @ 250 Vac. The DC rating is 10 A @ 30 Vdc.

5.5.1.2 Transfer Operations Connections

K1, K2, K3, and K4 are factory wired to operate the transfer switch. The relay contacts for each are rated for 10 A, 1/3 HP @ 250 Vac. The DC rating is 10 A @ 30 Vdc. K1 - K4 are Form C relays but only the Form A contacts are used to operate the transfer switch.

Note: The ATC-300+ Controller MUST BE properly grounded at J-5, Pin 12 for proper operation.

Output Relay K1 (Open S2)

This Form A relay is used for control of the transfer switch to open Source 2 (three position contactor type), or close Source 1 (molded case), or close Source 1 (two position contactor type). The K1 relay momentarily energizes until the ATC-300+ senses that Source 1 closed/open, then K1 de-energizes.

Output Relay K2 (Open S1)

This Form A relay is used for control of the transfer switch to open Source 1 (three position contactor type), or close Source 2 (molded case), or close Source 2 (two position contactor type). The K2 relay momentarily energizes until the ATC-300+ senses that Source 2 closed/open, then K2 de-energizes.

Output Relay K3 (Close S1)

This Form A output is used to close Source 1 of the switch. The K3 relay momentarily energizes until the ATC-300+ senses that the Source 1 is closed, then K3 de-energizes.

Output Relay K4 (Close S2)

This Form A output is used to close Source 2 of the switches. The K4 relay momentarily energizes until the ATC-300+ senses that the Source 2 is closed, then K4 de-energizes.

5.6 Operating Voltage and Measurements

The ATC-300+ Controller operates with control power from 65 to 145 Vac. The ATC-300+ operates on single and three phase systems with selectable frequency settings of 50 or 60 Hz depending on the system ordered.

The ATC-300+ can perform the time delay engine start function without control power. This is accomplished by the use of a supercap and a latching control relay. The supercap stays charged for up to two minutes to power the logic circuitry that provides the start pulse to the latching control relay. After power has been turned off for approximately two minutes, the Engine Start contact will be closed. The latching control relay, which controls the generator, only changes state when it receives start or stop pulses.

All voltage monitoring and measurements are true RMS measurements. J5-12 must be grounded to the frame for the controller to function correctly.

5.7 Engine Test

The Engine Test is intended to permit the periodic performance of tests of the system. The exact test conditions are determined by the programmed setpoints. The operator-selected parameters include setting the engine run time and the Test Mode. Refer to Table 2 for test programming details.

There are three test modes:

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

The factory default is set to 0 - No Load Engine Test

Note: If the Source 2 power source is not programmed as a generator, this function will be inactive.

NOTICE

IF THE ATS IS UNABLE TO PROCESS A ENGINE TEST REQUEST DUE TO THE ATS STATUS, THE REQUEST IS IGNORED.

When the Engine Test pushbutton is pressed, the following message will appear on the LCD Display:

Line 1: Password 0 3 0 0 default
Line 2: Use Inc/Dec & Step

After entering the 4-digit password and pressing the Step/Enter pushbutton, the ATC-300+ will display the Time Delay on Engine Starting (TDES) timer countdown. Once the TDES countdown reaches zero, the ATC-300+ Controller will initiate an engine start. The engine run duration will be per the Engine Run Test Time setpoint.

If the (0) No Load Engine Test Mode has been selected, the transfer from Source 1 to Source 2 will not occur. If the (1) Load Engine Test Mode has been selected, the transfer from Source 1 to Source 2 will occur after the generator output has reached the specified setpoints. If the (2) Disabled Mode has been selected, or if the "Number of Generators" setpoint is programmed to zero, the Engine Test will not occur.

All enabled and programmed time delays will be performed per the setpoints during an engine test. The time delays will appear on the LCD Display with "countdown to zero" when active. Depending on the setpoints and the optional features selected with the ATC-300+ Controller, these can include:

- TDES;
- Time Delay Normal to Emergency (TDNE);
- Time Delay Emergency to Normal (TDEN);
- Time Delay for Engine Cooldown (TDEC);
- Time Delay Neutral (TDN); and
- Pre-transfer Delay Signal (TD PRE-TRAN).

All operations are "Failsafe", that is they prevent disconnection from the only available power source and also force a transfer or re-transfer operation to the only available power source.

During an engine test, if the Engine Test pushbutton is pressed a second time before the Engine Test is complete and correct password has been entered; the Engine Test will be terminated. An engine test may also be aborted in the following ways:

1. If the Emergency Source does not become available within 90 seconds of the ATC-300+ providing the engine start command;
2. If, during the TDNE countdown, the Emergency Source goes unavailable more than three times (Each time, TDNE will restart);
3. If the Emergency Source is powering the load and it goes unavailable for more than the TDEF setting; and
4. If the Normal source becomes unavailable.

When an engine test is aborted due to an unavailable source during TDNE countdown, the Alarm relay will energize, a "TEST ABORTED" message will appear on the display, and the event will be logged into the Transfer History as "Aborted Test".

5.8 Plant Exerciser

NOTICE

THE PLANT EXERCISER FEATURE ALLOWS FOR AUTOMATIC PROGRAMMING OF THE DESIRED TEST CYCLE ON A DAILY, 7-DAY, 14-DAY, OR 28-DAY BASIS. IF THE ATS IS UNABLE TO PROCESS A PLANT EXERCISER REQUEST DUE TO THE ATS STATUS, THE REQUEST IS IGNORED.

The plant exerciser is a feature that provides an automatic test of the generator. The test can be run daily, every 7 days, every 14 days, or every 28 days with durations equal to the programmed engine test time. Two optional modes of plant exercising are available:

- No Load Exercise; and
- Load Exercising with "Failsafe".

The ATC-300+ Controller allows the user to program the exact day, hour, and minute that the Plant Exercise will occur. This allows for the Plant Exercise to take place at the most opportune time for the specific facility.

