Certification
Transfer Switch Equipment
ATC-900 Controller

March 2015

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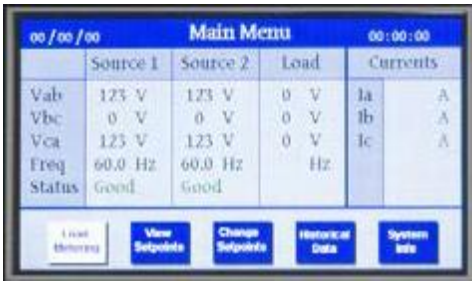
Table of Contents

ATC-900 Controller

The ATC-900 is the newest Eaton ATS controller. It is a comprehensive, multifunction, microprocessor based controller which provides an unmatched degree of flexibility to address the needs of any system. Ultimately destined to replace the ATC-600/800 in all applications, it will be standard on the Magnum ATS and Bypass / Isolation and closed transition switches, and it will be the high end controller on the open transition contactor and breaker type transfer switches.

March 2015



Display

The Color Thin Film Transistor Liquid Crystal Display (TFT) window is used to display all ATC-900 monitored parameters, setpoints and messages.

Display Messages (Alarms and Status)

Blue Bar at top of display

Displays “Main Menu” Date and Time

Red Bar Flashing at top of display (flashes over the Menu bar)

An alarm message that must have the initiating condition cleared AND reset from the Help Screen. (Press ***HELP***, then ***ENTER***. If condition has not been cleared, the Alarm cannot be cleared. (Ex: “Lockout”)

Yellow Bar Flashing at top of display (flashes over the Menu Bar)

An alarm message that is “self clearing”. The message will go away automatically when the condition clears.

Yellow Bar Status Message (appears BELOW the Menu Bar)

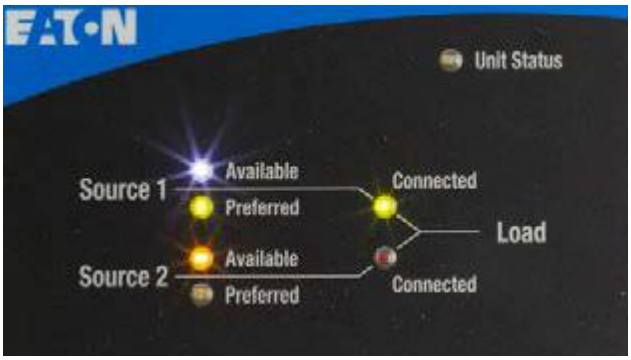
A “Status Message” such as a timer counting down. No action required

USB Port

The USB port is mounted on a device panel, and prewired to the controller.

One of the most useful new features of the ATC-900 is the USB port. Combined with a flash drive, and EASE programming software or Excel, it adds many useful features for the field technician or engineer and the end user. Every ATC-900 transfer switch includes a front panel, NEMA 4X rated, USB port for use in:

- Uploading/downloading setpoints.
- Set points can be preconfigured and saved on the flash drive and uploaded to the ATC-900.
- Set points can quickly be copied from one ATS and uploaded to another. No laptop is required.
- Downloading event data provides the ability to more thoroughly analyze information using a PC.
- Data can be quickly e-mailed when offsite troubleshooting support is required.



LED'S

LEDs are used to indicate the device's mode of operation, the status of the system, and the operations and/or conditions of displayed functions. The LED at the top of the ATC-900 provides a quick snapshot of the unit's status. Six LEDs, just above the display window, indicate which portions of the mimic bus are active, and the actual status of both sources

Unit Status

This GREEN LED blinks indicating that the ATC-900 is operating and providing the transfer switch control function in keeping with programmed setpoints. If the LED is not lit or is on continuously, a problem may be indicated.

Source 1 Available

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

Source 1 Preferred

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

Source 1 Connected

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

Source 2 Available

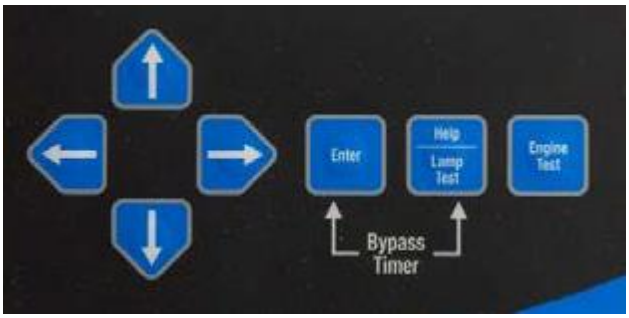
This AMBER LED is lit if Source 2 meets the criteria for programmed Source 2 setpoints.

Source 2 Preferred

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

Source 2 Connected

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



Pushbuttons

The front operations panel supports seven blue membrane pushbuttons. Certain pushbuttons, like the Increase and Decrease Pushbuttons, will also continue to scroll if they are pressed and not released.

Help

When the ***HELP*** pushbutton is pressed and released with the ATC-900 in any mode, the display will show a message. Pushing ***HELP*** a second time will abort the message. Messages and explanations relative to what is being viewed in the display are intended to prompt and assist the operator.

Engine Test

A self-test is initiated when the ***ENGINE TEST*** pushbutton is pressed and the controller password is entered. (Default is 0900) Pressing the ***ENGINE TEST*** again while in the engine run condition aborts the test.

- Upon test initiation, a generator start of the non-preferred source is engaged after the Time Delay Engine Start timeout.

- If a load test is programmed, a transfer with all programmed times occurs.

The ATC-900 includes a unique set of independently programmable time delays activated during a test.

- The test engine run timer will hold the load on Source 2 for the required timeout and the test is concluded with a retransfer cycle.
- For an engine run only test, no transfer will occur and the engine will run for the programmed run time.

Enter

The ***ENTER*** pushbutton completes the current selection

INCREASE (Up) , DECREASE (Down), LEFT and RIGHT Arrow

These pushbuttons, are used for step-by-step changes or held depressed for scrolling, increase, or decrease setpoints. The pushbuttons allow for navigation through the menus for all functionality.

PASSWORDS

Default Password for Setpoint Change and Engine Test:

0900

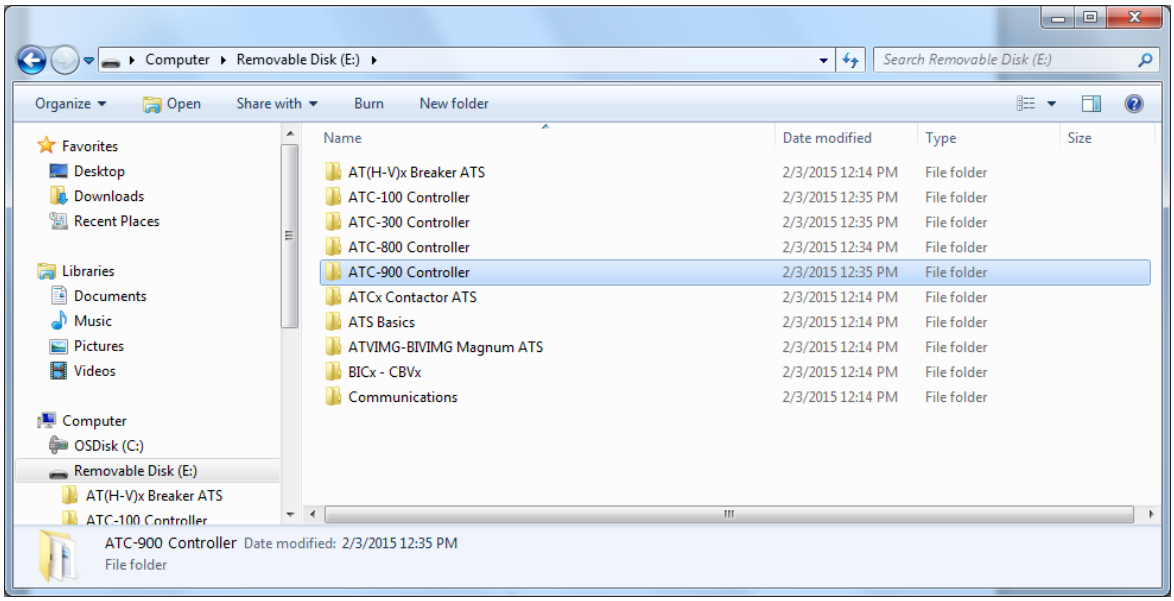
Backdoor (forgotten password): (requires password reset)

6275

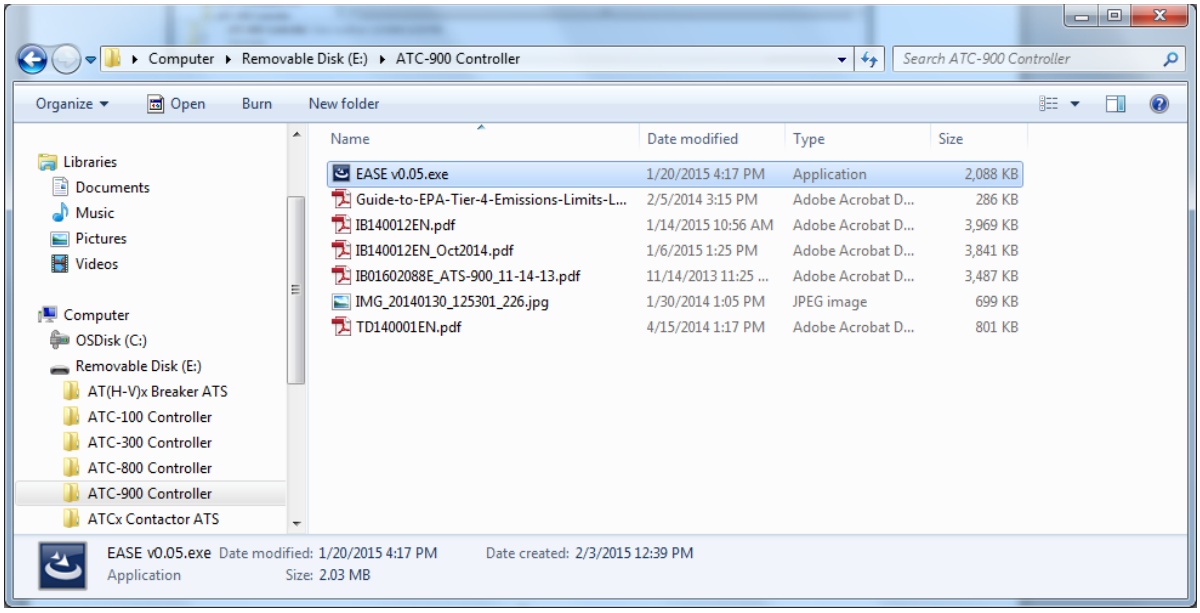
Lab 900-0: ATC-900 Programming Software

Part 1: Install the ATC-900 Programming Software on Your computer.

1. Insert the class material flash drive into an empty USB port on your computer and after selecting the removable disk, select the **ATC-900 Controller** folder.

