1.0 Overview

The 7” RAC is a color touch-screen display with easy-to-use functions that provide a powerful interface to Automatic Transfer Switches equipped with ATC-900 or ATC-300+ controllers. It supports serial RS-485 Modbus RTU and Modbus TCP/IP natively. Available Multiview Firmware supports any combination of ATC-900’s and ATC-300+’s, up to 8 controllers on a single RAC.

The 7” RAC Kit contains the following:

- 10-11054-1 (Delta DOP-107EG 7” Color HMI Display)
- IB01602080E (Ethernet Setup Document – Ethernet connections only)
- ELC-PS02 (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 RAC: Status, Control, and Setpoint Editing.

**Status Indicators**
- S1 / S2 Available
- S1 / S2 Preferred (ATC-900 only)
- S1 / S2 Connected
- S1 / S2 Status
- Emergency Inhibit
- Lockout / Monitor Mode
- Go to Emergency Active
- Engine Test Active
- Transfer in Progress
- Source 1 Voltage Metering
- Source 2 Voltage Metering
- Load Voltage Metering (ATC-900 only)
- Load Current Metering (ATC-900 with DCT module only)
- Waiting for Manual Retransfer
- History of Events
- Active Timers
- Last Transfer Time (ATC-900 only)

**Controls**
- 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 a 24VDC voltage source with a minimum current of 360 mA. There is a removable terminal block connector on the back of the unit for incoming power termination.

The RAC supports Modbus RTU (serial RS-485) and Modbus TCP/IP (Ethernet). However, since ATS controllers only support Modbus RTU, 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. This requires custom firmware per installation site.
3.1 ATS Controller Setup

Every ATS controller connected to the RAC needs to be set as follows:

- **Modbus Configuration (ATC-900):** 9600, 1-stop, None
- **Baud Rate (ATC-300+):** 9600
- **Address:** 01, 02, 03, 04, 05, 06, 07 or 08 (each controller connected to a single RAC must be a unique address)

**Termination SW1:** Normally set to OFF. However, for long communication runs or when experiencing communication timeouts, a 120 Ohm resistor may be installed on one end of the communication daisy-chain (see drawing 66A8395 for proper resistor location). If this is done, SW1 must be set to ON **only** on the last controller in the communication daisy-chain. All other controllers must be set to OFF.

3.2 RAC Setup

The firmware comes preloaded onto the unit according to your switch configuration when ordered through your Eaton ATS distributor and should require no user firmware uploading. If your firmware is corrupt or the wrong version was uploaded, please contact ATS Tech Support for assistance.

**Your RAC 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 Station Detail screen for Singleview Firmware). Enter your level 2 password (default of AC45). A list of available controller com links will appear. 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 is available in Section 4.5.

4.0 RAC Screens

The RAC has a total of 6 screen types. The following is a summary of the available screens and their function:

- **Overview** – In a multi-controller system, this shows the status of all controllers at once. *This screen will not be shown if you only have a single controller enabled in the System Setup screen.*
- **Station Detail** – Shows a more detailed view of a single station 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 viewing and editing of every available setpoint on the ATS controllers.
4.1 Overview Screen

The Overview screen (Multiview firmware only) shows the status of up to 8 ATS controllers. In the example above, Station 1, an ATC-900 transfer switch named ATS1, has S1 connected, S2 preferred, and no bus energized. Station 2, an ATC-300+ transfer switch named DEMO ROOM, has S1 available and connected. Station 3 has timed out and is trying to reconnect automatically. Station 4, an ATC-900 named CHILLERS, is connected to S2 (non-preferred source) due to a S1 power failure. Stations 5 through 8 are disabled per the user.

To view more details and controls for any communicating transfer switch, press anywhere inside the desired station window. This will take you to the Station Detail screen (section 4.2) for that transfer switch.

If any controller has an Alarm condition, an audible alarm will sound from the RAC. To view the alarm, press on the station window of the alarmed controller. Once you are on the Station Detail 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 (only available on ATC-900 controllers). To close the alarm popup, press “Close”.

--- ALARM ---

**Engine Test Aborted**

Remote Alarm Reset | Silence Alarms
---|---

Close
To view the alarm popup window again at any time, press the “ATC-xxx IN ALARM” indicator on the Station Detail screen.

4.2 Station Detail Screen

The Station Detail shows a more detailed view of a single controller. *Note: ATC-300+ controllers have no Load monitoring.* The top area contains status 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 4.4). 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.
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 controller 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, 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. ATC-300+ only supports in-phase transitions.*

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 transfer switch controller 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 RAC (password protected, level 1).

The bottom area of the screen shows navigation and control buttons. The “View all Stations” button navigates to the Overview Screen (Section 4.1). Note: this button is not available if only a single station is enabled. 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).