The hour and minute that the Plant Exerciser is performed are programmed with the "PE HOUR" and "PE MINUTE" setpoints where "PE HOUR" is in military time (1:00 PM = 13:00) and the "PE MINUTE" can be set from 0 to 59. The test day is programmed with the "PE DAY" setpoint. The ATC-300+ Controller compares the "PE DAY" setpoint with the "WEEKDAY" setting, which is set along with the time and date. If a 7-day plant exercise is programmed, the selections are from "1 SUN" through "7 SAT".

If a 14-day plant exercise is programmed, the "PE DAY" setpoint can be set from "1 SUN" to "14 SAT" where "1 SUN" is the first Sunday of the 14-day period and "14 SAT" is the second Saturday of the 14-day period.

If a 28-day plant exercise is programmed, the "PE DAY" setpoint can be set from "1 SUN" to "28 SAT" where "1 SUN" is the first Sunday of the 28-day period and "28 SAT" is the fourth Saturday of the 28-day period.

If desired, the Plant Exerciser can be disabled by choosing "OFF" for the "Plant Exer-" setpoint.

Plant Exercising in the Load Exercising Mode is "Failsafe". If the generator fails during testing for any reason, the ATC-300+ will signal the transfer switch to return to the Source 1 power source. The ATC-300+ will display "FAILSAFE" until a pushbutton is pressed.

5.9 In-phase Transition (Optional Feature 32F)

The In-phase transition feature permits a transfer or re-transfer only between 2 available sources that have a minimal phase angle difference (synchronized). The In-phase transition feature includes user-adjustable permissible frequency difference setpoint (0.0 - 3.0 Hz) and a programmable Sync timer. The Sync times will count down and be displayed while waiting for the two sources to synchronize.

In-phase transition is an open transition with both sources in-phase. An anticipatory scheme is used for controlling the main contacts. The advance angle is calculated based on the frequency difference between the two sources and also the response time of the main contacts. This results in the optimum reconnect angle of 0 degrees for all of the frequency difference values.

Both sources must be available and the frequency difference must be less than the in-phase transition frequency difference setpoint (0.0 to 3.0 Hz). When these conditions are met, the ATC-300+ Controller will monitor the phase difference between the two sources. The synchronization timer will count down and be displayed as "SYNC TIME" while waiting for synchronization to be detected. When the phase difference is within the advance angle window, the "transfer" command is given. This is an open transition but both sources will be in-phase when the transfer occurs.

In the event source 1 and source 2 fail to synchronize within a specified amount of time, due to excessive phase angle difference or frequency difference, the alarm relay will energize and failure will be logged into the transfer history as either "Sync Fail - Freq" or "Sync Fail - Phase" depending on whether the frequency difference or the phase difference was excessive.

5.10 Program Mode

The ATC-300+ Controller is fully programmable from the device's faceplate once the Password has been correctly entered. Any operator associated with programming the ATC-300+ Controller will quickly discover that ATC-300+ programming is just a matter of simple, repetitive steps. However, because of the importance placed on this function and its critical relationship to the proper functioning of the system, Section 6 of this manual is dedicated to the Program Mode. Refer to that section and Table 2 for details.

Beginning with version 4.0 Firmware the transfer switch product type (SWITCH TYPE) can be changed through the front panel "Change Setpoints" function. This should only be required when installing a new controller into an existing switch, so to protect against accidental changes the SWITCH TYPE cannot be viewed or changed via Modbus. The available types are:

- BRKR - Molded case breaker/switch**
- CNT3 - Contactor, 3-position (1600A frame and below)**
- CNT2 - Contactor, 2-position (400A frame and below)**
- 3KC - Contactor, 3-position (3000A frame)**
- Magnum - Power Frame breaker/switch (future)**

Section 6: Programming

6.1 Introduction

The ATC-300 Controller is fully programmable from the device's faceplate or remotely through the communications port. Users can reprogram setpoints as well as other parameters. The time, date, and setpoints can only be changed while the device is in the Program Mode.

Program Mode is achieved by entering a valid password when prompted by the Setpoints screens. The Unit Status LED will **blink at a faster rate when viewing the setpoints while in Program Mode.**

NOTICE

WHILE IN THE PROGRAM MODE, THE ATC-300+ CONTROLLER IS NEVER OFF-LINE AND CONTINUES TO FUNCTION IN ACCORDANCE WITH PREVIOUSLY PROGRAMMED SETPOINTS.

6.2 Password

To enter the Program Mode, the ATC-300+ Controller requires a password to prevent unauthorized persons from modifying setpoint values.

There are five screens related to the password, which is a four-digit number from 0000 to 9999.

1.

VIEW SETPOINTS?	YES
-----------------	-----

Use the Increase or Decrease pushbuttons to select Yes, then use the Step/Enter pushbutton to enter the selection and move to the next screen

2.

CHANGE SETPOINTS?	YES
-------------------	-----

Use the Increase or Decrease pushbuttons to select Yes or No, then use the Step/Enter pushbutton to enter the selection and move to the next screen. If No is selected, the user will be able to review the setpoints but not make any changes. If Yes is selected, the Password screen will appear. 0300 is the default password.

3.

PASSWORD (Use Inc/Dec)	0300
---------------------------	------

Use the Increase or Decrease keys to scroll to the desired value (0 - 9) for the first digit, then use the Step/Enter key to enter the value and move to the next digit. Repeat for remaining three digits. After all four numerals of the password are entered, press the Step/Enter pushbutton to enter the password and proceed to the next screen. If an invalid password is entered, the LCD Display shall read "Invalid Password" and the user must press the Step/Enter pushbutton to initiate another password entry sequence.

Note: The factory default password is "0300". If the password is forgotten, contact the factory.

ATC-300+ Automatic Transfer Switch Controller

4.

CHANGE PASSWORD?	YES
------------------	-----

Use the Increase or Decrease pushbuttons to select Yes or No, then use the Step/Enter pushbutton to enter the selection and move to the next screen. If No is selected, the first Setpoint screen will appear. If Yes is selected, the following screen will appear.

5.

