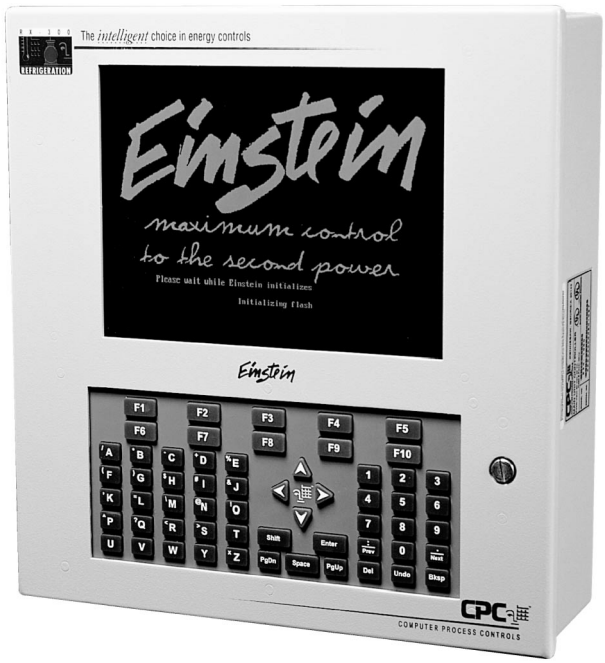
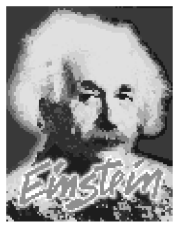
026-1602 Rev 3 4-11-01

Einstein

Einstein BX Building Controller User's Guide





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Revision History

026-1602 Rev 3 4-11-01

- Removed support for old Lighting Control and RT-100 applications
- Added documentation of Enhanced Lighting application
- Added ARTC graphic illustration guide
- Added ARTC board numbering instructions
- "Cold Reset" and "Cold Reset Button" now called "Clean Out" and "Clean Out Button."
- Split "Quick Start" section into full-sized chapters on AHU, Zone Control, ARTC, Time Scheduling, and Enhanced Lighting
- Added instructions for using Holiday Schedules
- SP1, SP2, SP3, and SP4, previously used as days of the week for holiday dates, now appear as HD1, HD2, HD3, and HD4.
- Added "In vs. Out Enthalpy" strategy of economization control to AHUs and Zone Control.
- "Average KW" in Power Monitoring now means the average of all KW samples taken in a one-minute window.
- Added section about input and output alarm setup.
- Added warning to power down Einstein before plugging internal modem into the PC-104 slot
- Appendix C Network ID Worksheets changed to 8-1/2" by 11" format (were 11x17 fold-outs).
- Included index

Table of Contents

1 Introduction

The Einstein BX series of controllers are microprocessor-based control systems designed to provide complete control of HVAC systems (such as air handling units or rooftop units), lighting, dehumidification, and other components related to environmental control. The Einstein BX is the controlling component of a two-network configuration (both RS485 I/O and Echelon Lonworks networks) that includes input and output communication boards, remote communication software, and a variety of sensors, probes, and transducers.

The Einstein BX is primarily designed to control heating and cooling, either by direct control of an air handling unit (connected to the Einstein BX via I/O boards) or by using control boards mounted in rooftop units, such as the RT-100 rooftop controller or the Advanced Rooftop Controller (ARTC). Rooftop units are most commonly grouped into zones so that several can work together to heat or cool a single zone within the building.

In addition, the Einstein BX includes several power monitoring and demand control features, giving site managers the tools necessary to manage power consumption efficiently.

1.1 Einstein BX Models

The Einstein BX is available in two models: the BX-300 (*P/N 830-1000*) and BX-400 (*P/N 830-1001*). The only significant difference between the Einstein BX-300 and the Einstein BX-400 is the total number of building control devices that may be operated by a single controller. ***Table 1-1*** shows the differences between capabilities for the BX-300 and BX-400.

Capabilities	BX-300	BX-400
Air Handlers	6	8
HVAC Zones	32	40
Lighting Circuits	24	48
Power Monitoring	32 circuits	64 circuits
Power Monitoring	16 circuits	16 circuits
Analog Sensor Modules	64	72
Digital Sensor Modules	64	72
Schedules	64	64

Table 1-1 *- BX-300 vs. BX-400 Comparison*

1.2 The Einstein RX

The counterpart to the Einstein BX is the Einstein RX, which controls refrigeration systems. The Einstein RX's primary function is to maintain adequate temperature control for refrigerated cases to prevent spoilage and product loss and also to maximize energy efficiency. In addition, the Einstein efficiently operates all other systems that support refrigeration (including compressor racks and condensers) and other components not directly related to refrigeration control, such as satellite HVAC systems, anti-sweat heaters, and sensor control modules.

1.3 Introduction to Einstein Networking

1.3.1 The Einstein BX's I/O Network

Most of the general purpose input and output communications devices required by the Einstein to control building environmental systems are connected to the Einstein via the **I/O Network.** The I/O Network is a simple RS485 three-wire connection that allows data interchange between input boards (which read sensor values and digital closures), output boards (which carry out commands from Einstein's control applications), and the Einstein BX itself.

The I/O Network is the same thing as the COM A and COM D networks found on CPC's previous generation of controllers, REFLECS. This allows current owners of CPC's Building Environmental Control (BEC) or Building Control Unit (BCU) controllers to easily retrofit with an Einstein BX without need for re-wiring.

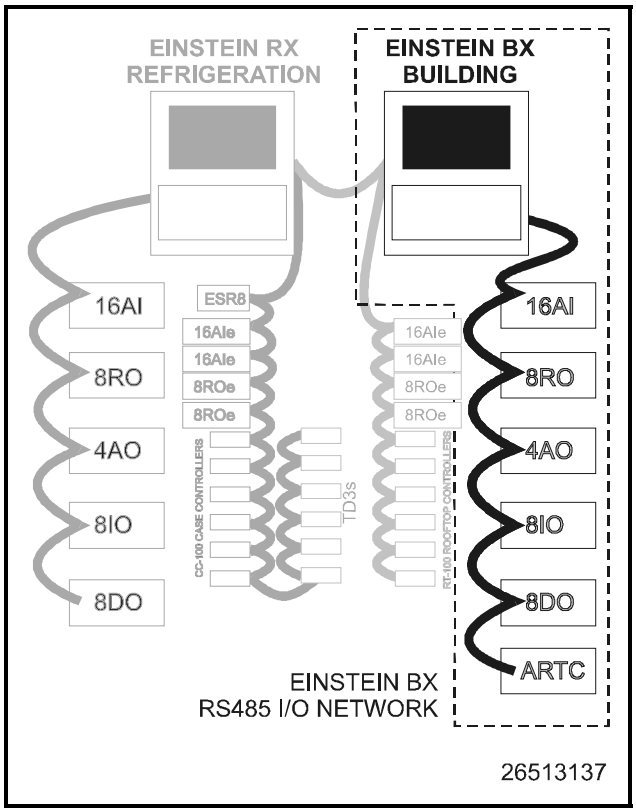


Figure 1-1 *- Einstein BX I/O Network Diagram*

Figure 1-1 shows the peripherals that make up the I/O network:

- *16AI* - Input communication device - sends values from up to sixteen analog or digital sensors to the Einstein.
- *8RO* - Relay output board - activates and deactivates up to eight devices.
- *4AO* - Analog output board - contains four 0-10VDC analog outputs. Used for controlling variable-speed devices and other peripherals requiring analog values.
- *8DO* - Digital output board - contains eight outputs that pulse 12VDC. Ideal for use as anti-sweat heater controllers.
- *8IO* - Combination input/output board - combines functions of 16AI, 8RO, and 4AO boards. Includes eight inputs, eight digital outputs, and two analog outputs.
- *ARTC* - Advanced Rooftop Controller - the ARTC is a control board that mounts in a rooftop unit and controls heating stages, cooling stages, dehumidification, and air damper control for a single rooftop unit.

1.3.2 The Einstein BX's Echelon Lonworks Network

The Einstein is also compatible with a network platform called Lonworks. This is most commonly referred to as "the Echelon network," after the company who invented the platform, the Echelon Corporation.

In general, peripherals with control functions — such as case controllers, rooftop HVAC controllers, and other Einstein BX and RX units — are interconnected on the Echelon network. These controllers do most of their own computation and system control, but they communicate with other Einsteins to provide logging, alarm control, and other functions.

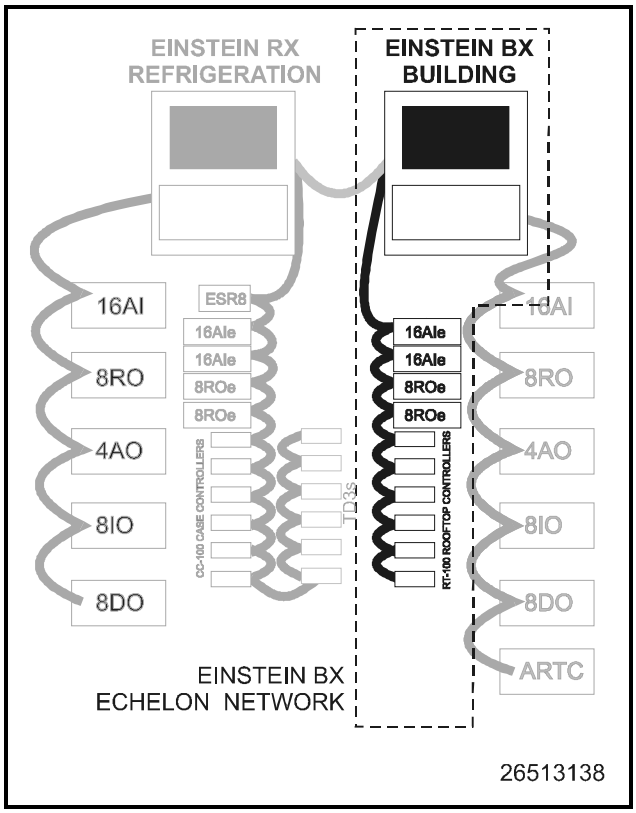


Figure 1-2 *- Einstein BX Echelon Network Diagram*

Figure 1-2 shows the Einstein BX peripherals that communicate across the Echelon network:

- *RT-100* - Rooftop control board - the inputs and outputs on this board allow the Einstein BX to control a single rooftop control unit (RTU). The RT-100 mounts inside an RTU enclosure and controls heating, cooling, and fans.
- *16AIe* - Echelon-based input communication device - sends values from up to sixteen analog or digital sensors to the Einstein.
- *8ROe* - Echelon-based relay output board - acti-

vates and deactivates up to eight devices.

1.3.3 Interconnection With Other Einsteins

In large installations where more than one Einstein BX is present, or where Einsteins are controlling both refrigeration and building HVAC systems in the same site, the Einsteins share information with each other across the Echelon network.

Figure 1-3 shows an example of a possible Einstein control system along with the necessary peripheral control and communication devices. This diagram shows an Einstein RX and its related components connected to an Einstein BX and its related components.

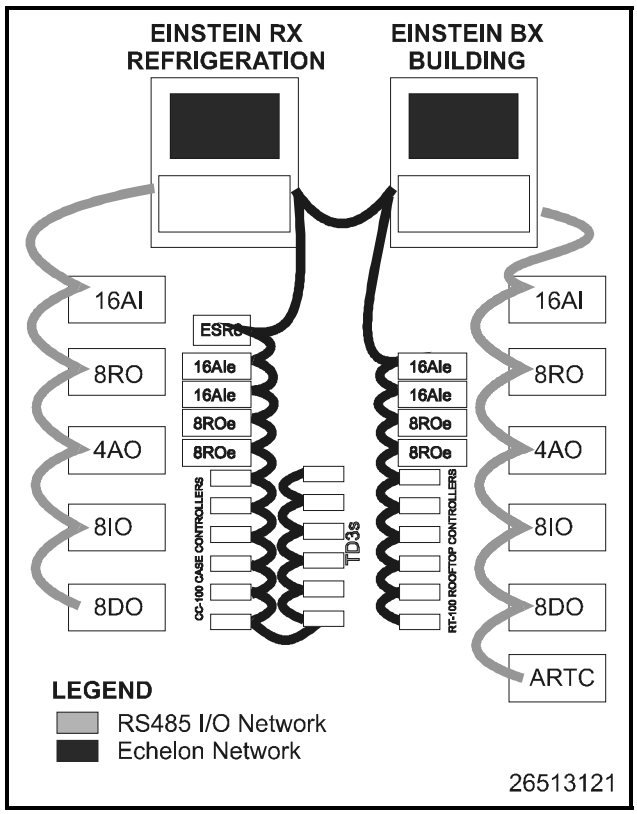


Figure 1-3 *- Einstein RX/BX Network*

1.4 Einstein Documentation

The Einstein RX and BX controllers are among the most versatile and customizable control system products available on the market. Because of the enhanced capabilities of the Einsteins, programming, installation, and operation of Einstein and its accompanying peripherals are supported by several different CPC publications. All of the publications listed below can be ordered by contacting CPC.

- ***Einstein BX User's Guide (P/N 026-1602)*** - The manual you are currently reading. The User's Guide covers hardware installation, network setup, and important operator functions such as viewing status screens or logs, and performing bypasses and overrides.

  The software programming section in the User's Guide is designed to quickly guide you through setup of the most simple and vital environmental control applications (such as HVAC zones or air handling units). Several configuration options that are less commonly used will not be covered in this manual. For information about these advanced control functions, see ***P/N 026-1604, Einstein BX Programmer's Reference Guide.***

- ***Einstein BX Programmer's Reference Guide (P/N 026-1604)*** - The Programmer's Guide covers all Einstein applications and all configurable options in each application. This manual is designed to aid the programmer who is already familiar with programming the Einstein BX and who wishes to enable certain advanced features or control strategies (Scheduled for release in April 2000).

- ***Router and Repeater Installation Guide (P/N 026-1605)*** - If you have a large site with 64 or more devices on the Echelon network, you might require the use of a router or repeater to properly set up your Echelon network. The Router and Repeater Installation Guide will help you determine when a router or repeater should be used, how and where to set it up, and how to configure the Einstein(s) on the network to interact with the router or repeater.

- ***Peripherals Manual (P/N 026-1701)*** - The Peripherals Manual gives important installation information about sensors, transducers, thermostats, and other essential items that are a part of every CPC control network. The Peripherals Manual is not necessary for field installation instructions (these are given in the User's Guide); however, it may be a useful reference for contractors and OEMs who require more information about a specific peripheral.

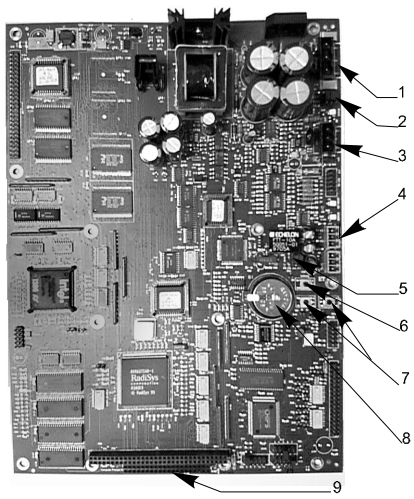
- ***SS-100 Serial Server Installation Guide (026-1607)*** - The SS-100 is a communications device that allows TCP/IP connection with an Einstein via the serial port. This manual shows how to configure the SS-100 and enable the Einstein to communicate over TCP/IP.

- ***NetCom Card Installation Guide (026-1608)*** - The NetCom Card is a communications device that allows TCP/IP connection with an Einstein via the PC-104 slot. This manual shows how to configure the NetCom Card and enable the Einstein to communicate over TCP/IP.

2 Hardware Overview

This section gives an overview of the Einstein, the hardware, and how it communicates across the I/O and Echelon networks to control an entire system.

2.1 Einstein Processor



LEGEND			
1	Power Terminals (24VAC Class 2 only)	6	Service Button
2	RS 485 Termination Jumpers (J2,3,4)	7	Reset Buttons (2)
3	I/O Network Connection	8	Lithium Battery
4	Echelon Network Connectors (2)	9	PC-104 Slot
5	Termination Jumpers (J16,17)		

26502038

Figure 2-1 *- Einstein Circuit Board*

The Einstein BX (***Figure 2-1***) primarily interacts with refrigeration system components, such as compressor racks, condensers, and refrigerated cases. In addition, the Einstein RX provides extensive sensor control, logging, and graphing features that allow the user to view accurate real-time information about system conditions.

Part #s	Einstein Model Descriptions
831-1001	BX-400 Controller with LCD & keypad
831-1011	BX-400 Controller without LCD & keypad
831-1021	BX-400 Flushmount with LCD & keypad
831-1031	BX-400 Flushmount without LCD & keypad
831-1000	BX-300 Controller with LCD & keypad
831-1010	BX-300 Controller without LCD & keypad
831-1020	BX-300 Flushmount with LCD & keypad
831-1030	BX-300 Flushmount without LCD & keypad

Table 2-1 *- Einstein Controller Part Numbers and Descriptions*

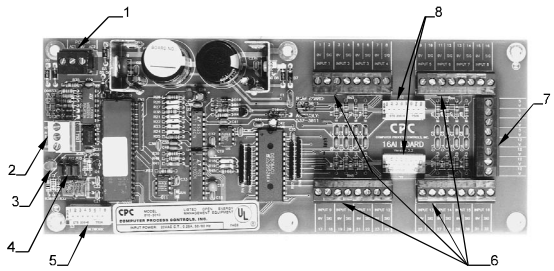
Specifications

Dimensions	Hinged Box: Base: 12.012" W x 12.690" H x 3.5" D Door: 12.312" W x 13.040" H x 0.5" D
	Flush Mount: Base: 12.012" W x 12.690" H x 3.5" D Mtg Plate: 12.312" W x 12.990" H x 0.090" D
Operating Temp	32°F to 120°F (0°C to 49°C)
Storage Temp	-40°F to 150°F (-40°C to 66°C)
Operating Humidity	5% - 90% RH non-condensing at 90°F
Storage Humidity	5% - 100% RH
Power	24 VAC ±20%, 50/60 Hz, class 2

Table 2-1 *- Einstein Specifications*

2.2 Associated Circuit Boards

2.2.1 16AI



LEGEND			
1	AC Input Power Connection	5	Address and Baud Rate Dip Switch
2	I/O Network Connection	6	Input Connections
3	LED Power Indicator	7	Output Power Connection
4	Termination Resistance Jumpers	8	Input Dip Switches

26501001

Figure 2-2 *- 16AI Analog Input Board*

The 16AI Analog Input Board *(P/N 810-3011)* is capable of receiving input signals through any of 16 two-wire input connections. The board receives either digital or analog data from sensors wired to any of the 16 input connections located on the board. Input definition screens within the Einstein allow the user to define each input for refrigeration and building environmental control.

The 16AI Board is designed with several features that make it easy to install, wire, and configure. These main user interface features are shown in ***Figure 2-2***.

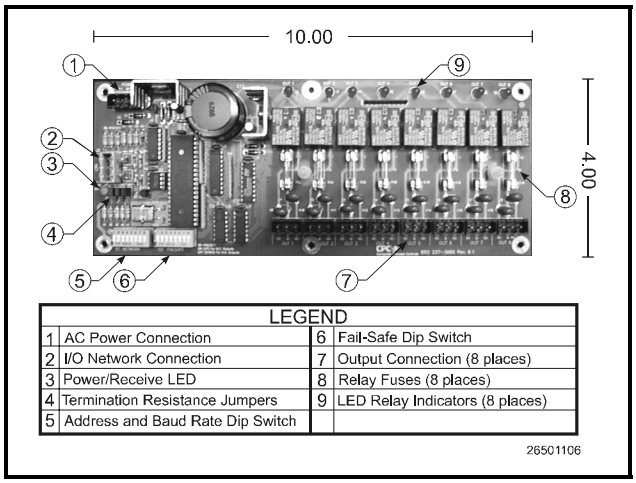
2.2.2 The 8RO Relay Board

The 8RO *(P/N 810-3005)* board is a general-purpose board used to connect an Einstein to any of eight standard control relay outputs.

To function, the 8RO board must be connected through either the Echelon network or the RS485 I/O network to the Einstein. When properly installed, the 8RO receives an electrical impulse from the Einstein, which either opens or closes any of eight contact relays. Output definitions within the Einstein allow the user to configure the 8RO board to interact with any refrigeration system or environmental control component.

The 8RO board is the direct link between the Einstein and component operation. Information gathered by the controller from the input boards is checked against current stored set points. If differences in the received input data and the set point information are detected, a signal is either sent to the proper 8RO relay, or an existing signal is discontinued. Through the use of this relay signal, control functions that can be properly maintained by a simple contact closure sequence are effectively operated by the Einstein.

Like the 16AI input board, the 8RO board is easily installed and operated within the CPC network environment because of its straightforward design. Several of these features are shown in ***Figure 2-3***.



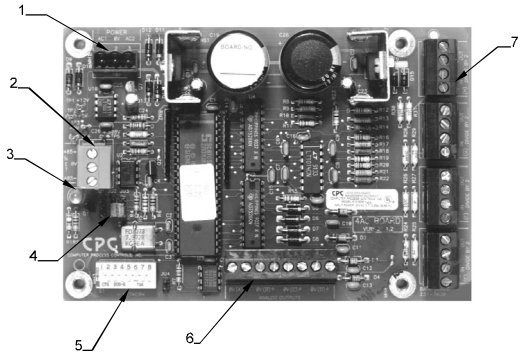
LEGEND			
1	AC Power Connection	6	Fail-Safe Dip Switch
2	I/O Network Connection	7	Output Connection (8 places)
3	Power/Receive LED	8	Relay Fuses (8 places)
4	Termination Resistance Jumpers	9	LED Relay Indicators (8 places)
5	Address and Baud Rate Dip Switch		

26501106

Figure 2-3 *- 8RO Relay Output Board*

2.2.3 4AO

The 4AO Analog Output Board, *(P/N 810-3030)* (***Figure 2-4***) is configured with four analog output connections that provide a variable voltage signal to any of four analog devices that may be controlled by a single Einstein.



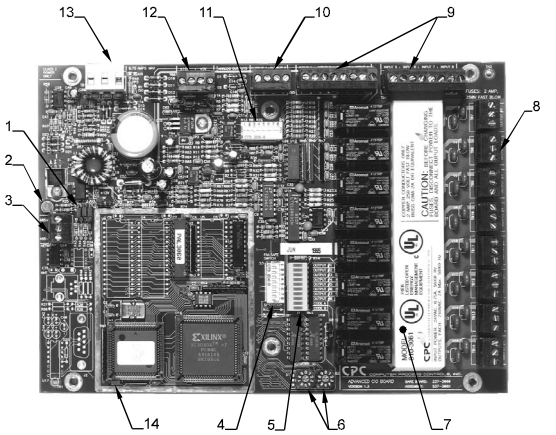
LEGEND			
1	AC Power Input Connection	5	Address and Baud Rate Dip Switch
2	I/O Network Connection	6	Analog Outputs (4 places)
3	LED Power Indicator	7	Divider Circuits (4 places)
4	Terminating Resistance Jumpers		

26501007

Figure 2-4 *- 4AO Analog Output Board*

2.2.4 8IO Combination Input/Output Board

The 8IO Combination Input and Output Board *(P/N 810-3061)* is a communication board designed to provide input and output functions within the same board when space restrictions do not allow for installation of dedicated boards. The 8IO has input and Form C relay output connections for monitoring of sensors and control of loads. The 8IO is shown in ***Figure 2-5***.



LEGEND			
1	Termination Resistance Jumpers	8	Output Connections (8 places)
2	LED Power Indicator	9	Input Connections
3	I/O Network Connection	10	Analog Outputs
4	Fail-Safe Dip Switch	11	Input Type Dip Switch
5	LED Output Indicators	12	Power Output Connection
6	Network Address Rotary Dials	13	AC Power Input Connection
7	Relay Output Fuses (under cover)	14	4AO Enable Jumper (JU4)

26501010

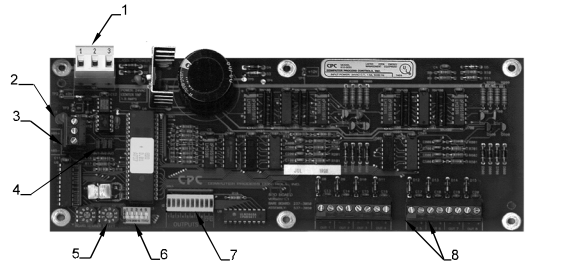
Figure 2-5 *- 8IO Combination Input/Output Communication Board*

2.2.5 8DO Digital Output Board and PMAC II Anti-Sweat Controller

For control of anti-sweat heaters, CPC supplies the 8DO Digital Output board (*P/N 810-3050*). The 8DO has eight outputs which may pulse up to 150mA at 12VDC.

Since the 8DO is primarily designed to control anti-sweat heaters, the 8DO is the heart of CPC's Pulse Modulated Anti-Sweat Control (PMAC II) panel. The PMAC II (*P/N 851-1000*) provides 16 channels of anti-sweat control circuitry. The PMAC II panel combines the 8DO with high-capacity relays in a single enclosure, providing 256 total amps of anti-sweat heater operation.

The 8DO is shown in ***Figure 2-6***. The PMAC II is shown in ***Figure 2-7***.



LEGEND			
1	AC Input Power Connection	5	Network Address Rotary Dials
2	LED Power Indicator	6	Fail-Safe Dip Switch
3	I/O Network Connection	7	LED Output Indicators
4	Terminating Resistance Jumpers	8	Digital Output Connections

26501042

Figure 2-6 *- 8DO Digital Output Board*

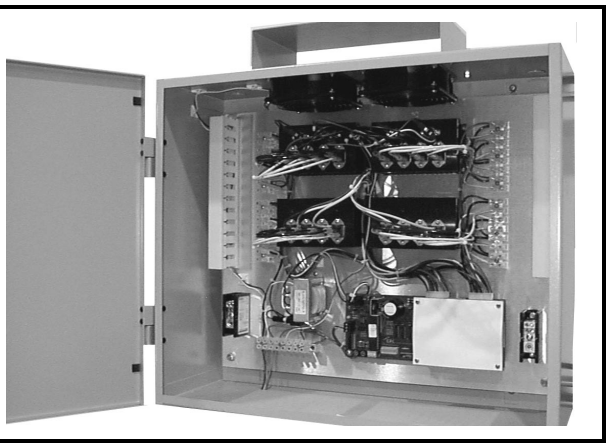


Figure 2-7 *- PMAC II Anti-Sweat Control Panel*

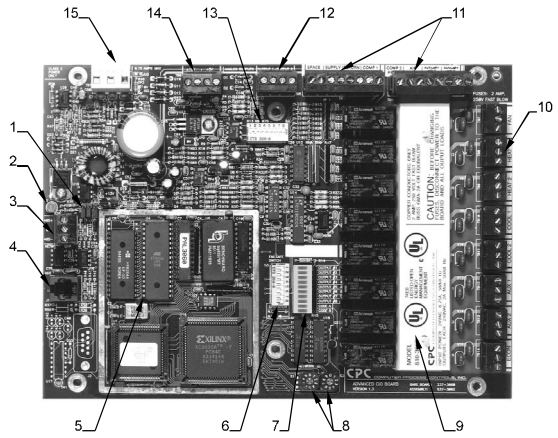
2.2.6 Advanced Rooftop Controller

The Advanced Rooftop Controller (ARTC) (P/N 810-3060), shown in ***Figure 2-8***, is a stand-alone version of the 8IO board, and is used to control rooftop HVAC units. The ARTC controls all functions of the HVAC rooftop control based on set points established within the Einstein. Because the ARTC is configured with a Random Access Memory (RAM) chip, microprocessor, and flash memory, it can continue to perform all controlling functions even when communication to the Einstein is lost. Furthermore, this same configuration allows the controller to download the most recent control set points to the Einstein after communication is reestablished.

Similar to the Einstein, the ARTC has various memory chips that are preprogrammed with default set points. The ARTC is capable of operating a rooftop unit as soon as the ARTC has been wired to an RTU and a single space tem-

perature probe. Set points may be altered at any time from the hand-held terminal and are valid until a connection between the ARTC and Einstein is made.

The ARTC monitors input data from sensors connected directly to it, and receives additional input data routed through the Einstein from sensors connected to other ARTCs or input boards.



LEGEND			
1	Termination Resistance Jumpers	9	Relay Output Fuses (under cover)
2	LED Power Indicator	10	Pre-Defined Output Connections (8 places)
3	I/O Network Connection		
4	Hand-Held Terminal Jack RJ11	11	Pre-Defined Inputs
5	Flash Memory Chip	12	Analog Outputs
6	Fail-Safe Dip Switch	13	Input Type Dip Switch
7	LED Output Indicators	14	Output Power Connection
8	Network Address Rotary Dials	15	AC Power Input Connection

26501022

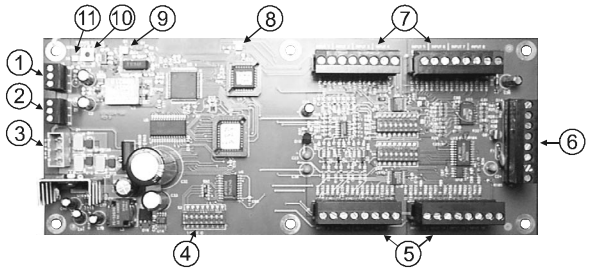
Figure 2-8 *- ARTC Advanced Rooftop Controller*

2.3 The Echelon® Network

The Einstein may communicate with other Einsteins and with certain compatible I/O devices via the Echelon network.

