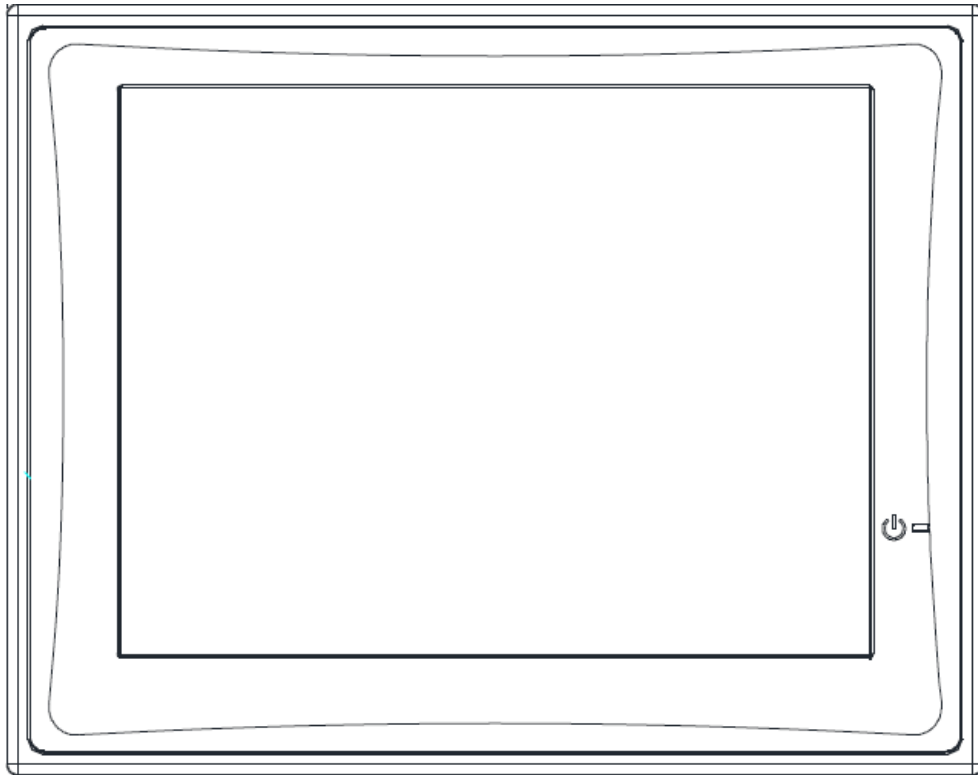

1.0 Overview

The 7" RAC is a color touch-screen display with easy-to-use functions that provide a powerful interface with up to 8 Automatic Transfer Switches equipped with the ATC-900 controller. It supports serial RS-485 Modbus RTU and Modbus TCP/IP natively. When using Ethernet to connect to an ATC-900, a serial-to-Ethernet Modbus gateway is required such as the PXG-900 or the ELC-CAENET.



The 7" RAC Kit contains the following:

- HMIVU07CUNBE (7" Color HMI Display)
- IL04801003E (HMI Instruction Leaflet)
- IB01602080E (Ethernet Setup Document)
- ELC-PS01 or 02 (Optional 24VDC power supply)
- IB140010EN (This Instruction Sheet)
- 66A8395, E, or EM (HMI Wiring Diagram)
- 66A8448H02 (HMI Interconnect Module – serial connections only)

2.0 Features

There are three types of features incorporated into the ATC-900 RAC: Status, Control, and Setpoint Editing.

Status Indicators

- **S1 / S2 Available**
- **S1 / S2 Preferred**
- **S1 / S2 Connected**
- **S1 / S2 Status (Under/Over Voltage, Under/Over Frequency, etc.)**
- **Emergency Inhibit**
- **Lockout / Monitor Mode**
- **Closed on Emergency**
- **Go to Emergency Active**
- **Engine Test Active**
- **Transfer in Progress**
- **Source 1 Voltage Metering**
- **Source 2 Voltage Metering**
- **Load Voltage Metering (includes Current if DCT module is installed)**
- **Waiting for Manual Retransfer**
- **History of Events**
- **Active Timer**

Control Pushbuttons

- **Go to Emergency / Cancel Go to Emergency**
- **Start / Stop Engine Test**
- **Alarm Silence**
- **Remote Alarm Reset**
- **Bypass Timers**
- **Manual Retransfer**

3.0 Setup and Wiring

The RAC requires 24VDC power with a minimum current of 360 mA (See “A” below). There is a terminal block connector on the back of the unit to install wires for the power. The software comes preloaded onto the unit according to your switch configuration, and should require no user programming.

The RAC supports Modbus RTU (serial RS-485) and Modbus TCP/IP (Ethernet). However, since the ATC-900 controller only supports serial Modbus, an RS-485 serial-to-Ethernet gateway must be used for Modbus TCP/IP. Eaton recommends using the ELC-CAENET module or a Power Xpert Gateway (PXG-900).

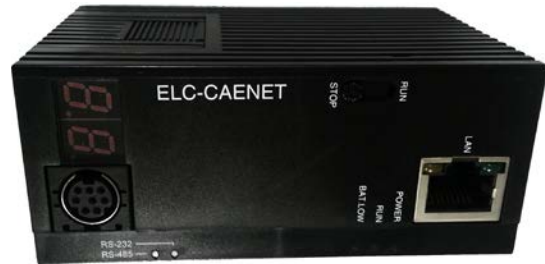
Drawing 66A8395 shows the wiring of the unit over serial Modbus. Consult drawing 66A8395E (or EM) when using Ethernet gateways. All RS-485 serial cable must have three insulated conductors (D0, D1, COM) and one ground (drain) connected to the

shielding of the cable. The Eaton recommended cable is Belden 3106A. Ethernet cable may be any CAT5/6 certified cable.

Note: multiple Modbus Ethernet gateways may be used to further expand the communication flexibility of the system. Drawing 66A8395EM should be referenced for wiring of multiple gateways.