NEW PASSWORD (Use Inc/Dec)	0000
----------------------------	------

Use the Increase or Decrease pushbuttons to scroll to the desired value (0 - 9) for the first digit of the new password, then use the Step/Enter pushbutton to enter the value and move to the next digit. Repeat for remaining three digits.

The user then steps through the setpoint screens and can change the setpoint values. During this time, the Unit Status LED will blink at a faster rate. At the end of the setpoint screens, the user will be prompted to save the setpoints.

6.3 Display Only Mode

In the Display Only Mode, the ATC-300+ Controller allows the user to view all setpoints and their programmed values. Each press of the Next/Enter pushbutton will advance the program to the next setpoint. Setpoint values CANNOT be changed while in the Display Only Mode.

6.4 Change Setpoints Mode

In the Change Setpoints Mode, the user can step through the Setpoint screens and change the Setpoint values using the Increase and Decrease pushbuttons. During this time, the Unit Status LED will blink at a faster rate to indicate Program Mode. At the end of the setpoint screens, the LCD Display will read Save Setpoints? Either the Increase or Decrease pushbutton may be used to select either Yes or No". The Next/Enter pushbutton is then pressed to enter the selection. If Yes is selected at the Save Setpoints? Screen, the ATC-300+ shall save the Setpoint settings and the LCD Display shall read Programming Setpoints to confirm entry. If "No" is selected, then all Setpoints will remain unchanged.

6.5 Programmable Features and Setpoints



CAUTION

CHANGING THE SYSTEM NOMINAL VOLTAGE OR FREQUENCY SETPOINT WILL AUTOMATICALLY CHANGE ALL THE PICKUP AND DROPOUT SETTINGS TO THE NEW DEFAULT VALUES.

All ATC-300+ Controller programmable features and associated setpoint possibilities with any required explanations are presented in Table 2.

Table 2. Programmable Features and Setpoints (In Order of Display)

SETPOINT	SETPOINT UNITS	DESCRIPTION	RANGE	FACTORY DEFAULT
New Password	Four Digits	Set New Password	0000 to 9999	0300
TDES	Minutes: Seconds	Time Delay Engine Start	0 to 120 seconds	0:03
TDNE	Minutes: Seconds	Time Delay Normal to Emergency	0 to 1800 seconds	0:00
TDEN	Minutes: Seconds	Time Delay Emergency to Normal	0 to 1800 seconds	5:00
TDEC	Minutes: Seconds	Time Delay Engine Cool-off	0 to 1800 seconds	5:00
NOM FREQ	Hertz	Nominal Frequency	50 or 60 Hz	As ordered
NOM VOLTS	Volts	Nominal Voltage	120 to 600 volts	As ordered
S1 UV DROP	Volts	Source 1 Undervoltage Dropout Range:	70 to 97% of Nominal System Voltage (0=Disabled)	80%
S2 UV DROP	Volts	Source 2 Undervoltage Dropout Range:	70 to 97% of Nominal System Voltage (0=Disabled)	80%
S1 UV PICK	Volts	Source 1 Undervoltage Pickup Range:	(Dropout +2%) to 99% of Nominal System Voltage (0=Disabled)	90%
S2 UV PICK	Volts	Source 2 Undervoltage Pickup Range:	(Dropout +2%) to 99% of Nominal System Voltage (0=Disabled)	90%
S1 OV DROP	Volts	Source 1 Overvoltage Dropout Range:	105 to 120% of Nominal System Voltage (0=Disabled)	115%
S2 OV DROP	Volts	Source 2 Overvoltage Dropout Range:	105 to 120% of Nominal System Voltage (0=Disabled)	115%
S1 OV PICK	Volts	Source 1 Overvoltage Pickup Range:	103% to (Dropout -2%) of Nominal System Voltage (0=Disabled)	110%
S2 OV PICK	Volts	Source 2 Overvoltage Pickup Range:	103% to (Dropout -2%) of Nominal System Voltage (0=Disabled)	110%
S1 UF DROP	Hertz	Source 1 Underfrequency Dropout Range:	90 to 97% of Nominal System Frequency (0=Disabled)	94%
S2 UF DROP	Hertz	Source 2 Underfrequency Dropout Range:	90 to 97% of Nominal System Frequency (0=Disabled)	94%
S1 UF PICK	Hertz	Source 1 Underfrequency Pickup Range:	(Dropout +1 Hz) to 99% of Nominal System Frequency (0=Disabled)	96%
S2 UF PICK	Hertz	Source 2 Underfrequency Pickup Range:	(Dropout +1 Hz) to 99% of Nominal System Frequency (0=Disabled)	96%
S1 OF DROP	Hertz	Source 1 Overfrequency Dropout Range:	103 to 110% of Nominal System Frequency (0=Disabled)	106%
S2 OF DROP	Hertz	Source 2 Overfrequency Dropout Range:	103 to 110% of Nominal System Frequency (0=Disabled)	106%
S1 OF PICK	Hertz	Source 1 Overfrequency Pickup Range:	101% to (Dropout -1 Hz) of Nominal System Frequency (0=Disabled)	104%
S2 OF PICK	Hertz	Source 2 Overfrequency Pickup Range:	101% to (Dropout -1 Hz) of Nominal System Frequency (0=Disabled)	104%
Modbus Configuration	Enabled/Disabled	Enabled	0 or 1	1
Time Sync	Off with PLC, w Meter	via Modbus	On or Off	Off
TDN	Minutes: Seconds	Time Delay Neutral	0 to 120 seconds	0:00
BAUD RATE		Modbus Baud Rate	9600 or 19200	9600

Table 2 Programmable Features and Setpoints (Cont.)

See tables in the appendix for Voltage and Frequency Pickup and Dropout settings.