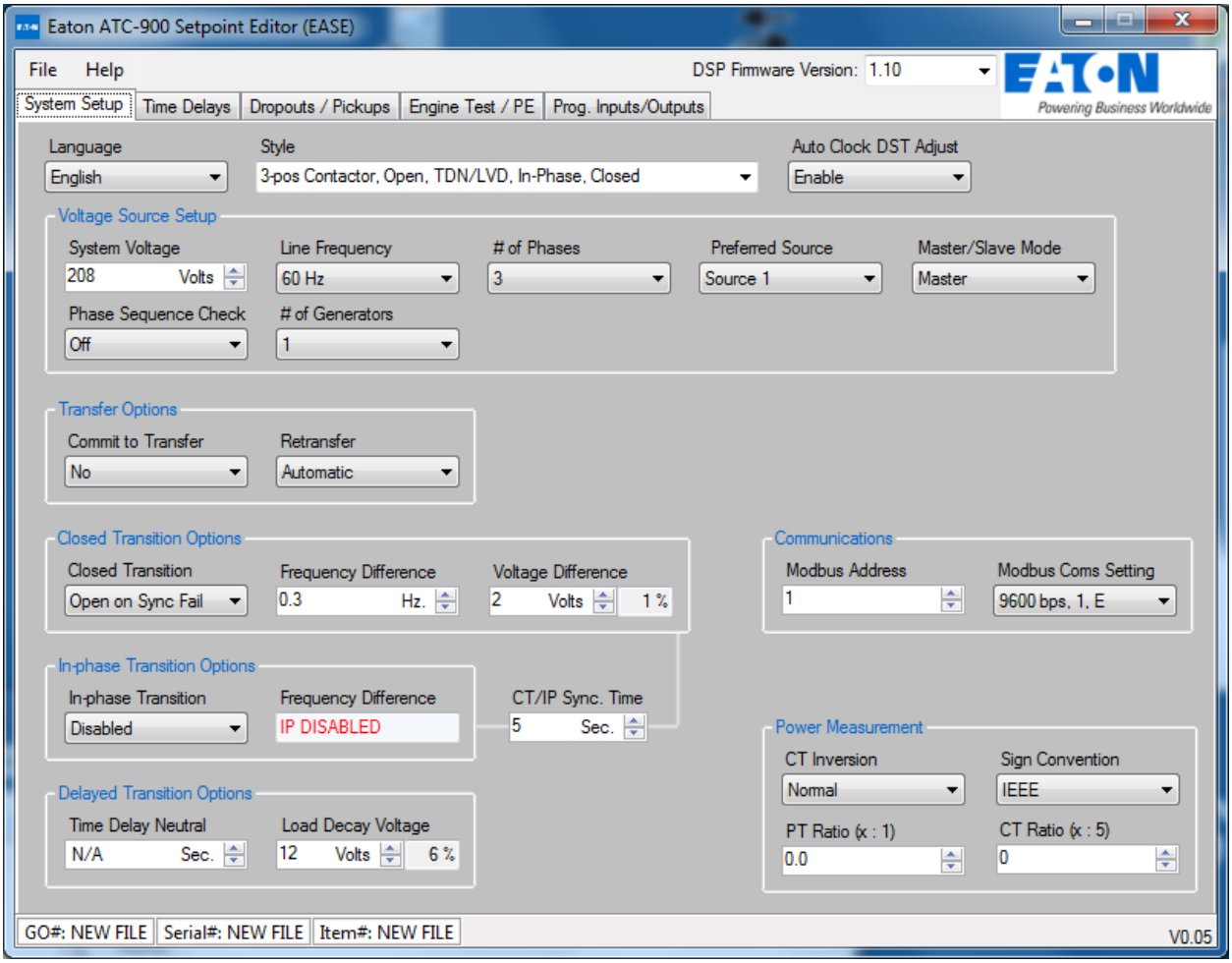


2. To install the programming software, double click on the **EASE vX.XX.exe file.**



3. Follow the on screen prompts to install the program.

4. Find the “EATON Ease” icon on your desktop and double click it. You should get a screen like this.



This is the “System Setup” screen for the Eaton EASE programming software. At this point you can navigate the various tabs and see what capabilities the program gives you.

5. For now close the program. We will return and use this program later in the class to set up a controller.

Introduction to the ATC-900 Controller Demo/Simulator

ATC 900 Controller Demo / Simulator

The ATC-900 Demo unit can simulate several conditions and react automatically to demonstrate transfer switch operation. This demo is set up to give the student the ability to program functionality of the controller and see effects from the programming

MAIN POWER SWITCH

"ON" to power up demo.

SOURCE 1 Selector

Turns “On” Source 1

SOURCE 1 Indicator

“Lit” indicates Source 1 is “good”

The indicator is driven by the S1 Available Output on the controller.

SOURCE 2 Selector

Turns “On” Source 2

SOURCE 2 Indicator

“Lit” indicates Source 2 is “good”

The indicator is driven by the S2 Available Output on the controller.

Engine Start Indicators

S1 Generator (Amber)

Indicates status of S1 Start Contact.

S2 Generator (Green)

Indicates status of S2 Start Contact.

OUTPUTS (1-4) (Top)

Indicators are provided and driven by output contacts which may be set up on the demo to demonstrate customer functions. These lights are NOT provided on a real ATS

INPUTS (1-4) (Left Side)

Programmable switches are connected to controller inputs on the demo. They may be set up to demonstrate customer control functions.

USB Port

Port may be used for saving or loading setpoints to a flashdrive. It can also be used to download events, history and high speed captures.

Lab 900-1: Demonstrate ATS Operation.

Part 1: Normal Operation – This lab will demonstrate normal operation of 3-Position Open Transition Contactor type Automatic Transfer Switch.

1. Set the selector switches on your demonstrator as follows:

MAIN POWER "ON" (White indicator should light)

SOURCE 1 "ON" (Green indicator should light)

SOURCE 2 "OFF"

All ***INPUT*** Switches (1 through 4) "OFF"

2. What LED's on the ATC-900 are lit?

S1 Available ◯ ***S1 Preferred*** ◯

S2 Available ◯ ***S2 Preferred*** ◯

S1 Connected ◯

S2 Connected ◯

Is ***Unit Status*** Flashing? ◯ Yes ◯ No

This is how a Transfer Switch would be found in its preferred state with Source 1 (Normal) Available and Connected.

The next step demonstrates a Source 1 Power Failure.

3. Turn ***SOURCE 1*** "OFF"
4. Did the controller go dark? _____
5. If so, the controller is waiting on the generator to start. When the ***S2 GEN START*** indicator lights, turn ***SOURCE 2*** "ON". The Red indicator should light.
6. Did the ATC-900 Source 2 Available LED light? _____
7. The controller should go through some timing functions and should now indicate that it has connected to Source 2. Is the ***Source 2 Connected*** LED lit? _____
8. The ATC-900 displays alarms and status messages using a color bar at the top of the display. What alarm message is flashing? _____
9. What does the yellow alarm color mean? _____

The ATS Controller is indicating operation on EMERGENCY power.

Demonstrate what happens when the preferred source becomes available.

10. Turn ***SOURCE 1*** "ON". The GREEN Indicator should light, and the ***Source 1 Available*** LED should light.
11. The ATC-900 should go through some timing sequences which are displayed as information messages, and then reconnect to Source 1.

12. After (TDEC) times out and the ***S2 GEN START*** goes out, turn ***SOURCE 2*** "OFF". The RED indicator and the ***Source 2 Available*** LED should extinguish. The controller should now indicate Source 1 Available, Preferred and Connected. This demonstrates the simple operation of an Automatic Transfer Switch.

Look at the Historical Data in the controller.

13. Press the ***Right*** Arrow key until the "Historical Data" menu selection lights up.
14. Press ***Enter***. This screen is a summary of the counters and last reset date.
15. The "Event Summary" menu choice should be lit. Press ***Enter***.
16. There should be 7 events at the top of the screen that relate to your recent interaction with the demo and simulating a power failure. Record those events.

Date	Time	Event

17. While on the "Event Summary Screen", you will notice a red pointer on the left of the screen, and an "Event Details" selection lit.
18. Using the ***Down*** Arrow key, select the event "Open Transition to Source 1 Complete", and press ***Enter***. You now see additional information about the event.
19. Go back to the Main Menu.

Save the Historical Data in the Event File on the controller to a Flash Drive.

20. Insert a flash drive into the USB port on the demonstrator.
21. Press the ***Right*** or ***Left*** Arrow key till "USB" menu selection lights. Press ***Enter***.
    a. Note: The first time the flashdrive is inserted, the controller will create a directory named "ATC-900". and two subdirectories on the flash drive.
22. When the message "Created ATC-900 Directory Structures" appears press ***Enter***. If the directory was previously created this step is skipped.
23. You will be taken to the "USB Functions" Menu
24. Using the ***Right*** arrow select "Save Events" and press ***Enter***.

25. Remove the flash drive from the demo and insert it in a USB port on your computer.
26. Navigate to the “Removable Disk” on your files menu and navigate to the ATC-900 directory.
27. Select the History Folder, and then double left click on “EVTxxxxxx-xx.CSV file that you have previously saved. It will open on EXCEL automatically.
    a. The file naming format will be “EVTmmddyy-xx, where xx is a sequence number. If you save multiple files on the same day they will get increasing sequence numbers.
28. There should be 13 events pertaining to your previous operation, most recent at the top of the list. Notice that the event detail is included in the saved event file as well as all the event data which had to be viewed separately on the controller screen.

Part 2: Demonstrate an ATS Alarm – This lab will demonstrate what happens when the Automatic Transfer Switch fails to operate properly and results in an alarm**.**

1. On you demonstrator set the selector switches as follows:

   MAIN POWER “ON” (White indicator should light)

   SOURCE 1 “ON” (Green indicator should light)

   SOURCE 2 “OFF”

   All ***INPUT*** Switches (1 through 4) “OFF”

2. What LED’s on the ATC-900 are lit?

   S1 Available ◯ ***S1 Preferred*** ◯

   S2 Available ◯ ***S2 Preferred*** ◯

   S1 Connected ◯

   S2 Connected ◯

   Is ***Unit Status*** Flashing? ◯ Yes ◯ No

   The ATS is operating on the good Source 1.

Now demonstrate what happens when an engine test is initiated and the generator fails to produce an acceptable source

3. Press the ***Engine Test*** pushbutton
4. Did the screen ask you to enter a password? _____
5. If so, using the ***Left*** and ***Right*** arrow keys to move the cursor, and the ***Up*** and ***Down*** arrow keys to change values, enter the password (0900). When the cursor is under the last digit, press the <right> arrow key one more time.
6. The <Enter Password> selection on the menu bar should light. Press ***Enter***.

7. A message in a yellow bar should now display.
8. What is the message on the display? _____
9. Do **NOT** turn on Source 2, rather wait on the timer to reach “0”.
10. What happened? _____

You should see a message “Engine Test Aborted” flashing on a red background at the top of the display screen. This is an alarm indicating an engine failure of some sort.

Part 3: Clearing an Alarm and restoring operation.

You see a red bar with the message “Engine Test aborted”

1. The message also advises you to push what button? _____

2. Press the ***Help*** button.

3. To reset the ALARM, press ***Enter***. The controller should clear the alarm and immediately return to the Main Menu.

4. View the History Events Log. Record the 3 events

Date	Time	Event

5. Using the procedure in Part 1, download a new events file and see if you can see the events related to the failed engine test.