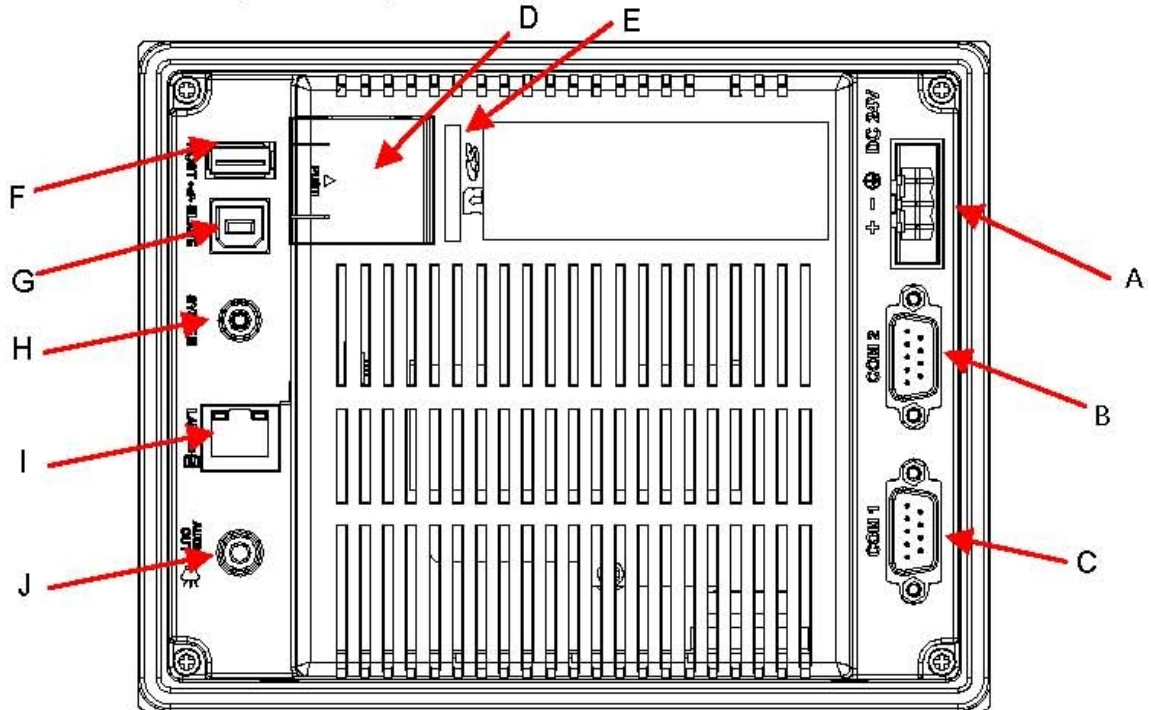


PXG-900 Ethernet Gateway



ELC-CAENET Ethernet Gateway

HMIVU07CUNBE (Rear View)



A	Power Input Terminal	F	USB Host
B	COM2 and COM3 ^(Note1)	G	USB Slave
C	COM1	H	System Button
D	Battery Cover	I	Ethernet Port
E	Memory Card Slot	J	Audio Output Port

NOTE

1. Refer to the Pin Definition for Communications section for simultaneous use of COM2 and COM3.

3.1 ATC-900 Setup

The communication setpoints on each ATC-900 need to be set as follows:

Baud Rate: 9600, 1-stop, Even

Address: 01, 02, 03, 04, 05, 06, 07 or 08 (each ATC-900 must be unique)

Termination SW1: Normally OFF. Should be ON for last controller in the chain only if using a 120 Ohm resistor on the opposite end of a communication daisy-chain.

3.2 RAC Setup

Your HMI is factory set with communications disabled for all controllers, and must be enabled during startup. To enable communications, press on any disabled controller from the Overview screen (or the “System Setup” button on the Controller screen if you have a single-view HMI). Enter your password (default of 0900). A list of available controller com links will appear. To name a controller, press the “Edit” button next to the corresponding controller. To enable communications to a controller, press the red “Disabled” button under the Coms column; it will change green and display “Enabled”. To disable communications to a controller, press the green “Enabled” button; it will change back red and display “Disabled”. More detail can be seen in section 4.0 below.

To change your ATC-900 Setpoints, simply press the orange “Edit ATC # Setpoints” button, and you will be taken to the first setpoint screen. See section 4.6 for more details.

You can also change items like HMI touch screen force, touch screen calibration, time & date, brightness & contrast, alarm & touch volume, and others. To do this, you have two options:

The first is to simply press the small SYSTEM button on the back of the unit for two seconds. The system menu will now be displayed on the screen. The menus are self-explanatory but if additional help is required, consult the manual on the Eaton website called “HMiSoft User Manual” IL04801003E.

The second option is to enter the “System Setup” screen again and press the “HMI Setup” button. This is useful if the back of the unit is not easily accessible.