SETPPOINT	SETPPOINT UNITS	DESCRIPTION	RANGE	FACTORY DEFAULT
ADDRESS		Modbus Address	1 to 247	1
PLANT EXER	Days	Plant Exerciser Programming	OFF, DAILY, 7-DAY, 14-DAY or 28 DAY	OFF
PE LOAD XFR		Plant Exerciser Load Transfer	0 or 1 (1 = yes)	0
PE DAY	Days	Plant Exerciser Day of the Week	1 SUN, 2 MON, 3 TUE, 4 WED, 5 THU, 6 FRI or 7 SAT	
PE HOUR	Hours	Plant Exerciser Hour	0 to 23	0
PE MINUTE	Minutes	Plant Exerciser Minute	0 to 59	0
TEST MODE		Test Mode	0, 1 or 2 (0 = No Load Engine Test, 1 = Load Engine Test, 2 = Disabled)	1
TER	Hours: Minutes	Engine run test time	0 min to 600 min	0:30
SWITCH TYPE		Device types	Breaker-3 position contactor-2 position contactor-3K-MG	2 position contactor
TPRE	Minutes: Seconds	Pretransfer delay timer	0 sec to 120 sec	0:00
PHASES		Three phase or single phase	1 or 3	AS ORDERED
VOLT UNBAL *	Volts	Voltage Unbalanced	0 or 1 (1 = Enabled)	1
UNBAL DROP %	Percent	Percent for Unbalanced Voltage Dropout	5 to 60% of Phase to Phase Voltage Unbalance	12%
UNBAL PICK %	Percent	Percent for Unbalanced Voltage Pickup	Dropout minus (UNBAL DROP % -2) to 3%	10%
UNBAL DELAY	Seconds	Unbalanced Delay Timer	0 to 30	0:20
TDEF	Seconds	Time Delay Emergency Fail Timer	0 sec to 60 sec	6
IN-PHASE	Hertz	In-Phase Transition	0 or 1 (1 = Enabled)	1
IP FREQ DIFF	Hertz	In-phase Transition FrequencyDifference	0.0 Hz to 3.0 Hz	1.0
SYNC TIME	Minutes	In-phase Transition Synchronization Timer	1 min to 60 min	5
PHASE REV		Phase Reversal	OFF, ABC, or CBA	OFF
DST ADJUST		Day Light Savings	0 or 1 (1 = Enabled)	1
MAN RETRAN		Manual Retransfer	0 or 1 (1 = Enabled)	0
LANGUAGE		Selected Language	English, French, or Spanish	English
TIME SYNC	Real Time	Clock Synchronization	0 or 1 (1 = Enabled)	1
TZO	Minutes	Time Zone Offset	-720 to +840	-300
SAVE SETPOINTS?		Save Changed Setpoints	Yes or No	Yes
CHANG TIME/DATE?		Set Time and Date		
	Hours	Set Hour	0 to 23	Eastern Standard Time
	MINUTES	Set Minute	0 to 59	Eastern Standard Time
	WEEKDAY	Set Weekday	SUN, MON, TUE, WED, THU, FRI or SAT	Eastern Standard Time
	MONTH	Set Month	JAN or 01	Eastern Standard Time
	DAY	Set Day	1 to 31	Eastern Standard Time
	YEAR	Set Year	Current Year	Eastern Standard Time
RESET SYSTEM COUNTERS?			Yes or No	No
RESET ALL?		Resets all System Counters	Yes or No	No
RESET ENGINE RUN?	Hours	Resets ENGINE RUN Counter	0 to 9999	XXXX
RESET S1 CONN	Hours	Resets S1 CONN Counter	0 to 9999	XXXX
RESET S2 CONN	Hours	Resets S2 CONN Counter	0 to 9999	XXXX
RESET S1 AVAIL	Hours	Resets S1 AVAIL Counter	0 to 9999	XXXX
RESET S2 AVAIL	Hours	Resets S2 AVAIL Counter	0 to 9999	XXXX
RESET LOAD ENERG	Hours	Resets LOAD ENERG Counter	0 to 9999	XXXX
RESET TRANSFERS	Cycles (Counts)	Resets TRANSFERS Counter	0 to 9999	XXXX

* For a 3-phase delta source or HRG (High Resistance Grounding), this feature should be turned off via the VOLT UNBAL set-point. Section 7: Troubleshooting and Maintenance

7.1 Level of Repair

This manual is written with the assumption that only transfer switch system troubleshooting will be performed. If the cause of malfunction is traced to an ATC-300+, the malfunctioning unit should be returned to Eaton for a replacement.

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

NOTICE

DURING CONVERSATIONS WITH EATON CONCERNING TROUBLESHOOTING OR PRODUCT RETURN, THE CUSTOMER MAY BE ASKED FOR INFORMATION PERTAINING TO THE SOFTWARE VERSION AND OPTIONS INCLUDED IN THE SPECIFIC UNIT. THE SYSTEM INFO SCREEN HAS THE DATA REQUIRED FOR THE CONTROLLER. IF THE CONTROLLER IS NOT FUNCTIONAL USE THE LABEL ON THE BACK OF THE UNIT.

7.2 ATC-300+ Device Troubleshooting

The Troubleshooting Guide (Table 3) is intended for service personnel to identify whether a problem being observed is external or internal to the unit. For assistance with this determination, contact Eaton. If a problem is identified to be external to ATC-300, proceed to Section 7.3 and continue troubleshooting.

If a message is flashing on top of the display and the cause of the fault is resolved, simply press increase-decrease buttons and the message will be removed.

Table 3. Troubleshooting Guide.