Instead of having one or more parent controllers receiving data and sending commands to a limited number of I/O boards, as is the case with the RS485 network, the Echelon network allows all compatible controllers and I/O boards to actively communicate with each other. As a result, the Echelon network allows for many communication options that the RS485 cannot provide.

2.3.1 The 16AIe



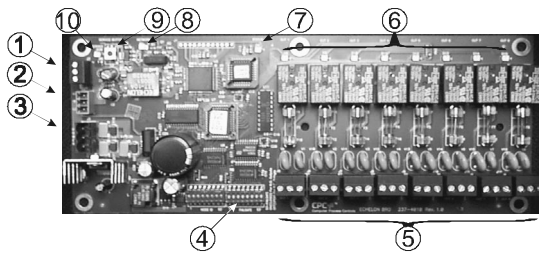
LEGEND			
1	Echelon In	7	Inputs 1-8
2	Echelon Out	8	Status LED
3	Power	9	Network LED
4	Node ID	10	Service Button
5	Inputs 9-16	11	Service LED
6	Voltage Outputs		

26501112

Figure 2-9 *- 16AIe*

The 16AIe (P/N 8000-4010) is an Echelon-based input board similar in function to its I/O network counterpart, the 16AI (see **Section 2.2.1**). The 16AIe receives input signals through any of 16 two-wire connections. The board receives either digital or analog data from sensors wired to any of the 16 input connections located on the board.

2.3.2 The 8ROe



LEGEND			
1	Echelon In	6	Output LEDs (8)
2	Echelon Out	7	Status LED
3	Power	8	Network LED
4	Network Failsafe	9	Service Button
5	Form C Outputs (8)	10	Service LED

Figure 2-10 *- 8ROe*

The 8ROe *(P/N 810-4010)* is an Echelon-based input board similar in function to its I/O network counterpart, the 8RO. The 8ROe board is the direct link between the Einstein and component operation. Information gathered by the controller from the input boards is checked against current stored set points. If differences in the received input data and the set point information are detected, a sig-

nal is either sent to the proper 8ROe relay, or an existing signal is discontinued. Through the use of this relay signal, control functions that can be properly maintained by a simple contact closure sequence are effectively operated by the Einstein.

The 8ROe features Form C contacts for wiring outputs as either normally open or normally closed. Fail-safe dip switches on the 8ROe allow the installation technician to specify the desired state of each relay in case of communications loss.

3 Hardware Mounting

This section of the manual shows how a Einstein and each of the individual Einstein components are mounted.

3.1 The Einstein

3.1.1 Location

The Einstein should be mounted in a room with an ambient temperature between 32°F — 120°F (0°C — 48.9°C) with a relative humidity of 0-95% (non-condensing at 90°F).

3.1.2 Mounting

The Einstein comes in two different enclosure styles. The hinged box body style is designed to be mounted against a wall, and the flush mount body style is meant to be mounted inside a door or panel with the front mounting plate flush with either the front or the back of the mounting surface.

3.1.2.1 Hinged Box

The Hinged Box enclosure is meant to be mounted against a wall using the four mounting holes at the rear of the enclosure. These holes are accessible without any removal of boards inside the enclosure. ***Figure 3-1*** shows the dimensions of this enclosure and the location of the mounting holes.

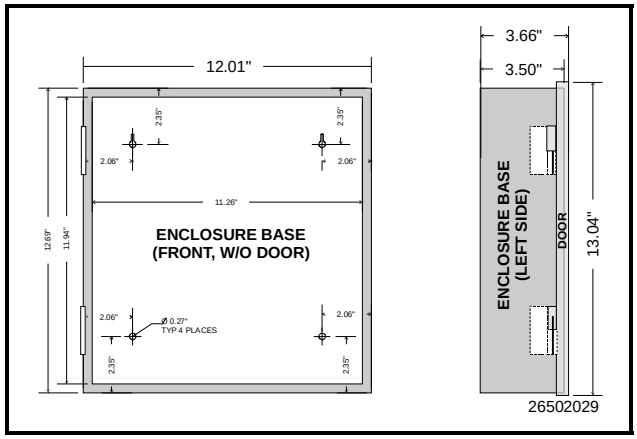


Figure 3-1 *- Einstein Hinged Box Mounting Dimensions*

3.1.2.2 Flush Mount

The Flush Mount enclosure bolts against a surface using the six mounting holes shown in ***Figure 3-2***. This enclosure may be mounted in either of two ways. First, the back side of the mounting plate against the front of the wall, with the Einstein processor board recessed into a hole in the mounting surface (as shown in ***Figure 3-2***). Second, the unit may be mounted entirely inside the wall with the front plate bolted against the back of the surface, so that the front of the unit is visible through the hole in the wall.

In both cases, you will need to cut a rectangular hole into the mounting surface 11.8" high by 11.11" wide (30 cm high by 28.22 cm wide). Once this hole is cut, mount the unit as desired using the six outer mounting holes shown in ***Figure 3-2***.

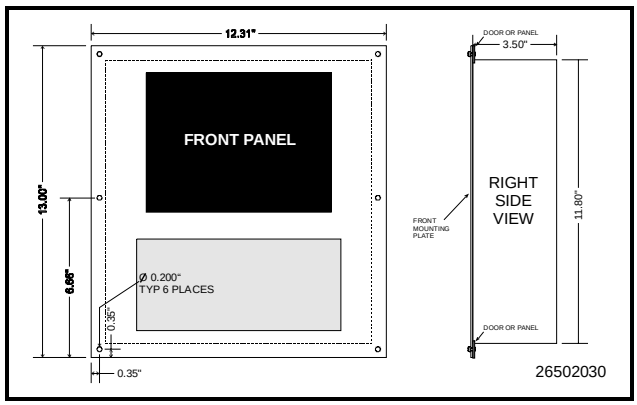


Figure 3-2 *- Einstein Flush Mount Mounting Dimensions*

3.2 Mounting I/O Boards

The 16AI, 8RO, 8DO, 4AO, 8IO, and ARTC boards are usually installed by the refrigeration or building equipment manufacturer. Therefore, the installer need only make the necessary connections between the Einstein and the cases, condenser boards, and/or HVAC units.

In some instances, an installer may be required to mount an I/O board. There are no restrictions on the location of these boards; however, for ease of network configuration, it is recommended that the boards be located adjacent to the Einstein. I/O boards may be mounted without an enclosure, but they should be mounted in a location that is not easily accessible to avoid tampering or damage.

3.2.1 Single/Double Enclosure Mounting for I/O Boards

The Single enclosure and Double enclosure is supplied with 4 mounting holes in the rear panel of the enclosure. The mounting holes can be accessed without removing any of the boards inside the enclosure. ***Figure 3-3*** shows the enclosure dimensions and weight for the Single enclosure. ***Figure 3-4*** shows mounting dimensions for the Double enclosure. When mounting boards inside the enclosure, refer to ***Figure 3-6*** for mounting dimensions

for the 16AI, 8RO, and the 8DO.

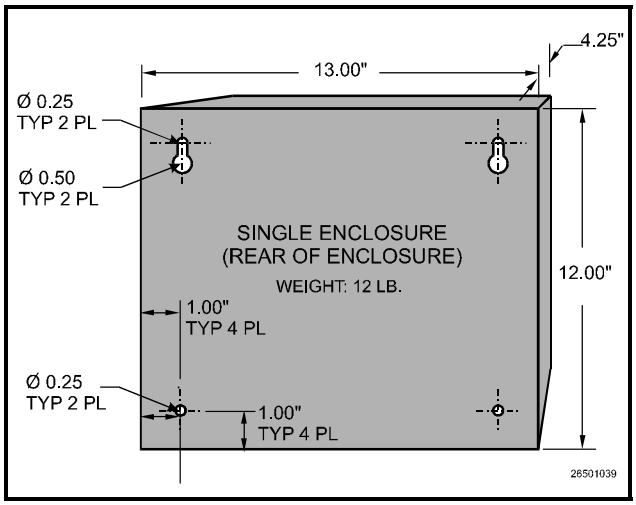


Figure 3-3 *- Single Enclosure Mounting Dimensions*

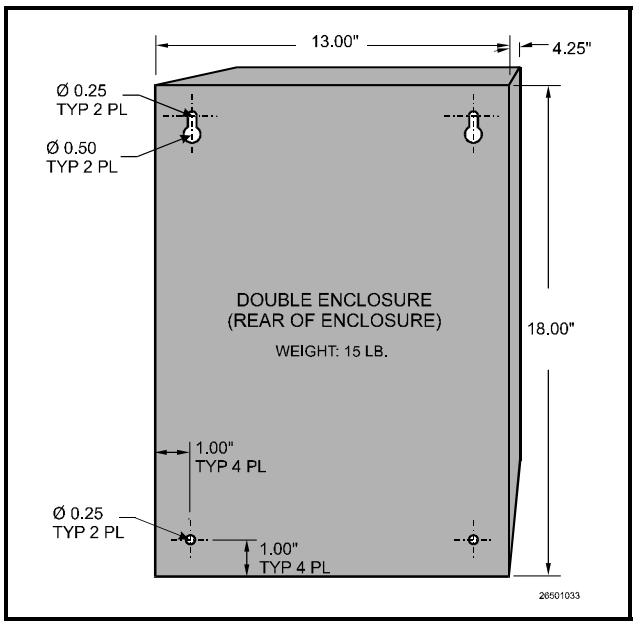


Figure 3-4 *- Double Enclosure Mounting Dimensions*

3.2.2 8IO/ARTC Weather Resistant Enclosure Mounting

The 8IO Combination Input/Output Board and Advanced Rooftop Control boards are generally supplied with a weather resistant enclosure.

The weather resistant enclosure is supplied with 4 mounting holes on flanges at the top and bottom of the enclosure. The mounting holes can be accessed without removing any of the boards inside the enclosure. ***Figure 3-5*** shows the enclosure dimensions and weight.

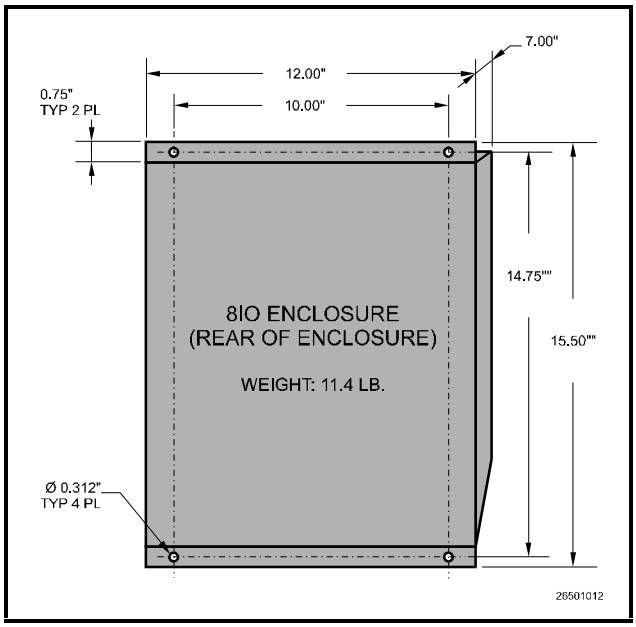


Figure 3-5 *- Weather Resistant Enclosure*

3.2.3 16AI, 8RO, 8DO, and 4AO Boards Without Enclosures

16AI, 8RO, and 8DO boards not supplied with an enclosure are supplied with a snap-track for easy installation. The insulation sheet and I/O board must be removed from the track before the track is mounted. The snap-track is mounted using the 0.1875" mounting slots. ***Figure 3-7*** shows this installation procedure.

Figure 3-6 provides mounting dimensions for the 16AI, 8RO, and the 8DO boards. ***Figure 3-8*** provides mounting dimensions for the 4AO.

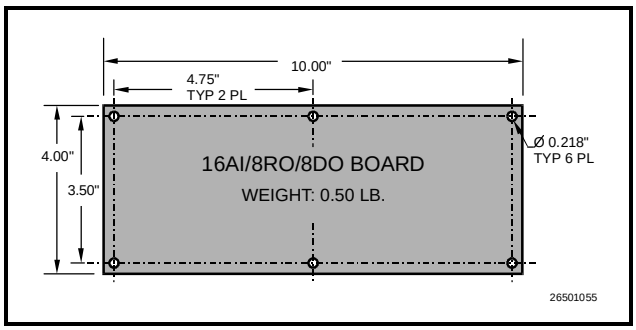


Figure 3-6 *- 16AI/8RO/8DO Mounting Dimensions*

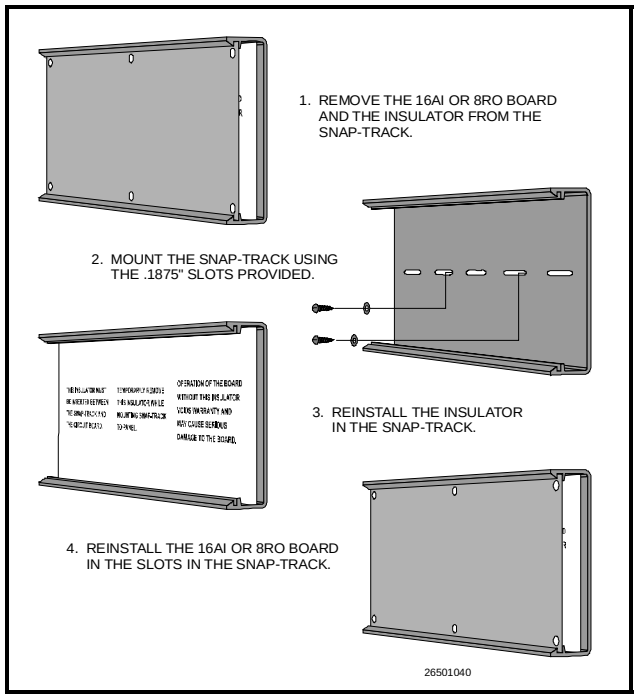


Figure 3-7 *- 4AO, 8RO, or 16AI Snap-Track Installation*

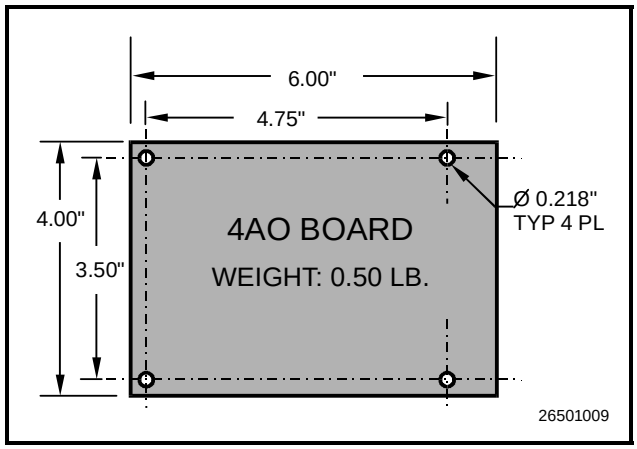


Figure 3-8 *- 4AO Mounting Dimensions*

3.2.3.1 8IOs/ARTCs Without Enclosures Mounting

8IO and ARTC boards not supplied with an enclosure are supplied with 0.500" long metal stand-off dowels that are pressed into the mounting holes in the board. ***Figure 3-9*** shows the mounting dimensions for the 8IO and ARTC boards.

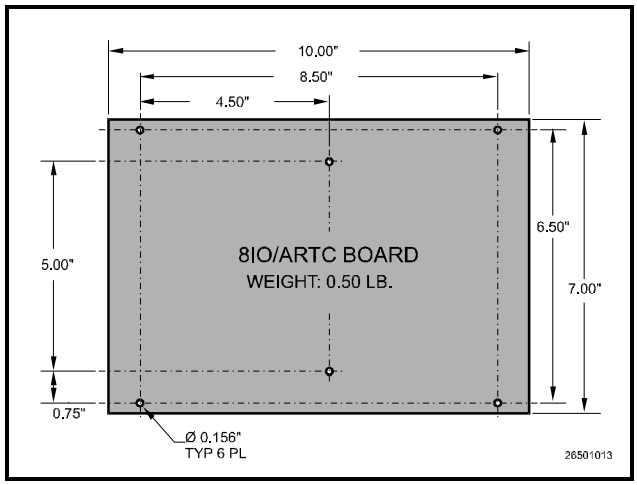


Figure 3-9 *- 8IO/ARTC Mounting Dimensions*

3.2.3.2 4AO Boards Without Enclosures Mounting

4AO boards not supplied with an enclosure are supplied with a snap-track for easy installation. The insulation sheet and I/O board must be removed from the track, and the track mounted using the 0.1875" mounting slots. ***Figure 3-7*** shows this installation procedure for 16AI and 8RO boards. Installation for the 4AO board is identical. ***Figure 3-8*** provides mounting dimensions for the 4AO board.

3.3 Mounting the Internal Modem

WARNING!

<u>Power down</u> the Einstein before plugging the modem into the PC-104 slot. Failure to do so can damage the modem and void the warranty.

The Einstein's internal modem mounts in the PC-104 slot located at the bottom center of the Einstein processor board (*See* ***Figure 3-10***). **<u>Disconnect power to the unit</u>**, and carefully plug the male pins on the back of the modem card into the Einstein's PC-104 slot. Use the standoffs and screws supplied with the modem card to secure the card to the processor board, as shown in ***Figure 3-10***. When finished, restore power to the Einstein.

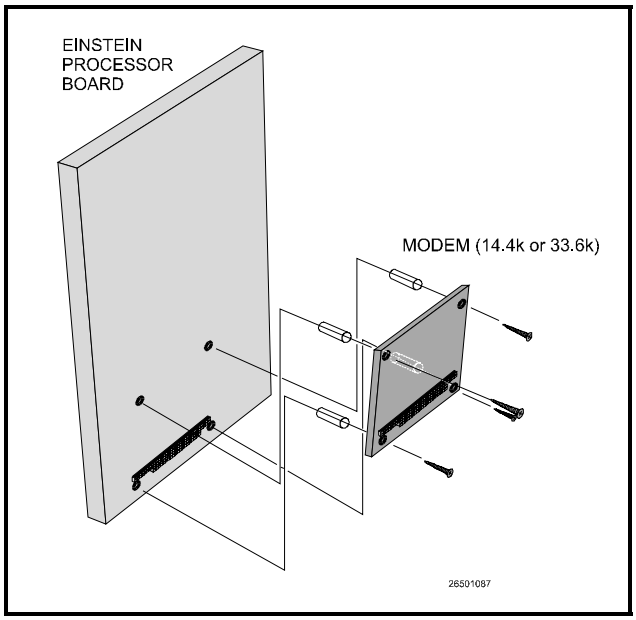


Figure 3-10 *- Mounting the Internal Modem Board*

3.4 Mounting Repeaters

Repeaters are used to extend the maximum length of a segment of Echelon cable, or to act as a bridge between two devices that are farther apart than the cable's maximum node-to-node distance. CPC offers two versions of the repeater; an internally mounted repeater *(P/N 832-1000)* and an external repeater that comes in an enclosure *(P/N 832-1010)*.

3.4.1 Mounting for Internal Repeaters

The internal repeater plugs directly into the PC-104 slot on the Einstein processor board. The repeater is supplied with four metal stand-offs that are used to mount the repeater on to the processor board. The internal repeater is physically similar to the internal modem; refer to the diagram in ***Figure 3-10*** for mounting instructions.

3.4.2 Mounting for External Repeaters

External repeaters are mounted within an enclosure. The mounting bracket at the bottom of the enclosure has two 0.156" bolt holes on either side. Use the bolt holes to mount these repeaters in the field as necessary.

When mounting external repeaters, keep in mind that they require a 24VAC Class 2 power source in order to operate. This will likely require a transformer such as P/N 640-0041 (110V) or P/N 640-0042 (220V) to be mounted near the external repeater enclosure. Make sure there will be enough space next to the repeater to mount the transformer.

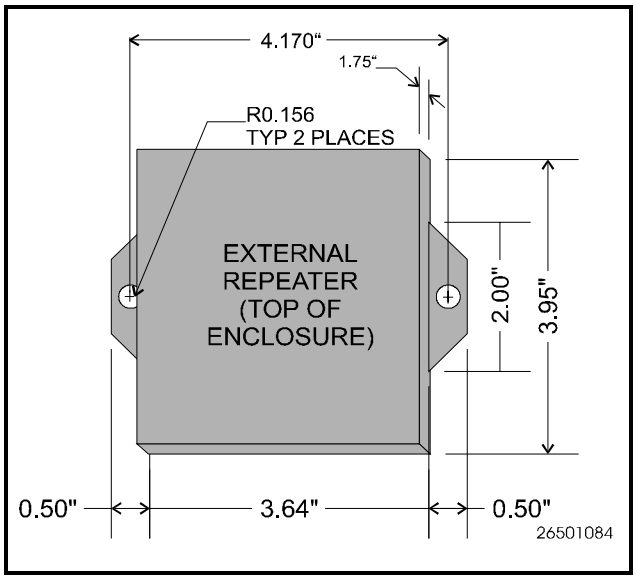


Figure 3-11 *- External Repeater Enclosure Dimensions*

3.5 Sensors and Transducers

3.5.1 Inside Temperature Sensor

3.5.1.1 Location

Inside temperature sensors are supplied within a wall-mounted enclosure for attachment to a standard switch plate.

The temperature sensor should be located in a central location—within the zone to be measured—away from doors, windows, vents, heaters, and outside walls that could affect temperature readings. In addition, the sensor should not be mounted above other sensors that generate heat during operation (such as relative humidity sensors).

The indoor temperature sensor should be between 4 and 6 feet from the floor.

3.5.1.2 Mounting

Mount the sensor using the screws provided as shown in ***Figure 3-12***.

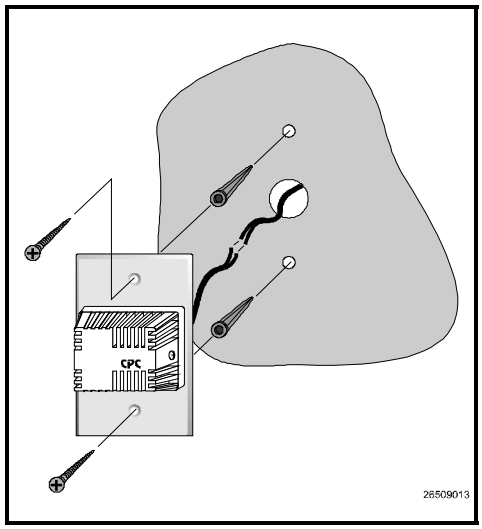


Figure 3-12 *- Inside Temperature Sensor Mounting*

3.5.2 Outside (Ambient) Temperature Sensor

3.5.2.1 Location

The outside or ambient temperature sensor should be located on the north side of the building, preferably under an eave to prevent sun-heated air from affecting the temperature of the sensor.

3.5.2.2 Mounting

The temperature sensor may be mounted using any standard tubing clamp. CPC also offers an aluminum cover and clamp (P/N 303-1111) which may be mounted as shown in ***Figure 3-13*** (fasteners are not provided).

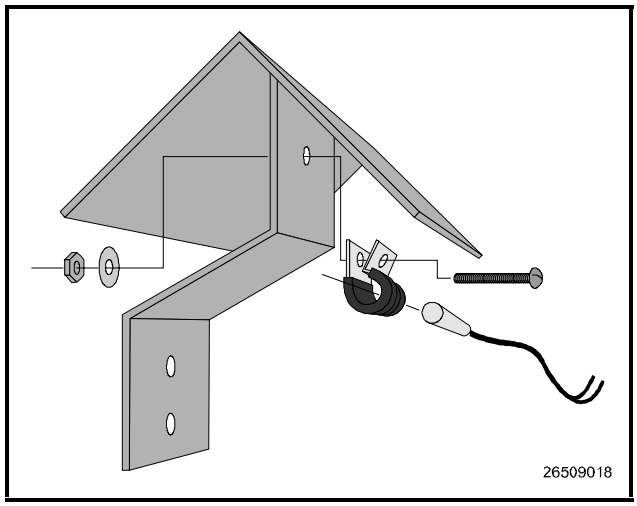


Figure 3-13 *- Outside Temperature Sensor with Cover and Clamp*

3.5.3 Insertion Temperature Probe

3.5.3.1 Location

The 12-inch insertion temperature probe may be used to monitor temperature in either the supply or return air ducts of the AHU or RTU.

3.5.3.2 Mounting

The insertion probe may be mounted in any orientation within the duct as long as the probe is in the air flow of the duct. The probe housing should be secured using self-tapping screws. A 0.250” diameter hole is required for the probe. ***Figure 3-14*** shows the installation of the insertion probe (self-tapping screws are not provided).

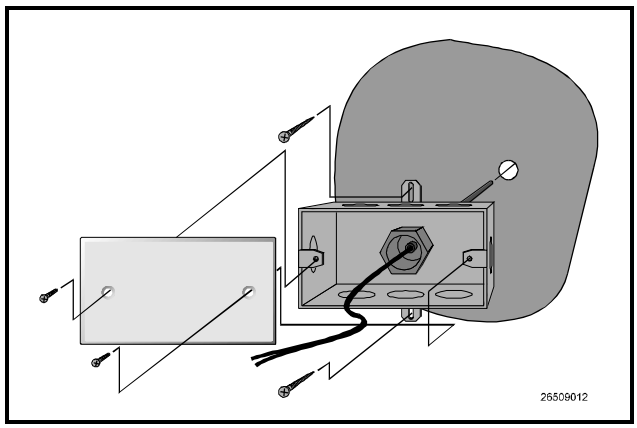


Figure 3-14 *- 12-Inch Insertion Probe Mounting*

3.5.4 Supply and Return Air Sensors

In addition to the 12-inch insertion temperature probe, CPC uses the same temperature sensor used for outside and inside temperature to monitor supply and return air temperature. When used in this application, the sensors are supplied without enclosure covers. The sensors should be mounted directly in the air stream of the supply or return air duct. The sensors are not supplied with any mounting hardware for this application.

3.5.5 Humidity Sensors and Humidistats

3.5.5.1 Indoor RH Sensors

The indoor relative humidity sensor should be mounted in a central location within the zone to be measured, away from doors, windows, vents, heaters, and outside walls that could affect temperature readings. The sensor should be between four and six feet from the floor. Note that this sensor generates a small amount of heat; therefore, do not mount temperature sensors directly above RH sensors.

Mount the sensor as follows:

1. Remove the two screws from the sides of the enclosure, and remove the cover.
2. Mount the sensor to the wall using the two mounting holes near the flattened corners of the mounting plate (as shown in ***Figure 3-15***).
3. Replace the cover and the cover mounting screws.

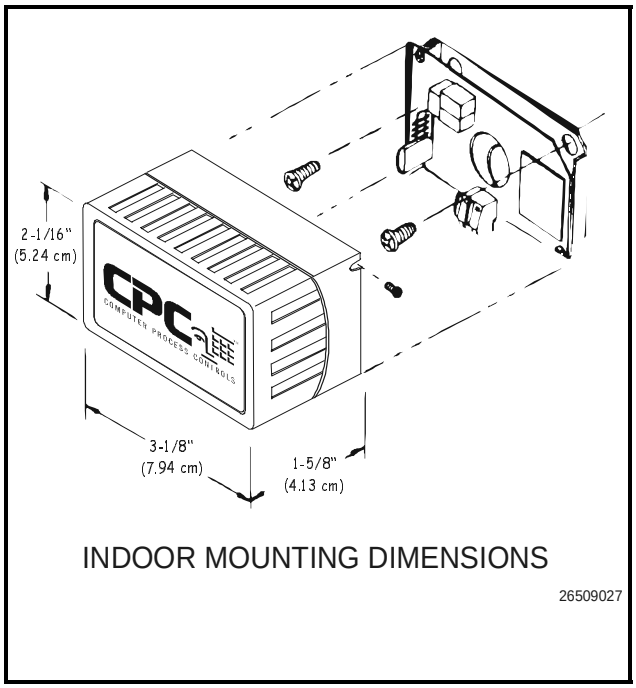


Figure 3-15 *- Indoor RH Mounting Dimensions*

3.5.5.2 Outdoor RH Sensor

When mounting outdoors, point the transmitter down so that water does not collect in the sensor cavity.

The outdoor sensor should be mounted in a sheltered area, preferably on the north side of a building under an eave. This prevents sun-heated air from rising up the side of the building and affecting the relative humidity at the sensor.

Mount the sensor using the two screw holes shown in ***Figure 3-16***.

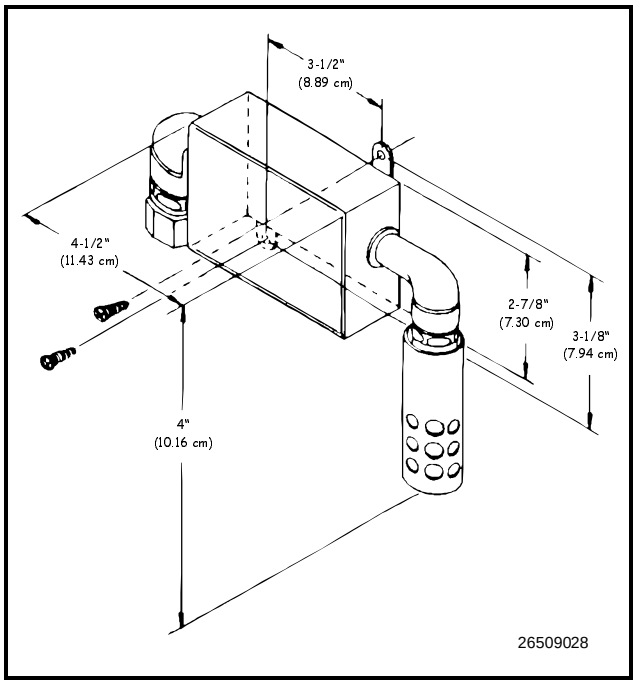


Figure 3-16 *- Outdoor RH Sensor Mounting Dimensions*

3.5.6 Dew Cell Dew Point Probe

3.5.6.1 Location

The Dew Cell Dew Point Probe should be located 4 to 6 feet from the floor with the probe pointing up. It is recommended that the Dew Cell Dew Point Probe be mounted in an area where it will be exposed only to minimal amounts of dust.