Part 4: Lessons Learned

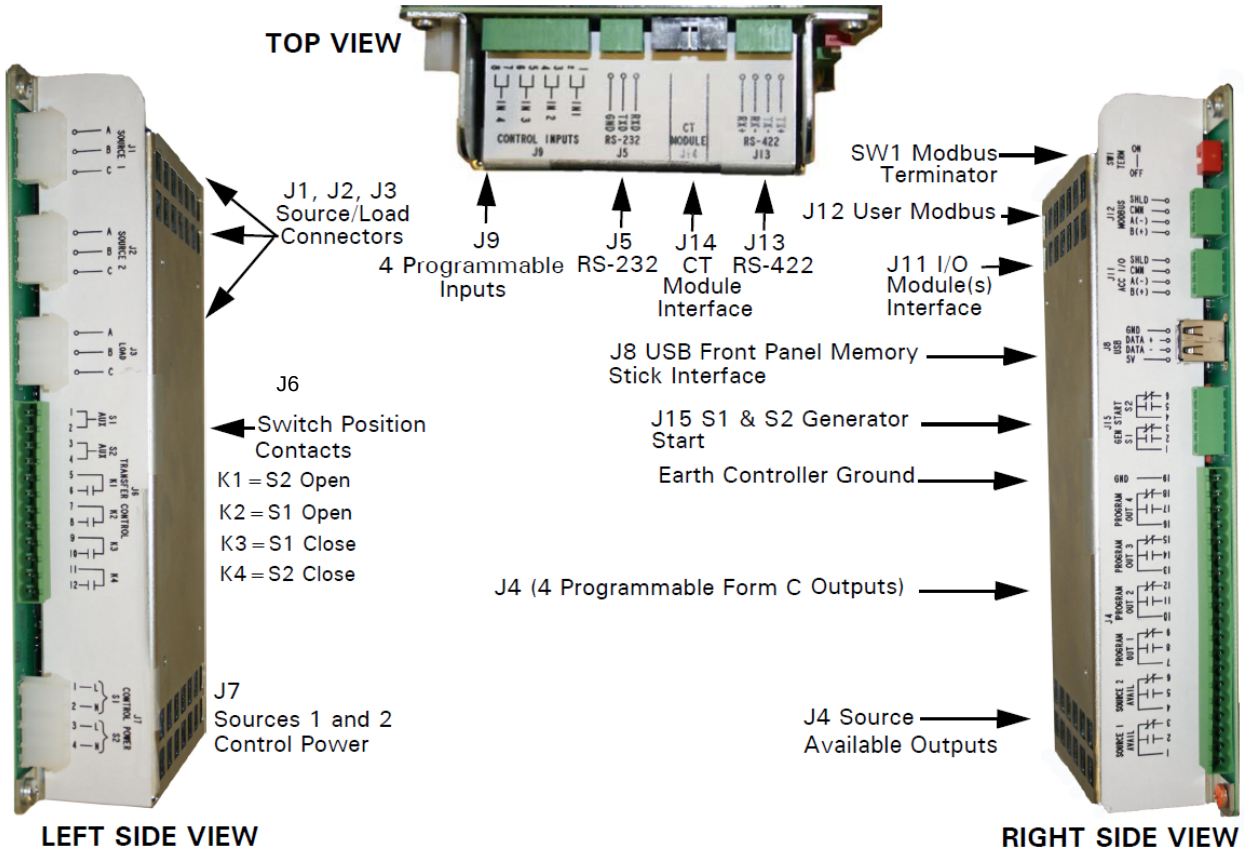
1. The controller indicates normal operation by showing the status of both sources, date and time.

2. When the controller has determined there is a problem it will display an alarm message. This is in a flashing yellow or red bar at the top of the Main Menu

3. If the message appears in a YELLOW flashing bar, the condition must be cleared, and the message will go away automatically.

4. If the message appears in a RED flashing bar, the condition must be cleared AND an alarm reset on the controller must be done using the ***Help*** and ***Enter*** keys.

5. The events can be displayed on the screen of the controller or downloaded to an event file on a flash drive for analysis.



Rear Panel ATC-900 Controller

Connectors

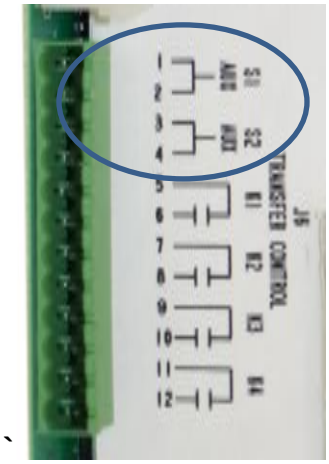
- J1 – Source 1 Sensing (120 – 600 VAC)
- J2 – Source 2 Sensing (120 – 600 VAC)
- J3 – Load Sensing (120 – 600 VAC)

CAUTION: J1, J2, J3 have FULL LINE VOLTAGE applied.

- J4 – Outputs (See OUTPUTS below)
- J5 – RS-232 Comm Port
- J6 – Transfer Control (See INPUTS and OUTPUTS)
- J7 – Control Power (120VAC 2 sources)
- J8 – USB Interface
- J9 – Programmable Inputs (See INPUTS)
- J11 – I/O Module interface
- J12 – User Modbus
- J13 – RS-422 Comm Port
- J14 – CT Module Interface
- J15 – Engine Contacts (See OUTPUTS)

Inputs

The rear access area provides for access to input connections. Each contact input is wetted by 24 volts at 6 ma.



There are TWO inputs which are always needed for ATS operation.

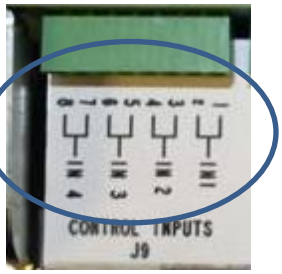
- **Source 1 Aux (J6,1-2)**

  This input is wired to the Source 1 breaker (or contactor) dry auxiliary contact that is closed when the Source 1 breaker is closed.

- **Source 2 Aux (J6,3-4)**

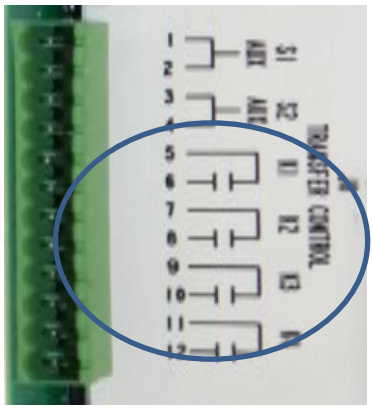
  This input is wired to the Source 2 breaker (or contactor) dry auxiliary contact that is closed when the Source 2 breaker is closed.

There are FOUR programmable inputs. (J9,1-8)



- FIXED/LOCKED inputs if provided with options supplied by the factory. (Cannot be changed in the field)
- PROGRAMMABLE Inputs are not used by factory supplied options.
- When the Inputs are "Fixed" the “Programmable Inputs” display will show the particular input as in the designated slot. The display will show a fixed I/O as black instead of blue. The fixed I/O will also show up in the System Info Menu Screen.
- Additional I/O modules with 4 Inputs and 4 outputs are available. A maximum of FOUR additional modules may be used for a maximum total of 20 inputs and 20 outputs.

Outputs



Output Relays K1, K2, K3, K4 (J6, 5-12)

The K relay outputs are used to control the transfer device.

Power Breakers, Contactors, and Motor Driven Breakers. The K function as follows:

- K1 = S2 Open
- K2 = S1 Open
- K3 = S1 Close
- K4 = S2 Close.

Wall Mount Breaker, and two-position contactor switches use only the K1 and K2 contacts:

- K1 = Open S2, Close S1
- K2 = Open S1, Close S2

There are FOUR outputs provided for necessary ATS functions. (See Page 16)

- **S1 Available (J4, 1-2-3)**

  This Form C relay is used to indicate the availability of Source 1 based on the S1 setpoints programmed. The full Form C contact of this relay is implemented with common pin 1, normally closed pin 3, and normally open pin 2 of connector J4. This relay duplicates the Source 1 available status LED meaning that the setpoint criteria have been met. The relay contacts are rated for 10 A, 1-3 HP @ 250 VAC. The DC rating is 10 A @30 VDC.

- **S2 Available (J4, 4-5-6)**

  This Form C relay is used to indicate the availability of Source 2. The full Form C contact of this relay is implemented with common pin 4, normally closed pin 6, and normally open pin 5 of connector J4. This relay duplicates the Source 2 available status LED meaning that the setpoint criteria have been met. The relay contacts are rated for 10 A, 1-3 HP @ 250 VAC. The DC rating is 10 A @30 VDC.

- **S1 Generator (J15, 1-2-3)**

  This latched coil relay provides a Form C contact on pins 1(COM), 2 (NO), 3 (NC) of connector J15. The relay is the generator start relay for system configurations employing a generator on the input source designated

Source 1. The generator start relay contacts are rated for 5 A, 1/6 HP @ 250 VAC. The DC rating is 5 A @ 30 VDC.

The Generator Contacts are powered separately in a power failure by a supercap and separate circuitry.

- **S2 Generator (J15, 4,5,6)**

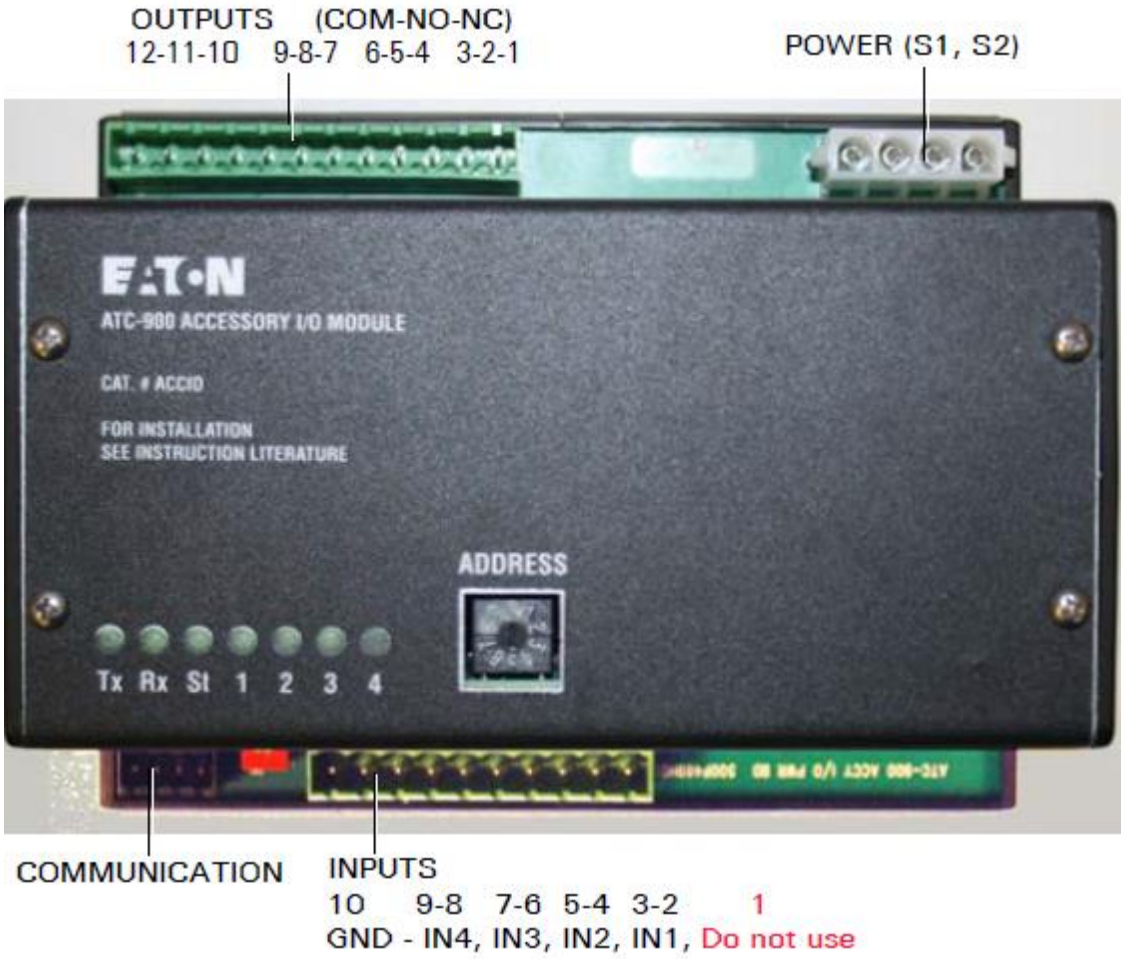
  This latched coil relay provides a Form C contact on pins 4 (COM), 5 (NO), 6 (NC) of connector J15. The relay is the generator start relay for system configurations employing a generator on the input source designated Source 2. The generator start relay contacts are rated for 5 A, 1/6 HP @ 250 VAC. The DC rating is 5 A @ 30 VDC

  The Generator Contacts are powered separately in a power failure by a supercap and separate circuitry.