SYMPTOM	PROBABLE CAUSE	POSSIBLE SOLUTION(S)
All front panel indicator LED's are off.	Control power is deficient or absent. ATC-300 is malfunctioning.	Verify that control power is connected at J7 and that it is within specifications. Replace the unit.
Automatic LED is not blinking.	Control power is deficient or absent. Stuck waiting for Neutral position ATC-300 is malfunctioning	Verify that control power is connected at J7 and that it is within specifications. Mechanical problem; No input from limit switch. Replace the unit.
One or more voltage phases read incorrectly.	Incorrect wiring. ATC-300 is malfunctioning.	Verify voltage with multimeter. Check wiring. Replace the unit.
Front panel pushbuttons do not work.	Bad connection inside ATC-300.	Replace the unit.
Unit did not accept new setpoints via front panel.	Operator error. Make sure "Enter" is pressed when completed. No pushbuttons pressed for 2.5 minutes.	See Section 5 for rules on programming setpoints. Avoid intervals of 2.5 minutes of inactivity with pushbuttons when changing setpoints.
Voltage dropout and pickup setpoints are different than what was programmed.	Adjusted nominal voltage setpoint.	Re-adjust all dropout and pickup setpoints to default values.
Frequency dropout and pickup setpoints are different than what was programmed.	Adjusted nominal frequency setpoints.	Re-adjust all dropout and pickup setpoints to default values.
Changed undervoltage, overvoltage, underfrequency, or overfrequency dropout setpoint and the pickup setpoint changed also.	Pickup upper or lower limit ranges are dependent upon dropout setpoints. To prevent misapplication, they are automatically adjusted when overlapping occurs.	
Source 1 or Source 2 is not available when it should be.	Voltage and/or frequency is not within setpoint values.	Verify voltage and/or frequency with multi-meter. Check programmed setpoint values.
Source 1 or Source 2 is not shown connected when it should be.	No input from S1 or S2 aux contacts. ATC-300 is malfunctioning.	Verify contact closure at desired control input on J4. Replace the unit.
Engine fails to start after TDES times out.	S1 or S2 Generator start relay contacts not closed. Incorrect wiring at generator.	Replace the unit. Check engine wiring/maintenance.
Engine starts at 2 minutes with TDES set over 2 Minutes.	Any TDES value above two minutes, with no power on the controller, will start the generator (fail-safe) after two minutes.	Power Controller with UPS or 24VDC (using DCT).
Engine fails to turn off after TDEC times out.	S1 or S2 Generator start relay contacts not open. Incorrect wiring at generator. Connected LED not lit for either source.	Replace the unit. Check engine wiring. Verify contact closure at desired control input on J4. Replace the unit.
Unit will not perform an Engine Test.	Incorrect password after Test button was pushed Engine Test setpoint is set to Disabled. Number of Generators setpoint is set to 0.	Re-enter correct password. The factory password is 0300 Re-program Engine Test setpoint. Re-program Number of Generators setpoint.

Table 3. Troubleshooting Guide (Cont.).

SYMPTOM	PROBABLE CAUSE	POSSIBLE SOLUTION(S)
Plant exerciser (PE) failed to exercise.	Incorrect date or time setting.	Verify real time settings for Time/Date.
	Incorrect setpoint programmed for PE day and/or time.	Re-program PE day and/or time setpoint.
	Generator voltage and/or frequency did not become available within 30 seconds of engine starting.	Verify voltage and/or frequency with multi-meter. Check programmed setpoint values. Check engine maintenance.
Unit displays "Lockout."	No contact closure at Lockout programmed input.	Verify Lockout input circuit is closed. If not use jumper the two pins.
Unit displays "INHIBIT"	No contact closure at Emergency Inhibit programmed Input	Check Emergency Inhibit Wiring.
Unit displays an S1 open or close error	Source 1 circuit did not open when it was commanded to open.	Check Source 1 circuit trip wiring. Press "Help" then "Enter" push-buttons to clear message.
	Source 1 circuit did not close when it was commanded to close.	Check Source 1 circuit wiring. Press "Help" then "Enter" push-buttons to clear message.
	S1 Aux Close contacts did not open when Source 1 opened.	Check S1 Aux Close control input wiring on on J6-1,2. Press "Help" then "Enter" push-buttons to clear message.
	S1 Aux Close contacts did not close when Source 1 closed	Check S1 Aux Close control input wiring on on J6-3,4. Press "Help" then "Enter" push-buttons to clear message.
Unit displays an S2 open or close error	Source 2 circuit did not open when it was commanded to open.	Check Source 2 circuit trip wiring. Press "help" then "enter" push-buttons to clear message.
	Source 2 circuit did not close when it was commanded to close.	Check Source 2 circuit wiring. Press "help" then "enter" push-buttons to clear message.
	S2 Aux Close contacts did not open when Source 2 opened.	Check S2 Aux Close control input wiring on J6-1,2. Press "help" then "enter" push-buttons to clear message.
	S2 Aux Close contacts did not close when Source 2 closed	Check S2 Aux Close control input wiring on J6-3,4. Press "help" then "enter" push-buttons to clear message.

NOTICE

WHILE PERFORMING TESTING, IF AN UNDESIRE OR UNDOCUMENTED RESULT OCCURS, FIRST CONTACT THE LOCAL GENSET DEALER. IF THE RESULT IS NOT CORRECTED, CONTACT THE EATON ATS TECHNICAL SUPPORT AT 1-877-386-2273 OPTION 2, OPTION 4, OPTION 3.

7.3 General Switch Problem Solving

⚠ DANGER

HAZARDOUS VOLTAGES IN AND AROUND TRANSFER SWITCH EQUIPMENT DURING THE PROBLEM SOLVING PROCESS CAN CAUSE PERSONAL INJURY AND/OR DEATH. AVOID CONTACT WITH ANY VOLTAGE SOURCE WHILE PROBLEM SOLVING. USE LOCK-OUT TECHNIQUES TO ASSURE POWER IS REMOVED.

⚠ WARNING

ONLY PROPERLY TRAINED PERSONNEL FAMILIAR WITH THE TRANSFER SWITCH EQUIPMENT AND ITS ASSOCIATED EQUIPMENT SHOULD BE PERMITTED TO PERFORM THE PROBLEM SOLVING FUNCTION. SPECIFICALLY, ONLY PERSONS CLASSIFIED AS QUALIFIED UNDER FAILURE, TO UTILIZE QUALIFIED PERSONNEL (UNDER NFPA 70E) SHOULD WORK ON EQUIPMENT. IF NOT, IT COULD RESULT IN PERSONNEL INJURY AND/OR DEATH.