3.5.6.2 Mounting

Mount the probe using the standard switch cover supplied with the unit as shown in ***Figure 3-17***.

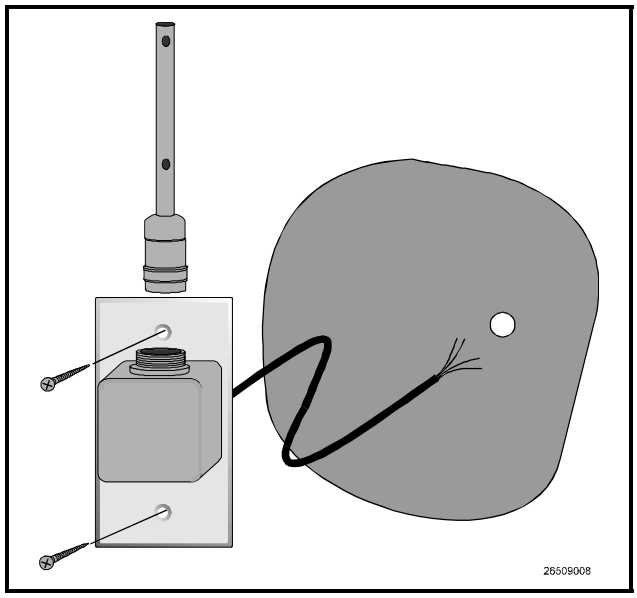


Figure 3-17 *- Dew Cell Dew Point Probe Mounting*

3.5.7 Light Level Sensor

3.5.7.1 Location

The Light Level Sensor should be located facing away from direct sunlight, preferably facing north in the Northern Hemisphere or south in the Southern Hemisphere.

3.5.7.2 Mounting

The light level sensor is not supplied with mounting hardware. The sensor should be mounted horizontally through the knockout of a standard weather-resistant junction box. ***Figure 3-18*** shows a typical mounting configuration.

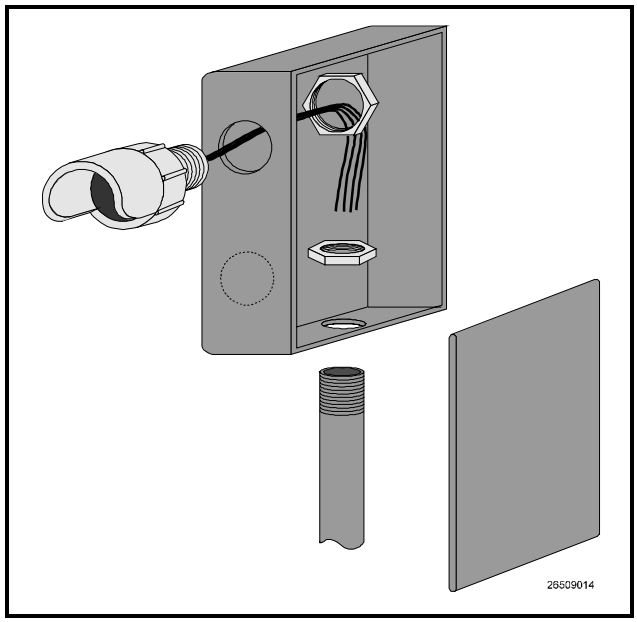


Figure 3-18 *- Light Level Sensor Typical Mounting*

3.5.8 Leak Detection

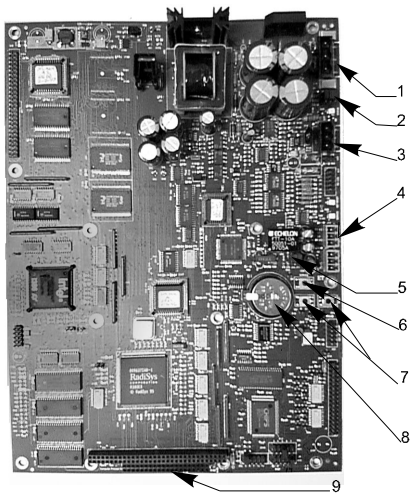
CPC supplies the Infrared Leak Detector System as a stand-alone unit that monitors refrigeration leaks in up to sixteen zones. Consult *026-1304, Infrared Leak Detector Installation and Operation Manual,* for mounting and installation instructions.

3.5.9 Power Monitors

CPC uses standard off-the-shelf power monitors for power monitoring. Installation instructions supplied with monitoring units should be used for both the watt-hour transducer and the transducer power supply.

4 Hardware Configuration

4.1 Setting Up The Einstein



LEGEND			
1	Power Terminals (24VAC Class 2 only)	6	Service Button
2	RS 485 Termination Jumpers (J2,3,4)	7	Reset Buttons (2)
3	I/O Network Connection	8	Lithium Battery
4	Echelon Network Connectors (2)	9	PC-104 Slot
5	Termination Jumpers (J16,17)		

26502038

Figure 4-1 *- Einstein Circuit Board*

Open up the case (if box-mounted) and remove the aluminum cover to expose the main circuit board.

4.1.1 Power Input Jack

Starting at the top right side of the board, the first plug is the 24 VAC input. This must terminate into the power supply transformer.

Einstein requires 24VAC Class 2 power, which is supplied by a non-center-tapped Class 2 transformer.

CPC supplies two transformers that may be used to power Einsteins: one for use with 110VAC (P/N 640-0041), and one for use with 220VAC (P/N 640-0042). Both transformers are rated at 50VA, and each will power one Einstein unit.

4.1.2 RS485 Jumpers

The RS485 termination jumpers (J2, J3, and J4) are used to terminate the devices at the beginning and end of an RS485 network. Normally, the Einstein is the beginning of all RS485 I/O networks, so all three of these jumpers should be set to the UP position.

4.1.3 RS485 Port

Below the status light is the RS485 Network plug. This is where all I/O boards (except the case controllers and rooftop controllers) are connected.

4.1.4 Echelon Network Connect

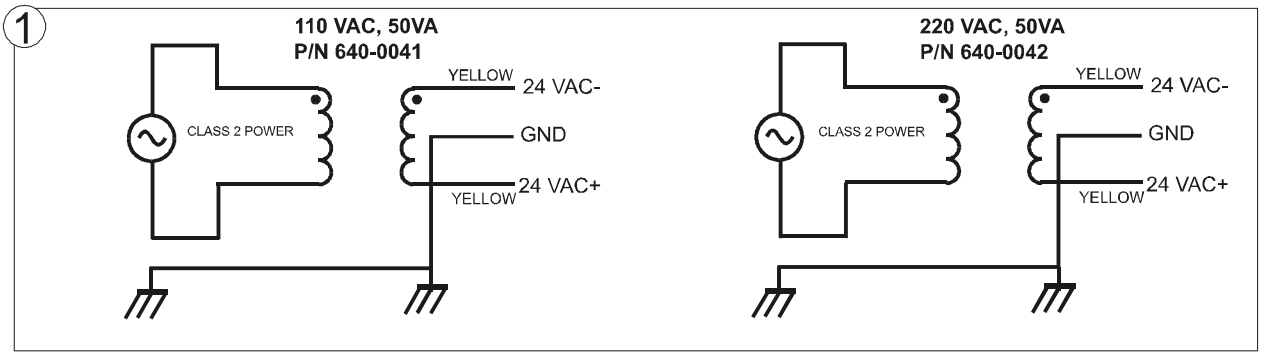
The next two jacks are the Echelon network plugs. One is input and the other is output (both will work each way). These plugs are the connection to the Case Controller (CC-100), the Rooftop Controller (RT-100), the Evaporator Stepper Regulator board (ESR8), and other Einsteins.

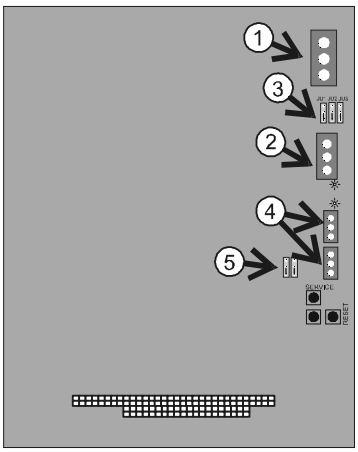
4.1.5 Echelon Jumpers

The two Echelon jumpers (J16 and J17) are located next to the two Echelon network ports. One Einstein per network segment must be terminated. For small networks below 64 nodes, this means one Einstein must be terminated and the rest unterminated. In large installations with one or more routers, one Einstein on each side of the router must be terminated.

EINSTEIN INSTALLATION GUIDE

1





1. Connect power transformer to the Einstein.

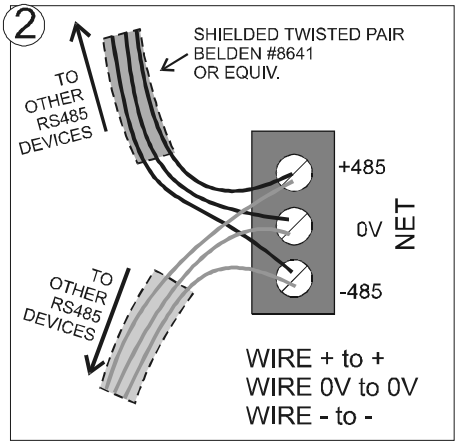
2. Connect Einstein to the RS485 I/O Network.

3. Set RS485 termination jumpers UP if at either end of a daisy chain. Otherwise, set jumpers DOWN.

4. Connect Einstein to the Echelon network.

5. One Einstein should be terminated for every group of up to 64 nodes (as divided by router). Terminate by setting both jumpers UP. Otherwise, set jumpers DOWN.

2



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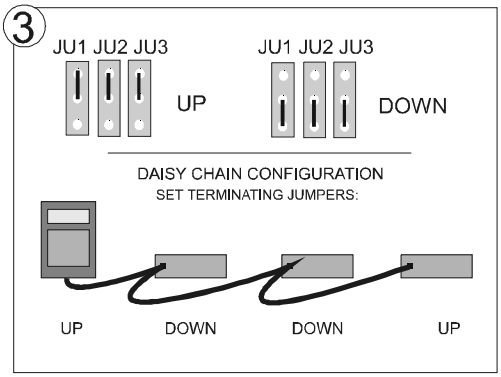

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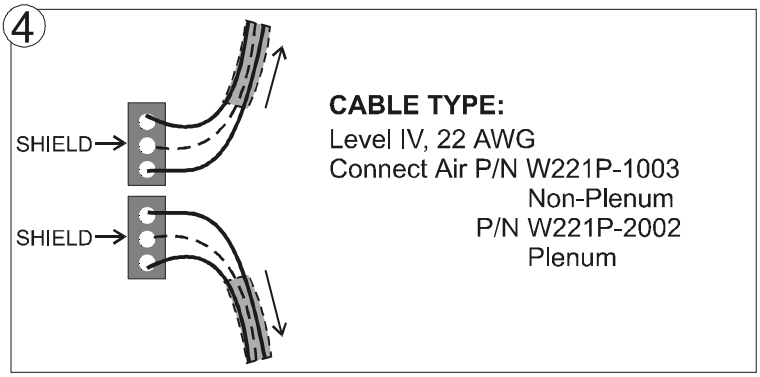

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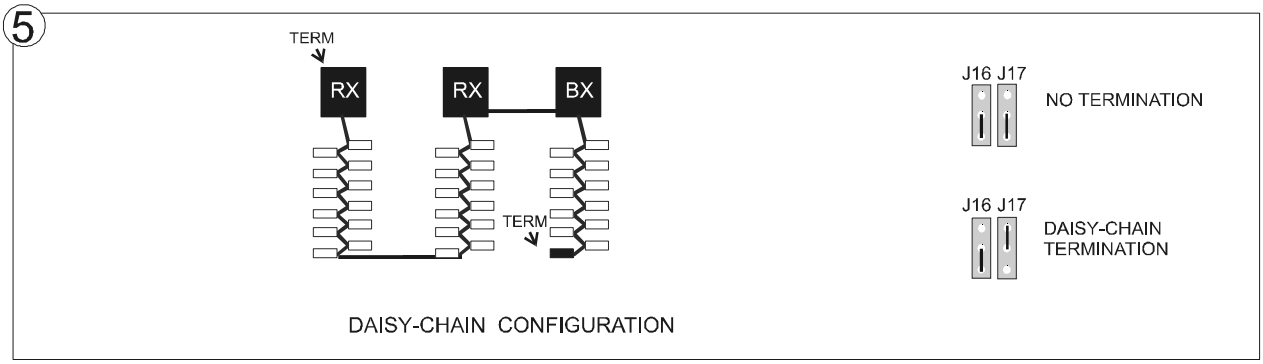


4.2 The I/O Network

Each Einstein controller may connect with up to 31 input and/or output boards via the RS485 network. This network is used by the Einstein to read data from the input boards and to send commands to the analog and digital output boards. Case controllers and rooftop controllers are not part of the RS485 Network.

4.2.1 Wiring Types

CPC specs Belden #8641 shielded twisted pair cables for use as I/O network wiring (or Belden #82641 and Belden #88641 for plenum installations).

If the recommended cable is not available in your area, be sure the wiring meets or exceeds the following specs:

Shielded?	Yes
Conductor Type	Twisted Pair
Gauge	18 - 24 AWG
Capacitance between signal wires	31 pF/ft or less
Capacitance between signal and shield	59 pF/ft or less
Nominal Impedance	120Ω±50Ω

Table 4-1 *- RS485 I/O Network Wiring Specifications*

4.2.2 Daisy Chains

The RS485 Input/Output (I/O) network connects all input and output communication boards together in a single open communications loop. This loop, or "daisy chain," connects the Einstein to multiple input and output communication boards, and terminates at the last input or output board on the network. A diagram of this network arrangement is shown in ***Figure 4-2***.

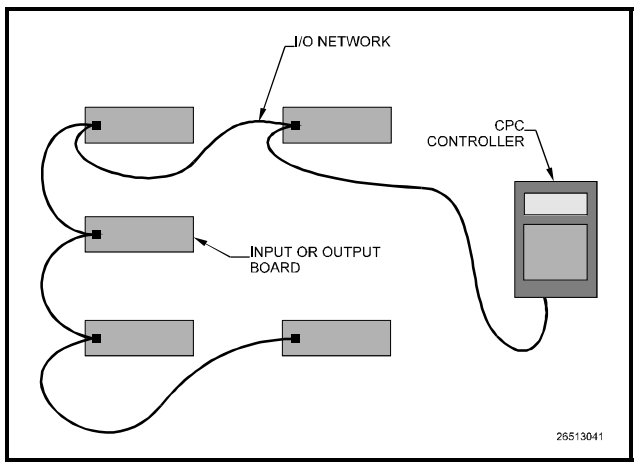


Figure 4-2 *- I/O Network Configurations*

4.2.3 Network ID Numbers

Each device on an RS485 segment has either a network dip switch or rotary dials that must be used to assign the board a unique **network ID number**.

The network ID number makes a board unique from other boards on the network of the same type. This allows Einstein to find it and communicate with it easily.

Boards of the same type should be numbered in sequence, starting with one and continuing with two, three, and so forth. For example, if a segment contains four 16AI boards and five 8RO boards, you should number the 16AIs one, two, three, and four; and the 8ROs one, two, three, four, and five. The same should be done with multiple 4AO and 8DO boards, and IRLDS leak detection units.

For all boards except 8IO, 8DO, and ARTC boards, the network dip switch labeled S1 (or S3 for the 16AI board) is used to set the unique board number of the unit and the baud rate. The 8IO, 8DO, and ARTC use rotary dials to set the board number of the unit.

Refer to the Installation Guide pages at the end of this section of the manual for information on how to set board numbers.

4.2.3.1 Numbering the 8IO Boards

When it comes to network numbering, the 8IO Combination Input/Output board is a special case. It is actually a combination of three types of CPC boards: the 8 inputs are configured like a 16AI, the 8 relay outputs are configured like an 8RO, and the two analog outputs are configured like a 4AO.

When an 8IO is present on the network, it must be treated like all three board types. Therefore, when numbering 8IOs, you must number the input side of the board as if it were a 16AI, and you must number the output side of the board as if it were an 8RO.

The two analog outputs, when enabled, are considered a 4AO board that is fixed as board #1. Therefore, if an 8IO is using analog outputs AND 4AOs are present on the network, you must start numbering the 4AOs as #2, and then #3, #4, etc. Consequently, since each 8IO is hard-wired to act as “4AO #1”, you may not have two 8IOs with enabled analog outputs on the same network segment.

When the 8IO is not using its analog outputs, a jumper on the board may be removed to disable them, in which case the 8IO is not considered a 4AO board.

Figure 4-3 provides a graphic representation of board numbering for two 16AIs, three 8ROs, and two 8IOs.

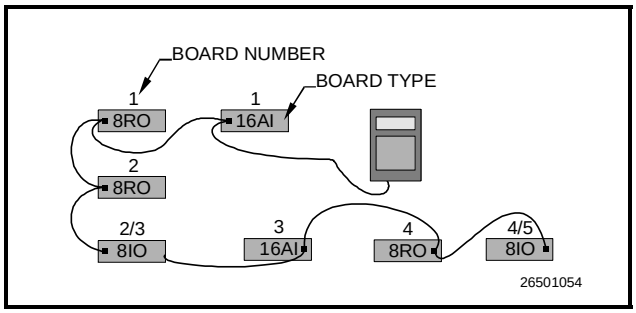


Figure 4-3 *- Network Device Numbering*

4.2.3.2 Numbering ARTC Boards

The ARTC boards, like the 8IO boards, use rotary dial switches to set their number on the I/O network. However, the ARTC does not have to have separate input, output, and analog numbers as the 8IO does -- ARTCs have a single board number from 1 to 31. This board number is set using rotary dial switches S1 and S2, with S1 representing the "tens" digit of the number, and S2 representing the "ones" digit. For example, to set an ARTC to be board #12, set S1 to "1" and S2 to "2."

4.2.4 Setting the Baud Rate

All I/O boards have dip switches that determine the baud rate at which they communicate. Currently, the baud rate dip switch in network components may be set at either 4800, 9600, 19200, and 38400. Setting of the baud rate is accomplished using switch S1 on the 4AO, 8RO, and 8RO-FC output boards; and switch S3 on the 16AI input board (refer to the board's installation sheets at the end of this section for specific dip switch settings).

Baud Rate for the IRLDS

The IRLDS can be set to either 9600 baud or 19.2K baud by dip switch #6. "ON" places the rate at 9600 baud while "OFF" sets it at 19.2K baud. Refer to the IRLDS's installation sheet at the end of this section for specific dip switch settings.

Baud Rate for the 8IO, ARTC, and 8DO

There are three I/O devices that do not have baud rates determined by dip switches. They are as follows:

1. *The 8IO* - this board automatically detects the baud rate being used by the I/O devices on the network, and adjusts to match their baud rate.
2. *The 8DO* - this board automatically detects the baud rate being used by the I/O devices on the network, and adjusts to match their baud rate.
3. *The ARTC* - this board is fixed at 9600 baud.

Recommended Baud Rate

The baud rate that should be used depends on whether or not there is an ARTC board on the I/O network. If no ARTC is present, the Einstein and all I/O devices should be set to 19.2K baud. If an ARTC is present, it may only communicate at 9600 baud; therefore, the Einstein and all other boards on the network must also be set to 9600 baud.

4.2.5 Setting the Terminating Resistance Jumpers

All I/O boards and the Einstein have a set of terminating resistance jumpers (one jumper for each wire lead). These jumpers are labeled JU1, JU2, and JU3 on the I/O board and J3 on the Einstein.

The purpose of the jumpers is to indicate the two ends, or termination points, of the segment. On a daisy chain, one device at the beginning and one device on the end must be terminated by placing all three termination jumpers in the UP position. All other devices on the daisy chain must be set to the DOWN position. ***Figure 4-4*** shows the proper terminating resistance jumper settings for the Einstein and for all I/O boards.

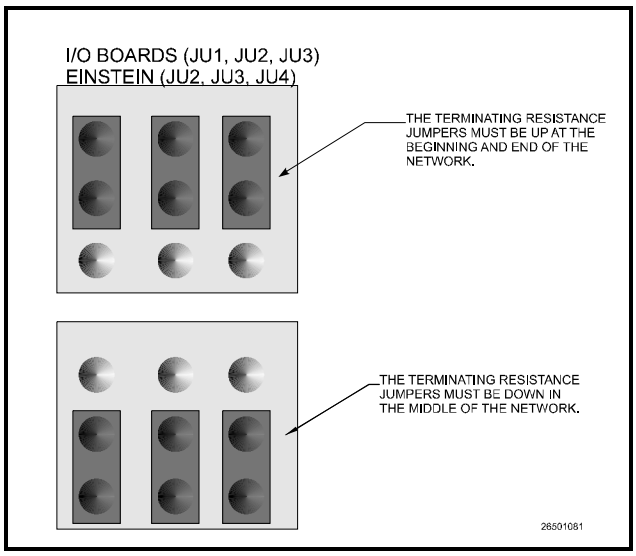


Figure 4-4 *- I/O Network Termination Jumper Settings*

4.2.6 Powering the I/O Boards

For powering all I/O boards (16AIs, 8ROs, 4AOs, 8DOs, 8IOs and ARTCs), CPC specs several sizes of transformers: a three-board, 56VA transformer *(P/N 640-0056)*, a five-board, 80VA transformer *(P/N 640-0045)*, and a ten-board, 175VA transformer *(P/N 640-0048)*.

The names "three-board, five-board, and ten-board" are only guidelines that refer to the number of 8RO boards that may be powered by one transformer. In reality, the number of boards that can be wired to a single transformer will depend on the boards' VA rating as compared to the transformer's VA rating.

To select a power transformer for a board or a series of boards:

1. Determine what the total VA is for the boards that will be powered by the transformer (see ***Table 4-1***).

   Example: Two 8IOs (18.0 VA each), and one 4AO (10.0 VA) boards are to be powered by one transformer. The total VA is:

   $$(2 \times 18VA) + (1 \times 10VA) = 46VA$$

2. Use a transformer that has a power rating higher than the total calculated VA (see ***Table 4-2***).

Example: For boards totalling 46VA, a three board transformer (56VA) is sufficient, since 56VA is greater than 46VA

Unit	amps	VA	VAC	Center tapped?
16AI	0.25	5.0	24	Yes
8RO	0.75	15.0	24	Yes
4AO	0.5	10.0	24	Yes
8DO	1.5	18	24	Yes
8IO/ARTC	0.75	18	24	No
IRLDS			115/230	N/A

Table 4-1 *- Device Power Requirements*

	Three-Board	Six-Board	Ten-Board
P/N	640-0056	640-0080	640-0048
Power Rating	56 VA	80 VA	175 VA

Table 4-2*-Power Ratings for CPC Transformers*

I/O Board Transformers should be located within 10 feet of the board it is powering, preferably within the board enclosure.

4.2.6.1 Wiring the I/O Boards to a Transformer

The 16AI, 8RO, 4AO, and 8DO all require the use of a center tap. This is acheived by connecting the 0V terminal on the board's three-pin power connection to the center tap on the transformer's secondary (pin 8).

The 8IO and ARTC boards must never be center tapped. Instead, the 0V terminal of the 8IO and ARTC boards must be connected to a separate Earth ground.

Figure 4-5 shows a sample configuration where two center-tapped boards and one non-center-tapped board are connected to the same transformer secondary. The two center-tapped boards share a ground connection to the center tap of the transformer. The non-center-tapped board is grounded with a separate Earth ground.

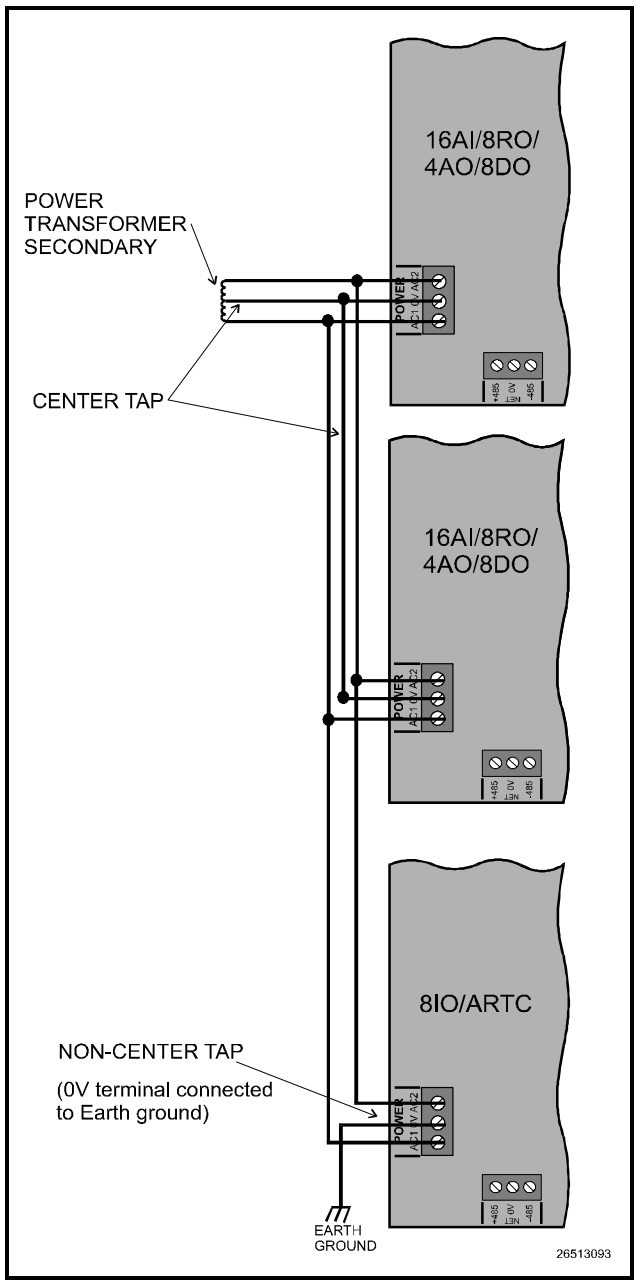


Figure 4-5*-Wiring 8IOs/ARTCs with Other Center-Tapped Boards*

4.2.6.2 Wiring Types

For powering I/O boards, use only the listed wire types from ***Table 4-3***. Three-conductor non-shielded cables are the recommended wire for connecting between the center tapped transformer and the I/O boards. Shielded cable

should not be used for power wiring. The center tap should be wired with the third conductor to earth ground at the transformer.

Power Wiring Types	
14 AWG	Belden 9495
18 AWG	Belden 9493

Table 4-3 *- Power Wiring Types*

The wire length from the transformer and the number of boards connected to the same wire determines the type wire gauge used. In most cases, the the distance between the I/O boards and the transformer that supplies power to them is not enough to be concerned with. But it is very important not exceed this maximum wire length or the boards will malfunction.

Use these formulas to determine if the wire gauge you are using fits within specification:

14 AWG:

Feet = 0.25/(VA/24) x 0.00252

18 AWG:

Feet = 0.25/(VA/24) x 0.0064

(VA is the total VA rating of the I/O boards)

For example, if you had an 80 VA load:

14 AWG: 29 ft (rounded down)

18 AWG: 11 ft

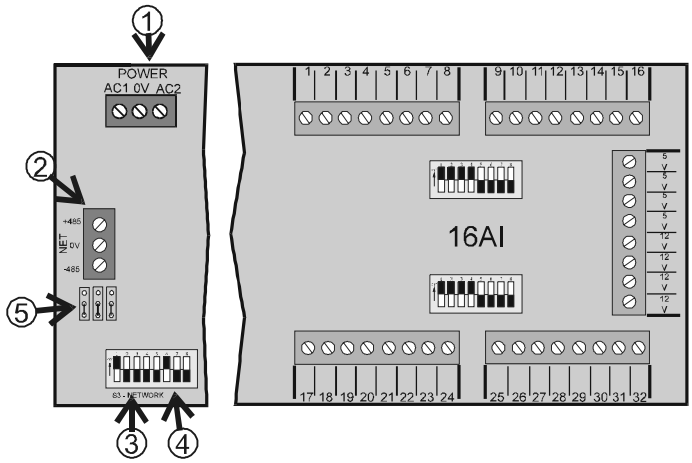
Figure 4-6 *- Power Wire Lengths*

Sensors requiring 24VAC can be powered from the same transformer powering the input board as long as the resulting total load of both the input board(s) and the sensor(s) connected to the transformer does not exceed the transformer's VA rating. Consult **Section 4.2.6,** *Powering the I/O Boards*, and **Section 5.6.1,** *Powering Echelon Devices* for more information.

4.2.7 Board Installation

The following pages give step-by-step graphical instructions on all steps necessary to install each I/O network device so that it is powered up and able to communicate with Einstein. If these devices have not yet been mounted, refer to **Section 3,** *Hardware Mounting* for mounting instructions for these devices.