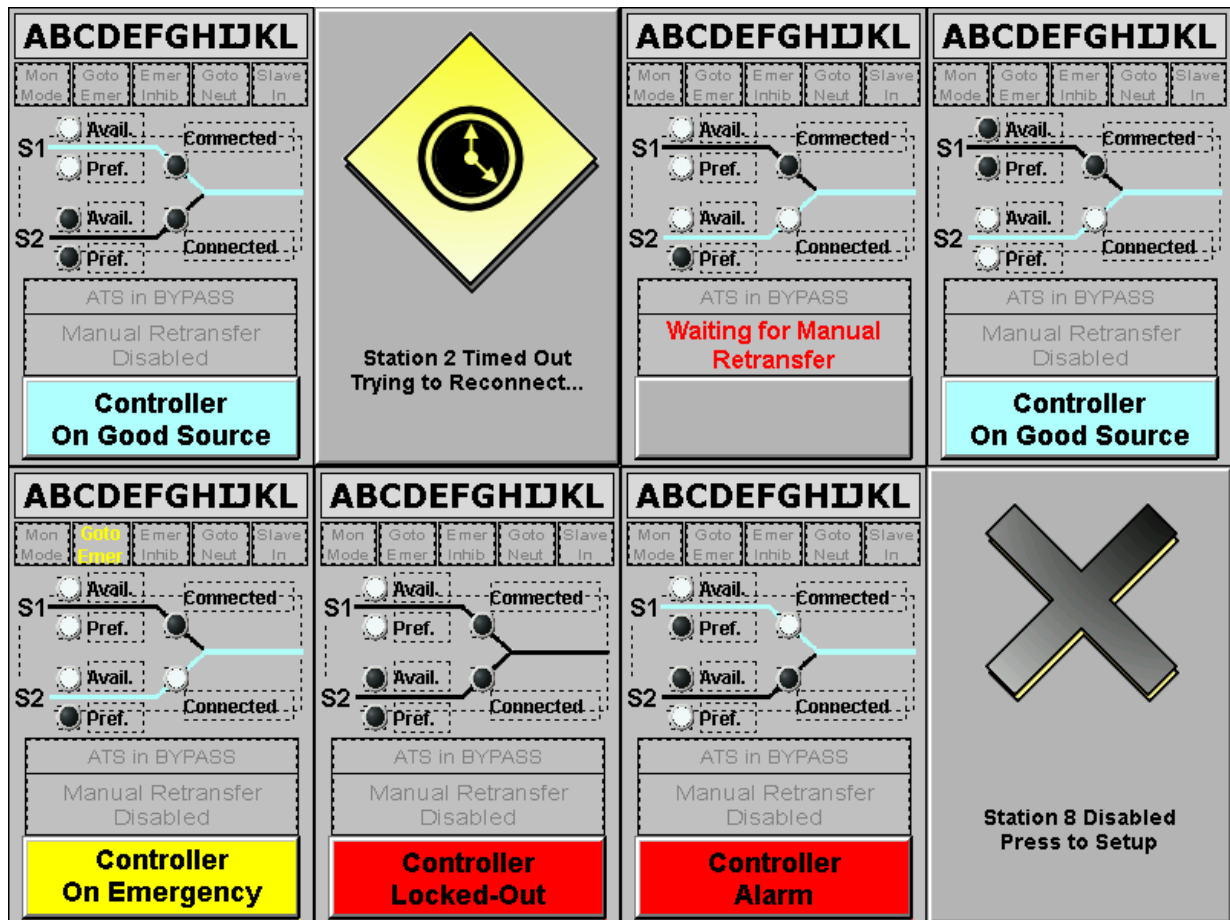
4.0 HMI Screens

The RAC has a total of 6 screens (5 if using single-view firmware). The following is a summary of the available screens and their function:

- **Overview** – In a multi-view system, this shows the status of all controllers at once. *This screen is not included if you have a single-view firmware HMI.*
- **Controller View** – Shows a more detailed view of a single controller and gives limited control functionality.
- **Trend Data (S1/S2/Load)** – Shows trend data (voltage, frequency, unbalance, and load current) for each of the sources and load.

- **Alarms and Events** – Shows the user a time and date-stamped list of certain events and alarms.
- **System Setup** – Allows naming, enabling/disabling coms, and setpoint editing of each controller along with password and HMI setup.
- **Controller Setpoints** – Allows editing of every available setpoint on the ATC-900 controller.

4.1 Overview Screen

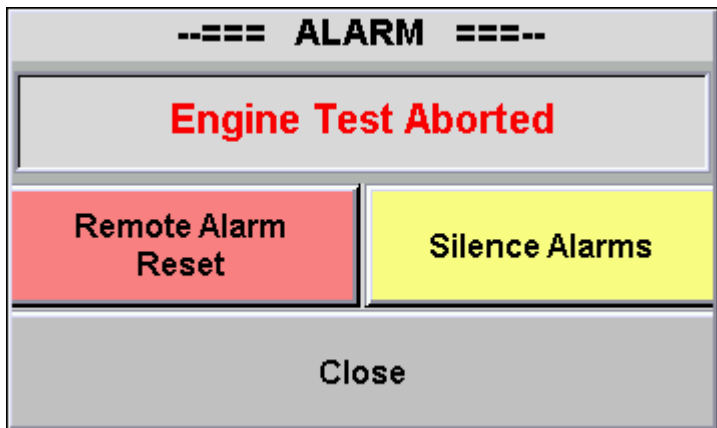


The Overview screen (only available with multi-view firmware HMI) shows the current status of up to 8 ATC-900 controllers. In the example above, Station 1 is communicating and shows power connected through S1. Station 2 has timed out and is trying to reconnect automatically. Station 4 is connected to S2 (preferred source). Stations 5, 6, and 7 all have various alarm conditions which are displayed by the status window below each station. Station 8 is disabled per the user.

To view more details and controls for any communicating controller, press anywhere inside the summary window of the desired controller. This will take you to the Controller View screen (section 4.2) for that particular controller.