This section explains basic troubleshooting for Transfer Switches. The particular switch instruction booklet should be used to troubleshoot. 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 following sections as observed Problem Symptoms and one or more possible Solution Steps. All of the steps presented may not apply to all transfer switches, depending upon the logic. **Remember, only qualified individuals familiar with the transfer switch equipment and the system in which it is applied should attempt these problem solving procedures.**

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:

Note: If a message is flashing on top of the display and the fault is removed, simply press "Help" and then "Enter" and the message will be removed.

1. General Order Number (GO#) of transfer switch, plus related Item Number;
2. Catalog Number of transfer switch;
3. Actual location of transfer switch (type of facility, address, etc.);
4. Style number of the controller;
5. Company, name and position of individual representing company;
6. Basic description of situation as it exists; and
7. Any results of problem solving steps taken and/or readings taken from the events and summaries.

The transfer switch is recommended to be exercised monthly to ensure expected operation during an actual power outage. The switching mechanism is an electrochemical type device tied to a controller, relays, etc., and operating these will ensure good operation. Not only is the switch exercised but usually the ATS is tied to a generator which can then also be exercised.

7.3.1 Transfer Switch Appears Inoperative

Step 1: Verify that all plugs and sockets are properly interconnected. Assure that the SWITCH TYPE (Device) setpoint is programmed for the type of switch the controller is be used on (2 position contactor, 3 position contactor, breaker, 3K contactor).

Step 2: If the source available LED is not on or the display shows the wrong voltage, make sure the controller setpoints match the system voltage. Verify that the correct system voltage is at the switch.

Step 3: Verify that the voltage selection plug on the transformer is in the proper position to match the system voltage.

Step 4: Look for any obviously burned components. Determine the cause and rectify, if possible. Replace defective components after the cause is determined.

Step 5: Is switch closed on source 1? Verify whether or not the system voltage now appears on the load terminals.

If YES: Proceed to check logic for problems in respective logic instruction book.

If NO: Check all power connections and the switching mechanism. What does the controller show for voltages on the main screen?

7.3.2 Transfer Switch Will Not Automatically Transfer to Normal

Step 1: Is Option 29G installed? If so, there is a switch on the door Labeled Auto Manual with either push buttons for S1 close, Trip, S2 Close or a three position switch with the same. The Auto Manual selector-switch must be in Auto for it to run with the controller.

Step 2: Is Option 9B installed? If so, there is a selector switch labeled "Maintenance"(or "Monitor Mode" for contactor-based switches.

If YES: Verify selector switch is in the "Operate" position.

If NO: Proceed to Step 3.

Step 3: Are the correct line voltage and frequency available at terminals N1, N2, and N3? Record the readings.

If YES: Proceed to Step 4.

If NO: Is the switch a source swap?.

Step 4: Is the transformer voltage selector plug in the correct position?

If YES: Proceed to Step 5.

If NO: Position plug correctly.

Step 5: Check the voltage on transformer NT1 by measuring voltage between voting relay KV-1 and GND. Is the voltage measured 120 Vac (+/- 10 volts)? Record the reading.

If YES: Proceed to Step 6.

If NO: Check voltage transformer NT1.

Step 6: Is the power source available?

If YES: Proceed to Step 8.

If NO: Apply the correct system voltage to the Source connections. or change the setpoints on the controller to match the system voltage

Step 7: Is the switch connected to the Source 2?

If YES: Proceed to Step 8.

If NO: Proceed to Step 9.

Step 8: If a problem persists, contact Eaton.

7.3.3 Transfer Switch Will Not Automatically Transfer to the Source

Step 1: If the alternate source is a generator, is it running?

If YES: Proceed to Step 2.

If NO: Check the generator. Check the engine start contacts.

Step 2: Is the correct line voltage and frequency available at the source terminals? Record the readings.

If YES: Proceed to Step 3.

If NO: Verify that there is output voltage from the generator.

Step 3: Is the voltage selector plug in the correct position?

If YES: Proceed to Step 4.

If NO: Position plug correctly.

Step 4: Is the source available?

If YES: Proceed to Step 5.

If NO: Proceed to Step 6.

Step 5: Is a test Engine Test or Plant Exerciser being run, or is the "Go to Emergency" input energized?

If YES: Proceed to step 6.

If NO: STOP! The transfer switch should not transfer to source 2 if source 1 is available and connected.

Step 6: Make sure that the setpoints are set according to the system voltage.

If YES: Proceed to Step 7.

If NO: .Adjust system voltage setpoints to match system voltage and phase.

Step 7: Is the switching device charged (3K contactor)?

If YES: Proceed to Step 8.

If NO: Check voltage at C29 (com) and C30 (line) for 120vac. This voltage is there for the charging motor.

Step 8: Is the switching device OPEN or closed?

For 3K contactor closure, there would be 120vac on:
 A24, A25 for Source 1 Close
 C1, C2 for Source 2 Close
 A26, A27 for Source 1 open
 C3, C4 for Source 2 open

See Figure 4 for close and open commands (Ks) from the controller.

In all cases, the controller will remove the 120vac after 6 seconds.

Step 9: If a problem persists, contact Eaton.

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

7.4 Replacement

Follow these steps to replace the ATC-300.

Step 1: Turn off control power at the main disconnect or isolation switch of the control power supply and lock it out to guard against other personnel accidentally turning it on. Follow all local safety requirements for transfer switches which includes appropriate PPE.

Step 2: Verify that all “foreign” power sources wired to the ATS Switch are de-energized. These may also be present on some of the terminal blocks.

Step 3: Before disconnecting any wires from the unit, make sure they are individually identified to ensure reconnection can be correctly performed. Taking a picture may help with re-connections.

Step 4: Disconnect all plugs and connectors going to the ATC-300.

CAUTION

SUPPORT THE ATC-300 FROM THE REAR SIDE WHEN THE SCREWS ARE LOOSENED OR REMOVED IN STEP 5. WITHOUT SUCH SUPPORT, THE UNIT COULD FALL AND THE CONTROLLER COULD BE DAMAGED.