16AI INSTALLATION GUIDE



1. Connect board to power transformer.

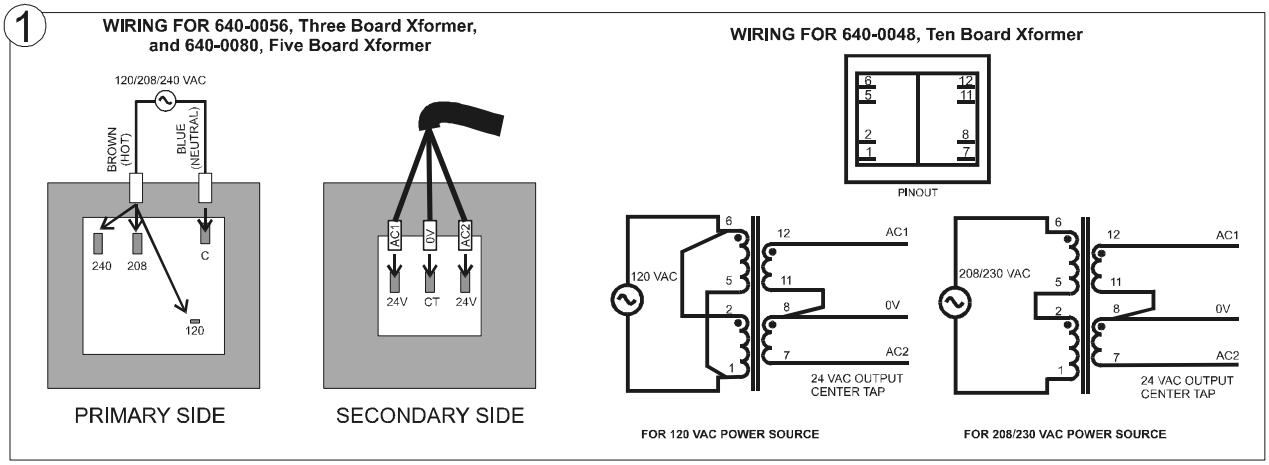
2. Connect 16A1 to the RS485 I/O Network.

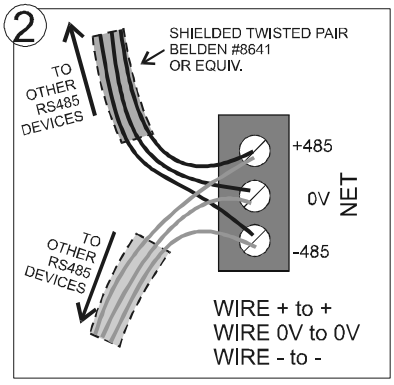
3. Set the network address on the first five rockers of dip switch S3.

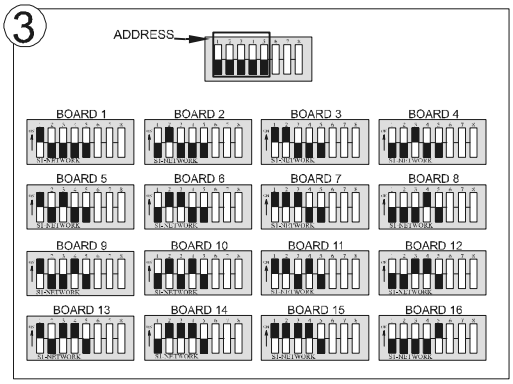
4. Set the network baud rate using rockers 6 and 7 of dip switch S3.

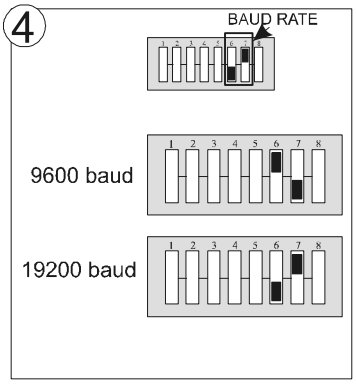
5. Set RS485 termination jumpers UP if at either end of a daisy chain. Otherwise, set jumpers DOWN.

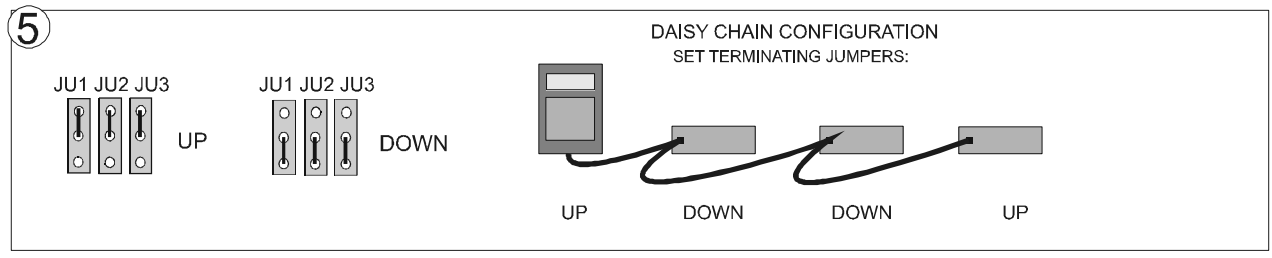
Note: If you change any dip switch settings while the board is powered, disconnect the power and re-power the board to reset.



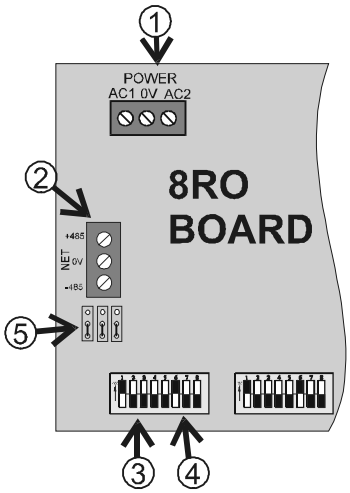








8RO INSTALLATION GUIDE



1. Connect board to power transformer.

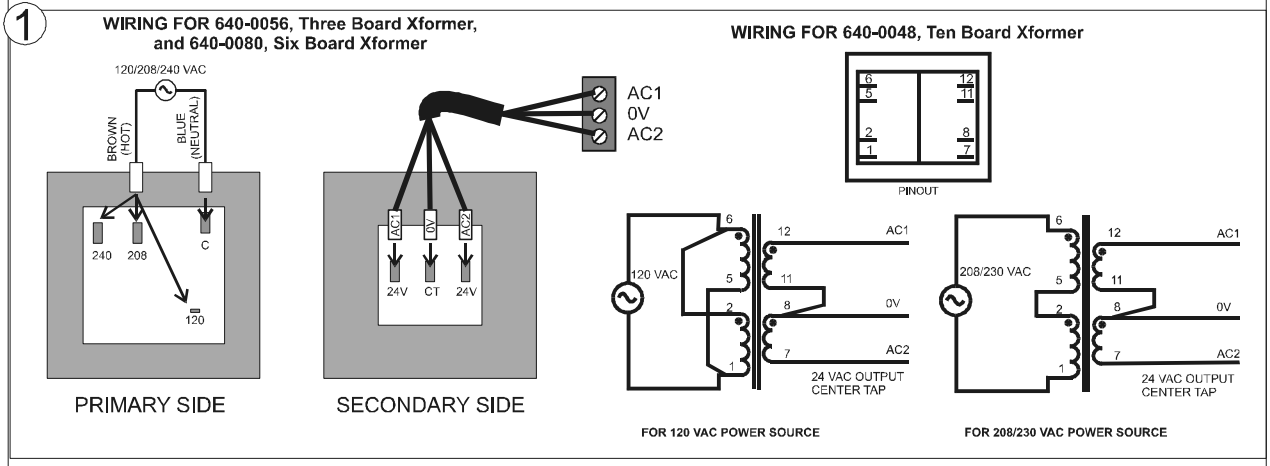
2. Connect 8RO to the RS485 I/O Network.

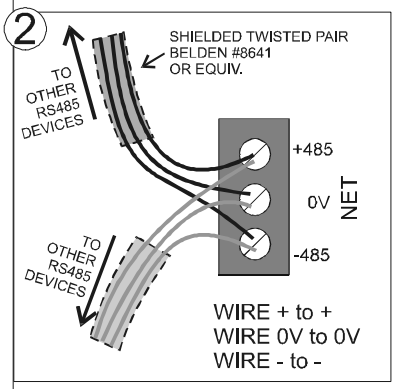
3. Set the network address on the first five rockers of dip switch S1.

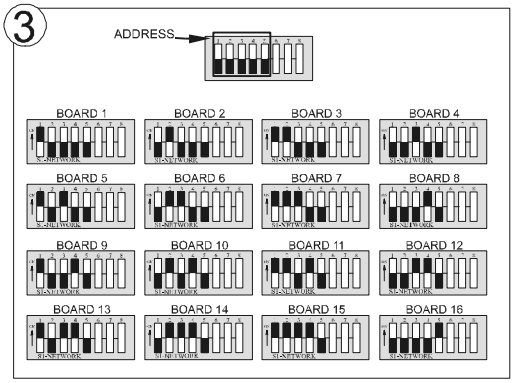
4. Set the network baud rate using rockers 6 and 7 of dip switch S1.

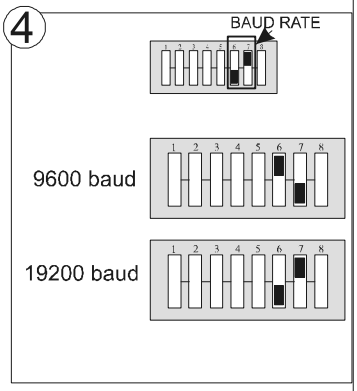
5. Set RS485 termination jumpers UP if at either end of a daisy chain, at the hub of a star, or at the end of the longest leg of a star configuration. Otherwise, set jumpers DOWN.

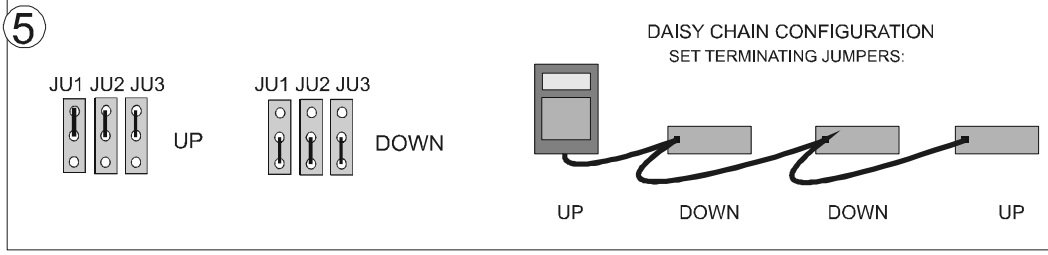
Note: If you change any dip switch settings while the board is powered, disconnect the power and re-power the board to reset.



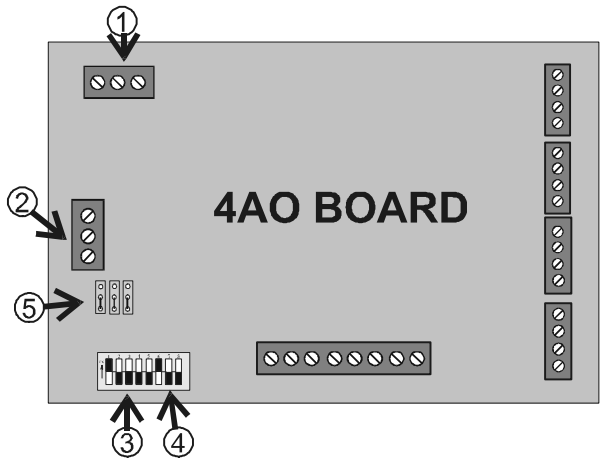








4AO INSTALLATION GUIDE



1. Connect board to power transformer.

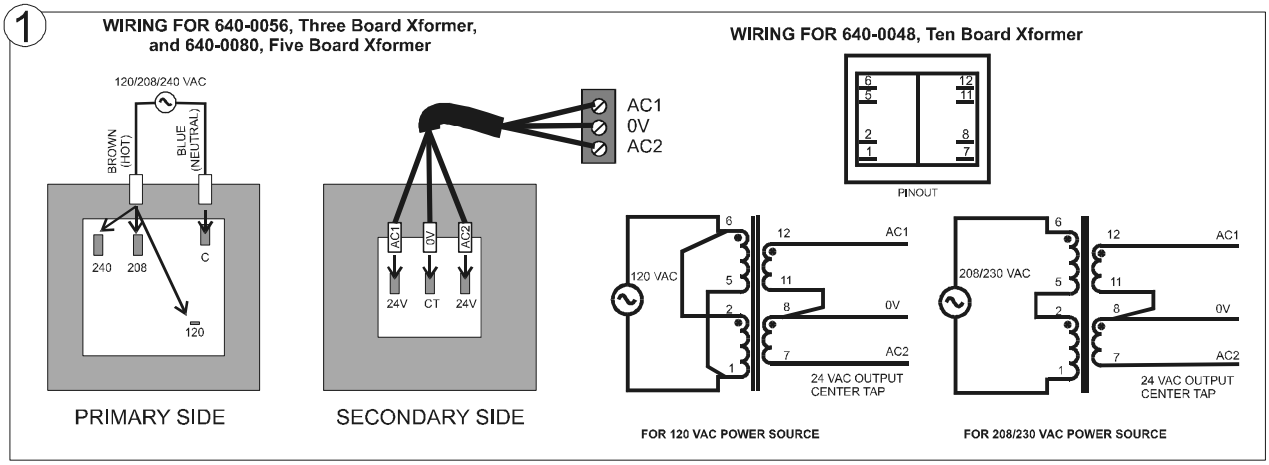
2. Connect 4AO to the RS485 I/O Network.

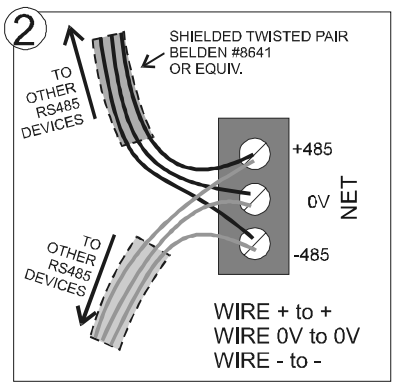
3. Set the network address on the first five rockers of dip switch S1.

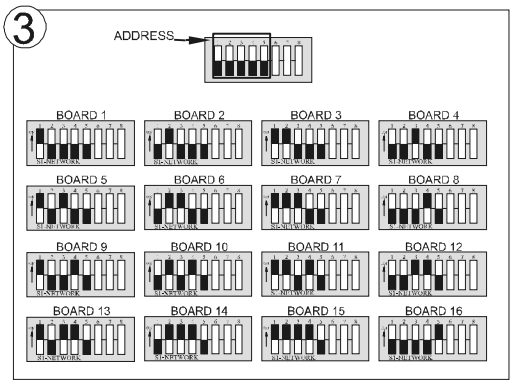
4. Set the network baud rate using rockers 6 and 7 of dip switch S1.

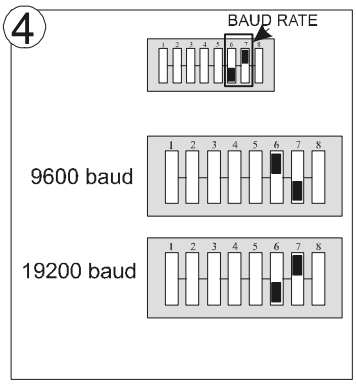
5. Set RS485 termination jumpers UP if at either end of a daisy chain. Otherwise, set jumpers DOWN.

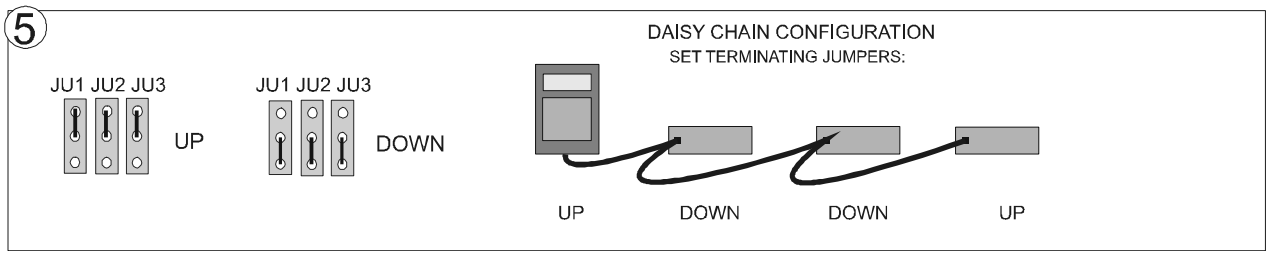
Note: If you change any dip switch settings while the board is powered, disconnect the power and re-power the board to reset



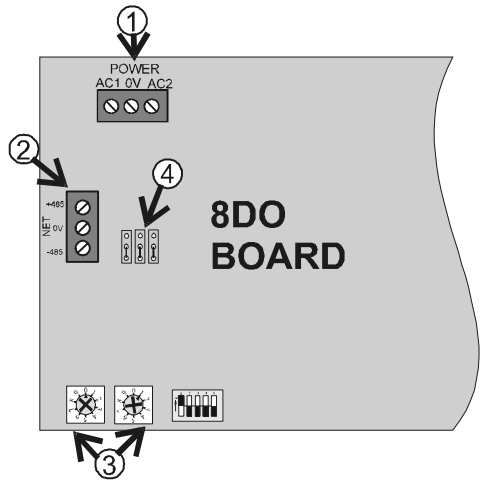








8DO INSTALLATION GUIDE



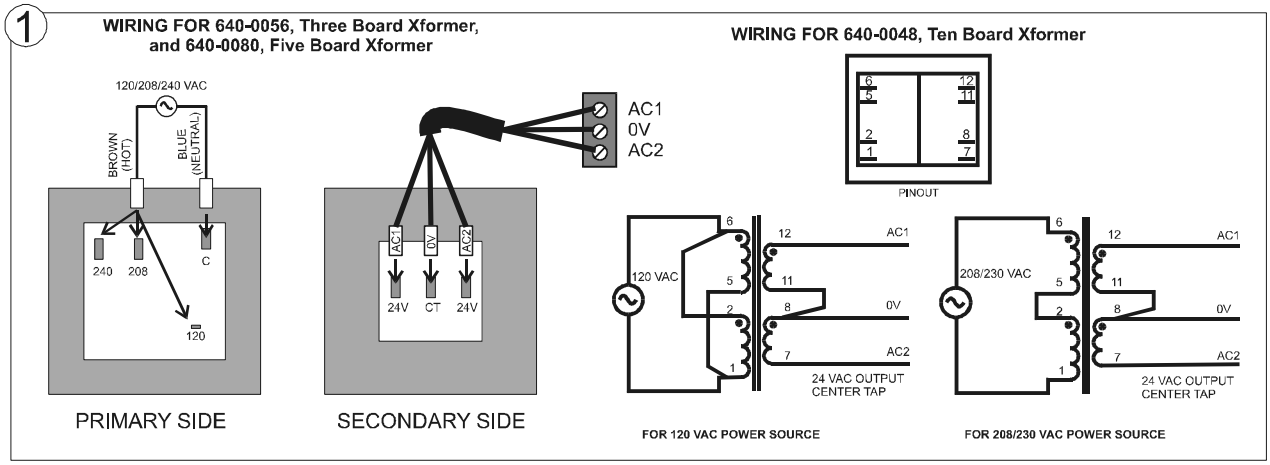
1. Connect board to power transformer.

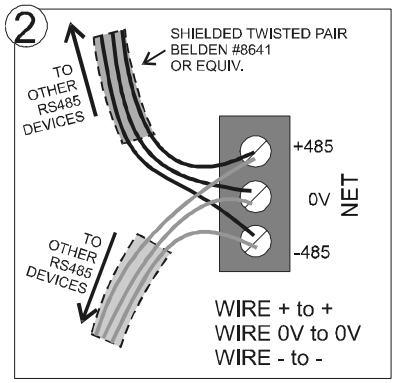
2. Connect 8DO to the RS485 I/O Network.

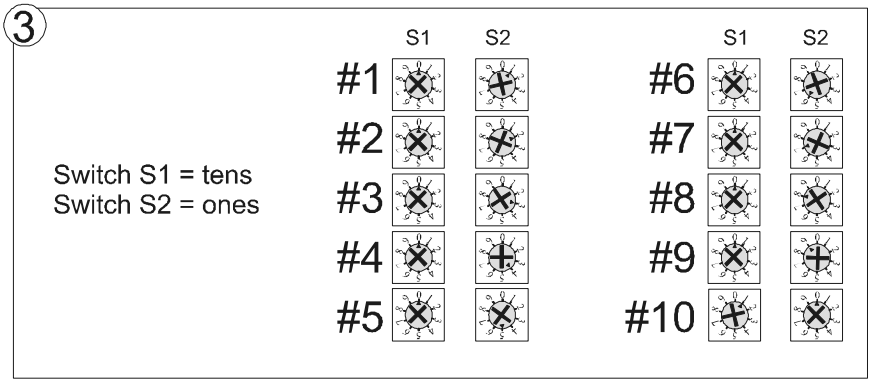
3. Use the rotary dials S1 & S2 to set the board number. Use switch S1 to set the “tens” portion of the board number, and S2 as the “ones” portion of the board number. Example: to set the board as 8DO #1, set S1 to zero and S2 to one.

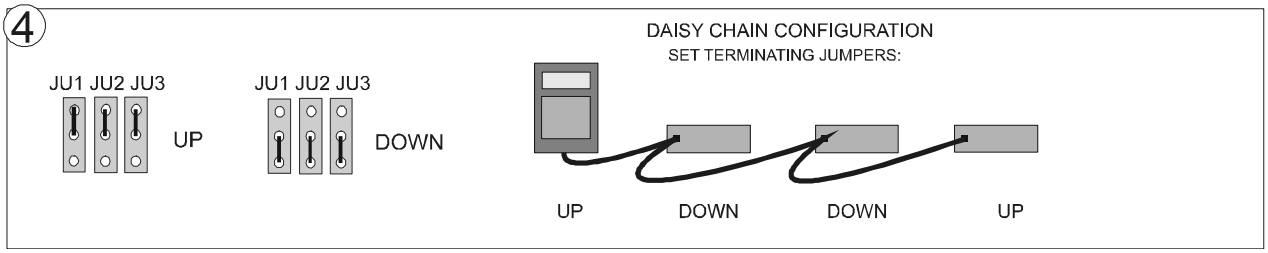
4. Set RS485 termination jumpers UP if at either end of a daisy chain. Otherwise, set jumpers DOWN.

Note: If you change any dip switch settings while the board is powered, disconnect the power and re-power the board to reset

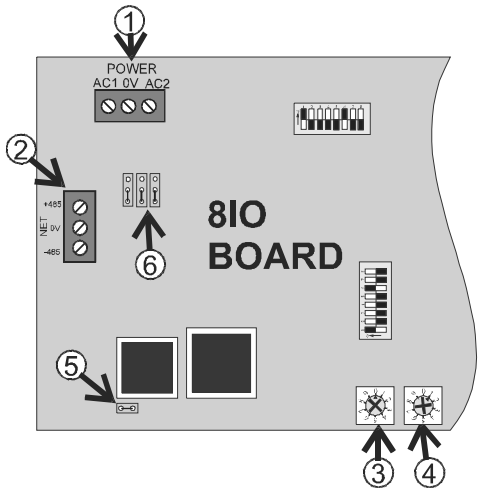








8IO INSTALLATION GUIDE



1. Connect board to power transformer. ***DO NOT USE THE CENTER TAP! Connect 0V terminal to a separate Earth ground.***

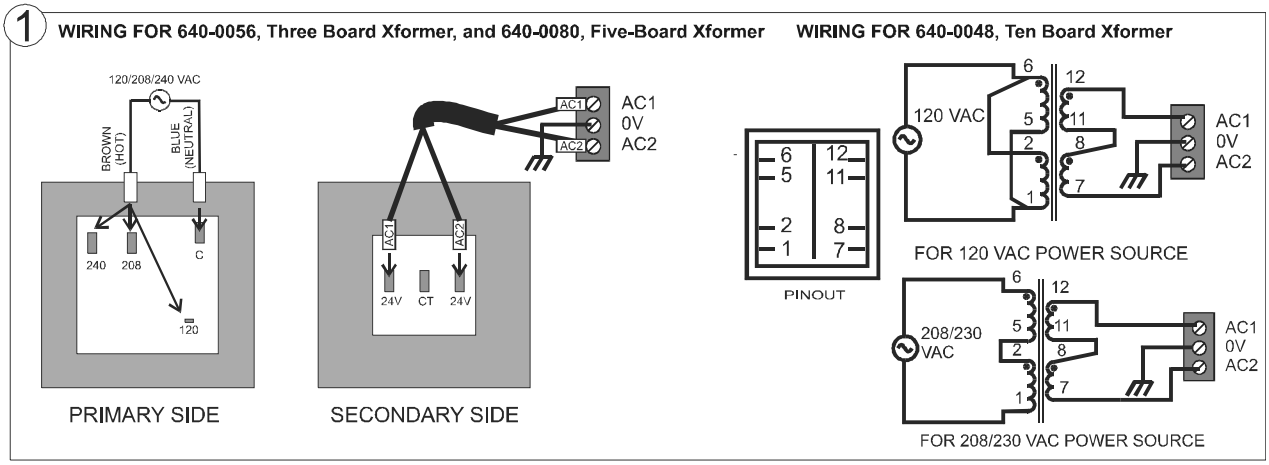
2. Connect 8IO to the RS485 I/O Network.

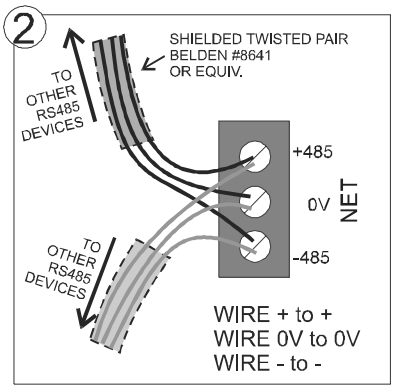
3. The output section of this board must be given a separate network ID number as if it were an 8RO . Set the network ID number using rotary switch S1.

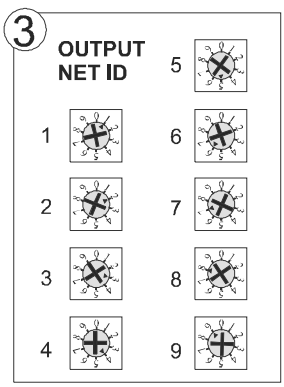
4. The input section of this board must be given a separate network ID number as if it were a 16AI. Set the network ID number using rotary switch S2.

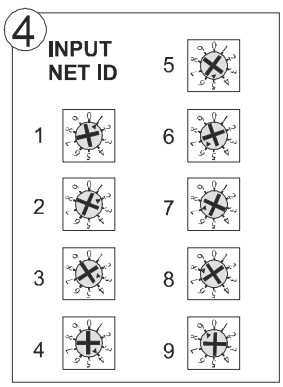
5. Set the jumper JU4 to enable or disable the analog outputs.

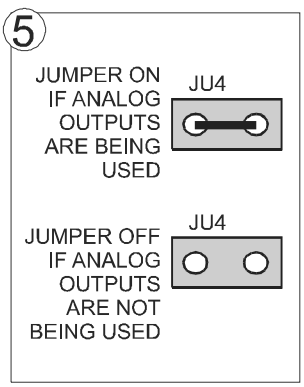
6. Set RS485 termination jumpers UP if at either end of a daisy chain. Otherwise, set jumpers DOWN.

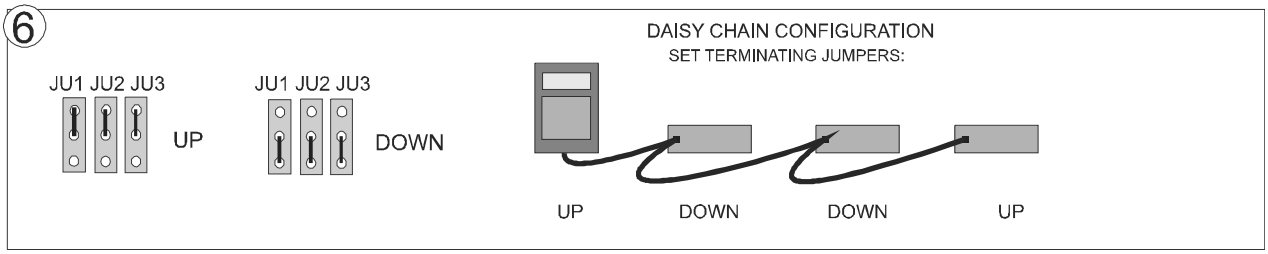




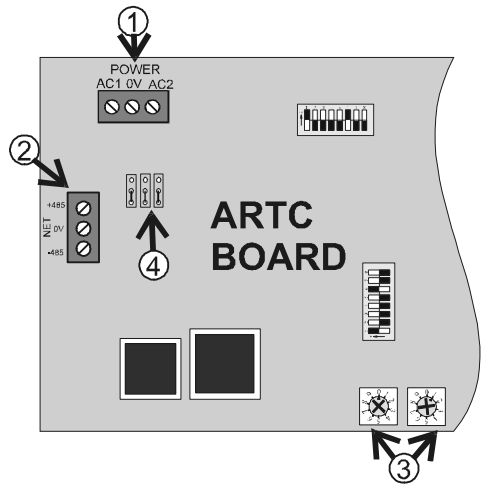








ARTC INSTALLATION GUIDE



1. Connect board to power transformer. ***DO NOT USE THE CENTER TAP! Connect 0V terminal to a separate Earth ground.***

2. Connect 8IO to the RS485 I/O Network.

3. Set the board number for this ARTC using the rotary dials S1 and S2. Switch S1 signifies the “tens” portion of the board number, while switch S2 signifies the “ones” portion of the board number..