There are FOUR programmable Outputs (J4, 7-18) (See Page 16)

- FIXED/LOCKED Outputs provided by the factory. (Cannot be changed in the field)
- PROGRAMMABLE Outputs that are not used by factory supplied options.
- The display will show a fixed I/O as black instead of blue. The fixed I/O will also show up in the System Info Menu Screen.
- Additional I/O modules with 4 Inputs and 4 outputs are available. A maximum of FOUR additional modules may be used for a maximum of 20 inputs and 20 outputs.

ATC-900 I/O Module



I/O Module Description

- The I/O Module is an extension of the ATC-900 controller's programmable inputs and outputs.
- Each I/O Module has four inputs and four outputs. The inputs are internally wetted with 24 VDC. Up to four modules can be used with the ATC-900 and that will give the user up to 20 inputs and 20 outputs (including the controller's I/Os).
- Depending on the options selected with the transfer switch, some of the I/Os may be required to be fixed from the factory so that the user cannot change that particular input or output.
- The module(s) are interfaced to the controller using 485 communications with a picked address on the front of the unit.
- Each I/O module requires 120Vac for power.
- The I/O Module's is Din Rail mounted. Din Rail is furnished with the unit.

DCT Module Description (Integrated Metering)

- The DCT (Direct Current-Current Transformer) Module is a current transformer interface to the ATC-900 allowing current to be metered along with voltage and frequency that is already integrated into the controller.
- The DCT Module attaches to the ATC-900 back using four screws. A ribbon cable plugs in to J14.
- Using the DCT module and the ATC-900, the unit serves as a multifunction power meter and provides multifunction measurement of most electrical parameters.
- Using the DCT Module will allow multifunction measurements including:
    - Voltage
    - Current
    - Power
    - Frequency
    - Energy, etc.
- The information is displayed on the color display on the front of the ATC-900.
- Readings can also be monitored through the RS-485 modbus on the controller.
- The DCT Module also has a 24 VDC input for powering the ATC-900 controller. If 120 VAC and 24 VDC is supplied to the controller simultaneously, then the 120 VAC will be the powering supply.

ATC-900 with DCT module attached.

Ethernet Module Description

- The Ethernet Communications Module is an accessory that operates as a communicating device in conjunction with a the ATC-900 via an Ethernet network.
- The Ethernet Module provides Ethernet TCP/IP. It also provides alarms; command, event, and data logging, configuration of setpoint, alarm, and logging parameters, and control functions such as open/close output contacts..

ATC-900 Firmware Timers

Transfer Timers		Range	Factory Default
TD Normal to Emergency	TDNE	0-9999s (2:46:39)	0s
TD Emergency to Normal	TDEN	0-9999s (2:46:39)	5:00
TD Pre-Transfer		0-120s (2:00)	0:01
TD Post Transfer		0-120s (2:00)	0:10
Engine			
TD Engine Start S1	TDES 1	0-120s (** See IB)	0:03
TD Engine Start S2	TDES 2	0-120s (** See IB)	0:03
TD Engine Cooldown	TDEC	0-9999s (2:46:39)	5:00
TD Emergency Fail	TDEF	0-6s	0:06
Engine Test			
Engine Test Run Timer	TER	0-600min (10:00)	0:30

** TDES may be set for longer times IF the controller is powered by 24VDC

Notes:

1. There are separate Engine Test Timers for TDNE, TDEN and TDEC

ATC-900 Pickup / Dropout Setpoints

	Pickup	**Default**	**Dropout**	**Default**
Undervoltage	(dropout +2%) – 99% of NOMV	90%	70 – 90% of NOMV	80%
Overvoltage	103% of nominal to (dropout - 2%) (0 = disabled)	110%	105–120% of nominal (0 = disabled)	115%
Underfrequency	(dropout + 1 Hz) to 99% of nominal (0 = disabled)	96%	90–97% of nominal (0 = disabled)	94%
Overfrequency	101% to (dropout - 1 Hz) 104% (0 = disabled)	104%	103–110% (0 = disabled)	106%
Voltage Unbalance	3% to (dropout - 2%) (0 = disabled)	10%	5–20% of phase-to-phase voltage unbalance (0 = disabled)	20%
Phase Sequence	ABC, CBA, Off	Off		

ATC-900 Historical Data

Historical Data includes totalizing counters and date of last reset.

- Source 1 Available
- Source 1 Connected
- Source 2 Available
- Source 2 Connected
- Source 2 Engine Run
- Tier 4 Timer
    - EPA permits max 100 hours operation of the Source 2 Generator per year while NORMAL source is available. Use caution resetting this timer! (Reset ALL Timers includes Tier 4!)
- Load Energized
- Number of Transfers
- Event detail
- Event Data
- High Speed Captures

Programming I/O's

Input Choices

- **Remote engine test**
  Input to initiate a test to simulate a loss of power on Source 1

- **Bypass TDEN/TDNE timers**
  Remote capability to bypass TDNE/TDEN time delays

- **Preferred Source Selector**
  Input to change preferred source (Source 1 or Source 2)
  NOTE: You must first go to "Setpoints – System Setup (1 of 3)" and change Preferred Source to "External".

- **Go to Emergency (S2)**

  - When the external contact is closed, a transfer to the Emergency Source will be initiated.
  - If the Emergency Source should fail and the Normal Source is available, the ATC-900 will initiate a transfer back to the Normal Source (failsafe).
  - The ***Go To Emergency*** input is only active when either Source 1 or Source 2 is preferred. This input is not active when the Preferred Source selection is set to "None".
  - 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 de-activated.

- **ATS in Bypass**
  This input is ONLY used in a Bypass/Isolation Transfer Switch and is controlled by the PLC in the equipment. It will cause the display to show a message that indicates the controller is operating the BYPASS section of the equipment.

- **Auto / Non-Auto**
  Automatic Operation / Non-automatic Operation

- **Manual Retransfer**
  Initiate retransfer from the backup source to the preferred source. Depending on the preferred souce selection, retransfer can be from S1 to S2 or S2 to S1.

- **Manual Retransfer ON/OFF**
  Enable / Disable Manual Retransfer

- **Load Shed / S2 Inhibit**
  Operation on Source 2 is prohibited.

- **Go to "Center Off" position**
  Put the 3 position ATS in the OFF position so that neither source is connected to the load.

- **Lockout**
  The Lockout contact is closed to indicate normal, automatic operation. Opening this contact will inhibit all automatic operation. This feature is included when Non-automatic control is required. The ATC-900 continues to monitor source status and will accurately display status on the controller's MIMIC bus.

- **Monitor Mode**
  Disable automatic control. Controller continues to monitor sources and position.

- **Enable Manual re-transfer**

- **Manual retransfer**

  With manual operation set, a momentary closure allows the ATC-900 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 precedes automatically failsafe.
  NOTE: You must first go to "Setpoints – System Setup (2 of 3)" and change Manual Retransfer to "External".

- **Test**
  Initiate TEST sequence, Load or No Load. There are separate TDNE, TDEN, TDEC timers for the Test Function.

- **Slave**
  In a Master/Slave configuration for a three source system, the Slave ATS controls two generators. This input receives the Engine Start Signal from the Master ATS.
  NOTE: You must first go to "Setpoints – System Setup (2 of 3)" and change Operating Mode to "Slave".
  ADDITIONAL READING: See the discussion on Slave Operation on Page 34 of IB140012EN, "ATC-900 Master/Slave Implementation".

Fixed Outputs

- **Source 1 available (always provided)**
  - The ATC-900 will measure voltage and frequency and if they are measured in the envelope of the settings an Output will show that S1 is Available

- **Source 2 available (always provided)**
  - The ATC-900 will measure voltage and frequency and if they are measured in the envelope of the settings an Output will show that S2 is Available

Programmable Outputs

- **Source 1 connected**
  - Provides 1 form-c relay contact that indicates the position of the source 1 power switching device.

- **Source 2 connected**
  - Provides 1 form-c relay contact that indicates the position of the source 2 power switching device.

- **Load sequence**
  - Outputs provide the capability for sequential contact closure of up to 10 contacts after a transfer. A single adjustable time delay between each of the relay closures is provided. Operates using the configurable output contacts (form-c), Adjustable 0-120 seconds.

- **Selective load shed**
  - Provides an output contact that opens to shed a customer load if the measured kW value on generator exceeds the Load Shed kW setpoint value. The load will be picked up if the Load Restore setpoint is attained.

- **Load bank control**
  - Provides a remote output to disconnect a load bank if source 1 fails while the load bank is running.

- **Pre/post transfer**
  - Provides a signal prior to the transferring of the load. Will not transfer until the programmable delay set point in the controller is reached. If both sources are not available, this option will ignore the time delay set in the

controller. The time delay is programmable for 0-120 second pre transfer and 0-120 seconds post transfer.

- **Outputs (alarms)**

- **ATS not in automatic**
  - Provides remote indication that the ATS is not in automatic mode,

- **General alarm**
  - Failure to Transfer

- **ATS in test**
  - Provides remote indication that the ATS is currently running a test. The test could be initiated by the device panel engine test pushbutton or automatically using the programmed engine exercisor.

- **Engine test aborted**
  - Provides remote indication that an engine test has been aborted. If during engine test, if either S1 or S2 is removed, the output will be enabled. The ATC-900 event log contains detailed event information that can help assess the reason the test was aborted

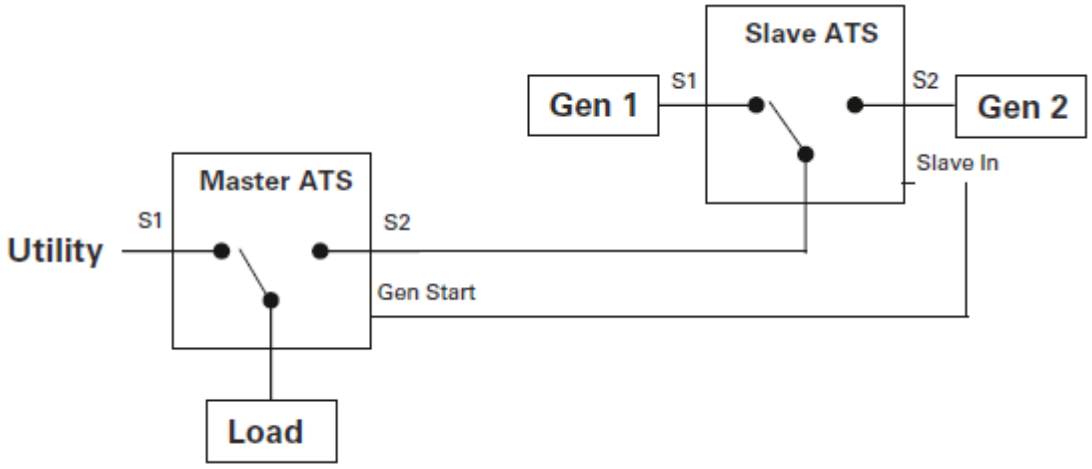
- **Cooldown in process**
  - Provides remote indication that an engine cooldown is in progess

- **Engine start contact status**
  - Provides remote indication that the engine start contact is calling for the generator to start.