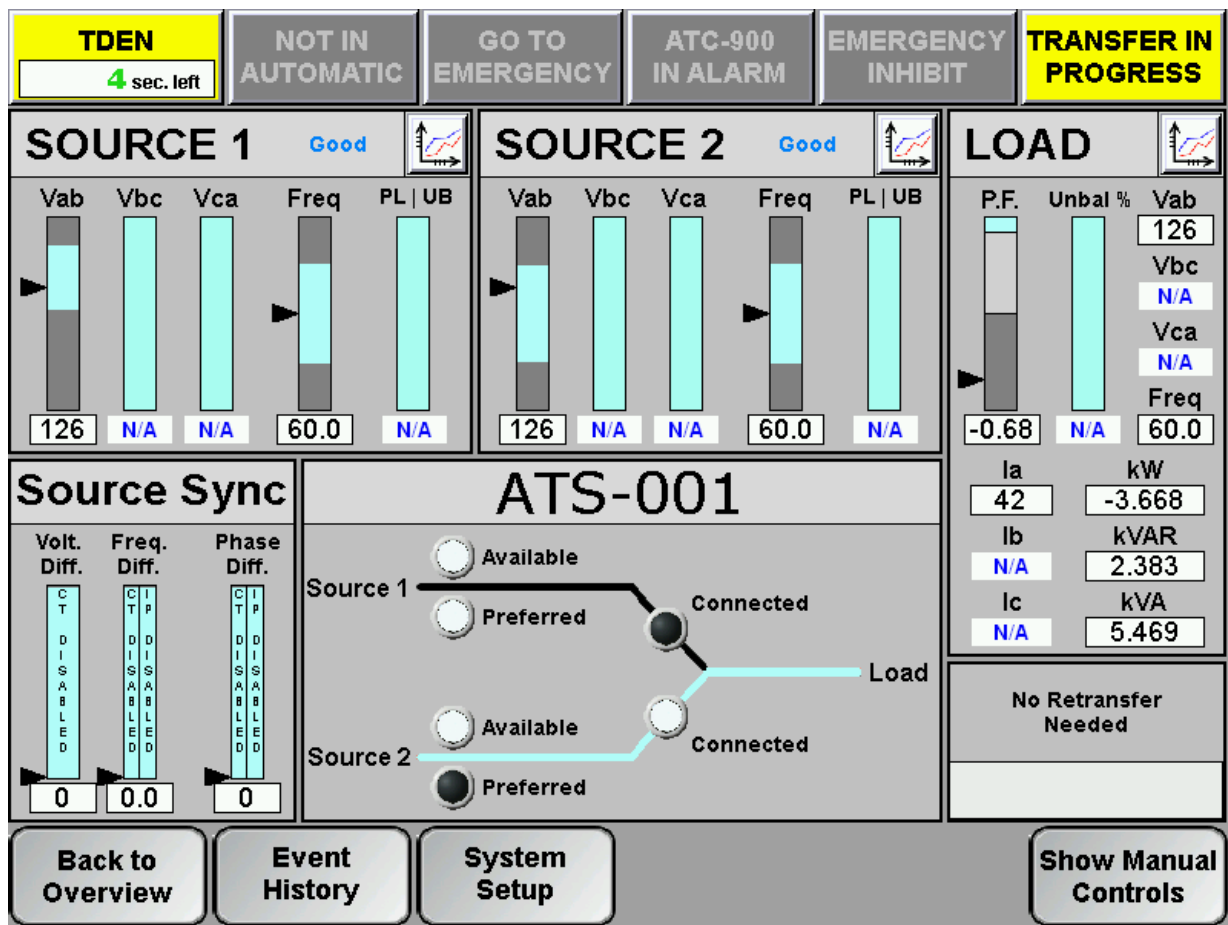
To enable/disable controllers, press on any disabled station window and enter your password. See section 4.4 for more information on the System Setup screen.

If any controller has an Alarm condition, an audible alarm will sound from the HMI. To view the alarm, press on the alarmed controller window. Once you are on the Controller View screen, an alarm popup window should be displayed. To silence the alarm, press “Silence Alarms” button. To perform a remote alarm reset, press the “Remote Alarm Reset” button. To close the alarm popup, simply press “Close”.



To view the alarm popup window again at any time, press the “ATC-900 IN ALARM” indicator on the Controller View screen.

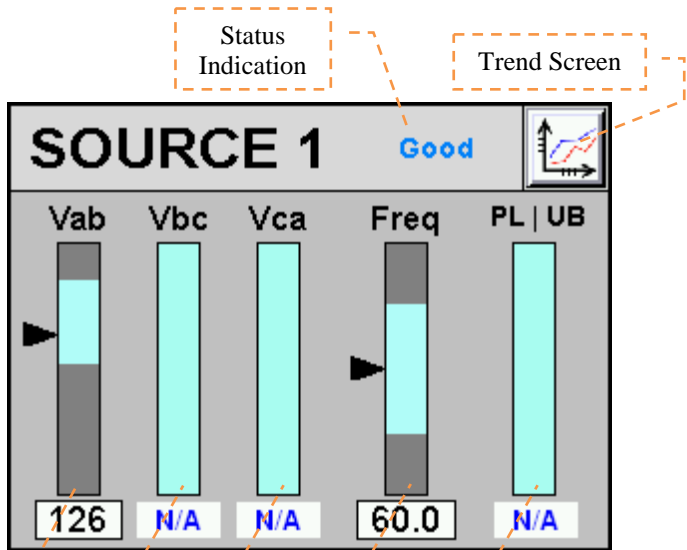
4.2 Controller View Screen



The Controller View shows a much more detailed view of a single controller. *Note: this will be the default screen for a single-view firmware HMI.* The top area contains a

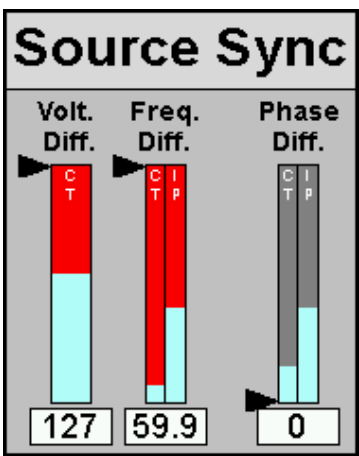
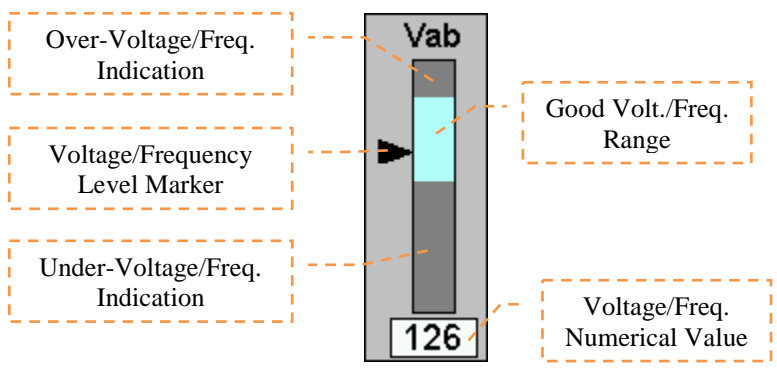
status grid with 6 indicators. Status indicators change from gray to a yellow or red color when active.