4. Set RS485 termination jumpers UP if at either end of a daisy chain. Otherwise, set jumpers DOWN.
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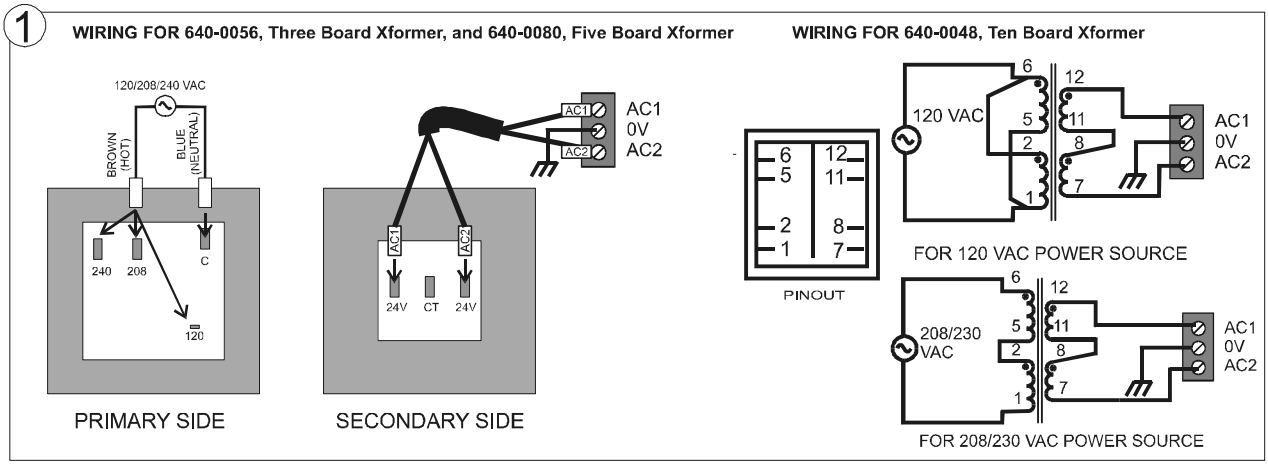
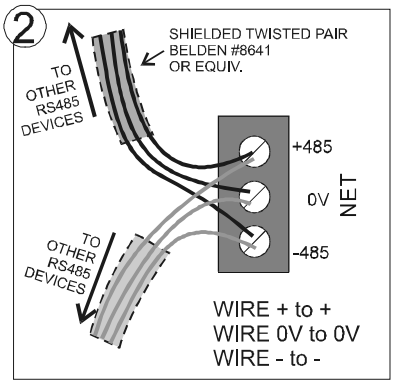
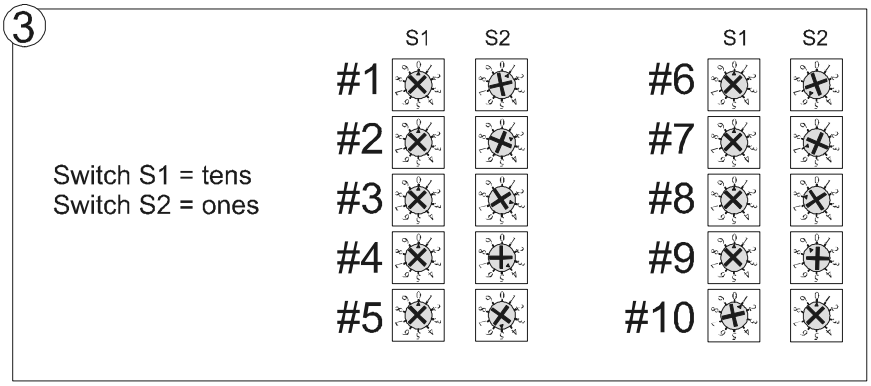
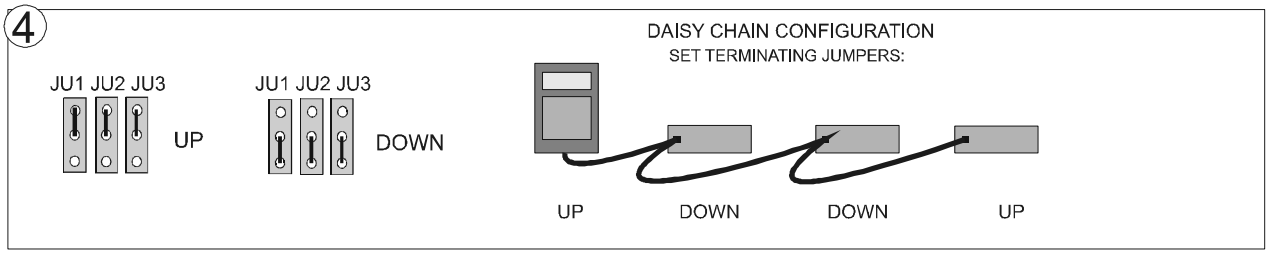








5 Echelon Network and Device Wiring

5.1 Overview

Echelon is a two-conductor network that interconnects Einsteins and other associated devices, such as CC-100 case controllers, TD3 temperature displays, and ESR8 evaporator stepper regulator boards. All Echelon devices are wired together using either of two methods of wiring: daisy-chaining or branched configurations.

5.2 Wiring Type

CPC specifies one type of cable for Echelon network wiring. This cable type's properties are listed in ***Table 5-1***.

Cable Type	Level 4, twisted pair, stranded, shielded
Wire Diam./AWG	0.65mm/22AWG
Loop Resistance	106(ohms/km)
Capacitance	49(nF/km)

Table 5-1 *- Echelon Network Cable Specifiactions*

Cable Type	Connect Air Pt. Number
1 pair, non-plenum	135-2300
1 pair, plenum	135-2301

Table 5-2 *- Recommended Wiring*

5.3 Echelon Network Structuring (Daisy-Chaining)

Echelon devices are networked together into configurations called **segments.** A segment is a group of up to 64 Echelon devices that are connected together on an unbroken series of wires.

The recommended way of constructing an Echelon network is called **daisy-chaining.** In the daisy-chain network configuration, devices are arranged by **subnets**, which consist of one Einstein and all Echelon devices associated with the Einstein.

First, all devices in a subnet are connected in an unbroken chain without branches or "star configurations" (see ***Figure 5-1***). Then, if more than one Einstein is present on site, all chains are connected so that the entire network forms a large unbroken chain, called a daisy chain (see ***Figure 5-2***). This allows for all devices in the Echelon network to be hard wired together for trouble free communication.

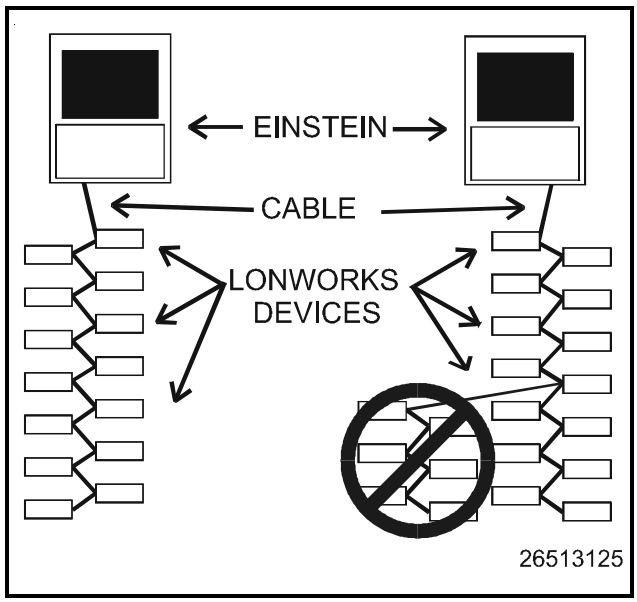


Figure 5-1 *- Echelon Wiring - Subnets*

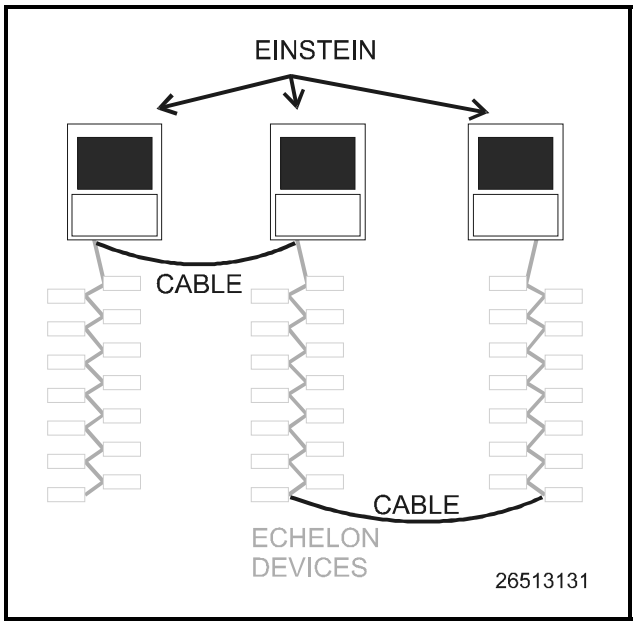


Figure 5-2 *- Echelon Wiring, pt. 2*

5.3.1 Maximum Number of Nodes

A daisy-chained segment may contain no more than 63 total Echelon devices (also called "**nodes**"). If there are 64 or more Echelon devices at your site, an Echelon-compatible router (*P/N 572-4200)* will be required. A router placed on the Echelon network allows you to add another 63-node daisy-chain network. For larger installations, multiple routers can be used to extend the network indefinitely.

More information about routers and how they are used in a daisy-chain Echelon network can be found in *P/N 026-1605, Router and Repeater Installation Guide*.

5.4 Device Termination

In a daisy-chain configuration, both ends of the network segment must be terminated. Terminate the Einstein by setting jumpers J16 and J17 to the UP position, as shown in ***Figure 5-3***. Other devices on the Echelon network are terminated either by jumpers on the control board or by connecting a 102-ohm “terminator block”at the end of the network segment (see **Section 5.4.1,** *Using a Termination Block (P/N 535-2715) to Terminate a Daisy Chain*). Refer to the installation guide references at the end of this section for specific device termination instructions.

All other Einsteins and Echelon devices that aren’t at the end of a daisy-chained network segment must be unterminated.

If a router or repeater is being used in a network, termination becomes more complicated, because routers and repeaters join multiple daisy-chain segments together. Refer to *P/N 026-1605, Router and Repeater Installation Guide*, for specific termination instructions.

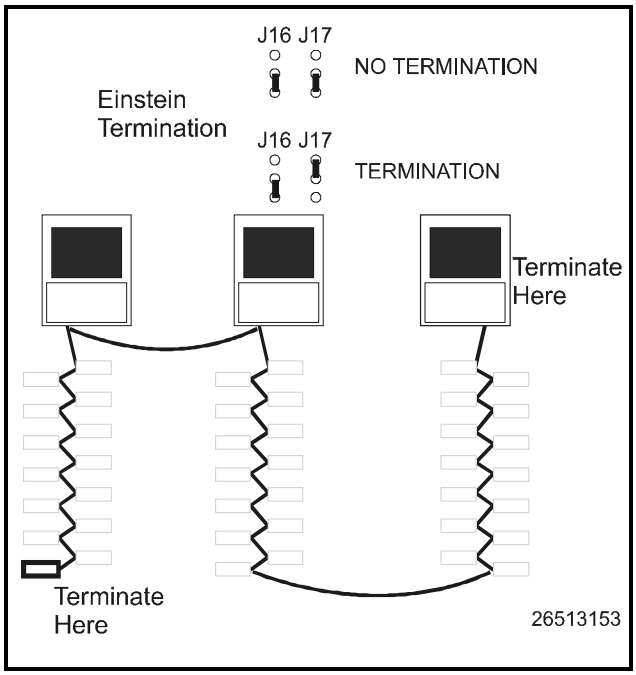


Figure 5-3 *- Einstein Termination - Daisy Chain*

5.4.1 Using a Termination Block (P/N 535-2715) to Terminate a Daisy Chain

Some Echelon network devices have no on-board means of terminating. For some other devices, it is inconvenient to use the jumpers supplied for termination.

To remedy these problems, CPC supplies termination blocks that can be wired to the end of an Echelon cable segment. This termination block uses the same three-pin connector as all other Echelon devices. Wire the two signal wires to the outside terminals, and connect the shield to the middle terminal (see ***Figure 5-4***).

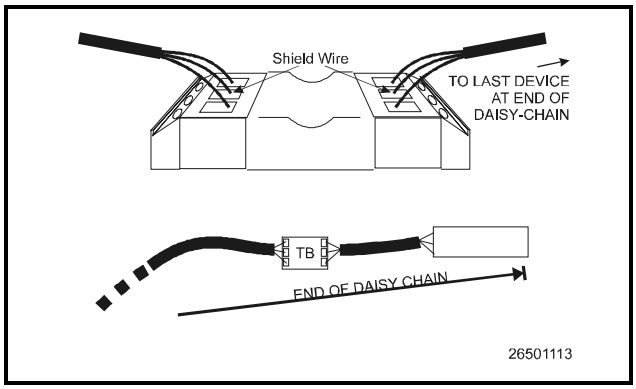


Figure 5-4 *- Placement and Wiring of the Termination Block*

5.5 Wire Restrictions

Maximum Total Segment Length

The total amount of wire used to connect all Einsteins and associated controllers in a single segment (not including devices on the other side of routers) cannot be longer than 4592 feet (1400 meters). If the total length of cable used is longer than 4592 feet, a repeater or router will be required.

Routers act as communication gateways that reduce the amount of network traffic. They are used when networks exceed their 63-node limit. Adding a router allows you to add another daisy-chain segment of 4592 feet with a maximum of 63 more nodes.

Repeaters boost signal strength and are only used in instances where a segment of 63 nodes or less uses more than 4592 feet of Echelon cable.

Refer to *P/N 026-1605, Router and Repeater Installation Guide*, for information about router and repeater placement.

5.6 Installing Echelon Devices

The Einstein BX building control system has several types of peripheral control boards that communicate using the Echelon network: the 16AIe analog input board, the 8ROe relay output board, and the RT-100 rooftop control.

5.6.1 Powering Echelon Devices

WARNING
Do not power Echelon devices with the same three-board, six-board, and ten-board transformers used to power the I/O Network. Echelon devices require Class 2 power to operate, which is not supplied by the I/O board transformers.

All Echelon devices require 24VAC Class 2 power. CPC specs several sizes of transformers to accomodate the full range of CPC's Echelon-compatible products. ***Table 5-3*** lists each transformer's part number and rating.

Xformer P/N	VA Rating	Input Voltage
640-0039	10 VA	110 VAC
640-0041	50 VA	110 VAC
640-0042	50 VA	220 VAC
640-0050	75 VA	110 VAC
640-0045	75 VA	220 VAC

Table 5-3 *- Class 2 Transformers for Echelon Devices*

To select a power transformer for one or more Echelon devices:

1. Determine what the total VA is for the boards and controllers that will be powered by the transformer (see ***Table 5-4***).

   Example: Two 8ROe boards (15.0 VA each), and one 16AIe (20.0 VA) boards are to be powered by one transformer. The total VA is:

   $$(2 \times 15VA) + (1 \times 20VA) = 50VA$$

2. Use a transformer that has a power rating equal to or higher than the total calculated VA (see ***Table 5-3***).

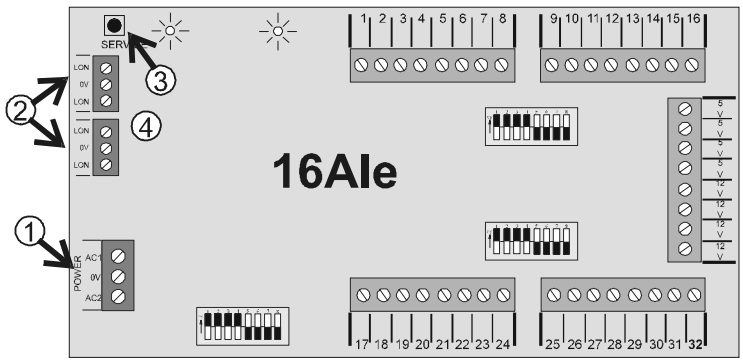
Example: Boards totalling 50VA can be connected to either a 50VA or 75VA transformer.

Unit	amps	VA	VAC	Center tapped?
Einstein	1.66	40	24	No
16AIe	0.80	20	24	No
8ROe	0.625	15	24	No
RT-100	0.75	25	24	No

Table 5-4 *- Device Power Requirements*

Refer to the installation guides on the next few pages for instructions on how to install these boards on the Echelon network.

16AIe INSTALLATION GUIDE



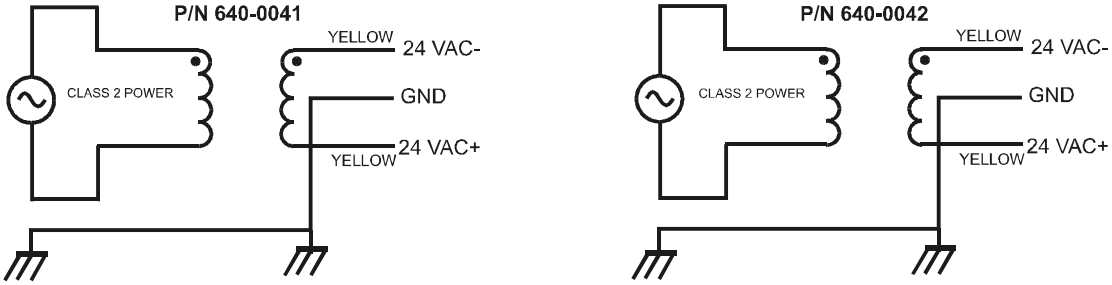
1. Connect board to power transformer Use only a Class 2, 24VAC transformer rated at 20VA or greater.

2. Connect 16AIe to the Echelon Network.

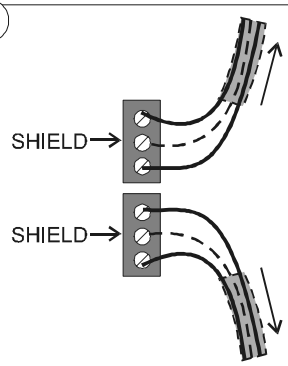
3. Use the Service Button to commission the 16AIe. Refer to the Einstein User's Guide for more information on how to do this.

4. If the 16AIe is at the end of a daisy-chain segment, connect a Termination Block to one of the Echelon terminals.

1



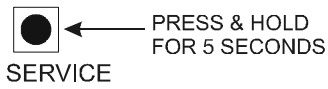
2



CABLE TYPE:
Level IV, 22 AWG
P/N 135-2300, Non-Plenum
P/N 135-2301, Plenum

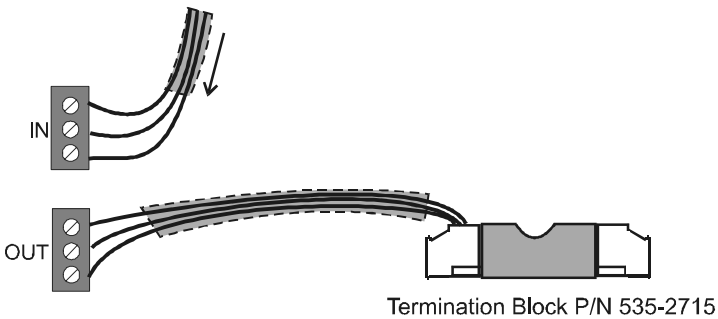
3

- Select board in Controller Network Config screen
- Press "SET ADDRESS" Function Key
- Select the "Service Pin" option
- Enter a wait time (hrs:mins:secs)
- Press Enter.

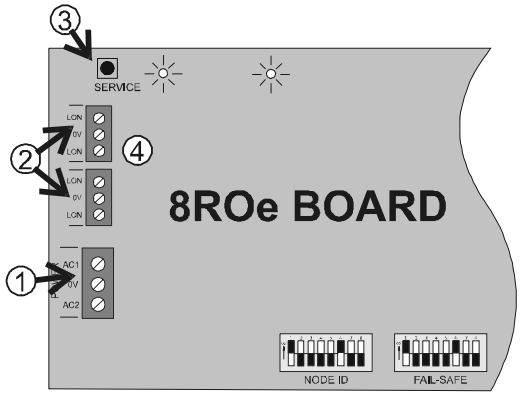


4

If termination is required, connect the Termination Block to the Output Terminal



8ROe INSTALLATION GUIDE

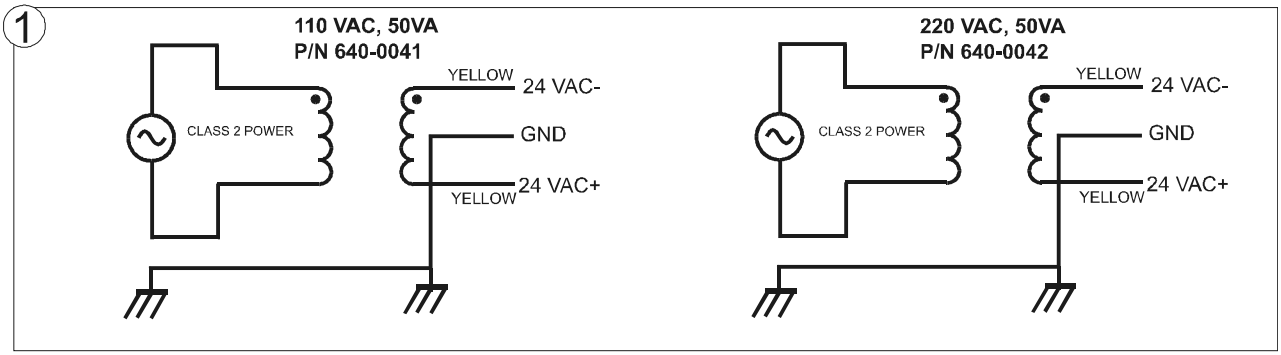


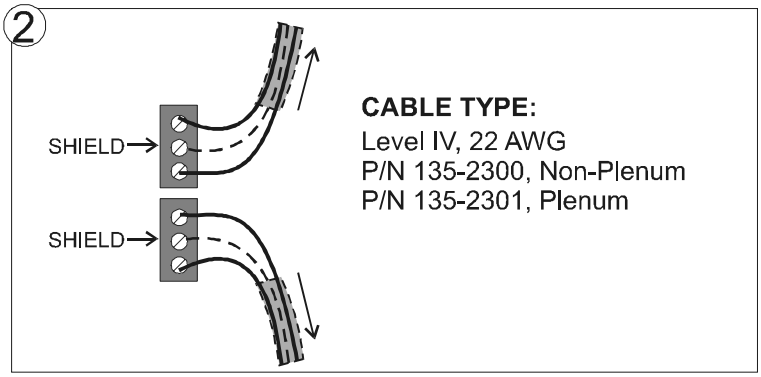
1. Connect board to power transformer Use only a Class 2 24VAC transformer rated at 15VA or greater..

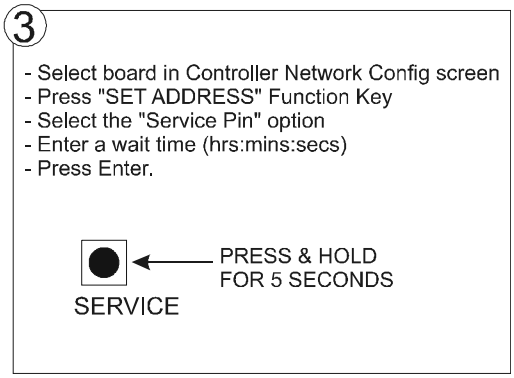
2. Connect 8ROe to the Echelon Network.

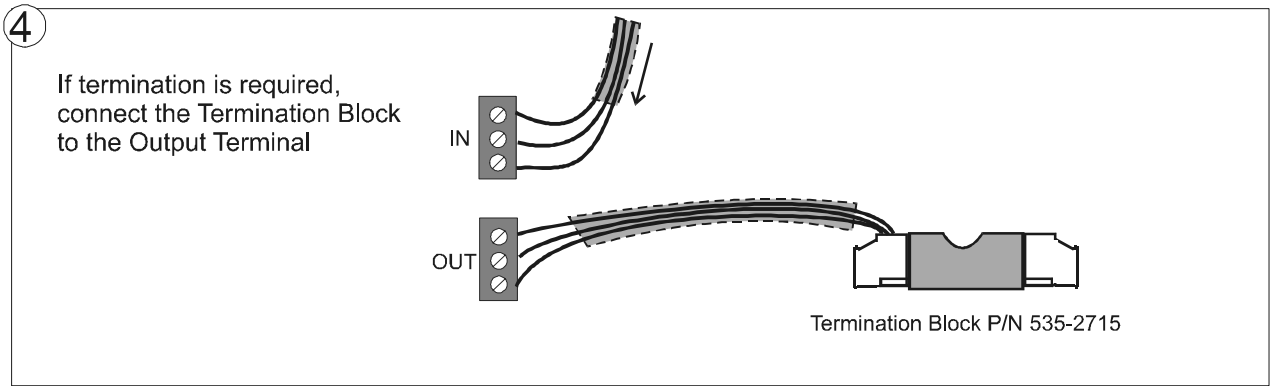
3. Use the Service Button to commission the 8ROe. Refer to the Einstein User's Guide for more information on how to do this.

4. If the 8ROe is at the end of a daisy-chain segment, connect a Termination Block to one of the Echelon terminals.









6 I/O Board and Echelon Device Setup

6.1 The 16AI and 8IO Inputs

6.1.1 Connecting Sensors to RS485 Input Boards

There are two RS485 network boards that may accept inputs: the 16AI Analog Input Board, and the 8IO Combination Input/Output Board. Wiring an input to these boards requires three steps:

1. Connect the sensor's signal wires to the two terminals of an input point.
2. Set the input type dip switch that corresponds to the point being connected.
3. If necessary, connect the sensor to one of the 5V or 12V power terminals.

6.1.2 Wiring

A point on a 16AI or 8IO board consists of two terminals, as shown in ***Figure 6-1***. One of these terminals reads the signal from the sensor, while the other is where the sensor's ground and/or cable shield wire is connected.

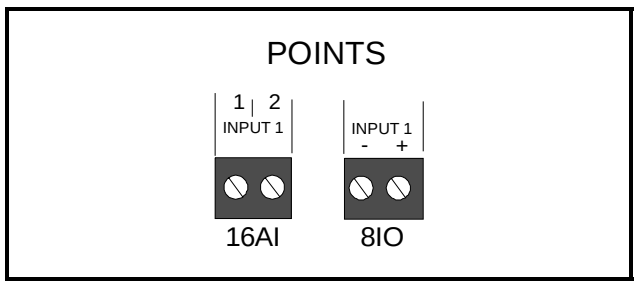


Figure 6-1 *- Input Board Points*

16AI Boards

On a 16AI, terminals are numbered 1-32, starting with the first terminal of point 1 and ending with the last terminal of point 16. The even-numbered terminals of a 16AI are always where the signal voltages are connected. The sensor grounds and cable shields are connected to the odd-numbered terminals.

8IO/ARTC Boards

On an 8IO or ARTC board, the two terminals of every point are labelled "-" or "+". The ground wire is always connected to the "-" terminal, and the signal wire is connected to the "+" terminal.

6.1.3 Sensor Wiring Types

Specific wiring types are required for each type of sensor used with Einstein.

All Analog Temperature Sensors and Air Flow Sensors

Temperature and air flow sensors are to be wired with shielded, 2 conductor, at least 22 GA wire (Belden # 8761 or equivalent).

All Pressure Transducers, Humidity Sensors, and Refrigeration Transducers

Pressure and refrigeration transducers and humidity sensors are to be wired with shielded, 3 conductor, at least 22 GA wire (Belden #8771 or equivalent).

Dew Point and Light Level Sensors

These sensors are to be wired with shielded, 4 conductor at least 22 GA wire (Belden # 8729 or equivalent).

6.1.4 Input Type Dip Switches

Each 16AI or 8IO point has an input type dip switch that must be set. Input type dip switches are located in the switch banks labelled S1 and S2 on the 16AI and switch bank S4 on the 8IO.

The input type dip switch tells the input board whether or not the sensor connected to the point requires a DC supply voltage in order to operate. If the sensor requires DC voltage, the dip switch should be set to the DOWN position. If the sensor does not require power, or if it uses AC power, the dip switch should be set to the UP position. Dip switches for unused points should be set to the UP position.

The dip switch positions for each specific sensor type is shown in ***Figure 6-2***.

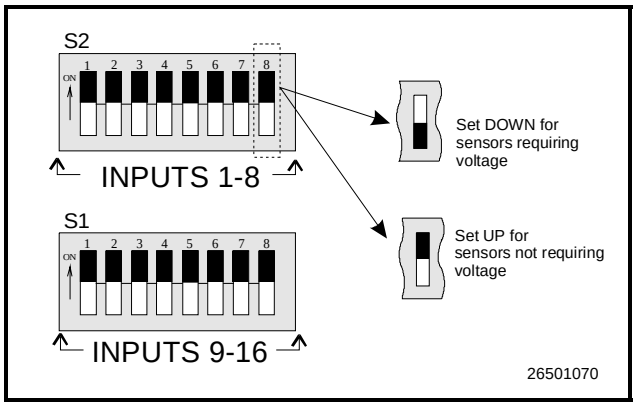


Figure 6-2 *- Input Type Dip Switches*

6.1.5 Power Connection

If power is needed to operate the sensor, several terminals exist on the 16AI or 8IO that may be used to supply AC or DC power. See ***Figure 6-3***.