- **Emergency inhibit on**
  - Provides remote indication that the emergency inhibit is on .

This functionality provides the user with the ability to control a three source system consisting of a utility and two generator sources.

- In a three source system, the Master ATS controls the engine starting and stopping of the Slave ATS. In the event of a source 1 power failure, the Master ATS engine start relay closes signaling the Slave ATS to start the preferred generator. (Note: The Slave ATS requires the DCT module for a DC power input.) The Master ATS handles all transfer time delays between the Utility to Generator transfer.
- If the preferred generator does not start within the programmed time delay, the Slave ATC-900 will signal the non-preferred generator to start.
- If “None Preferred” is selected, then both generators will start and the slave ATS will transfer to the first generator source available. The second generator will shut down after the ATC-900 senses the load is connected to an available source.

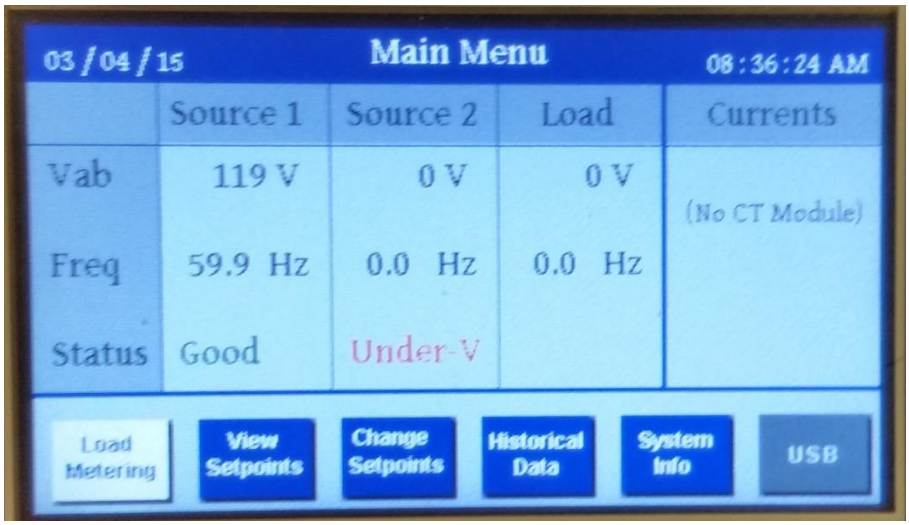


ATS Master / Slave Configuration

Lab 900-2: Menu Navigation and Features Programming

Part 1: Programming from the controller.

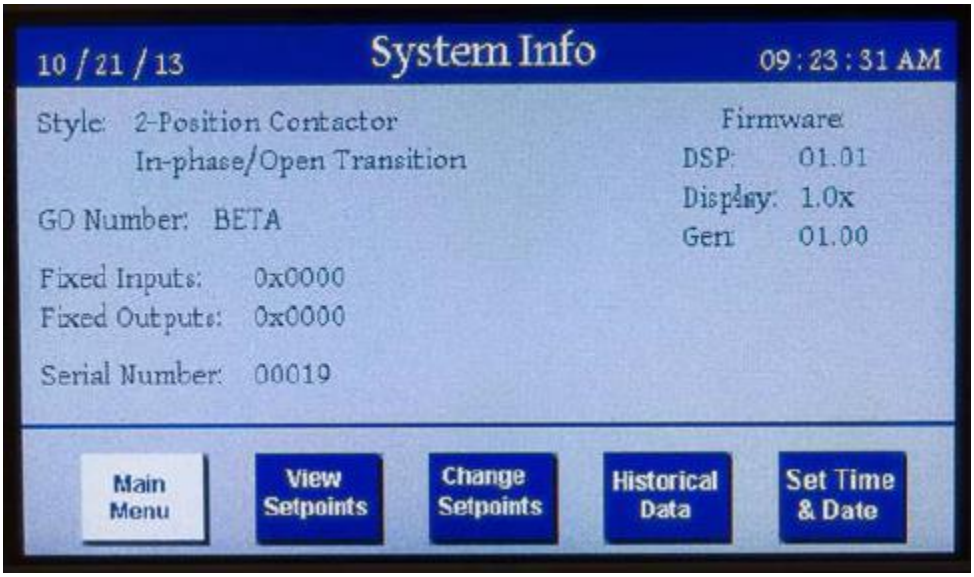
1. Set controls as follows:
   a. ***MAIN POWER*** "ON"
   b. ***SOURCE 1*** "ON"
   c. ***SOURCE 2*** "OFF"
   d. ***Inputs 1-4*** "OFF"
2. You should see the "Main Menu" similar to below.



3. Fill in the table below with your displayed values.

	Source 1	Source 2	Load
Vab	_____	_____	_____
Vbc	_____	_____	_____
Vac	_____	_____	_____
Freq	_____	_____	_____
Status	_____	_____	_____

4. Select “System Info”.
5. Press the ***Enter*** key.
6. You should now see a screen that looks like this:



7. Note the information available on this screen. What “Style” controller do you have in the demo? _____

   _____

Information on this screen CANNOT be changed in the field.

8. Press the ***Right Arrow*** key to select “View Setpoints”.
9. You will be able to navigate 3 screens by pressing ***Enter***
10. As you navigate the screens, answer how the following setpoints are configured
    a. Preferred Source _____
    b. System Voltage _____
    c. Manual Retransfer _____
    d. In-phase transition ON/OFF _____
11. Navigate back to the “Main Menu”

Program Customer Features: Set Input 1 and Input 2.

12. Turn the ***INPUT 1*** “On” and ***INPUT 2*** “ON””

13. Select “Change Setpoints” on the Controller.

14. You will need to enter the password (0900).

15. Select “Enter Password”

16. Select “Prog I/O”

17. Program ***INPUT 1*** for “Lockout”, and ***INPUT 2*** for “Remote Engine Test”

    a. Press ***Up*** or ***Down*** to select Input 1 (One or the other may get you there quicker!)

    b. Press ***Enter***. Item will change to RED.

    c. Press ***Up*** or ***Down*** to select “Lockout”

    d. Press ***Enter***

    e. Press ***Down*** to select Input 2.

    f. Press ***Enter***

    g. Press ***Up*** or ***Down*** to select “Remote Engine Test”

    h. Press ***Enter***

    i. Press ***Down*** until “Save” is lit on menu bar

    j. Press ***Enter*** and return to Main Menu

Part 2: Programming using the EASE software

In this section of the lab you will be using the EATON EASE configuration software utility. You will accomplish the following:

- Save the ATC-900 controller setpoints to your flash drive.
- Open the setpoint file from the flash drive using the EASE software on your computer.
- Monitor input settings and program new output settings.
- Change timer settings.
- Save the edited program.
- Load the newly created setpoint file into the controller.
- Be aware that whenever you load a setpoint file that changes settings, the controller automatically creates a backup file of the old settings on the flash drive.

1. Save the Controller Setup to a flash drive.

   Note: If you are going to install new setpoints it is ALWAYS best to start with the current settings in the controller to avoid accidentally changing a setpoint to something defaulted in the program.

   a. Insert the flash drive into the USB port on the ATC-900 demo.

   b. Using the ***RIGHT*** arrow key on the controller navigate to “USB”, press ***ENTER***.

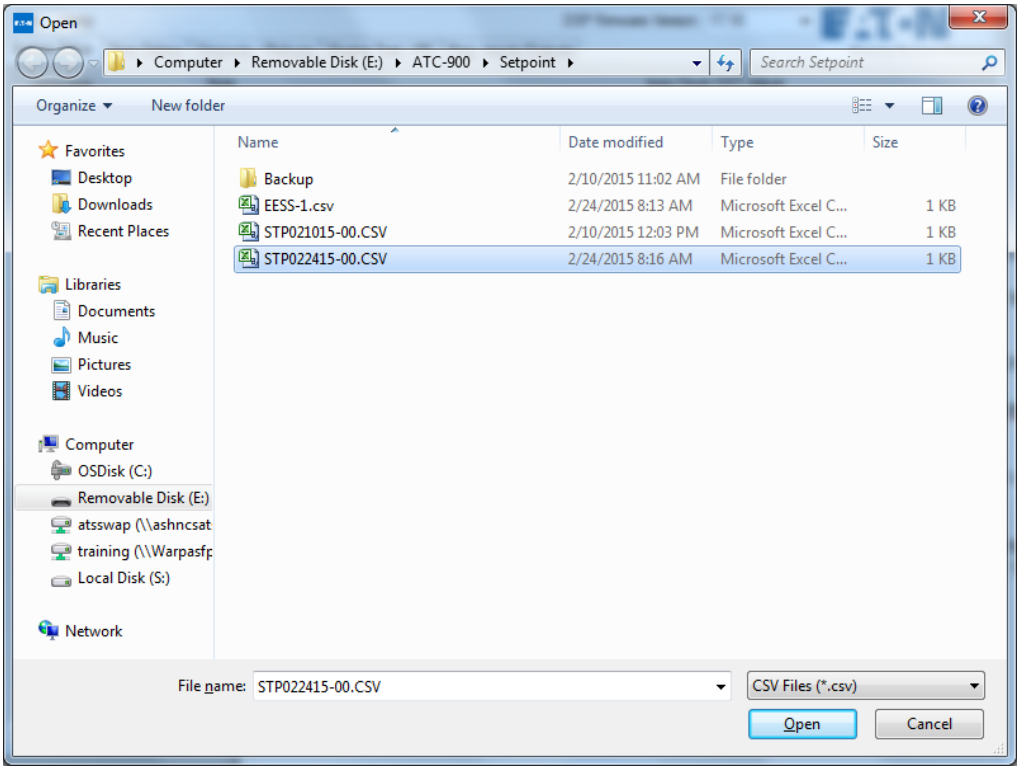
   c. Using the ***RIGHT*** arrow key navigate to “Save Setpoints”. Press ***ENTER***

      i. Note the file is saved in the format **STPmmddyy-xx**, xx is the sequence number.

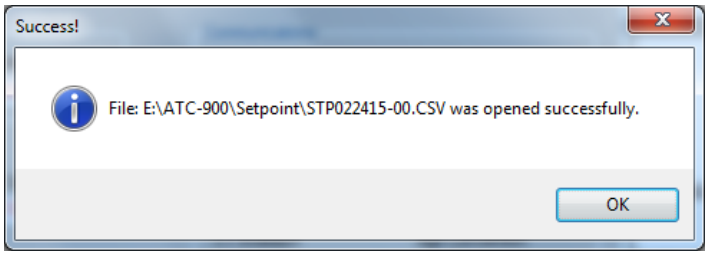
   d. Remove the flash drive from the USB port and place it in a USB port on your computer.

   e. Open the EASE program previously installed on your computer. Select FILE then OPEN. A window should open showing the ATC-900 file on your flash drive.

   f. Select the file you previously saved on the flash drive, similar to the screen below, then click “Open”.



g. You should get a window indicating the file was successfully opened.



h. Click “OK” and you will be on the EASE main screen.

i. Navigate to the “Prog Inputs/Outputs” tab and you should see your previously changed inputs indicating Input 1 is now “Lockout” and Input 2 is “Remote Engine Test”.

2. Using the EASE Program make ***OUTPUT 1*** a “PRE/POST TRANSFER TIME DELAY”, ***OUTPUT 2*** an “ALARM”, OUTPUT 3 “Source 1 Connected”, and OUPTUT 4 “Source 2 Connected".

3. Now that you have learned how to navigate the program, select “Time delays” and change TD Pre-Transfer” to 5 seconds and “TD Post-Transfer” to 5 seconds.

4. You must now save the new setpoint file.

NOTE: You may rename the file if desired, you may want to name it something that identifies it to the ATS you are working on.