Step 5: Remove the 4 mounting screws holding the unit against the door or panel. These are accessed from the rear of the unit.

Step 6: Set the screws aside for later use.

Step 7: Mount the replacement unit.

Step 8: Secure the ATC-300 to the panel with the 4 mounting screws.

Step 9: Re-connect all plugs and connectors to their proper socket on the ATC-300. Make certain that each plug is securely seated.

Step 10: Clear out all personnel, close all ATS panels, remove any lockouts, and restore control power. Ensure all setpoints are correct.

7.5 Maintenance and Care

The ATC-300 is designed to be a self contained and maintenance free unit. The printed circuit boards are calibrated and conformally coated at the factory. They are to be serviced by factory trained personnel only. The front panel including the display can be cleaned lightly with a soap and water mixture.

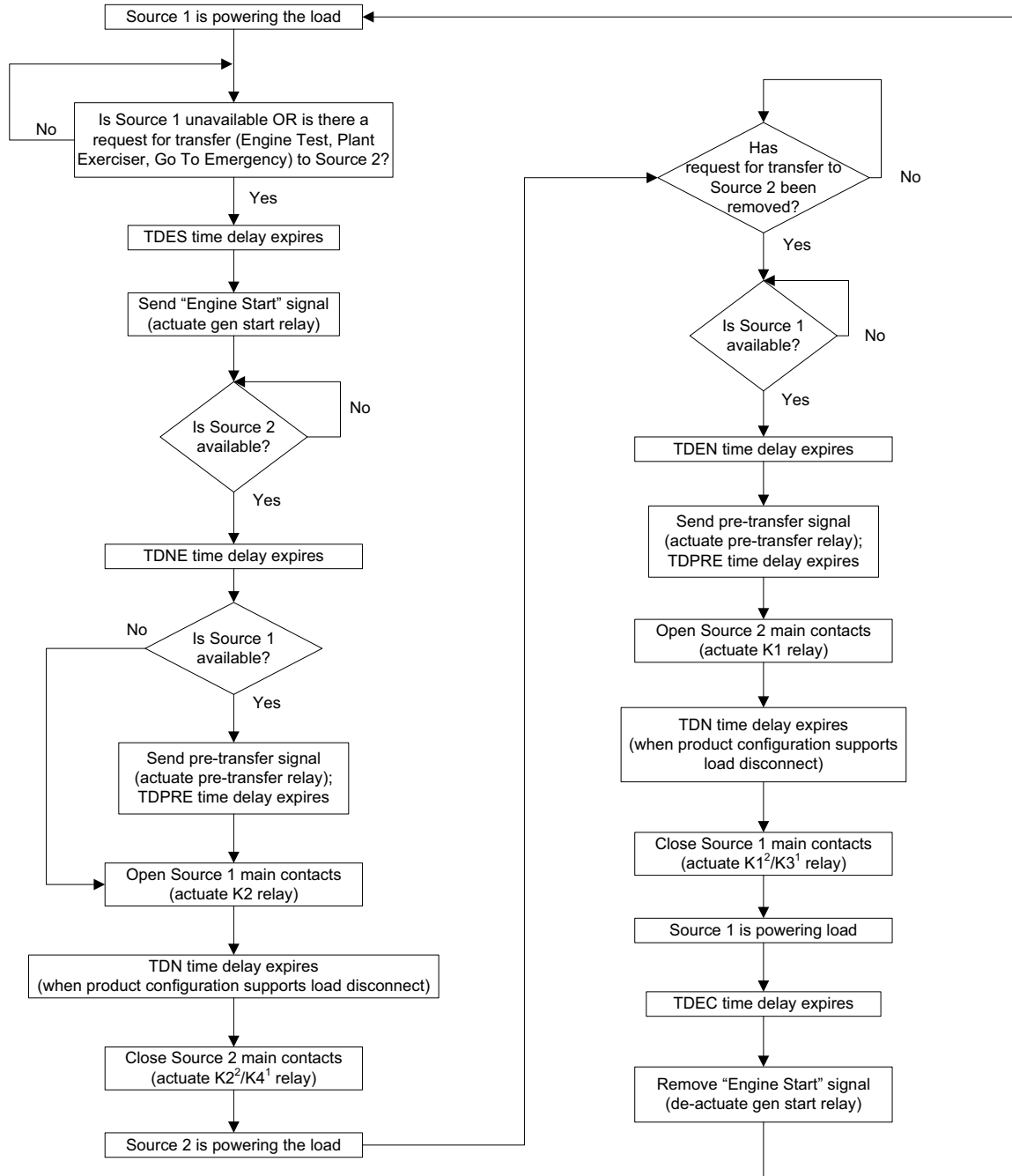
Appendix A: Display Message for Status and Timers