Below the status indicators are the Source 1, Source 2, and Load detail windows. These windows include graphical and numerical representations of voltage, frequency, and phase loss/unbalance as well as status indication and a trend screen button (Section 4.5). If your controller has a DCT Module add-on, you will see additional Load metering including kilowatts, kVAR, kVA, power-factor, and three-phase current.



Voltage/Freq./Phase-loss/Unbalance Indicators

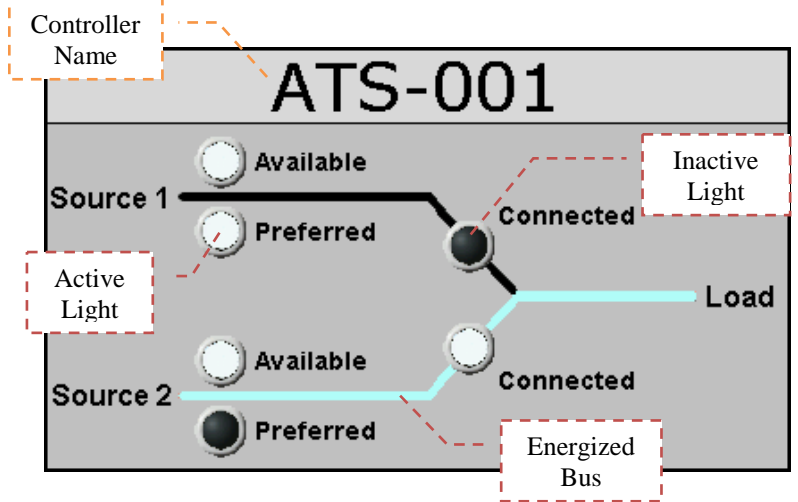
The voltage, frequency, phase-loss, and unbalance indicators have been designed to show a quick graphical representation of how 'healthy' the source is. The top grey area indicates the Over-voltage or frequency dropout range. The bottom grey area indicates the Under-voltage or frequency dropout range. The middle light-blue area indicates the "good" range. These areas resize dynamically depending on how the dropouts are set in the ATC-900's setpoints. If the voltage or frequency reaches the upper or lower ranges, they will turn from grey to red, indicating a problem. Note that the numerical value will change to "N/A" if the value is ever invalid (e.g. Vbc, Vca, and Unbalance in a single-phase system.)



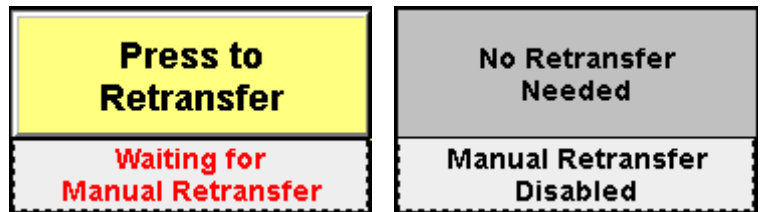
Below the Source 1, Source 2, and Load status windows is the Source Sync window. On three-phase systems, this window will display how far apart the two power sources are from each other. The difference is given in Volts, Frequency, and Phase. When closed transition or in-phase is enabled on the ATC-900, the allowable range will be shown on the bar graph. If the difference is higher than the allowable range, it will turn from grey to red, indicating that it is not okay to do an in-phase or closed transition at that time.

Note that there are different indicators for closed (CT) and in-phase (IP) transitions for Frequency and Phase Difference.

To the left of the Source Sync window is the Mimic Bus window. This window acts identically to the mimic bus on the System Overview screen. The upper banner displays the name of the selected controller. The bus area shows which source is available, preferred, and connected. Active lights are white, while inactive lights are black. The currently energized bus is depicted by a light-blue colored line.



To the right of the Mimic Bus area is the Manual Retransfer window. This area indicates whether manual retransfer is enabled or disabled, as well as alerting the user if the ATC-900 is waiting for a manual retransfer signal. The manual retransfer can be initiated remotely by pressing the button labeled “Press to Retransfer” when it appears on the HMI.



The bottom area of the screen shows navigation buttons along with the “Show Manual Controls” button. The “Back to Overview” button navigates to the Overview Screen (Section 4.1). *Note: this button is not available in the single-controller firmware.* The “Event History” button navigates to the Alarm/Events Summary screen (Section 4.3). The “System Setup” button navigates to the System Setup screen (Section 4.4).



The “Show Manual Controls” button expands a small area with 3 control buttons: Go to Emergency, Bypass Timers, and Start Engine Test. All control is password protected except Bypass Timers. To hide the manual controls, press the “Hide Manual Controls” button.

Engine Test Button

To initiate an engine test from the RAC, press the Start Engine Test button and enter your password. The ATC-900 will signal the generator to start. Once the generator has reached nominal voltage, it will run until the Engine Test Run Time expires (adjustable in the ATC-900). If your ATC-900 is programmed for Load Transfer, then

it will also transfer your load to the generator during the engine test. To abort the test early, push the Cancel Engine Test button on the RAC.

Go to Emergency Button

To initiate a go to emergency command from the RAC, press the Go to Emergency button and enter your password. The ATC-900 will initiate a transfer to your non-preferred (emergency) source. To go back to your preferred (normal) source, push the Cancel Go to Emergency button. If you have Manual Retransfer enabled, the “Press to Retransfer” button will appear (see below).