5. After saving the file, close the EASE program, and remove the flash drive from your computer and place it in the USB port on the demo.

6. Load the newly created setpoint file into the controller.

7. Note that upon loading the edited STP file into the controller, a backup file of the previous setpoints is created on the flash drive. Remove the flash drive and record the name of the backup file and the directory in which it is located.

_____

Lessons Learned

1. Use the ***Left / Right*** arrow to navigate to the USB function.

2. Use the ***Up /Down*** arrows to select a file to load or save.

3. You must “Save” setpoints after changing them.

4. The EASE program makes field changes much easier, and makes a backup record of the previous setpoints

5. Always start with the setpoints in the controller before making changes! NEVER start with the defaults in the program.

6. ALWAYS make a copy of the setpoints file for the customer, and tell him to keep it in a safe place.

Lab 900-3: Demonstrate Operation of “LOCKOUT”

1. Set demo switches as follows:
    a. ***MAIN POWER*** “ON”
    b. ***INPUT 1*** “ON”
    c. ***INPUT 2*** “ON”
    d. ***SOURCE 1*** “ON”
2. Controller should have Source 1 Available, Preferred, and Connected LED’s lit. Screen should be on “Main Menu”
3. Turn ***INPUT 1*** “OFF”
4. What Happened?
    a. What color bar appears at the top of the display?_____
    b. What message? _____
    c. What is status of Output #2 (previously programmed as an Alarm) ? _____
5. Now turn ***SOURCE 1*** “OFF”
6. Wait approximately 5 seconds.
7. Turn ***SOURCE 2*** “ON”
8. Does the message still appear? _____

9. Did the ATS Transfer? _____

10. Turn ***SOURCE 1*** "ON"

11. Did the Alarm go away? _____

12. Turn ***INPUT 1*** "ON" (this clears the alarm condition)

13. Follow the instructions on the screen to reset the alarm.

14. Did Output #2 (Alarm) go off? _____

15. Turn ***SOURCE 2*** "OFF"

Lessons Learned

1. "Lockout" prevents further operation of the ATS
2. Resetting the Alarm cannot be done until the problem is cleared.

Lab 900-4: Demonstrate Operation of the Remote Engine Test Input.

Note: The engine test is programmed to do a load test for 1 minute.

1. Set controls as follows:
    a. ***MAIN POWER*** "On"
    b. ***SOURCE 1*** "On"
    c. ***Input 1*** and ***Input 2*** "ON"
2. Momentarily turn ***INPUT 2*** "Off", then back to "On". (This is done because we using a switch to simulate a pushbutton.) This initiates the Engine Test.
3. When message "Waiting for S2 Generator" appears, Turn ***SOURCE 2*** "ON".
4. Observe the transfer to "Source 2 Connected".
5. Abort the Engine Timer by pressing <Engine Test> One Time.
6. Observe the transfer to "Source 1 Connected".
7. When TDEC countdown has completed, turn ***SOURCE 2*** "OFF".

8. Press the ***RIGHT ARROW*** key to light up “Historical Data” on the Menu Bar.

9. Press ***ENTER.***

10. You are looking at Timer/Counters

11. “Event Summary” should be lit on the Menu Bar. Press ***ENTER***

12. Record the events related to your test. There should be six entries. Include Date, Time and Description.

    a. _____ _____ _____

    b. _____ _____ _____

    c. _____ _____ _____

    d. _____ _____ _____

    e. _____ _____ _____

    f. _____ _____ _____

13. Investigate specific details on some events.

    a. Use the ***UP/DOWN*** arrow to select “Open Transition to Source 2 Complete”.

    b. Record the 5 details about you event.

        1 _____ _____ _____

        2 _____ _____ _____

        3 _____ _____ _____

        4 _____ _____ _____

        5 _____ _____ _____

    c. Use the Enter pushbutton to view the Event Data on one of the details.

    d. Return to the main menu.

Lessons Learned

1. The Event Log shows a chronological list of events with the most current at the top that have occurred.

2. Some events present details as to timers and initiations.

3. Information may be helpful in analyzing issues with equipment.

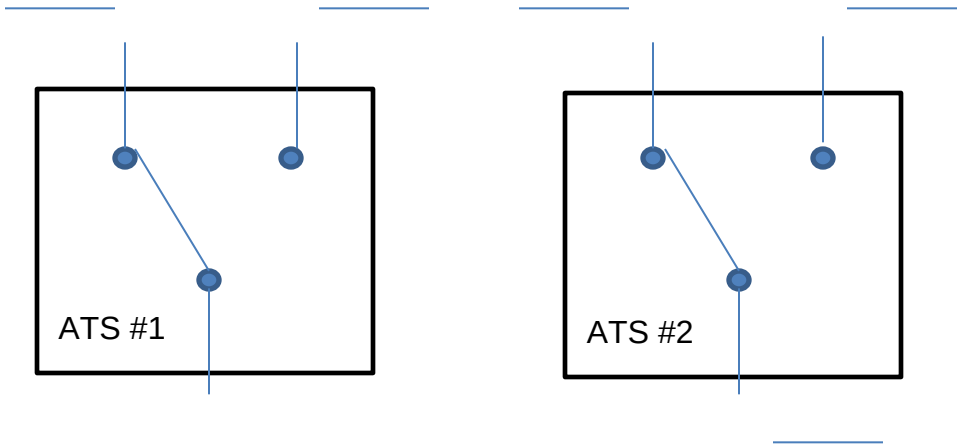
4. Pressing Engine Test will abort the Engine Test.

Lab 900-5: Change setpoints in the field per customer request.

Often in the field you may be asked to make setpoint changes by the engineer or the end customer to tailor the ATS to his/her system requirements.

In this particular case the customer has designed three source system using two transfer switches. You will be making some changes to **ATS #1 which the customer is using as a dual utility ATS**. His concern is that ATS #2 should switch to the backup generator before ATS #1 switches to the backup utility.

Label the source inputs and load, and show the interconnection between ATS#1 and ATS#2



Labels: **Util #1**, **Util #2**, **Gen**, **Load** and **ATS #1 Connect**

\

His choice is to increase the Voltage Pickups and Dropouts in ATS #1.

1. What is the potential issue with the ATS#1 default dropout set at 80% of Nominal (Same as ATS #2 which is the utlity/generator ATS)?

   _____

2. In order to demonstrate how the pickup and dropout values work in the classroom hook up the variable voltage supply for Source 1.
    a. Turn ***MAIN POWER*** "OFF" on the controller demo.
    b. You will need to remove the rear panel on the demo.
    c. Unplug P1/J1 (Source 1 Sensing) on the back of the controller. This is the plug at the top on the left side of the controller
    d. Insert the variable supply inline, then reconnect AC power to the controller demo.

3. To verify the default PU and DO values set the dial on the voltage supply to 90%,

4. Turn ***MAIN POWER*** "ON".

5. Set ***SOURCE 1*** to "ON".

6. Set ***SOURCE 2*** to "OFF".

7. Record the controller setpoint values for:
    a. System Voltage _____
    b. Undervoltage Dropout Source 1 _____
    c. Undervoltage Pickup Source 1 _____
    d. Return to the MAIN Menu

8. Using the variable voltage supply, turn the knob slowly to verify the S1 Pickup and dropout settings.

9. With S1 Available lit, slowly turn the Variac dial CCW. You will need to watch the Main Menu carefully when checking the dropout. Very shortly after the Source 1 Available and the Source 1 ON indicators extinguish the menu will go to a status screen waiting on S2 to become available. You do NOT need to turn on Source 2. Watch the indicated S1 voltage BEFORE the menu changes to the status screen.

10. Record the S1 dropout voltage. _____volts

11. Slowly turn the Variac control CW and when the Source 1 Available and Source 1 ON indicators light, STOP. Wait for the main menu and record the Source 1 Voltage displayed. This is the Pickup Voltage.

12. Record the S1 pickup voltage. _____volts.

13. Do these recorded values verify the values recorded above? _____

14. How else might you verify the PU and DO values? _____

15. The customer has requested that you change the default undervoltage pickup (90% x NOMV) and dropout (80% x NOMV) values. He wants the pickup to be 94% of Nominal, and the dropout to be 86% of Nominal on **BOTH** sources to insure the ATS transfers before ATS #2 starts and transfers to generator. Since the setpoints are set in volts, calculate the new values below:

    a. S1/S2 UV PICK = _____.

    b. S1/S2 UV DROP = _____

16. Reprogram the setpoints.

17. Repeat the verification step, and record the actual pickup and dropout values.

    a. New S1 UV DROP _____

    b. New S1 UV PICK _____

18. Were the values what you expected? _____

Lessons Learned

1. You must consider the SYSTEM and how pickups and dropouts can affect operation of the user system.

2. The history in the controller can provide useful information as to operation of the ATS.

Lab 900-6: Make customer requested Change.

Customer received ATS from the factory set up as a Utility / Generator ATS with Source 1 Preferred. He is going to use a dual utility feed, and wants a selector switch set up to select the preferred utility source.

1. ***INPUT 1*** "On"

2. ***INPUT 2*** "On"

3. ***MAIN POWER*** "ON"

4. ***SOURCE 1*** "ON"

5. ***SOURCE 2*** "ON"

6. Using the EASE Program

    a. Change the ATS to operate as a dual utility ATS. What System Setpoint has to change? _____

    b. Setup ***INPUT 3*** as a Preferred Source Selector Switch.

    c. Load the new setpoint file into the controller.

7. Following LED's should be lit: ***Source 1 Preferred, Available, and Connected*** and ***Source 2 Available.***

8. Turn ***INPUT 3*** to "ON".

9. Did the Preferred Source change to Source 2 and a transfer take place? _____

10. If not, what did you forget? (Hint: See the information on Programming I/O's earlier in the workbook.

11. What System setting needed to change?
    _____.

12. Did you fix the problem, and did turning ***INPUT 3*** to "ON" result in changing the preferred source and transferring to it? _____.

Lessons Learned

- Some features may require multiple setpoint changes.
- Number of generators controls how the Engine Start Contacts work.
- Always verify that your changes have achieved the desired results.

Lab 900-7: Demonstrate High Speed Captures

1. Set demo switches as follows:

    a. ***MAIN POWER*** "ON"

    b. ***SOURCE 1*** "ON"

    c. ***SOURCE 2 "OFF"***

2. Set the variac dial at “90” Check that the “S1 Available” LED is lit on the controller.

3. With a steady rotation turn the variac to “50” The “Source 1 Available” should extinguish.

4. Wait a few seconds then rotate the variac steadily back to “90”. The “Source 1 Available” LED should light.

5. Press the ***Right*** arrow key to “Historical Data” and press ***Enter***.

6. Press the ***Right*** arrow key to select “Hi-Speed Captures” and press ***Enter***.

7. You should see the top two “events” are:

    a. “Preferred Source Available”

    b. “Undervoltage”

8. Used the ***Down*** arrow key to select “Undervoltage” and press ***Enter***.

9. You should be looking at a graph of the UV “event”

10. What do the green and red lines on the graph indicate?

    a. Green: _____

    b. Red: _____

11. The blue line indicates graphed voltage indicate?
    _____

12. Go back to “High Speed Captures” and look at the “Preferred Source Available”

13. What caused the Source to be good? _____

14. If you have time, download the high speed capture data. Open the file in Excel® and graph the results.

15. Turn off the Main Power and disconnect the Variac Supply.

Troubleshooting

There are no circumstances where field repair of the ATC-900 controller should occur. Should it be determined that the controller is not operating properly it should be replaced.

It is a good idea to NOT assume a controller fault without further investigation.