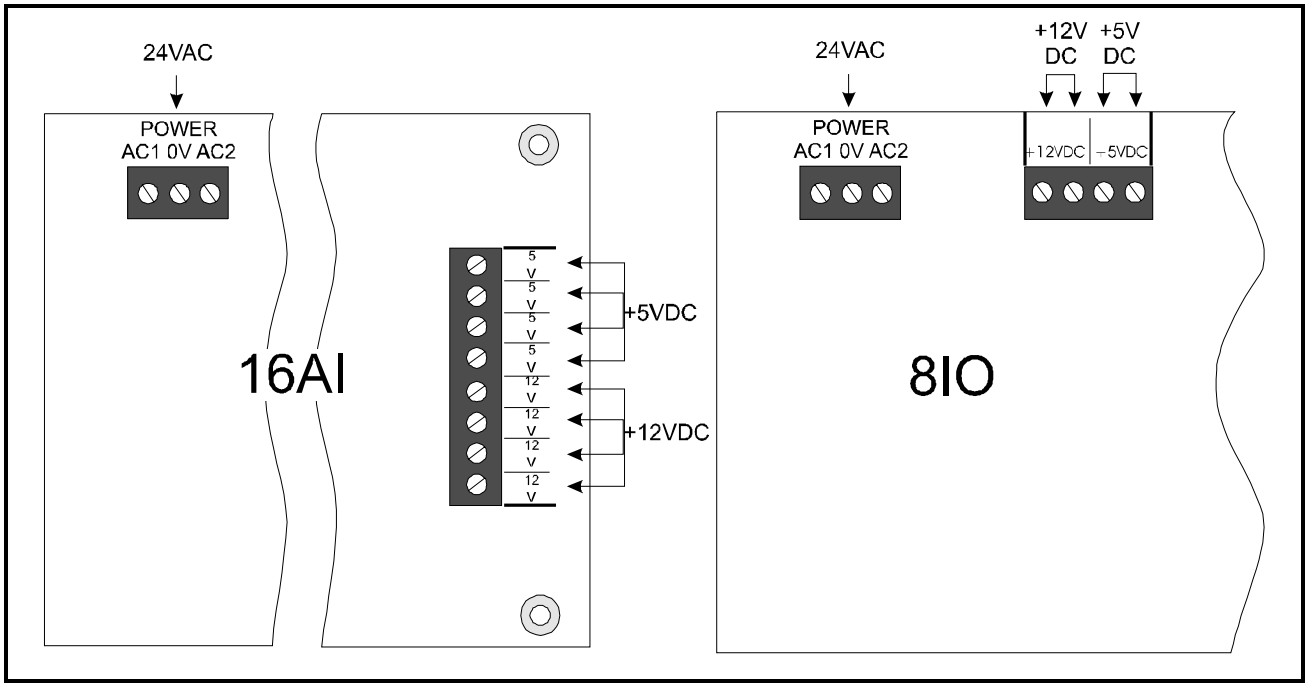


Figure 6-3 *- Input Board Power Sources*

Input boards may supply 12VDC, 5VDC, and 24VAC (by way of the board's own 24VAC power connection). To connect to one of the DC power sources, simply connect the sensor's power wire to one of the terminals. To connect to the 24VAC power source, connect the sensor's power wires to terminals AC1 and AC2.

Specific wiring instructions for each type of sensor are given in ***Table 6-1*** on **page 6-3**.

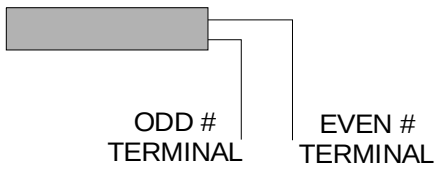
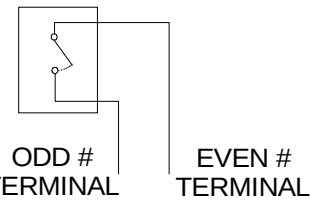
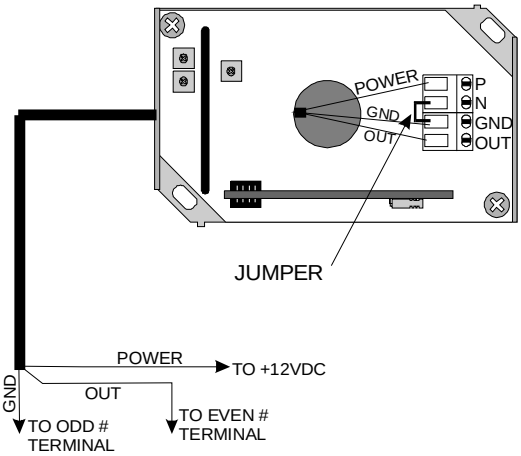
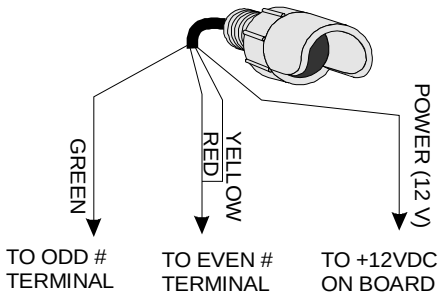
P/N	Sensor	Input Type Dip Switch	Wiring
various	Temp Sensors and Probes	Up	1. Connect one lead to the odd numbered terminal and the other lead to the even numbered terminal (polarity insensitive). 
various	Digital Sensors (Klixons, Sail Switches, etc.)	Up	1. Connect one lead to the odd numbered terminal and the other lead to the even numbered terminal (polarity insensitive). 
203-5750	Relative Humidity Sensor	Down	1. Wire the "P" sensor terminal to 12VDC supply on board. 2. Wire the "GND" sensor terminal to odd numbered terminal. 3. Wire the "OUT" sensor terminal to even numbered terminal. 4. Jumper sensor terminal "N" to sensor terminal "GND". 
206-0002	Light Level	Down	1. Wire GREEN ground wire to odd numbered terminal. 2. Wire YELLOW and RED signal wires to even numbered terminal. 3. Wire the POWER wire to a +12VDC source on input board. 

Table 6-1 *- Sensor Wiring*

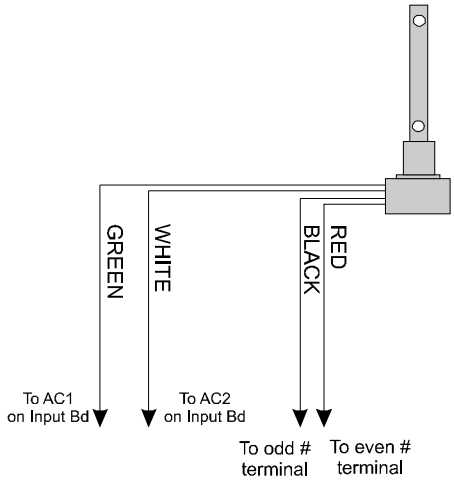
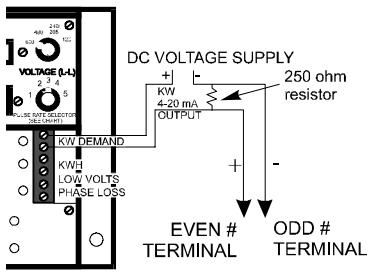
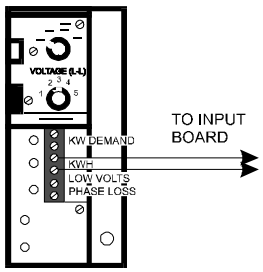
P/N	Sensor	Input Type Dip Switch	Wiring
203-1902	Dew Point Probe	Up	1. Connect the WHITE and GREEN wires to AC1 and AC2 power terminals. 2. Connect BLACK ground wire to odd numbered board terminal. 3. Connect RED signal wire to even numbered board terminal. 
550-2500 550-2550	kW Transducer	Down for 4-20mA, Up for Pulse	**4-20 mA output to input board** 1. Wire positive transducer terminal to positive 24VDC supply. 2. Wire negative transducer terminal to odd numbered input terminal. 3. Wire negative 24VDC supply to even numbered input terminal. 4. Place 250Ω resistor across odd and even numbered input terminals.  **Pulse Accumulator output to input board** 1. If the input board is an 8IO or a 16AI version E.02 or greater, connect the two KWH terminals to the input point (polarity insensitive) 2. If the input board is a 16AI version less than E.02, connect the KWH terminals to board point 1. Set input switch #1 DOWN, and set input switch #8 UP. 

Table 6-1 *- Sensor Wiring*

6.2 8RO, 8IO, 8RO-FC, and 8ROe Output Boards

The 8RO, 8RO-FC, 8IO, and 8ROe output boards each have eight relays that energize and de-energize to control output loads.

When setting up an output on one of these relays, you must make two important decisions:

1. Do you want an ON command from your controller to mean "energize the relay" or "de-energize the relay," and
2. When the relay is de-energized, as is the case when the 8RO or 8IO goes off-line or loses power, do you want the contacts to be OPEN or CLOSED?

Decision #1 is made by setting the **fail-safe switch.**

This is a bank of eight switches labeled S2 on the 8RO, 8ROe, and 8RO-FC and S3 on the 8IO. Each switch corresponds to an output on the board (switch #1 = output #1, etc).

Decision #2 is made either by setting a **fail-safe jumper** (for old-style 8ROs) or by wiring the load to either the N.O. or N.C. terminals on the Form C contact (all other output boards).

Table 6-2 shows how the fail-safe switch, jumpers, and/or Form C contacts should be configured based on how you want the output to perform during both normal operation and during network/power loss.

Controller Command vs. Contact State	Fail State	Set Switch To:	Set Jumper or Wire Form C Contacts To:
ON=CLOSED OFF=OPEN	ON	UP	N.C.
ON=CLOSED OFF=OPEN	OFF	UP	N.O.
ON=OPEN OFF=CLOSED	ON	DOWN	N.O.
ON=OPEN OFF=CLOSED	OFF	DOWN	N.C.

Table 6-2 *- Output Board Fail-Safe and Switch Settings*

6.2.1 Wiring Outputs to Points

Old 8ROs

The old design of 8RO (P/N 810-3002) used points with two terminals on them. To connect output devices to these points, wire the point terminals in series with the load, so that the path is closed when the 8RO relay is CLOSED and open when the 8RO relay is OPEN.

New 8ROs, 8RO-FCs, 8IOs, and 8ROes

All other Einstein-compatible output boards, including the new design of 8RO (P/N 810-3005), the 8RO-FC, the 8IO, and the 8ROe, have Form C contacts. ***Figure 6-4*** shows how to wire the three-terminal Form C contact.

One wire of the two-wire 8RO-FC connection should always be connected to the middle terminal. The second wire must either be connected to the N.C. terminal (if you want the path to be closed when the relay is de-energized) or the N.O. terminal (if you want the path to be open during power failure.

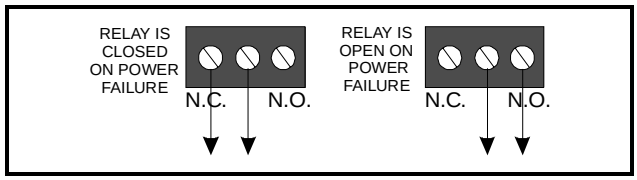


Figure 6-4 *- Form C Contact Wiring*

6.2.2 The Output LED

Each output point on an output board has an indicator LED that shows the status of the output. This LED is lit to show the output is ON, and unlit to show the output is OFF.

The definition of ON and OFF in this case is determined by the position of the fail-safe dip switch (see ***Table 6-2***). Therefore, if the output's switch is UP, a lit LED means the path is CLOSED, but if the switch is DOWN, a lit LED means the path is OPEN.

7 Setting Up Inputs and Outputs

At this point in the setup process, you should have all sensors and other input devices wired to points on 16AIs or 8IOs, and all output devices connected to 8ROs, 8DOs, 4AOs or 8IO outputs. Once the physical wiring is complete, you will need to tell Einstein the types of sensors or devices that are connected to each I/O point. This is achieved in the Input Summary and Output Summary screens.

7.1 Setting Up Inputs

From the Main Status screen, press F8 (Actions Menu) and then Y to select the System Configuration Menu.

Once you have access the System Configuration Menu, press 6 to go to the Input and Output Setup menu. Press 1 to call up the Input Summary Screen (***Figure 7-1***).

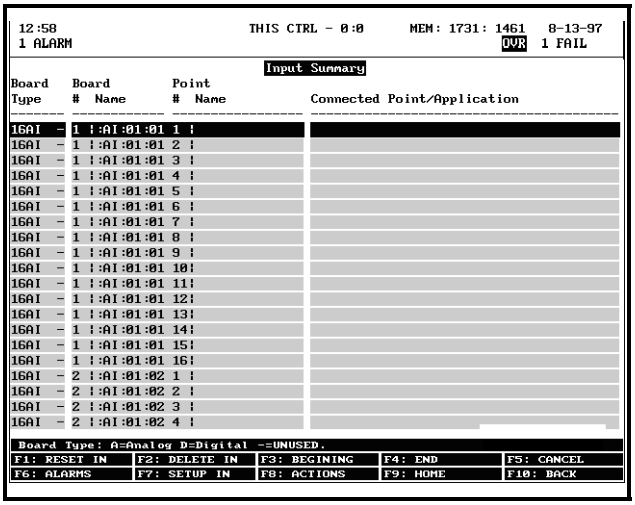


Figure 7-1 *- Input Summary Screen*

In order for the Einstein to properly read an input value from a sensor or transducer hooked to an I/O board, you must first tell the Einstein what kinds of devices are hooked to each input board point. This is achieved by using the Input Summary screen.

The Input Summary screen serves a dual purpose. It is both an at-a-glance summary of all points on each input board and a menu where points may be selected and configured.

7.1.1 Reading the Input Summary Screen

Each record in this screen contains the following information about a point:

1. Board Type

The Board Type fields are in the column of fields directly under the Board Type heading on the screen.

Board Type fields show which kind of input board the point is on. Since the 16AI is the only input board option, this field will always read "16AI." Even 8IO boards will appear as 16AIs in this field.

> ***When setting up 8IOs, remember that there are only eight usable input points, even though the 16AI that represents the 8IO in the summary screen has sixteen points. Only inputs one through eight may be defined; all other points will be ignored.***

The last character of the Board Type field also shows what type of input the point is defined as. If a point has already been defined as an analog or digital input, this field will signify its input type with an "A" (for analog) or "D" (for digital). If the point has not been identified, a "-" will appear at the end of the field instead.

2. Board # and Name

The point's board number and board name appear in its point record under the Board # and Name columns.

The Board # and the Board Name are separated by a short vertical line in the point record. For example, if a point belongs to a 16AI with a network address of 1 and the name HVAC A, "1 HVAC A" will appear underneath the Board # and Name columns.

3. Point # and Name

The point number of each point appears in its record under the Point # column. If the point has already been defined, its chosen name (or default name) will appear underneath the Point Name column.

The Point # and the Point Name are separated by a short vertical line in the point record. For example, if a point has a number of 10 and a name SPACE TEMP, "10 SPACE TEMP" will appear underneath the Point # and Name columns.

4. Connected Point/Application

If a point has already been defined and is currently being used by an application, the name of the input to which the point is connected will be displayed in the Connected Point/Application field.

7.1.2 Configuring a Point from the Input Summary Screen

To configure a point, use the ▲ and ▼ keys to move the cursor to the point you wish to set up, and press F7 - SETUP-IN.

A pop-up menu such as the one shown in ***Figure 7-2*** will prompt you to specify the point as analog or digital. Press 1 if the input is analog, press 2 if the input is digital, or press C to cancel setup.

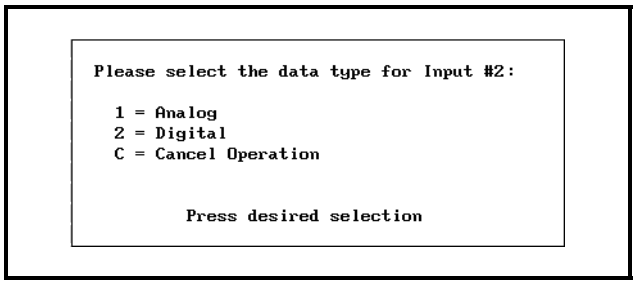


Figure 7-2 *- Data Type Pop-Up Menu*

Depending upon what type of input you selected, the Setup Analog Input or the Setup Digital Input screen will appear. The analog screen is described in **Section 7.1.2.1**, while the digital screen is described in **Section 7.1.2.2**.

7.1.2.1 Setup Analog Input Screen

The Setup Analog Input screen (***Figure 7-3***) is where sensor types, units, and default values are specified for analog input points.

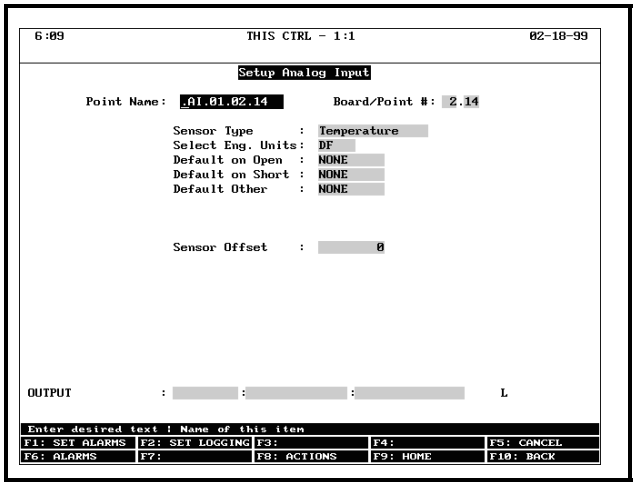


Figure 7-3 *- Setup Analog Input Screen*

Point Name The Point Name is simply a name for the point that may be used as a reference.

Assigning a descriptive name to a point makes setting up inputs for applications much easier. For example, if you have an inside temperature sensor located in Zone 1 of your building, you may name it "ZONE 1 TEMP". Then, when programming your HVAC applications, you may easily define Zone 1's temperature sensor input by tying it to ZONE 1 TEMP. This keeps you from having to keep track of which sensors are tied to which point numbers.

You are required to enter a point name in the Point Name field. The default name is ":{BOARD NAME}:{BOARD NUMBER}:{POINT NUMBER}."

Board/Point Number The Board/Point Number will automatically be defined if you are configuring the point from the Input Summary Screen. If you pressed F3 while defining an analog input in an application, you will need to enter the point number in this field.

Sensor Type The analog input may come from a number of different sensor types. ***Table 7-1*** shows the possible types. To select one, press Prev or Next to scroll through the list or choose the sensor type from the Look-Up Table (F7).

Sensor Type	Description
Temperature	Temp Sensor
100 LB	Standard 100 LB transducer (1-6VDC output)
200 LB	Standard 200LB transducer (1-6VDC output)
500 LB	Standard 500LB transducer (1-6VDC output)
Eclipse-100 LB	Eclipse 100 LB transducer (0.5-4.5VDC output)
Eclipse 200 LB	Eclipse 200 LB transducer (0.5-4.5VDC output)
Eclipse 500 LB	Eclipse 500 LB transducer (0.5-4.5VDC output)
Refrig. Leak	Refrigerant Leak Detector (not IRLDS)
Refrig. Level	Refrigerant Liquid Level Probe
Liquid Level	Liquid Level Float Sensor
Light Level	Light Level Sensor

Table 7-1 *- Sensor Input Types*

Sensor Type	Description
Linear	General purpose linear output sensor
Humidity	Relative Humidity sensor
Pulse Accum.	Kilowatt value from KW transducer pulse accumulation readings (see "Units Per Pulse" on page 3).
KW Transducer	Kilowatt transducer using 4-20ma/0-5V signal
Dew Point	Dew point probe
LM235 Temp.	ECI temperature sensor

Table 7-1 *- Sensor Input Types*

Select Eng. Units The engineering units of the sensor value are entered in the Select Eng. Units field. This value is set automatically to an appropriate default unit whenever the Sensor Type is changed. To select a different engineering unit, press Prev or Next to scroll through the options or select the unit from the Look-Up Table (F7).

Units Per Pulse The Units Per Pulse field appears only when "Pulse Accum" is entered in the Sensor Type field.

The Einstein is capable of generating an analog KW value by counting the number of pulses from the pulse accumulation outputs of a KW transducer. Each pulse from the transducer signifies that a fixed number of KW has been used.

The number of KWs per pulse varies depending upon the type of transducer being used. Consult the transducer's documentation for the exact number of KWs per pulse and enter it in this field.

Default on Open The value placed here will determine the value the unit reports if there is an "open" condition detected in the sensor input connection. An "open" condition could be the result of a broken wire to the sensor or a sensor failure.

Default on Short The numeric entry in this parameter is the default value the analog input would report if a "short" is detected on the sensor input connection. A "short" could be the result of a damaged wire or a sensor failure.

Default Other The value placed in Default Other is the value reported if the input is not updated after a certain amount of time. If there is a failure that will not allow the input board to report the value of the sensor, the value placed in this parameter will be reported.

Sensor Offset If a sensor needs a numeric value added or subtracted to the calculated value, enter the number here. The value can be positive or negative. Sensors sometimes have to have offsets.

Output

This field displays the link between the input and the application(s) they feed into. You do not need to enter anything in this field. You will be able to link applications to this point during the application setup process.

7.1.2.2 Setup Digital Input Screen

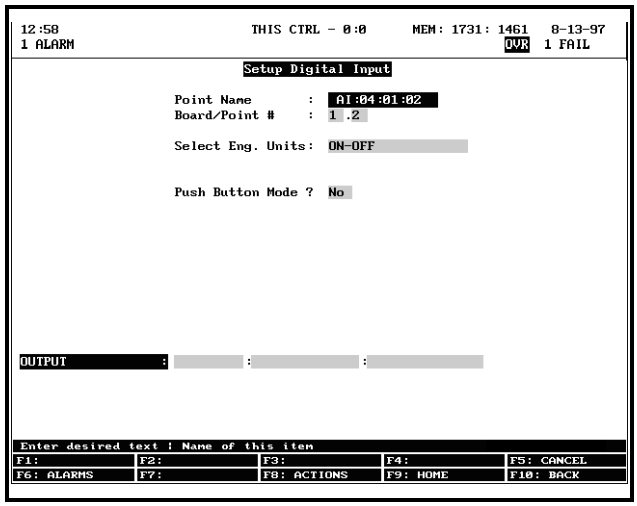


Figure 7-4 *- Setup Digital Input Screen*

The Setup Digital Input Screen is where digital input points are given point names, engineering units, and other important parameters.

Point Name The Point Name is simply a name for the point that may be used as a reference.

Assigning a descriptive name to a point makes setting up inputs for applications much easier. For example, if you are setting up a push-button switch to bypass a lighting schedule, you may choose to name it "LIGHT RESET 1". Then, when programming your Lighting Control application, you may easily define lighting schedule 1's reset input by tying it to LIGHT RESET 1. This keeps you from having to keep track of which contacts are tied to which point numbers.

You are required to enter a point name in the Point Name field. The default name is ":{BOARD NAME}:{BOARD NUMBER}:{POINT NUMBER}."

Board/Point Number The Board/Point Number will automatically be defined if you are configuring the point from the Input Summary Screen.

Select Eng. Units The Select Eng. Units field is where you may select how the ON and OFF states of this point are displayed and represented in Einstein's setup fields and status screens. By default, digital inputs have ON-OFF engineering units, meaning when the input is ON or OFF, the input will be represented as "ON" or "OFF" in the system software.

Since the controller looks at only the actual state of the point when it uses the input for control purposes, it is not necessary to define engineering units for digital inputs. However, selecting units that are appropriate to the input's function (such as BYP or NO_BYP for inputs that initiate bypasses) will make the input's state easier to read and understand.

To choose an engineering unit, press F7 and select the desired units from the Look-Up Table.

Push Button Mode? Digital inputs may be set up as "push button" inputs by changing this field to "YES".

Push Button Mode is a method of interpreting a digital state that is used strictly for push buttons. When used, a button press lasting longer than one second will change the state of the input. In other words, if the input is OFF, a button press will change it to ON, and another button press will change it back to OFF, etc.

Output This field displays the link between the input and its application(s). You do not need to enter anything in this field. You will be able to link applications to this point during the application setup process.

7.2 Setting Up Outputs

7.2.1 Output Summary Screen

From the Actions Menu, press F8 and then Y to select the System Configuration Menu.

Once you have access the System Configuration Menu, press 6 to go to the Input and Output Setup menu. Press 2 to call up the Output Summary Screen (***Figure 7-5***).

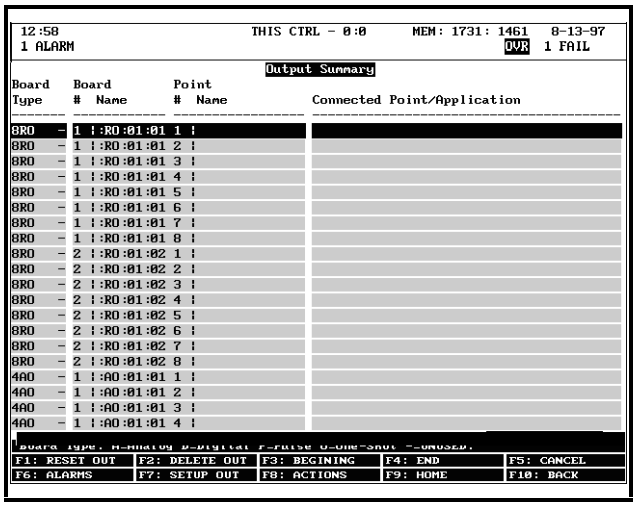


Figure 7-5 *- Output Summary Screen*

In order for the Einstein to properly control devices that are hooked to an I/O board, you must first tell the Einstein what type of output the devices require. This is achieved by using the Output Summary screen.

The Output Summary screen serves a dual purpose. It is both an at-a-glance summary of all points on each output board and a menu where output points may be selected and configured.

7.2.1.1 Reading the Output Summary Screen

Each record in this screen contains the following information about a point:

<u>Board Type</u>

The Board Type fields are in the column of fields directly under the Board Type heading on the screen.

Board Type fields will display "8RO" for relay boards, "8DO" for digital pulse boards, and "4AO" for analog output boards. Since 8IO boards must be set up as an 8RO and a 4AO in the network, each 8IO will be represented by an "8RO" and a "4AO".

When setting up analog output points on an 8IO, remember that there are only two usable analog output points on an 8IO, even though the 4AO representing the 8IO in the summary screen has four points. Define only points one and two on the 8IO.

The last character of the Board Type field also shows what type of input the point is defined as:

- ***A :*** analog output point (on a 4AO).
- ***D :*** digital ON-OFF type output (8RO, 8RO-FC,8DO)

- ***P :*** pulse width modulation output (analog percentage converted to percentage of ON time per period) (8RO, 8RO-FC, 8DO)
- ***O :*** one-shot pulse (fixed width pulse that occurs once on every change of state) (8RO, 8RO-FC, 8DO)
- ***- :*** undefined

Board # and Name

The point's board number and board name appear in its point record under the Board # and Name columns.

The Board # and the Board Name are separated by a short vertical line in the point record. For example, if a point belongs to an 8RO with a network address of 1 and the name RACK A, "1 |RACK A" will appear underneath the Board # and Name columns.

Point # and Name

The point number of each point appears in its record under the Point # column. If the point has already been defined, its chosen name (or default name) will appear underneath the Point Name column.

The Point # and the Point Name are separated by a short vertical line in the point record. For example, if a point has a number of 2 and a name STAGE 1, "2|STAGE 1" will appear underneath the Point # and Name columns.

Connected Point/Application

If a point has already been defined and is currently being used by an application, the name of the output to which the point is connected will be displayed in the Connected Point/Application field.

7.2.1.2 Configuring a Point From the Output Summary Screen

To configure a point, use the ▲ and ▼ keys to move the cursor to the point you wish to set up, and press F7 - SETUP-OUT.

If you press F7 to setup a 4AO output point, the Einstein will automatically transfer you to the Setup Analog Output screen (see ***Figure 7-8***). For all other output board types, pressing # will bring up a pop-up menu such as the one shown in ***Figure 7-6***. This menu will prompt you to specify the output as either digital, pulse, or one-shot. Press 1 if the output is digital, press 2 if the output is pulse, press 3 if the output is one-shot, or press C to cancel setup.

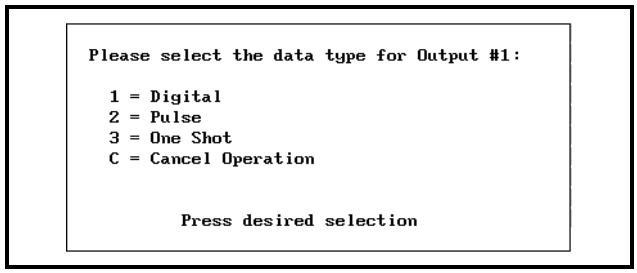


Figure 7-6 *- Output Data Type Pop-Up Menu*

Depending upon what type of output you selected, the Setup Digital Output, Setup Pulse Output, or Setup One-Shot Output screen will appear.

The Pulse and One Shot segments are covered in the advanced manual.