Manual Retransfer Button

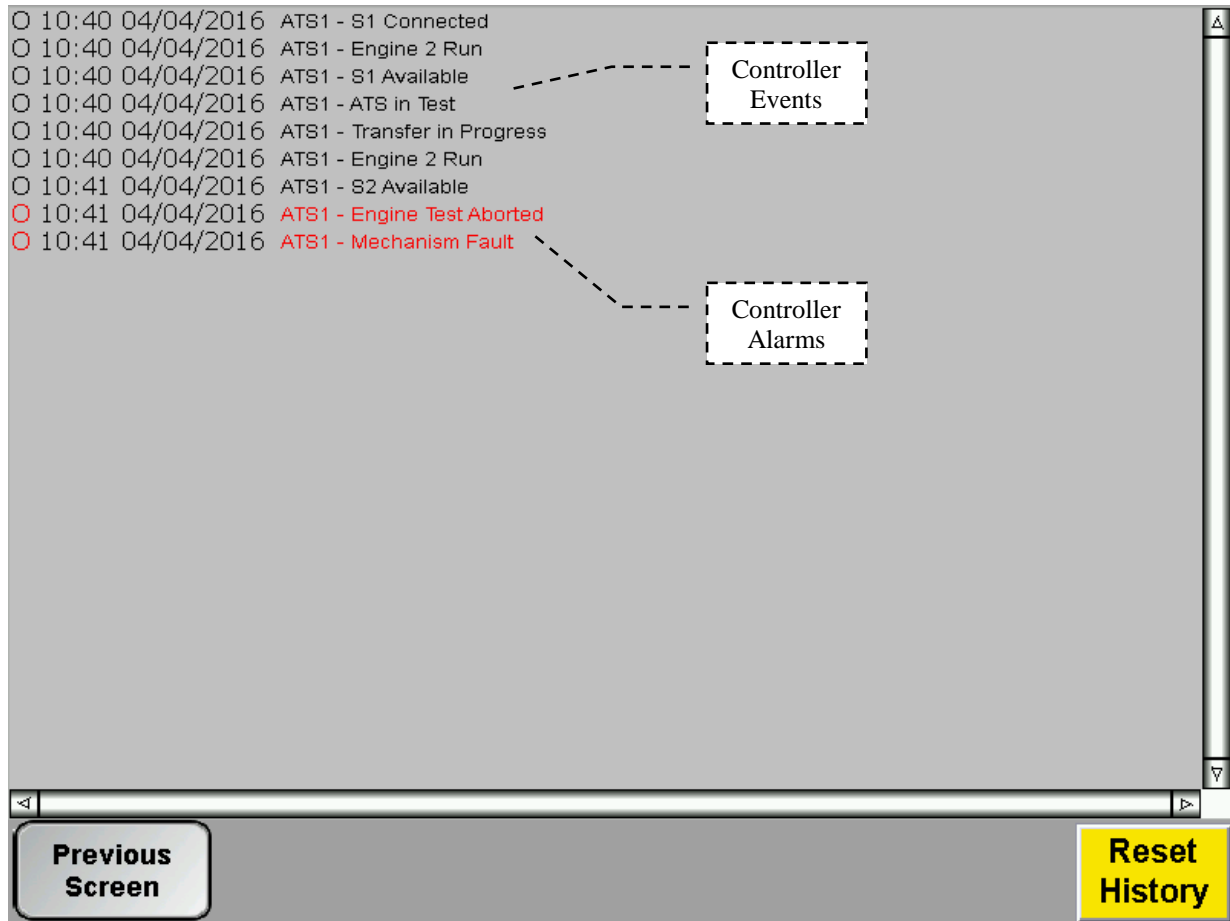
The Manual Retransfer button allows the ATC-900 to transfer back to the preferred (normal) source. It functions the same as the physical Manual Retransfer pushbutton located on the ATS front device panel (if equipped). *Note: this RAC pushbutton is only visible when the ATC-900 is waiting for a manual retransfer input, otherwise it will not appear. If manual retransfer is disabled on the ATC-900, the button will never be displayed.*

Bypass Timers Button

The Bypass Timers button allows the user to skip a currently active timer. While a timer is counting down, simply press the button, and it will be bypassed. This button works for the following timers:

Time Delay Normal-to-Emergency (TDNE)
Time Delay Emergency-to-Normal (TDEN)
Time Delay Neutral (TDN)
Time Delay Engine Start (TDES)
Time Delay Engine Cooldown (TDEC)
Time Delay Pre-transfer (TDPRE)
Time Delay Post-transfer (TDPOST)

4.3 Alarm and Events Screen



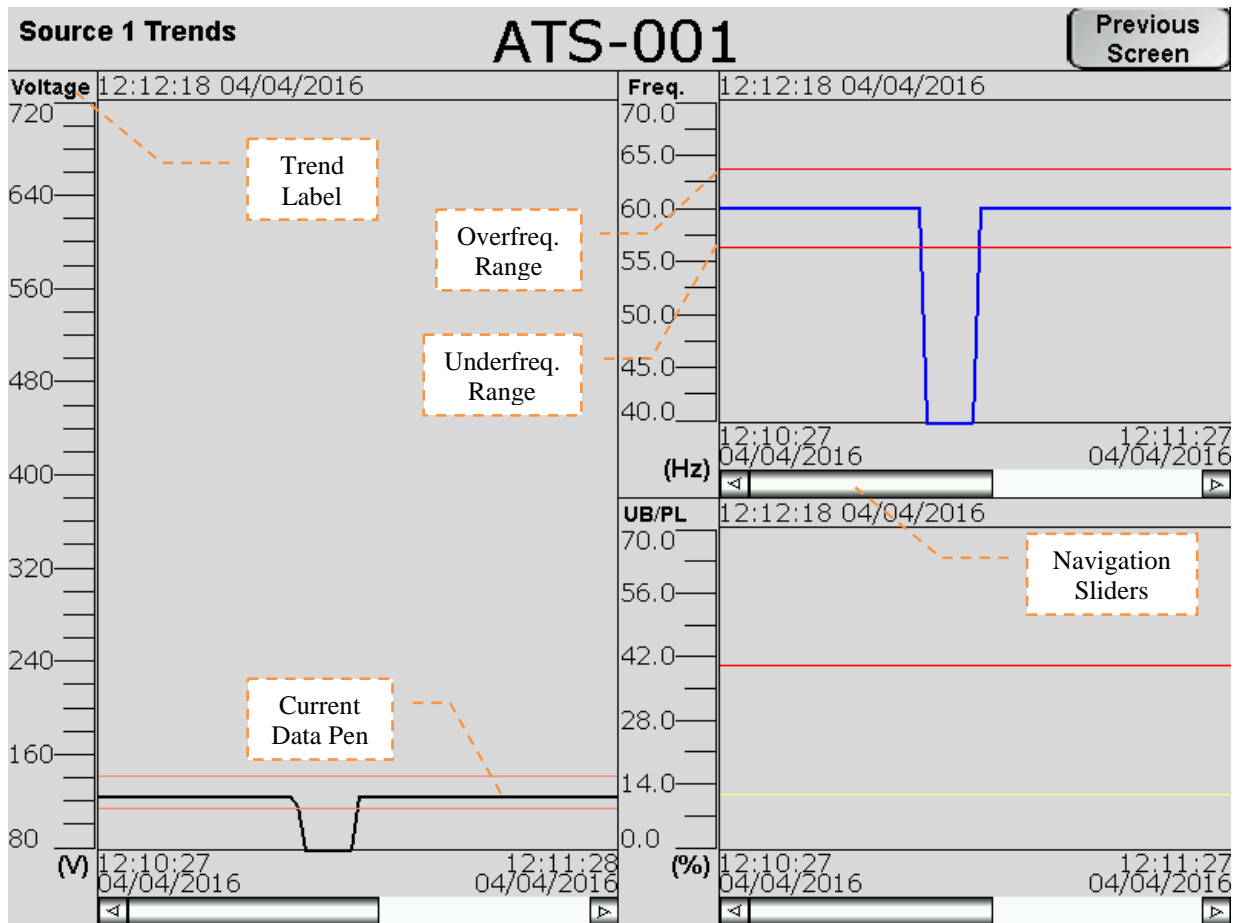
The Alarm and Events screen displays time/date-stamped alarms (in red) and events (in black) for all connected controllers. This information is stored in the HMI's memory, and will not be erased if the unit is powered down. Therefore, a "Reset History" pushbutton is provided to clear all historical events and alarms if needed. A list of all available messages is shown below.