Display Message

TDEC	Countdown cool-off timing before the generator contacts are opened.
TDES	Countdown timing before the generator contacts are closed.
TDNE	Countdown timing before Source 1 is disconnected before transferring to Source 2. Timing begins when Source 2 is available.
TDN	Countdown timing with both sources disconnected from the load. In the open position and requires a three position type switch (Time Delay Neutral).
TDEN	Countdown timing before Source 2 is disconnected before transferring to Source 1. Timing begins when Source 1 becomes available.
ATS NOT IN AUTOMATIC	Control input for monitor mode is closed.
LOCK-OUT	A trip condition has been detected by either breaker, and the system is locked-out from further transfers. Press Alarm Reset on the controller, after the fault is cleared, to unlock.
MAN RETRANSFER	Waiting for an input signal to complete the manual re-transfer; usually a push-button non-retained type switch.
EMERG INHIBIT	Indicates that a transfer to the Emergency Source is inhibited because the Emergency inhibit input is activated.
ENGINE RUN	The engine run test timer is counting down before the test is completed. Pressing the Engine Test push-button will abort this timer and the test.
START TEST	To initiate an engine test sequence, press the Engine Test pushbutton again, or press Increase and Decrease pushbuttons simultaneously to clear.
WAIT FOR S2	Waiting for the Source 2 source voltage and frequency to become available.
TD PRE-TRAN	Countdown timer before transfer begins. Timing begins after TDEN/TDNE expires or Manual Re-transfer input closes.
SYNC TIME	Countdown timing in minutes while waiting for sources to synchronize during an in phase transition.
SOURCE 1 DEVICE	Indicates that the Source 1 device (i.e. circuit breaker, contactor) failed to open or close
SOURCE 2 DEVICE	Indicates that the Source 2 device (i.e. circuit breaker, contactor) failed to open or close.
TDEF	Countdown timing before declaring Source 2 unavailable (accounts for momentary generator fluctuations).
TD UNBAL	Countdown timer before declaring a source unavailable due to a voltage unbalance condition.
TEST ABORTED	Indicates that an engine test or plant exercise was aborted after three unsuccessful attempts. Source 2 did not remain available while TDNE was timing.
GO TO SOURCE 2	Indicates that the load is transferring or connected to Source 2 because the Go To Source 2 control input is in the "unconnected" state.
FAILSAFE	Indicates that the load was connected to Source 2 but Source 2 became unavailable so the load transferred back to Source 1.
SETPOINTS ERROR	Memory problem with the setpoints. Contact the factory.
OPTIONS ERROR	Memory problem with the factory options. Contact the factory.
PROGRAMMING SETPOINTS	Setpoints are being saved in memory.
WAITING FOR NEUTRAL	Waiting for the neutral position to be reached by the switch.
WAITING FOR S1 TO CLOSE	Waiting for the Source 1 device (i.e. circuit breaker, contactor) to close.
WAITING FOR S2 TO CLOSE	Waiting for the Source 2 device (i.e. circuit breaker, contactor) to close.

Appendix B: Operational Flowcharts

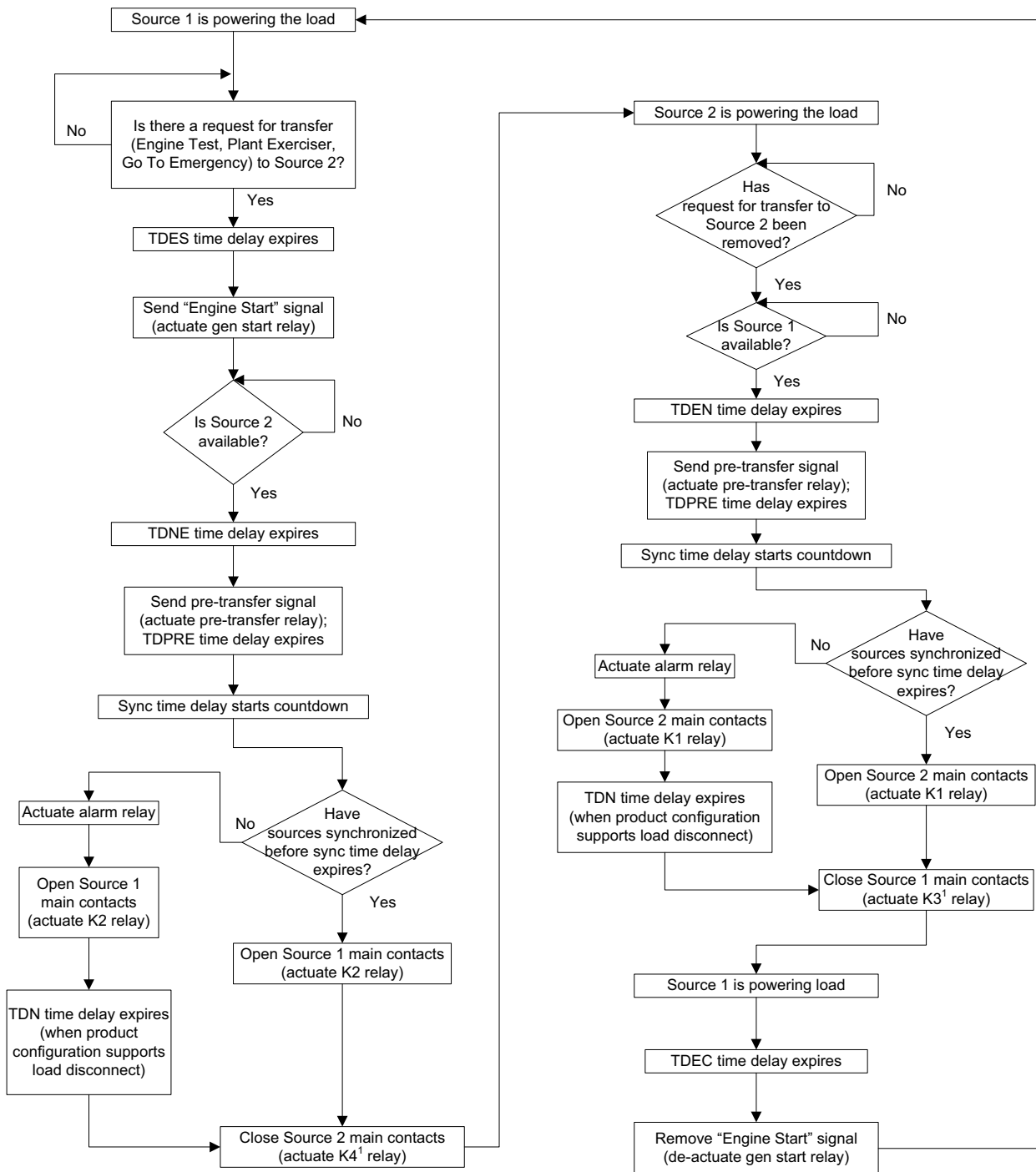
• Utility - Generator Transfer Switch



Notes:

- 1- applicable for contactor type transfer switches with support for time delay in load disconnect ("neutral") position
- 2- applicable for molded case type transfer switches

• In-phase Transition Implementation



Notes:

1- applicable for contactor type transfer switches with support for time delay in load disconnect ("neutral") position

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