**Show/Hide Manual Controls:** This button expands a small window with 3 control buttons: Go to Emergency, Bypass Timers, and Start Engine Test. All control is password protected level 1. To hide the manual controls, press the “Hide Manual Controls” button.

**Start Engine Test/Cancel Engine Test:** To initiate an engine test remotely from the RAC, press the Start Engine Test button and enter your level 1 password. The controller will close its generator start contacts. Once the generator has reached nominal voltage, the test will run until the Engine Test Run Time expires. If your controller is programmed for a Load Transfer test, then it will also transfer your load to the generator during the test. To abort the test early, push the Cancel Engine Test button on the RAC.

**Go to Emergency/Cancel Go to Emergency:** This button sends the controller a remote Go to Emergency command (password protected, level 1). Once initiated, the controller will transfer to your non-preferred (emergency) source. To go back to your preferred (normal) source, push the Cancel Go to Emergency button.

**Bypass Timers:** Allows the user to skip a currently active timer. While a valid timer is counting down, simply press the button, enter the level 1 password, and it will be bypassed. This button works for the following timers:

<table>
<thead>
<tr>
<th>Timer Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay Normal-to-Emergency (TDNE)</td>
<td></td>
</tr>
<tr>
<td>Time Delay Emergency-to-Normal (TDEN)</td>
<td></td>
</tr>
<tr>
<td>Time Delay Neutral (TDN) – ATC-900 Only</td>
<td></td>
</tr>
<tr>
<td>Time Delay Engine Start (TDES) – ATC-900 Only</td>
<td></td>
</tr>
<tr>
<td>Time Delay Engine Cooldown (TDEC) – ATC-900 Only</td>
<td></td>
</tr>
<tr>
<td>Time Delay Pre-transfer (TDPRE) – ATC-900 Only</td>
<td></td>
</tr>
<tr>
<td>Time Delay Post-transfer (TDPOST) – ATC-900 Only</td>
<td></td>
</tr>
<tr>
<td>Time Delay Normal Disconnect/Reconnect – ATC-900 Only</td>
<td></td>
</tr>
<tr>
<td>Time Delay Emergency Disconnect/Reconnect – ATC-900 Only</td>
<td></td>
</tr>
</tbody>
</table>
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

- In Lockout
- Engine Test Aborted
- Failed to Sync
- Uncommanded Transfer
- Closed Trans. S1->S2 Fail
- Closed Trans. S2->S1 Fail
- In-Phase Trans. S1->S2 Fail
- In-Phase Trans. S2->S1 Fail
- Open Trans. S1->S2 Fail
- Open Trans. S2->S1 Fail
- Generator 1 Unavailable
- Generator 2 Unavailable
- Mechanism Fault
- Internal Controller Fault
- Failsafe (300 only)

### EVENTS

- Go to Neutral (900 only)
- Slave In (900 only)
- Waiting for S2 Permit (900 only)
- Waiting for Sync (300 only)
- Overran Neutral (300 only)
- Waiting for Manual Retransfer (300 only)
- Remote Eng Test (300 only)
- Remote Go to S2 (300 only)
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 8.6 hours of historical data. The HMI can be configured from the factory to export and store additional 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 trend 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

**Station Name:** The RAC allows the user to name each ATS controller (up to 8 controllers per RAC with Multiview Firmware). Simply press the Edit button next to the controller you wish to name and type in your desired name using the on-screen keyboard.

**Coms:** The user can also enable/disable any communication link between the RAC and controller by pressing on the Enabled/Disabled button 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.

**Coms Status:** The RAC will display the current status for all 8 stations. Possible coms statuses are:
- Off – Coms are Disabled
- Trying to Connect – Coms are enabled but have not been established yet.
- Timed Out – Coms have been established but are now not responding.
- Good – Coms have been established and no issues are detected.

**Type/FW Ver.:** When Coms are enabled for the first time, the RAC will automatically poll the controller to see what type it is (ATC-300+ or ATC-900), as well as read the controller's firmware version. The type and FW version for each station can be seen on the far-right of the System Setup screen.
**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 Delta HMI Manual.

**Password Setup (Admin Level):** As mentioned earlier, passwords are needed to initiate controller functions and to access the setup menus. If you would like to change the passwords, press the Password Setup button in the Controller Setup screen.

<table>
<thead>
<tr>
<th>Level</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>0: Status Level</td>
<td>No Password</td>
</tr>
<tr>
<td>1: Operator Level</td>
<td>0900</td>
</tr>
<tr>
<td>2: Admin Level</td>
<td>AC45</td>
</tr>
</tbody>
</table>

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

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

The RAC allows the user to program all controller setpoints remotely. The setpoints are organized into categories:

- System Setup
- Time Delays
- Dropouts & Pickups
- Engine Test & Plant Exercisers
- Programmable I/O (ATC-900 only)

To access the desired category, press one of the navigation 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 RAC 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 appropriate controller 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.