ALARMS

EVENTS

In Lockout	S1 Connected	Slave In
Engine Test Aborted	S2 Connected	Waiting for S2 Permit
Failed to Sync	ATS Transferred	
Uncommanded Transfer	S1 Available	
Closed Trans. S1->S2 Fail	S2 Available	
Closed Trans. S2->S1 Fail	Load Sequence Active	
In-Phase Trans. S1->S2 Fail	Engine 1 Run	
In-Phase Trans. S2->S1 Fail	Engine 2 Run	
Open Trans. S1->S2 Fail	ATS in Test	
Open Trans. S2->S1 Fail	Transfer in Progress	
Generator 1 Unavailable	ATS in Bypass	
Generator 2 Unavailable	Monitor Mode	
Mechanism Fault	Go to Emergency	
Internal Controller Fault	Emergency Inhibit	
	Go to Neutral	

4.4 Trend Screens



The Trend screens show a graphical representation of Voltage, Frequency, Unbalance, and Amperage (Load trend only). The HMI takes data samples every 1 second for each controller it communicates to. The internal storage of the HMI can store up to 5.25 days of historical data on the single-view firmware, and up to 8.9 hours of historical data on the multi-view firmware. The HMI can be configured from the factory to export and store this data on an external USB drive or SD card. Additionally, data saved to external devices can be viewed on any PC program that supports CSV files.

If applicable, the trend windows also display the Under/Over-Frequency, Voltage, and Unbalance limits as set in the ATC-900. These are depicted by the red horizontal lines on each trend window.

To view trend data on the HMI, simply press the Trend button of the voltage source you wish to view (Source 1, Source 2, or Load). Once on the trend screen, you can go back and forth through time by using the scroll bar and arrows on the bottom of each trend window. The most recent data is on the *right* side of the window, while the oldest data is on the *left* side. To see a data point value at a specific point in time, press on the screen at the desired point and the HMI will draw a vertical line there and display the data value.

4.5 System Setup Screen

Eaton RAC98 v2.2

	Station Name		Coms	
Controller 1:	ATS-001	Edit	Enabled	Edit ATC Setpoints
Controller 2:	ATS-002	Edit	Disabled	Edit ATC Setpoints
Controller 3:	DATA ROOM	Edit	Enabled	Edit ATC Setpoints
Controller 4:	CHILLERS	Edit	Enabled	Edit ATC Setpoints
Controller 5:	HVAC	Edit	Enabled	Edit ATC Setpoints
Controller 6:	ATS-003	Edit	Disabled	Edit ATC Setpoints
Controller 7:	ATS-004	Edit	Enabled	Edit ATC Setpoints
Controller 8:	ATS-005	Edit	Disabled	Edit ATC Setpoints

Back to Overview HMI Setup Password Setup

The System Setup screen allows the user to type in a name for each ATS controller (up to 8 controllers per RAC in a multi-controller configuration, or 1 controller in a single-controller configuration). Simply press the Edit button next to the controller you wish to name and type in your desired name using the on-screen keyboard. These names will be displayed above each respective controller in the Overview screen. The controller's name will also be shown while viewing that controller's Controller View screen.