The ATC-900 Instruction Booklet (IB140012EN), Section 6, “Troubleshooting and Maintenance” should be consulted for symptoms, probable causes, and possible solutions.

Symptom	Possible Cause	Possible Solutions
All front panel indicator LED's are off.	Control power is deficient or absent. ATC-900 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-900 is malfunctioning	Verify that control power is connected at J7 and that it is within specifications. Mechanical problem; No inputfrom limit switch. Replace the unit.
One or more voltage phases read incorrectly.	Incorrect wiring. ATC-900 is malfunctioning.	Verify voltage with multimeter. Check wiring. Replace the unit.
Front panel pushbuttons do not work.	Bad connection inside ATC-900.	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-900 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 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. Re-program Engine Test setpoint. Re-program Number of Generators setpoint.

Symptom	Possible Cause	Possible Solutions
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.
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.

If assistance is needed for troubleshooting or replacement contact Technical Support for Transfer Switches at:

1-877-386-2273

Option 2, Option 4, then Option 3

Or

1-900-809-2772

Option 4, then Option 3

Appendix A: Displayed Alarm Messages

Red Bar

(Clear condition and Reset)

Engine Test aborted
Failed to Sync - Phase Angle
Uncommanded Transfer
Closed Transition Fail (1->2)
Closed Transition Fail (2->1)
In-phase Transition Fail (1->2)
In-phase Transition Fail (2->1)
Open Transition Fail (1->2)
Open Transition Fail (2->1)
Generator Unavailable
Mechanical Fault
Electronics Fault
Failed to Sync - Frequency
Failed to Sync - Voltage
Source 1 Mech Failed to Open
Source 1 Mech Failed to Close
Source 2 Mech Failed to Open
Source 2 Mech Failed to Close
Overran Neutral (S1->N)
Overran Neutral (S2->N)
Factory Options Error
Setpoints Error
Cal factor Error
State Error
Timer Error
Clock Error
RAM test Error
ROM test Error
Watchdog
Self-test Error
Gen Start Communications
Acc I/O Communications

Yellow bar

(Auto reset on clear condition)

Overvoltage
Undervoltage
Underfrequency
Overfrequency
Voltage Unbalance
Phase Reversal
Plant Exerciser
Monitor Mode
Go To Emergency
Emergency Inhibit
Go To Neutral
ATS On Bypass
Slave Inactive

Appendix B: Status Display Messages

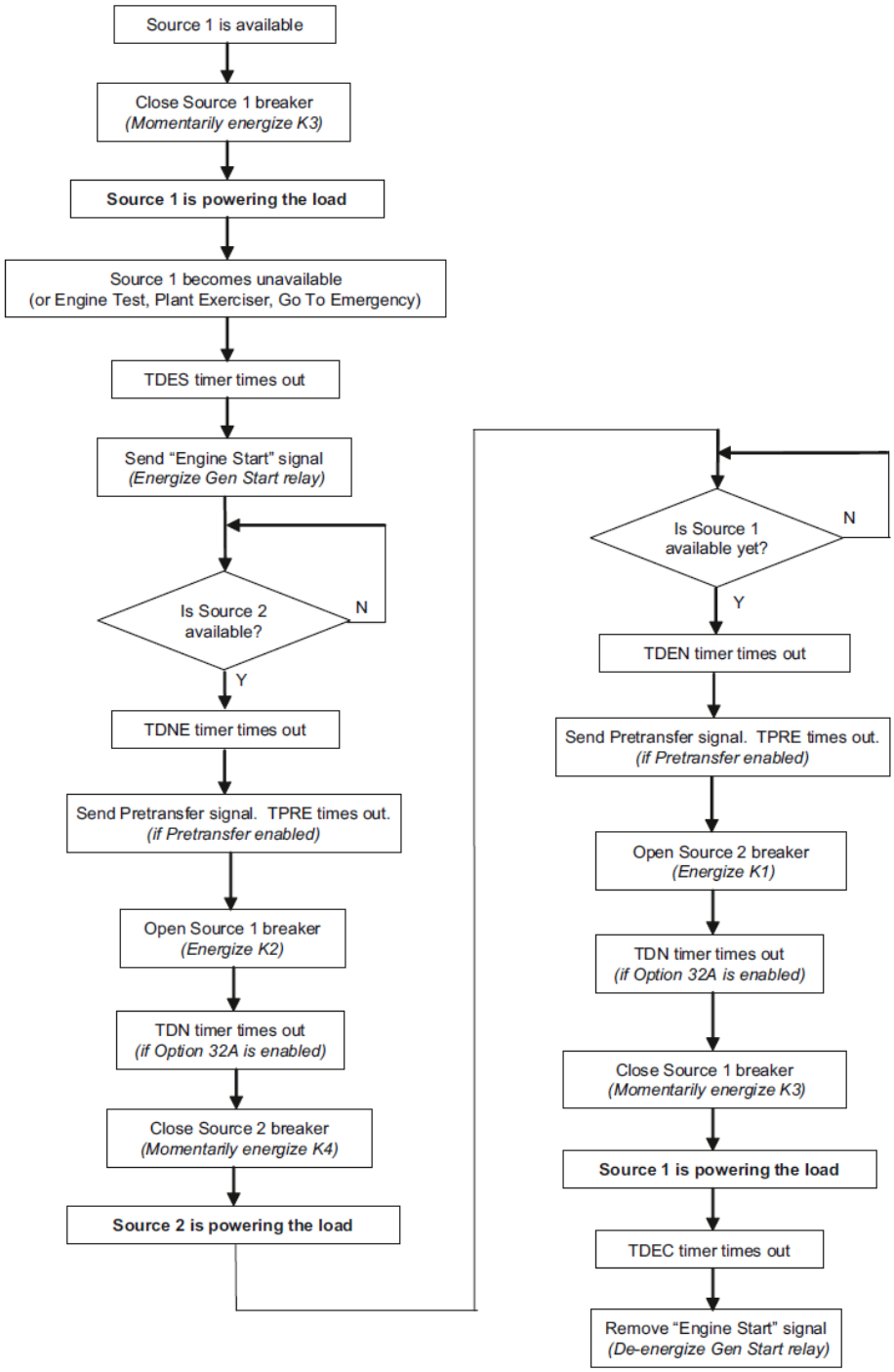
Status Display Message	Display Message Meaning
Time Delay Engine Cool	Countdown cool off timing before generator contacts are opened.
Time Delay Engine Start	Countdown timing before generator contacts are closed.
Time Delay Normal to Emergency	Countdown timing before normal breaker is opened for transfer to the emergency source.
Time Delay Neutral	Countdown timing with both sources disconnected from the load.
TXFR	Waiting for the switch to make the transfer from neutral position to the intended source.
Time Delay Emergency to Normal	Countdown timing before the emergency breaker is **to** opened for transfer to the normal source.
NEUTRAL	Both breakers or contactors are opened and the load is disconnected.
WAITING ON MANUAL	Waiting for an input signal to complete the manual re-transfer.
LOCK-OUT	A trip condition has been detected by either breaker (or contactor in the case of a contactor type ATS) and the system is locked-out from further transfers, The user must hit reset before the Lockout condition will be released..
Time Engine Run	The engine run test timer is counting down before the test is completed. Pressing the Engine Test ushbutton will abort this timer and the test.
START	To initiate an engine test sequence press Engine Test pushbutton again or press Increase and Decrease simultaneously to clear.
WAIT	Waiting for the generator source voltage and frequency to become available.

Time Delay Decay Normal Voltage	Waiting for load voltage to decay before completion of the transfer.
TDP	Countdown timing while waiting for a pre-transfer acknowledge input.
TSEQ	Countdown timing between sequenced loads.
WAIT NEUTRAL	Waiting for the neutral position to be reached by the switch.
WAIT S1	Waiting for Source 1 breaker (or contactor in the case of a contactor type ATS) to open/close during a closed transition.
WAIT S2	Waiting for Source 2 breaker (or contactor in the case of a contactor type ATS) to open/close during a closed transition.
Time Sync In-Phase	Countdown timing while waiting for sources to synchronize for an in-phase transition.
Time Sync Closed Transition	Countdown timing while waiting for source to synchronize for a closed transition.
ABORT	Indicates that an engine test or plant exercise was aborted after three unsuccessful attempts. The Emergency Source did not remain available while TDNE was timing.
INHIBIT	Indicates that a transfer to the Emergency Source is inhibited because the Emergency Inhibit input is activated.
S1 Breaker did not open/close	Indicates that the Source 1 circuit breaker failed to open or close.
S2 Breaker did not open/close	Indicates that the Source 2 circuit breaker failed to open or close.
S1 Contactor did not open/close	Indicates that the Source 1 contactor failed to open or close.

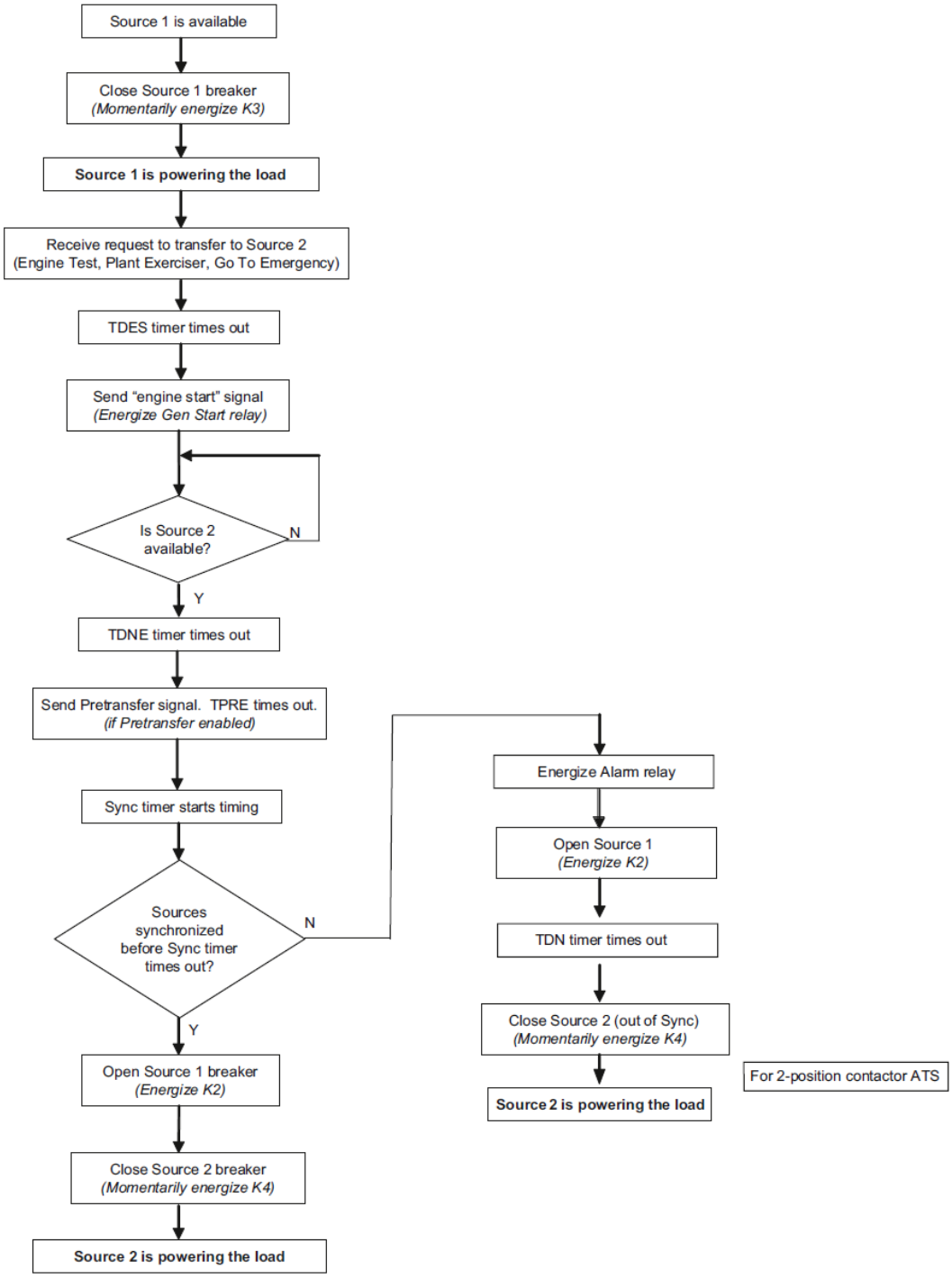
S2 Contactor did not open/close	Indicates that the Source 2 contactor failed to open or close.
Uncommanded Transfer	If a transfer is completed without the use of the controller i.e. manual transfer.
Engine Test Aborted	While in engine test, if either S1 or S2 is removed, the warning will display