7.2.1.3 Setup Digital Output

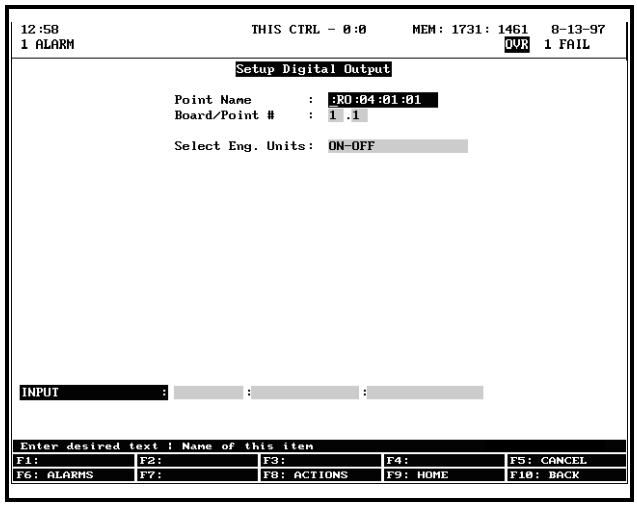


Figure 7-7 *- Setup Digital Output Screen*

Digital outputs are ON when the Einstein calls for them to be ON and OFF whenever the Einstein calls for them to be OFF. Most outputs that directly activate and deactivate output devices will need to be set up as the Digital output type.

Point Name The Point Name is simply a name for the output point that may be used as a reference.

Assigning a descriptive name to a point makes setting up outputs for applications much easier. For example, if you are setting up light input #3 for light circuit #2, you may choose to name it "INP #2 LIGHT #3". Then, when programming your Lighting Control application, you may easily define the fan output by tying it to INP #2 LIGHT #3. This keeps you from having to keep track of which contacts are tied to which point numbers.

You are required to enter a point name in the Point

Name field. The default name is ":{BOARD NAME}:{SUBNET NUMBER}:{BOARD NUMBER}:{POINT NUMBER}".

Board/Point # The Board/Point Number will automatically be defined if you are configuring the point from the Output Summary Screen.

Select Eng. Units The Select Eng. Units field is where you may select how the ON and OFF states of this point are displayed and represented in the Einstein's setup fields and status screens. By default, digital outputs have ON-OFF engineering units, meaning when the output is ON or OFF, the input will be represented as "ON" or "OFF" in the system software.

Engineering units are only a visual representation of the state of the output point (energized or de-energized). Therefore, it is not necessary to define engineering units for digital inputs. However, selecting units that are appropriate to the output's function (such as BYP or NO_BYP for inputs that initiate bypasses) will make the output's state easier to read and understand.

To choose an engineering unit, press F7 and select the desired units from the Look-Up Table.

INPUT This field links the output to an application. You do not need to enter anything in this field. You will be able to link applications to this point during the application setup process.

7.2.1.4 Setup Analog Output

The Setup Analog Output screen (***Figure 7-8***) is where output types, units, and default values are specified for analog output points.

In most cases, only the point name will need defining in this screen, unless you wish to change the 0-10V output range or configure a priority override.

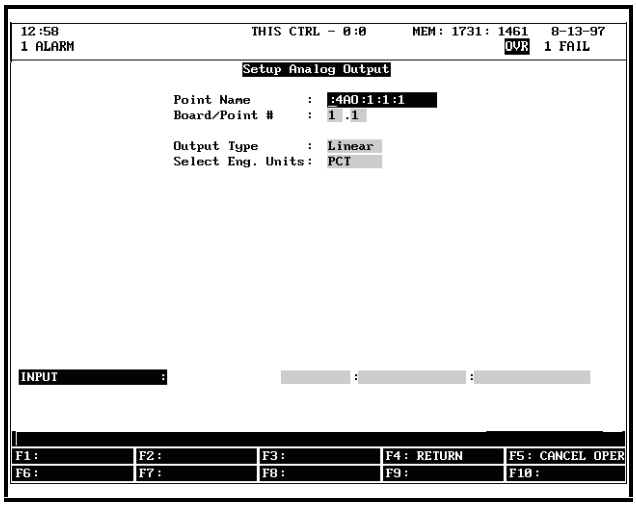


Figure 7-8 *- Setup Analog Output Screen*

7.2.1.5 Point Name

The Point Name is simply a name for the output point that may be used as a reference.

Assigning a descriptive name to a point makes setting up outputs for applications much easier. For example, if you are setting up fan #3 for Zone 1, you may choose to name it "FAN#1 HT#3". Then, when programming your HVAC Control application, you may easily define the fan output by tying it to FAN#1 HT#3. This keeps you from having to keep track of which contacts are tied to which point numbers.

You are required to enter a point name in the Point Name field. The default name is ":{BOARD NAME}:{SUBNET NUMBER}:{BOARD NUMBER}:{POINT NUMBER}".

Board/Point # The Board/Point Number will automatically be defined if you are configuring the point from the Output Summary Screen.

Output Type

The analog output may be either of two types: "Linear" and "VSComp".

"Linear" means that the output is a standard 0-10VDC linear output.

"VSComp" means that the output is a percentage (0% - 100%) that is driving an inverter that controls a variable-speed device such as a compressor or fan.

If the output will be driving a variable-speed device, choose "VSComp" in this field; otherwise, select "Linear". Use the Prev and Next keys to select.

Select Eng. Units

The engineering units of the output value are entered in the Select Eng. Units field. This value is set automatically

to percent (PCT). To select a different engineering unit, press Prev or Next to scroll through the options or select the desired unit from the Look-Up Table (F7).

8 Introduction to the Einstein

This section covers what to do when you are programming a new Einstein for the first time. The section includes logging on, specifying information about I/O boards and application types, and other topics related to Einstein programming and navigation.

8.1 Logging On

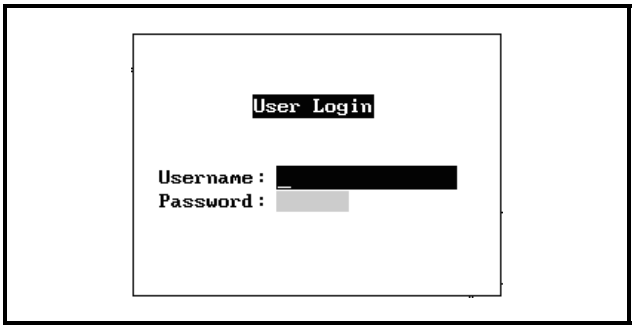


Figure 8-1 *- User Login Dialog Box*

When the Einstein is powered up for the first time, the first screen displayed after initialization is the User Login screen.

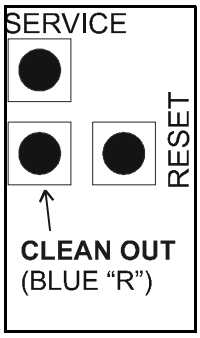
1. Enter “USER” in the Username field.
2. Press Enter.
3. Enter “PASS” in the Password field.
4. Press Enter.

8.2 Resetting the Einstein Controller

Resetting the Einstein controller needs to be done if:

- If you are programming your Einstein controller for the first time.
- If all of the settings need to be cleared.
- If the program settings are unknown.
- If the controller’s basic functions (navigating) are not able to be performed.

Open the Einstein controller panel. There are three buttons located midway down on the main circuit board (see ***Figure 2-1***). These buttons are used to perform various hardware functions.



Service Button - The Service Button is used for Echelon network configuration.

Reset Button - The button labeled "RESET" on the processor board resets the controller. Pressing and holding this button for five seconds will cause the Einstein to reset and retain all programmed applications, logs, and other data stored in memory.

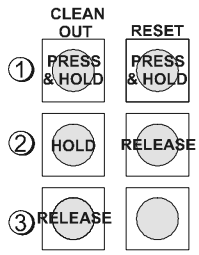
Clean Out - The button with no label on the controller is used to perform a function called "**clean out**." Using this button in conjunction with the Reset Button will cause a clean out, which is a reset that **erases all data from memory**. The Einstein will re-boot after a clean out with all programmed applications, logs, and other data erased.

Clean outs are also commonly called Blue’R’ resets, named for the key presses required to cold-reset CPC’s previous generation of controllers, REFLECS.

Performing a Clean Out

WARNING!!!

A clean out will erase all programmed parameters from memory. Do not follow these instructions unless you are absolutely sure you wish to remove all applications and logs from memory.



1.Press and hold down both the Reset Button and the Clean Out button.

2.When the screen clears, release the Reset Button, but CONTINUE TO HOLD DOWN THE CLEAN OUT BUTTON.

3.When the screen displays the message "CLEANOUT PROCESS INITIATED" release the Cold Reset button.

8.3 Network Setup

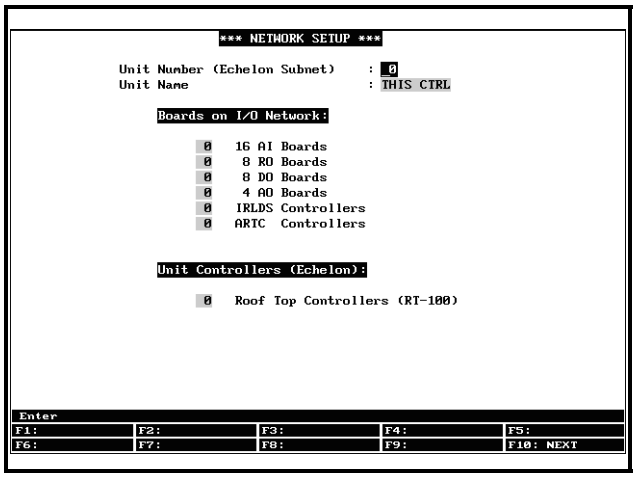


Figure 8-2 *- Network Setup Screen*

After logging in for the first time, the Network Setup screen will ask you to specify how many of each type of device will be connected to the Einstein you are currently programming.

Unit Number (Echelon Subnet) Each Einstein on the Echelon network must have a different unit number. This can be any number from 1 to 255, but each Einstein's number must be unique. No two Einsteins on the network may have the same unit number.

Enter this number in the Unit Number field. It is recommended you number the first Einstein "1" and number the other Einsteins on the network sequentially (2, 3, 4, etc.).

Unit Name Type a name for the Einstein in the Unit Name field.

Boards on the I/O Network

16AI Boards Enter the number of 16AI analog input boards on this Einstein's I/O network.

8RO Boards Enter the number of 8RO relay output boards on this Einstein's I/O network.

8DO Boards Enter the number of 8DO digital output boards on this Einstein's I/O network.

4AO Boards Enter the number of 4AO analog output boards on this Einstein's I/O network.

IRLDS Controllers Enter the number of IRLDS leak detection units on this Einstein's I/O network.

Unit Controllers (Echelon)

Roof Top Controllers Enter the number of roof top controllers (RT-100s) in this field.

When finished, press F10 to move to the next screen.

8.4 Application Setup

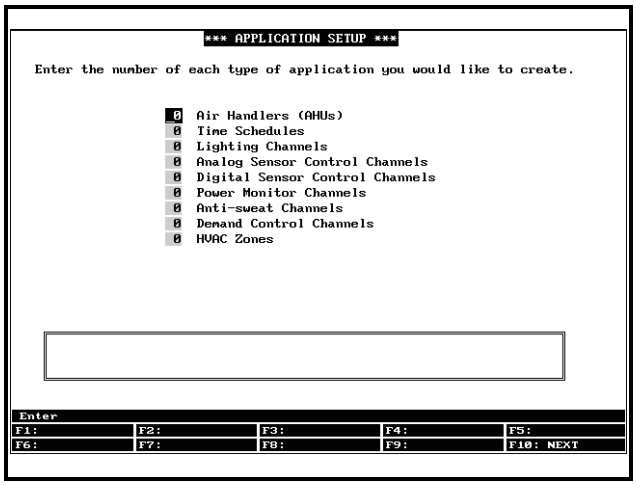


Figure 8-3 *- Application Setup*

The Application Setup screen is where you will enter information about the types of devices on the Einstein's control system. It is crucial that you enter exactly the right numbers of condensers, suction groups, and other application types in this screen — this step will save you time and will keep you from having to create new applications during the setup process.

Air Handlers Enter the number of air handler systems for this building system.

Time Schedules Enter the number of time schedules for this building system.

Lighting Channels Enter the number of lighting channels that will be controlled the Einstein.

Analog Sensor Control Channels Enter the number of analog sensor control modules for this refrigeration system. This number should include analog temperature sensors, pressure transducers, and all other inputs **except digital closures**.

Digital Sensor Control Channels Enter the number of digital sensor control channels for this Einstein Unit.

Power Monitor Channels Enter the number of power monitoring circuits for this Einstein Unit.

Anti-sweat Channels Enter the number of anti-sweat channels for this building system.

Demand Control Channels Enter the number of power demand control channels for this building system.

HVAC Zones Enter the number of HVAC zones for this building system.

When finished, press F10 to move to the next screen.

8.5 The Main Status Screen

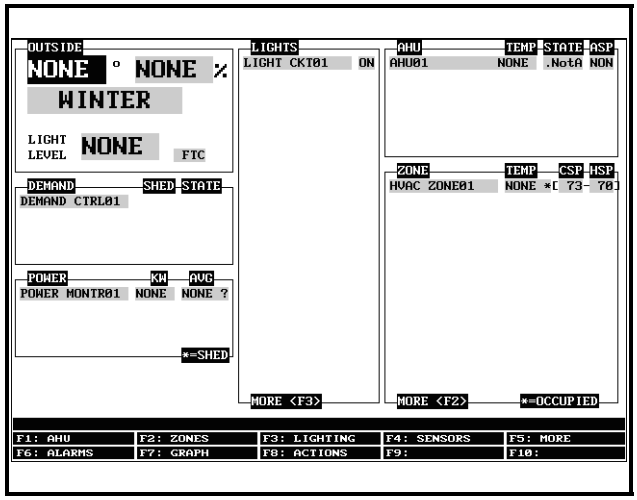


Figure 8-4 *- Main Status Screen*

The Main Status Screen is the “home” screen for the Einstein. When no one is logged in to the controller, this is the screen that will be shown in the display. When a user is logged in to the controller, it will be shown when the user is not performing any actions such as application setup, viewing other status screens, etc.

The Main Status Screen will vary depending on the configuration of the controller. In most cases, the Main Status Screen will show the real-time status of the most fundamental systems being controlled by the Einstein (Suction Groups, Condensers, and Case Circuits).

The Main Status Screen is a good place to point out three important common elements of all Einstein screens: the screen header, the function key descriptions, and the help line.

8.6 Common Screen Elements

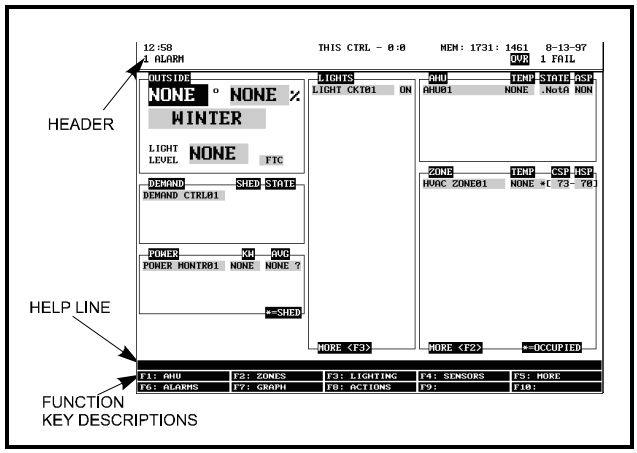


Figure 8-5 *- Common Screen Elements*

8.6.1 The Header

The first two lines at the top of the Einstein screen are referred to as the **screen header**. This area of the screen contains the time and date, controller name, subnet, and node number, and alarm and failure notifications. In addition, it contains highlighted indicators to show when a user is operating in a particular mode, such as full options, edit, macro record, or insert mode.

If the Einstein’s Global Data feature is being used to supply outside air temperature and outside relative humidity values, these values will also be displayed in the header.

8.6.2 The Function Keys

At the very bottom of every screen in the Einstein, there are ten boxes labelled F1 through F10. These boxes are the **function key** descriptions. The function key descriptions show what each of the ten function keys (F1 through F10) do when pressed.

Function key usage often varies depending on which screen or field Einstein is currently in.

Try This

For an example of how the function key descriptions change, use the arrow keys to move the cursor around in the Default Screen. You will see some descriptions (mostly F7) in the function button menu change as the cursor goes from field to field.

8.6.3 The Help Line

The line directly above the function button menu is called the **help line**. The help line displays information

about the currently selected field, such as general descriptions, possible ranges, and other information to help a user maneuver around and/or configure the field.

Try This

To see different messages the help line generates, start from the Main Status screen. Press F2 (ZONES). Highlight a circuit and press Enter. Press F8, then `B. Use the F2 buttons to move through the setup screens and notice how the help line changes as the screens change. When finished, press F9 (HOME) to return to the Main Status screen.

8.7 Screen Types

8.7.1 Status Screens

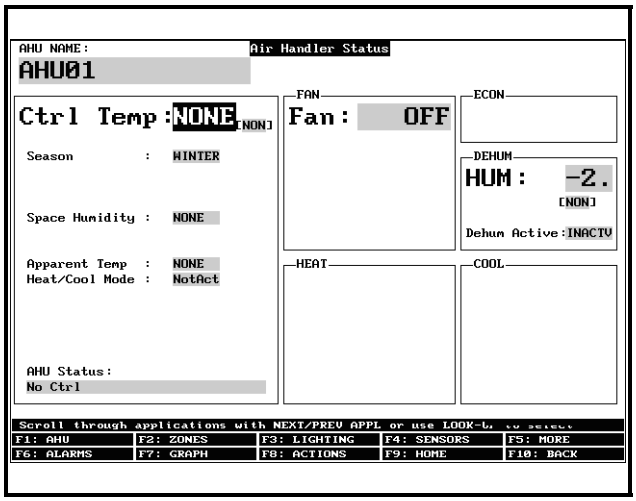


Figure 8-6 *- Air Handler Status Screen*

Status Screens are real-time views of application functions. They show the current status of all outputs, the current values of all inputs, and other important data such as control set points, run times, and whether or not bypasses or overrides are active.

Each status screen is specially designed to provide a concise at-a-glance view of how one or more systems are functioning.

Try This

To view the Suction Group status screen, start from the main status screen. Press the function key F1 (AHU). Choose which application to view and press Enter. The control temperature, fan status, and dehumidification status is displayed in this screen.

To view other application types, use the function keys F2, F3, and F4 (see ***Table 8-1***) to see the zones, lighting circuits and sensors status screens. Press F5 to get a full menu of even more of the accessible status screens.

Key	Function
F1	Air Handler Status
F2	HVAC Zones
F3	Lighting Circuits
F4	Analog and Digital Circuits

Table 8-1 *- Status Screen Function Keys*

Status Screen functions are explained in more detail in other sections of the manual. For now, press F8 to access another important screen: the Actions menu.

8.7.2 The Actions Menu

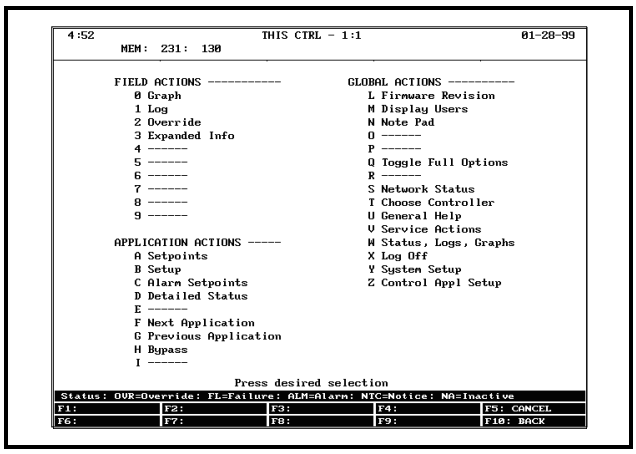


Figure 8-7 *- The Actions Menu*

The Actions Menu is the main menu used for doing just about any task in the Einstein system software. This screen lists a number of options that can be used to affect a selected field, an entire application, or the whole Einstein in general.

One of the more important features of the Actions Menu is the Setup Editor (select B) located in the Application Actions menu. The actual setup screen will vary, depending on where the cursor is placed in the Main Status screen before F8 is pressed. This is one of the easiest methods of editing an existing application.

There will be more on the actual usage of the Setup Editor and how to implement its functions later in this manual.

8.7.3 The Setup Editor

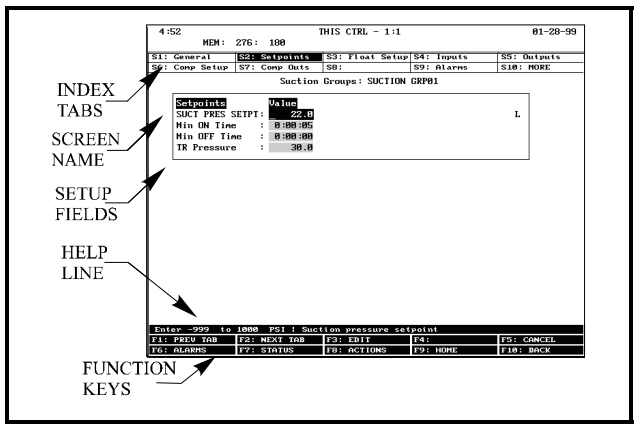


Figure 8-8 *- Typical Setup Editor Screen*

The Setup Editor utility is the interface used to change settings and set points, and define inputs and outputs in the Einstein. ***Figure 8-8*** shows a typical Setup Editor screen and its primary elements.

8.7.3.1 Index Tabs

The ten boxes at the top of the screen labelled **S1** through **S10** are known as the **index tabs**. These tabs provide a short index of the screens that are used to set up the current application. The numbers **S1** through **S10** represent the screen numbers (**S1** being screen 1, **S2** being screen 2, and so on).

Each of the setup screens that you may access will have a name beside its number. In ***Figure 8-8***, for example, you will notice some tabs have names, while others are blank.

As you move through these screens within the Setup Editor, the highlight will move to different tabs to indicate which screen is being displayed.

- Pressing F1 (PREV TAB) will back-up the order of the screens.
- Pressing F9 (HOME) at any point will take you to the Main Status screen.

Try This

To see each screen in a typical set up, start from the Main Status screen.

1. Position the cursor somewhere inside the AHU section and press F8 and *B. The General set up screen will be displayed.
2. Press F2 (NEXT TAB). The Setpoint set up screen will be displayed.
3. Press F2 again and the Inputs set up screen comes up.
4. Press F2 a few more times to see the rest of the set up menu screens. When the **S10** section (MORE) is highlighted, there may be more than one extra set up screen.
5. Keep pressing F2 while taking note of the extra screens until **S1** is highlighted once more.

These screens (**S1** through **S10**) contain all of the set up information that is associated with the selected air handler unit.

Sometimes there are empty sections in the tab menu where a tab selection should be. The tab is said to be inaccessible. There are several reasons why a tab may be inaccessible (i.e. without a name next to the number):

- The tab (and the corresponding screen) is unused and reserved for later revisions.
- The screen may only be accessed when running in Full Options mode.
- The screen may require one or more fields to be set to certain values before the screen may be accessed. For example, a screen containing nothing but compressor proof input definitions might be hidden if there is a field on another screen that tells the system there are no proof checking devices on the group's compressors. To access this screen, you would have to set this field to "YES".

The screen you are currently in is always highlighted in the screen's index tab. For example, in ***Figure 8-8***, because Screen 2 is displayed, tab **S2** is highlighted.

8.7.3.2 The Help Line

The line near the bottom of the screen above the function key menu is once again the **help line**. The help line this time provides a short description of the selected field, along with important information such as minimum and maximum value ranges, and setup instructions.

8.7.3.3 The Function Keys

The ten boxes at the very bottom of the screen show the function of keys F1 through F10. Most of these keys retain the same function no matter which field, screen, or application is selected in the Setup Editor. ***Table 8-2*** shows what each key is used for.

Key	Function	Description
F1	PREV TAB	Moves backward one screen.
F2	NEXT TAB	Moves forward one screen.
F3	EDIT	Brings up the Edit Menu Box.
F5	CANCEL	Exits the Setup Editor without saving any changes.
F6	ALARMS	Jumps immediately to Alarm Advisory Log screen.
F7	LOOK UP or STATUS	Brings up the Look-Up Table for the selected field. or Displays current status of the highlighted area.
F8	ACTIONS	Brings up the Actions Menu
F9	HOME	Saves changes, returns to default status or summary screen.
F10	BACK	Saves changes, returns to previous screen.

Table 8-2 *- Function Keys for Setup Editor*

After all of the functions of Einstein are set up, the next step is to set the System Configuration, which is basically how the system is used.

8.7.4 The Systems Configuration Menu

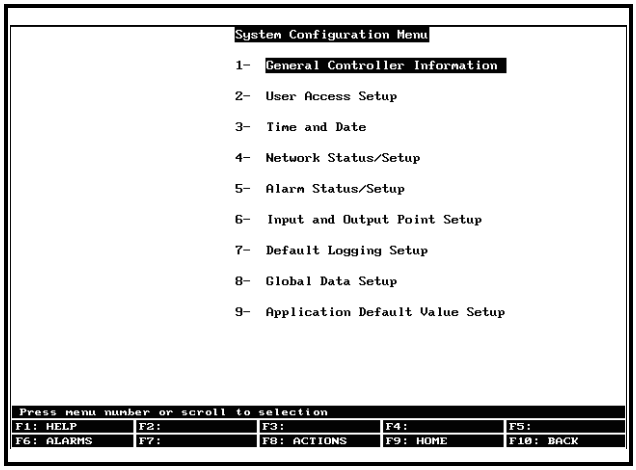


Figure 8-9 *- System Configuration Menu*

The System Configuration Menu is the menu to use to set up the Einstein. The options in this menu allow setting up time/date information, configuring user names and passwords, setting up alarming and logging, and other important data.

To enter the System Configuration Menu, press F8 (ACTIONS) and Y (SYSTEM SETUP).

The System Configuration menu contains nine menu items:

Menu Option	Description
1 - General Controller Info	Edit general information about the Einstein, such as engineering units, modem characteristics, and summer/winter change-over specifications.
2 - User Access Setup	Set up usernames and passwords, and define security level requirements.
3 - Time and Date	Change the current date and time, and specify date formats.
4 - Network Status/Setup	View and/or change the configuration of the Echelon and RS485 I/O networks.

Table 8-3 *- System Configuration Menu Options*

Menu Option	Description
5 - Alarm Status/Setup	Set up dial-outs and alarm reporting for the current Einstein.
6 - Inputs and Outputs Point Setup	View the status of all input and output boards, as well as set up individual points on the I/O boards.
7 - Default Logging Setup	Enter information about Logging Group applications such as the sampling frequency and total number of samples.
8 - Global Data Setup	Configure one or more analog or digital sensors to be used as “global” values by all Einsteins.
9 - Application Default Value Setup	Choose the default values most appropriate to the building control components in the system.

Table 8-3 *- System Configuration Menu Options*

At this point, you have learned how to log on, initialize the system, maneuver through Einstein’s setup screens, seen common screen elements, the Actions Menu screen, the System Configurations Menu and have initiated a basic system template.

9 System Configuration

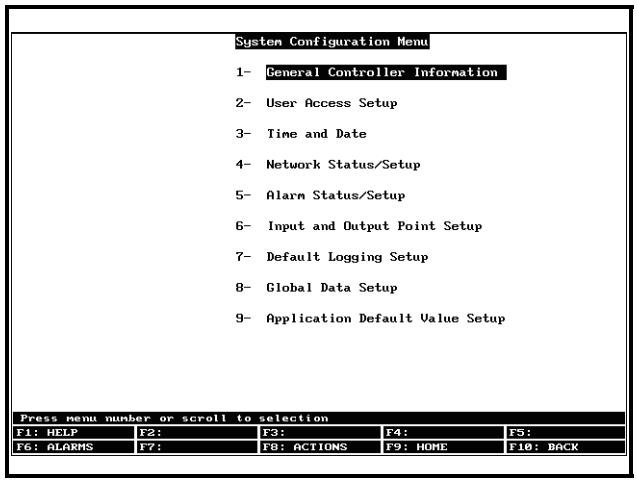


Figure 9-1 *- System Configuration Menu*

To access the System Configuration menu from the Main Status screen, press F8 (ACTIONS) and then Y (System Setup).

The General Setup screens are where the user selects controller names, default engineering units, baud rates, daylight savings time dates, refrigerant type, and other important items pertinent to the Einstein's basic operation.

To access this screen from the System Configuration menu, press 1 (General Controller Information).

9.1 General Information

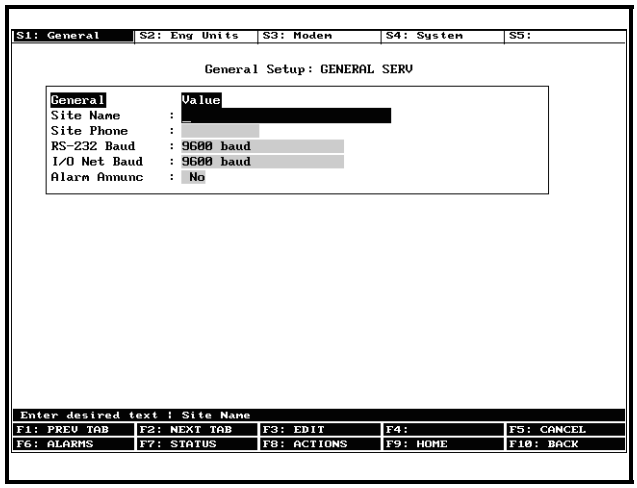


Figure 9-2 *- General Setup -- Screen One*

9.1.1 Modem Setup

If this Einstein has a modem that will be connected to a phone line, enter the phone number of this line in the Phone # field. Since this field is only ten characters long, enter the phone number without dashes, spaces, or parentheses.

9.1.2 Baud Rates

If a baud rate is changed in this screen, the controller must be rebooted (turned OFF then ON again) to make the baud rate change occur.

9.1.2.1 RS-232 Baud Rate

The RS-232 Baud Rate field determines the speed of communications between the Einstein and an RS-232 device (such as a satellite link or PC).