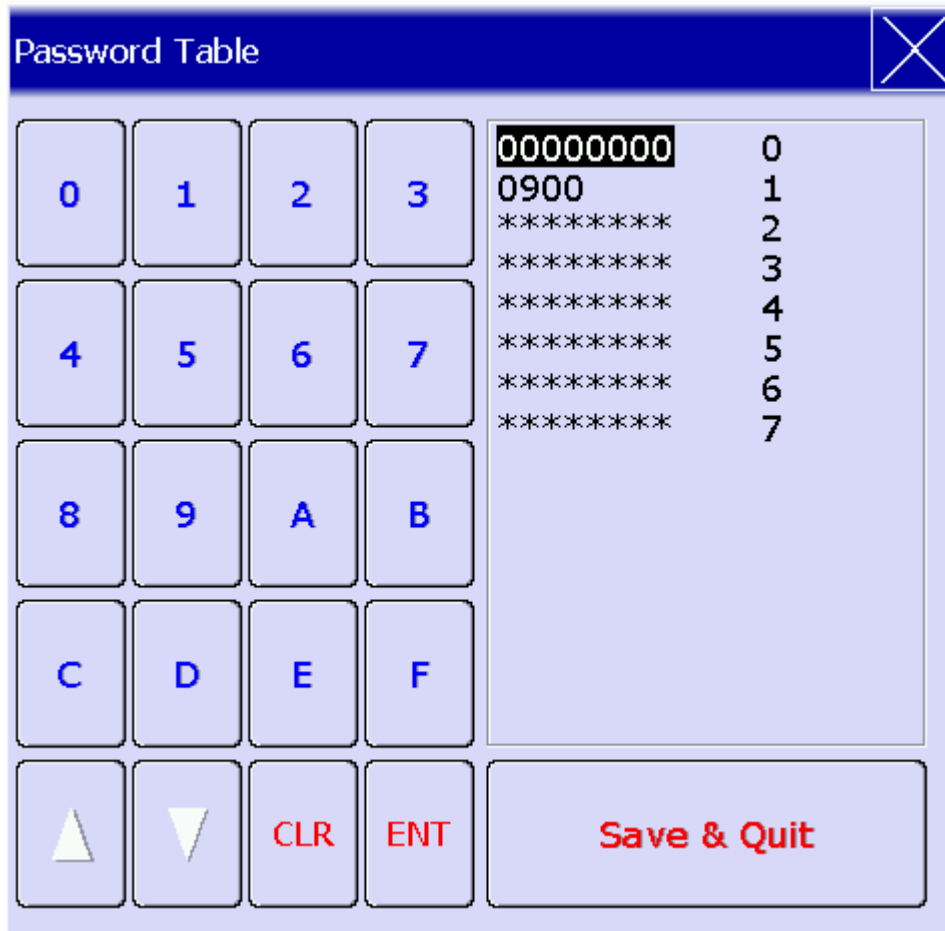
The user can also disable any communication link between the RAC and controller by pressing on the green circle next to the corresponding controller. When enabled, the display will show a green "Enabled" button; when disabled, the display will show a red "Disabled" button. To toggle the communication state, simply press the button and the state will toggle.

HMI Setup (Admin Level)

This button opens a menu that allows the operator to change items like touch screen force, touch screen calibration, time & date, brightness & contrast, alarm & touch volume, and others. By default, the HMI should be set up so the user will not have to

adjust anything in the field. Specific details on each setting can be found in the HMI Manual (IL04801003E).

Password Setup (Admin Level)



As mentioned earlier, passwords are needed to initiate controller functions (Engine Test, Go to Emergency, and Manual Retransfer) and to access the setup menus. If you would like to change the passwords, press the Password Setup button in the Controller Setup screen.

Default Password List

<u>Level</u>	<u>Password</u>
Level 0: Status Level	– No Password
Level 1: Operator Level	– 0900
Level 2: Admin Level	– AC45

The operator level applies to operator-related actions, such as initiating an engine test or go to emergency command and changing controller setpoints, enabling/disabling controllers, naming controllers. Admin level allows changing of HMI Setup and Passwords.

Caution: if you change your passwords, do not forget them or you will be unable to access these features!

4.6 Controller Setpoints

Next Page of Current Category

Return to Controller Setup		<h1>System Setup (1 of 3)</h1>		Next Page	
Language	0	0 = English 1 = French 2 = Spanish	Number of Generators	1	0 to 2
Style (Read-only)	ATC-900C30N		Number of Phases	1	1 or 3
CT Wiring Invert	0	0 = Normal 1 = Invert	Master/Slave Operation	0	0 = Master 1 = Slave
Sign Convention	0	0 = IEEE 1 = IEEE Alternate	Sequence Check	0	0 = Off 1 = ABC 2 = CBA
Line Frequency	60	50 or 60 Hz	Preferred Source	1	0 = None 1 = S1 2 = S2 3 = External Select
PT Ratio (x : 1)	0.0	0 = None, 2.0 to 500.0	Retransfer	0	0 = Automatic 1 = Manual 2 = External Select
CT Ratio (x : 5)	200	0 = None, 200 to 5000	Commit to Transfer	0	0 = No Commit 1 = Commit
Auto Clock DST Adjust	1	0 = Disabled 1 = Enabled	Continued on Page 2		
System Voltage	120	115 (50 Hz) or 120 (60 Hz) to 600 Vac	Valid Setpoint Ranges		
System Setup	Time Delays	Dropouts & Pickups	Engine Test & Plant Exercisers	Programmable I/O	

Setpoint Category Navigation Buttons

The HMI allows the user to program all ATC-900 controller setpoints remotely. The setpoints are organized into 5 categories:

- System Setup (3 pages)
- Time Delays
- Dropouts & Pickups (2 pages)
- Engine Test & Plant Exercisers (3 pages)
- Programmable I/O (variable pages depending on # of accessory I/O selected)

To access your desired category, simply press one of the buttons near the bottom of the screen. The currently active category will turn blue with white text. Some setpoint categories have more than one page. If this is the case, you will see a “Next Page” button in the upper-right corner. Pressing this will take you to the next setpoint page in that category. The example above shows the System Setup (1 of 3). Pressing the “Next Page” button will take you to System Setup (2 of 3). Pressing the “Previous Page” button will take you back to the previous setpoint screen. Some intermediate pages may have a next and previous page button.

To change a setpoint, simply press the corresponding setpoint box (white rectangle with blue border) and you will be prompted to enter a new setpoint value. Valid setpoint entries are always shown to the right of the setpoint box. For example, the CT Ratio (x : 5) setpoint can be set to 0 (none), or anywhere between 200 and 5000. If you are outside the limits, the HMI will display a popup letting you know it was an invalid entry.

To return to the Controller Setup menu at any time, press the “Return to Controller Setup” button in the upper-left corner.

For more information on any setpoint, consult the ATC-900 IB.

CAUTION

This is a remote control device. Caution should be applied to make sure that appropriate procedures are in place for Engine Tests and Remote Transfers. Appropriate procedures include, but are not limited to, switch doors being closed and latched, personnel knowledgeable of transfers, and other site safety recommended procedures.