Appendix C: Operational Flow Charts

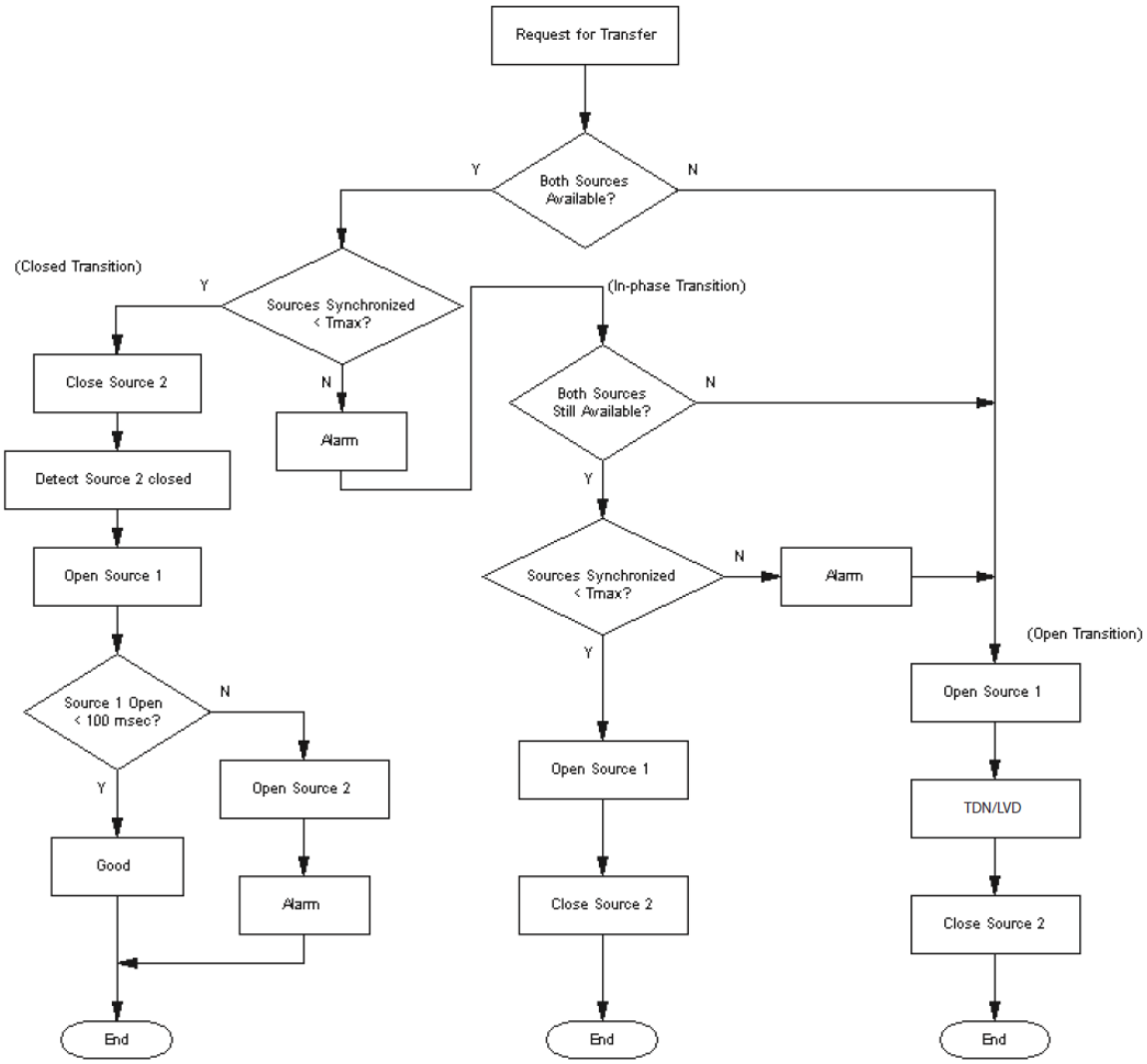
Utility - Generator Transfer Switch



In-phase Transition Implementation



Closed / In-phase / Open Transition Flowchart



Note: There are also other options for closed transition such as Closed Transition and Closed Transition to Load Decay or Time Delay Neutral.

Appendix D: ATC-900 Features/Setpoint Record Sheet

ATC-900 Programmable Features/Setpoints

Option					
Number	Description	Range	Factory Default	User 1	User 2
General settings					
--	Set New Password	0000 - 9999	0900		
--	Selected Language	English, French, Spanish	English		
--	Nominal Frequency	50, 60 Hz	As ordered		
--	Nominal Voltage	110 - 600V	As ordered		
--	Number of Phases	1, 3	As ordered		
--	Number of Generators	0,1,2	1		
--	Preferred Source	1,2,None	1		
--	PT ratio	n/a,2:1 - 500:1	As ordered		
--	CT ratio	n/a,200:5,5000:5	--		
--	Daylight Saving Time	On,Off	On		
--	Operating Mode	Stand-Alone / Master,Slave	Master		
--	Phase Sequence Check	ABC,CBA,Off	Off		
--	Commit in TDNE	Yes,No	No		
--	Manual Retransfer	Auto,Manual,External	Auto		
--	Modbus Address	1-247	1		
--	Modbus Baud Rate,Stop Bits,Parity	9600,1,Even	9600,1,Even		
		9600,1,Odd			
		9600,2,None			
		9600,1.None			
		19200,1,Even			
		19200,1,Odd			
		19200,2,None			
		19200,1,None			
Transition settings					
47	Closed Transition				
	Closed Transition	Disabled,Alarm,Open	As Ordered		
	Closed Voltage Differential	1-5% of NOMV	2%		
	Closed Freq Differential	0.0-0.3 Hz	.3 Hz		
32f/32d	Open-In phase Transition				
	In phase	Disabled,Alarm,Open	As ordered		
	In phase Freq Differential	0.0 - 3.0 Hz	1.0 Hz		
--	Synchronization Timer	1-60 minutes	5 minutes		
32a/32b	Open delayed Transition				
	Time Delay Neutral	0 - 10 minutes	0		
	Load Voltage Decay	2-30% of Nominal Voltage	6%		
Time Delays					
1A	Time Delay Normal to Emergency	0-9999 seconds (2:46:39)	0.00.00		
3A	Time Delay Emergency to Normal	0-9999 seconds (2:46:39)	0:05:00		
35A	Time Delay Pretransfer	0-120 seconds (2:00)	0:01		
35C	Time Delay Post Transfer	0-120 seconds (2:00)	0:10		
2A	Time Delay Engine 1 Start	0-120 seconds (0:02:00) **	0:00:03		
	Time Delay Engine 2 Start	0-120 seconds (0:02:00) **	0:00:03		
	** TDES MAY be set for over 2 minutes if the controller is externally powered				
	Range with External Power	0-259 minutes (4:19:00)			
	If TDES is set for longer than 0:02:00 with no external power				
	Engine Start Contact will close in 0:02:00				

4A	Time Delay Engine Cooldown	0-9999 seconds (2:46:39)	0:05:00		
7A	Time Delay Engine Fail	0-6 seconds	:06		
--	Voltage Unbalance Time Delay	10-30 seconds	:20		
Source Settings					
26P	Source 1 undervoltage dropout	70-97% of Nominal Voltage	80% of Nom		
	Source 1 Undervoltage Pickup	(dropout +2%) - 99% of Nom	90% of Nom		
5P	Source 2 Undervoltage Dropout	70-97% of Nominal Voltage	80% of Nom		
	Source 2 Undervoltage Pickup	(dropout +2%) - 99% of Nom	90% of Nom		
26K	Source 1 Overvoltage Dropout	105-120% of Nominal Volt	115%		
		(0 / OFF = Disabled			
	Source 1 Overvoltage Pickup	103-(Dropout -2%) of Nom	110%		
		(0 / OFF = Disabled			
5K	Source 2 Overvoltage Dropout	105-120% of Nominal Volt	115%		
		(0 / OFF = Disabled			
	Source 2 Overvoltage Pickup	103-(Dropout -2%) of Nom	110%		
		(0 / OFF = Disabled			
26J	Source 1 Underfrequency dropout	90-97% of Nominal Freq	94%		
		(0 / OFF = Disabled			
	Source 1 Underfrequency Pickup	(Dropout +1Hz) - 99% of Nom	96%		
		(0 / OFF = Disabled			
5J	Source 2 Underfrequency dropout	90-97% of Nominal Freq	94%		
		(0 / OFF = Disabled			
	Source 2 Underfrequency Pickup	(Dropout +1Hz) - 99% of Nom	96%		
		(0 / OFF = Disabled			
26N	Source 1 Overfrequency Dropout	103-110% of Nom	106%		
		(0 / OFF = Disabled			
	Source 1 Overfrequency Pickup	101% - (dropout - 1Hz) of Nom	104%		
		(0 / OFF = Disabled			
5N	Source 2 Overfrequency Dropout	103-110% of Nom	106%		
		(0 / OFF = Disabled			
	Source 2 Overfrequency Pickup	101% - (dropout - 1Hz) of Nom	104%		
		(0 / OFF = Disabled			
26L	Source 1 Unbalance Dropout	5-20% of Nominal Voltage	20%		
		(0 / OFF = Disabled			
	Source 1 Unbalance Pickup	3% - (dropout - 2%) of Nom	10%		
		(0 / OFF = Disabled			
5L	Source 2 Unbalance Dropout	5-20% of Nominal Voltage	20%		
		(0 / OFF = Disabled			
	Source 2 Unbalance Pickup	3% - (dropout - 2%) of Nom	10%		
		(0 / OFF = Disabled			
Engine Test / Plant Exerciser (PE1 / PE2 are independently programmable)					
6B	Engine Test Pushbutton on Controller				
	Test Mode	No Load, Load Transfer, Disabled	Load Transfer		
	Engine Run Test Time	0-600 minutes (10:00)	30min (0:30)		
23M	PE Time Delay Normal to Emergency	0-9999 seconds (2:46:39)	0:01:00		
	PE Time Delay Emergency to Normal	0-9999 seconds (2:46:39)	0:01:00		
	PE Time Delay Engine Cooldown	0-9999 seconds (2:46:39)	0:05:00		
	PE1/PE2 Test Mode	No Load, Load Transfer, Disabled	Disabled		
	PE1/PE2 run time	0 - 600min (10:00)	30min (0:30)		
	PE1/PE2 Schedule	Off, Daily, 7-day, 14 day, 28 day			
		or calendar date (up to 12)			
	PE1/PE2 Plant Start Time	HH:MM AM/PM			