The baud rate selected in this field should correspond with the baud rate for the RS-232 device. For example, if connecting a PC to this port, the PC's COM port should be set up to communicate at the same rate as what is set in this field.

There are four options to choose from. Select one of the options below using the Prev or Next keys:

- **Port Disabled** - When this option is selected, the RS-232 port will be disabled.
- **9600 baud**
- **19.2 Kbaud**
- **38.4 Kbaud**

9.1.2.2 I/O Net Baud Rate

The IO Net Baud Rate is the rate at which the Einstein will communicate with input and output boards on the RS485 I/O Network.

You may select either "9600 baud", "19.2 Kbaud", or "Port Disable" in this field. The appropriate baud rate is either 9600 or 19.2Kbaud, depending on whether or not an RT-100 is on the network.

9.1.2.3 Alarm Annunciator

In every Einstein network, at least one Einstein unit must be in charge of processing alarms from all Einsteins on the network and reporting them in some way, whether it be across the Echelon network, or remotely via modem or Ethernet. This Einstein unit is known as the alarm annunciator.

If you want the Einstein you are programming to be an alarm annunciator, set the Alarm Annunc field to "Yes."

When an Einstein is set up as an Alarm Annunciator, the default screen changes from the Main Status Screen to the Alarm Advisory Log screen.

Note
The Alarm Annunciator field must be set to Yes if you want to connect the Einstein to an Ethernet network using an SS-100 or NetCom Network card.

9.1.3 Eng Units Setup

Press F2 to advance to the Eng Units screen.

The fields listed under the Units heading determine the controller's default engineering units. The Einstein will use the engineering units chosen in these fields when displaying values on the status screens. The Einstein will also apply these units to set points and other user-entered parameters.

Table 9-1 lists all of the engineering units along with the options that may be chosen for each. For each of the Units fields, use the Prev and Next keys to scroll through the list of possible units. Or, F7 (LOOK UP) will display all of the available options for each field.

All of the engineering units most commonly used in the United States are selected as the default units. The U.S. defaults are highlighted in bold in ***Table 9-1***.

Measurement	Units (Abbreviation)
Temperature	**Degrees Fahrenheit (DF)** Degrees Celsius (DC)
Temperature Rate Change	**Degrees F/hour (DFH)** Degrees C/hour (DCH)
Pressure, Large	**Pounds/square inch (PSI)** Bars (BAR) Kilopascals (KPA)
Pressure, Small	**Inches of Water (INW)** Centimeters of Water (CMW)
Velocity, Air	**Feet/Minute (FPM)** Meters/Minute (MPM)
Velocity, Liquid	**Gallons/Minute (GPM)** Liters/Second (LPS)
Volume, Flow	**Cubic Feet/Minute (CFM)** Cubic Meters/Second (CMS)
Current	**Milliamperes (MA)** Amperes (A)
Light	**Lux (LUX)** Foot-candles (FTC)

Table 9-1 *- Engineering Units Options*

9.1.4 Modem Select

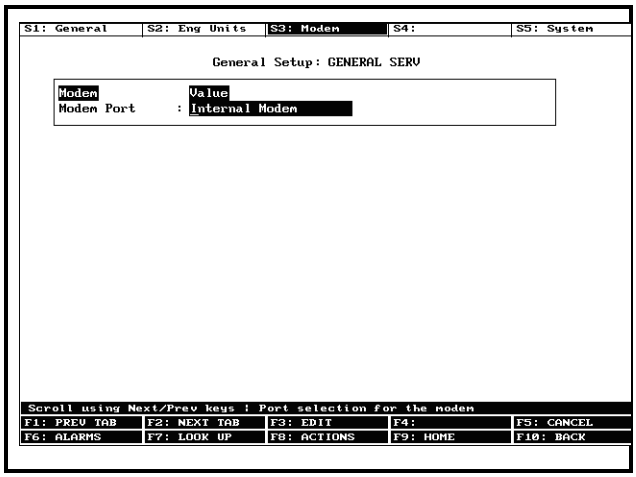


Figure 9-3 *- Modem Select Screen*

Press F2 to advance to the Modem Select screen. Use the Prev and Next keys to scroll through the options, or press F7 (LOOK UP) to view the available options. You can choose between an internal modem (one that is mounted directly on to the Einstein circuit board via the PC104 slot) or an external modem, which connects to the Einstein using a cable.

9.1.5 TCP/IP (Einstein 1.4 and

Greater)

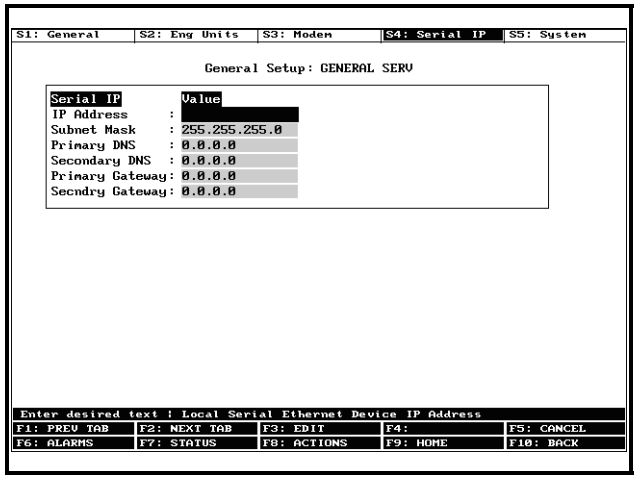


Figure 9-4 *- Serial IP Address*

Einstein units with version 1.4 or greater software may be configured to communicate across an Ethernet computer network using TCP/IP protocol. Ethernet network communication requires installation of either an SS-100 Ethernet Network Gateway (P/N 570-2000) or a NetCom Network Card (P/N 370-4000). Refer to *P/N 026-1607, SS-100 Serial Server Installation and Programming Guide*, for hardware installation instructions for the Ethernet Network Gateway.

Once all the hardware is properly installed, you will need to enter IP address information for the Einstein in the Serial IP screen.

IP Address The IP Address field sets the network address for this Einstein. Other network devices (such as PCs running UltraSite) will communicate with this Einstein by sending information to this specified address. Contact your network administrator to determine what IP address to enter.

The IP Address always consists of four numbers from zero to 255, each of which is separated by a period. Enter the address in this format.

Subnet Mask The Subnet Mask is a network variable that defines how the IP address will be translated by all devices on the network. Contact your network administrator to get the correct subnet mask value, and enter it in this field.

The default value, “255.255.255.0”, is the subnet mask commonly used for small networks.

Primary DNS Contact your network administrator to see if a Primary DNS value is required for this Einstein. If so, enter the Primary DNS address supplied by your adminstrator in this field. If not, leave this field set to “0.0.0.0”.

Secondary DNS Contact your network administrator to see if a Secondary DNS value is required for this Einstein. If so, enter the Secondary DNS address supplied by your adminstrator in this field. If not, leave this field set to “0.0.0.0”.

Primary Gateway Contact your network administrator to see if a Primary Gateway value is required for this Einstein. If so, enter the Primary Gateway address supplied by your adminstrator in this field. If not, leave this field set to “0.0.0.0”.

Secondary Gateway Contact your network administrator to see if a Secondary Gateway value is required for this Einstein. If so, enter the Secondary Gateway address supplied by your adminstrator in this field. If not, leave this field set to “0.0.0.0”.

9.1.6 System Refrigerant Type

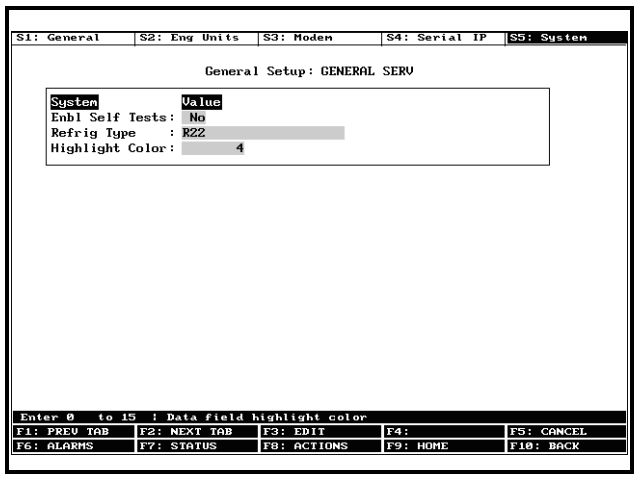


Figure 9-5 *- System Refrigerant Type*

Press F2 to advance to the system Refrigerant Type (SYSTEM) screen. Use the Prev and Next keys to scroll through the options, or press F7 (LOOK UP) to view the available options.

When through entering the value into the field, press F10 to return to the System Configuration Menu.

9.2 User Access

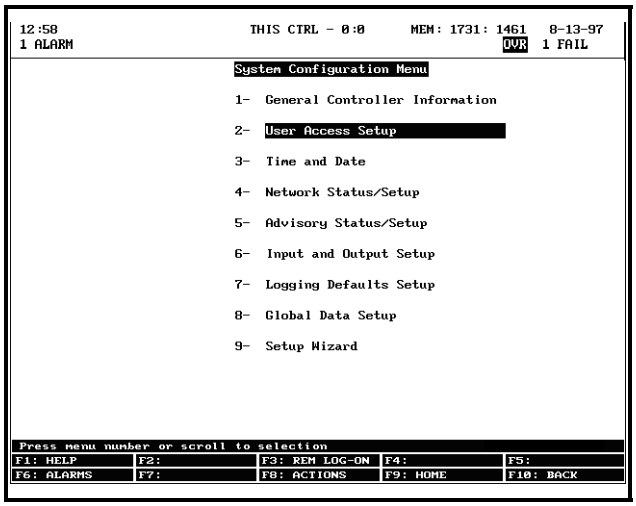


Figure 9-6 *- System Configuration Menu*

In the User Access Setup screen, you may add user names and passwords to the controller with varying levels of security, and customize user access for each security level.

To access this menu, choose option 2 from the System Configuration Menu.

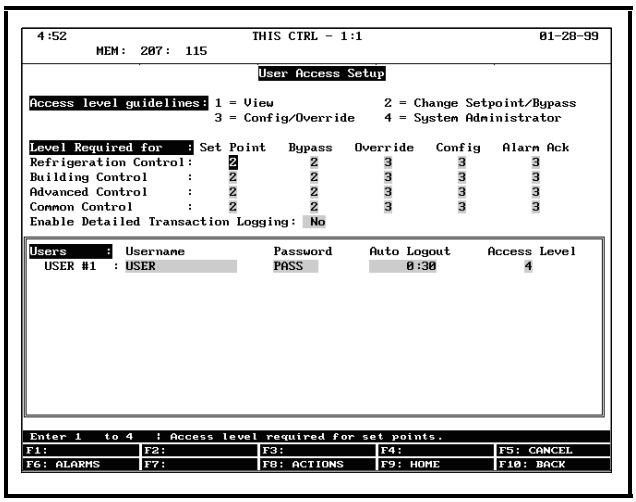


Figure 9-7 *- User Access Setup Screen*

An Einstein may be programmed with up to 25 different users. A user basically consists of a username, a password, and an access level. Whenever a username and password are entered during login, the Einstein searches the user records for the username and password. If found, the Einstein will log the user in at the access level chosen for the user in the user records.

The access level determines how many of the Einstein's features the user may use. The Einstein uses four access levels, one being the lowest, and four being the highest. ***Table 9-2*** gives a description of each level and the capabilities they have access to.

Level 1	Read-only access. Users may generally only view status screens, set points, and some system settings.
Level 2	Setpoint and bypass access. Users may perform all the tasks a level 1 user may, plus they may change control set points and bypass some devices.
Level 3	Configuration and override access. Users may perform all the tasks a level 2 user may, plus they may override system settings, create new cells, and program new applications.
Level 4	System Administrator access. All Einstein functions are accessible by a level 4 user.

Table 9-2 *- User Access Levels*

9.2.1 Changing Required User Access Levels

The "Level Required For" table in this screen is used to customize what access level is required to perform certain actions within the Einstein unit. There are four rows in this table, each of which corresponds to a different type of Einstein function or application.

- ***Refrigeration Control*** **-** This category includes changes or actions involving refrigeration applications specific to RX controllers (Suction Groups, Condensers, Circuits, CC-100s, etc.)
- ***Building Control*** **-** This category includes changes or actions involving building control applications specific to BX controllers (AHUs, Zones, Lighting Control, Time Schedule, Demand Control, etc).
- ***Common Control*** **-** This category includes control applications common to both RX and BX controllers (Sensor Control, Time Schedules, Conversion Cells, Analog or Digital Combiners, Global Data- etc.)
- ***Advanced Control*** **-** This category includes applications common to both boxes that are only used by advanced users, such as Loop/Sequence Controllers, Refrigeration or HVAC Simulations, etc.

Each row has five columns, each of which corresponds to a different category of user actions.

- ***Set Point*** **-** This includes all actions that change application set points. Also, **clearing** one or more alarms out of the Alarm Advisory Log is considered

a "set point" action (refer to **Section 20.4,** *Alarms,* for the definition of "clearing alarms").

- ***Bypass*** **-** This includes all actions that bypass a device to a certain state, such as initiating a manual defrost, or configuring an application input designated as a "bypass." Also, **resetting** one or more alarms in the Alarm Advisory Log is considered a "bypass" operation (refer to **Section 20.4,** *Alarms*, for the definition of "resetting alarms").
- ***Override*** **-** This includes any user-ordered override of a set point, input, or output.
- ***Config*** **-** This includes all actions that change an application setting. This includes configuring inputs and outputs.
- ***Alarm Ack*** **-** This includes **acknowledging** one or more alarms in the Alarm Log. Refer to **Section 20.4,** *Alarms,* for the definition of "clearing alarms."

For each row and column of the Level Required For table, enter the desired minimum priority level that will be required for users to perform actions on each type of application. Einstein will check this table when a user attempts an action to verify the user has the appropriate access level to make the change. If the user's access level is equal to or above the priority setting in the table, access will be allowed. If not, access will be denied.

9.2.2 Creating a New User Account

After entering the User Access Setup screen by pressing 2,

6. Move the cursor so that it is somewhere in the Users box at the bottom of the screen.
7. Press F1 to put a blank record (user) at the bottom of the list, or press F3 (INS RECORD) to insert a record directly below the cursor.
8. Type in the User name, and then move to the next entry point (Password) by pressing the right arrow button.
9. Type in a password for the next user, then press the right arrow button to advance to the next field.
10. The Auto Logout feature determines the amount of time it takes the Einstein to log off. Enter the amount of time for the user and press the right arrow button.
11. Enter the appropriate access level for the user. See ***Table 9-2***.
12. Press F10 (BACK).

9.2.3 Deleting an Account

To delete an account from the system:

1. Move the cursor so that it is highlighting the record to delete in the Users box at the bottom of the screen, and press F2 (DELETE RCRD).
2. A question box will appear to double check the deletion of the user. Press Y if you are sure about the deletion.

9.3 Time/Date Setup

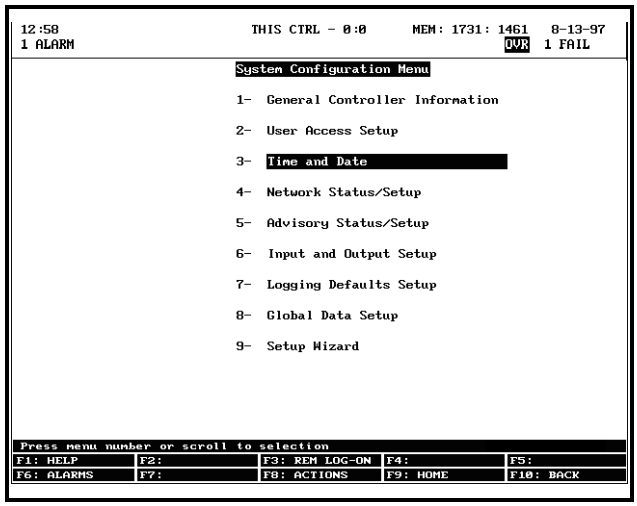


Figure 9-8 *- System Configuration Menu*

The Time Services Setup screen is where users may change the time, date, date format, Daylight Savings dates, and special time synchronization features.

To get to the Time Service Setup screen, press 3 (Time and Date). The Time Services Setup screen

(***Figure 9-9***) is where all time and date changes occur.

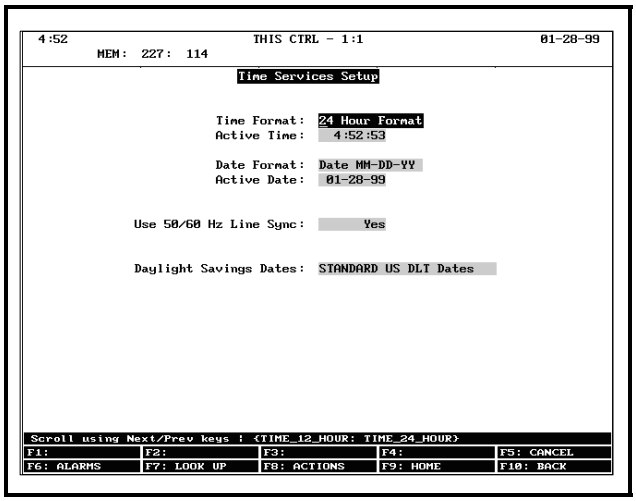


Figure 9-9 *- Time Services Screen*

9.3.1 Setting the Time and Date

The Time Format field affects how times are displayed and entered throughout the controller. When 24 Hour Format is selected in this field, the hours are displayed and entered as a number from 0 to 23. When 12 Hour Format is selected, the hours are displayed and entered as a number from 1 to 12; an A or a P at the end of the time signifies whether the time is A.M. or P.M.

Table 9-3 shows some times as how they would appear in both formats.

Time	12 Hour Format	24 Hour Format
7:15 a.m.	7:15:00A	7:15:00
12:00 noon	12:00:00P	12:00:00
11:59 p.m.	11:59:00P	23:59:00
12:00 midnight	12:00:00A	0:00:00

Table 9-3 *- Time Formats (12 and 24 hour)*

To select a time format, select either 12 or 24 hour using the Prev and Next keys.

Active Time

The Active Time is the current time in the controller's internal clock. This time may be changed by entering the new time in the Active Time field.

When a new time is entered in the Active Time field, it is sent across the network and changed on all device clocks so that all devices can remain synchronized.

Date Format

Dates may be presented and entered in either of two ways: month-day-year format, and day-month-year format. Choose the most appropriate date format by using the Prev and Next keys.

Daylight Savings Dates

The Daylight Savings Dates field determines what days the Einstein will make date adjustments for daylight savings time. There are three options:

- **STANDARD US DLT DATES** - the time changes automatically occur on the first week of April and the fifth week of October every year.
- **USER DEFINED DLT DATES** - when this option is chosen, fields appear at the bottom of the screen where the user may choose the month, week, and day of the year Daylight Savings Time starts and ends. Use the Prev and Next keys to cycle through the options in each of the fields.
- **DLT NOT USED** - the Einstein does not make any adjustments to the time to accommodate Daylight Savings Time.

9.4 Network Status/Setup

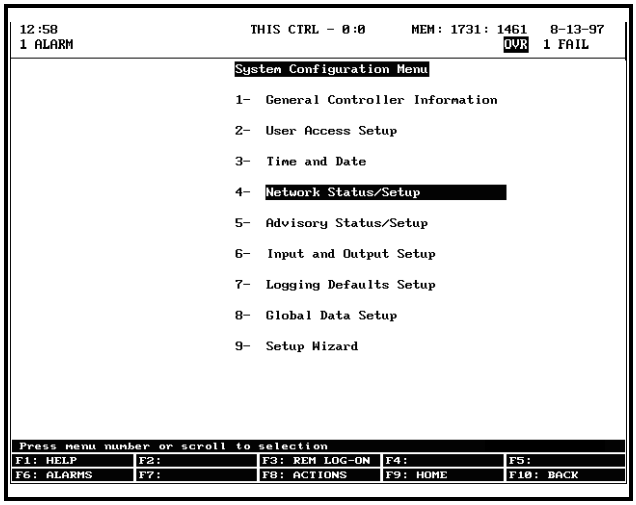


Figure 9-10 *- System Configuration menu*

If you are continuing the Einstein system configuration process, the screen on the Einstein you are programming should display the Time Services Setup screen. Press F10 twice to go back to the System Configuration screen.

Otherwise, starting from the Main Status screen, press 4 (Network Status/Setup).

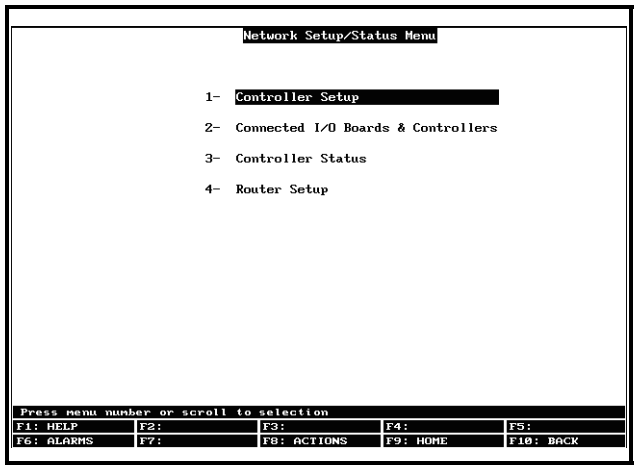


Figure 9-11 *- Network Setup/Status Menu*

9.4.1 Select Associated Controllers

From the Network Setup/Status Menu screen, choose the second section, Connected I/O Boards & Controllers, by pressing **2**.

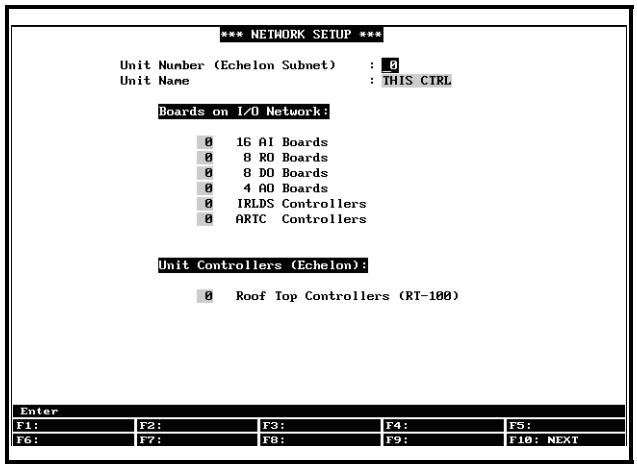


Figure 9-12 *- Associated Controllers Screen*

When you first logged on to the controller, you were asked to enter the number of I/O boards, IRLDS and RT-100 controllers present on the system. If you have not already specified the number of controllers, do so now.

All of the boards and controllers specified in that screen will be shown in the Controller Network Configuration/Status screen.

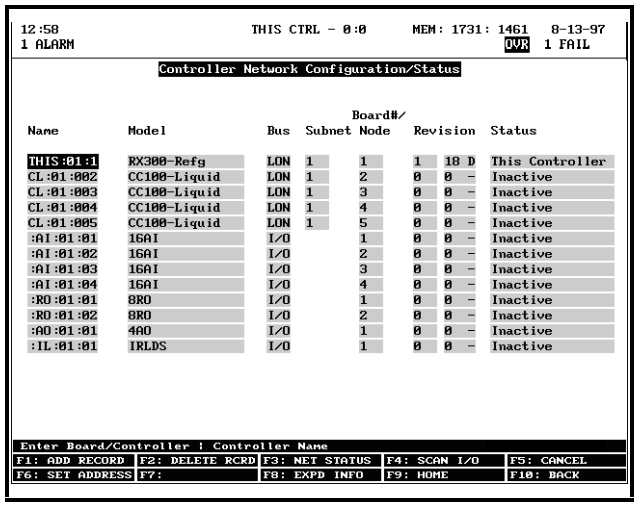


Figure 9-13 *- Controller Network Configuration/Status Screen*

9.4.2 Controller Setup/Status

Every device listed in the Controller Network Configuration/Status screen must have the correct values for the name, model, bus, subnet, board/node#, revision, and status. In addition, Echelon devices must be “commissioned” by registering its unique Neuron ID number in the Einstein’s memory.

The last column on this screen lists the status for each controller. When the status message is “Online,” the controller and the Einstein are communicating properly. If the message is “Offline,” then there is a problem with the controller’s power or the communication link between the controller board and the Einstein.

The first record in the Controller Network/Configuration Status Screen will always be the record for the controller you are currently logged into (labelled “This Controller” in the Status field). If you have already specified the number of RT-100s in the Controllers Associated With This BX300 screen, the RT-100s will be listed underneath the controller.

When the controller and its associated RT-100s are created using the Controllers Associated With This BX Ctrl screen, all of the fields in each record will be set up properly. In other words, the Model, Bus, and Subnet will be correct, and the Node and Name fields will be configured with functional default values. The only additional setup that will be necessary for these Echelon devices is to change the default names.

Controller Name

A name for the controller being set up must be entered in the Controller Name field. The name should be both unique (i.e. no other device on the network has the same name) and appropriate to the device’s function (for exam-

ple, “ROOF1” for rooftop controller #1).

To enter the name of the device:

1. Scroll down using the arrow buttons to the device to be named.
2. When the selection is highlighted, type the desired name. Use up to nine characters.
3. Press the direction arrows to guide the cursor to each device to be named.
4. Press either F9 to go to the Main Status screen or F10 to move back one screen.

Scan I/O

The Einstein is capable of automatically detecting and setting up all devices on the RS485 I/O network. To activate the Scan I/O feature, press F4 in the Controller Network Configuration/Status screen.

The Einstein will automatically detect each I/O device and record each device’s type and board number in a separate record. For each new board it finds, Scan I/O assigns a default name based on the board’s type and number. If different names are desired, you may change them by moving the cursor to the Controller Name field and typing the new name.

Status

The Status column on the far right side of the Controller Network Configuration/Status screen tells the current status of the controllers listed. If the message is “Inactive,” the board is offline. There is either a malfunction due to loss of power or the controller has not been configured properly. If the message is “Active,” then the board is online and operating normally.

9.4.3 Subnet/Node Assignment

Subnet Assign

If the device being set up is an Echelon network device, it must be assigned to a subnet. This is achieved by entering the subnet number in this field. If the device is an I/O network device, this field will not be accessible.

Node Assignment

The Board #/Node field serves two purposes. If the device is a Echelon network device, the node address must be entered in this field. If the device is an I/O network device, its network address (board number) must be entered in this field.

A node address from 1-127 must be entered for all Echelon network devices. There are no restrictions to what node numbers may be assigned to particular devices, except that no two devices may have the same node address. For simplicity, it is recommended that node addresses should start with “1” for the first device in the subnet and continue sequentially to “127” for all other devices in the subnet.

For I/O devices, the number in the Board #/Node field must match the network ID number chosen on the board’s dip switches or rotary dials.

9.4.4 Commissioning Echelon Devices

Once all records have been created and defined for all devices on the Echelon network, they must be “commissioned.” Commissioning is necessary for the Einstein to identify and establish communications with all devices on the network.

A device may only be commissioned if it is properly connected on the network and powered up.

How Commissioning Works

Each device that is capable of communicating on a Echelon network has a unique 12-digit Neuron ID code number that is hard-coded in a chip on the board. In order for the Einstein to begin communications with a unit controller or another Einstein, it must know the device’s ID number.

When a device is commissioned, its 12-digit code is either entered by hand into the Einstein (via the front panel keyboard) or sent across the network to the Einstein using the device’s service button. Once the Einstein knows the device’s 12-digit ID, it establishes communication and gives the device its user-defined subnet and node address. From that point on, the Einstein uses only the subnet and node address to communicate with the device.

As mentioned above, there are two ways in which a device may be commissioned. No one way is better than the other in terms of effectiveness, but one of the methods may be less difficult than the other depending on the type of installation.

The Service Button Method

To commission a device using the service button, you must first set up the Einstein to receive a service button signal, and then press the service button on the device. When the signal is received by the Einstein, the device will be commissioned.

To set up the Einstein to receive a service button signal, move the cursor to the Controller Name field of the record you wish to set up, and press the F6 - SET ADDRESS function key.

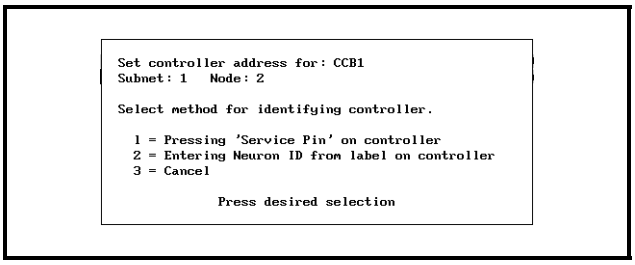


Figure 9-14 *- Commissioning Menu*

A menu will appear on the screen, giving you the option of either pressing the service button, entering the Neuron ID by hand, or cancelling and returning to the main screen. Press 1 to select the service button option.

Figure 9-15 *- Service Button Screen*

The Einstein will prompt you to enter a wait time in the Wait Time field. The Wait Time is the amount of time the Einstein will try to detect a service button press before declaring the attempt unsuccessful and returning to the main screen. To commission the device, the Neuron ID must be sent during the Wait Time duration.

After you enter a wait time in hours:minutes:seconds format and press Enter, the Wait Time duration begins. All that is left to do is to press the service button on the device to be commissioned.

WARNING

When the Einstein's Wait Time duration begins, the Einstein will accept the first Neuron ID code it receives. Be sure that no other service buttons on any devices on the network are being pressed during the Wait Time. Since the service button on the CC-100 is its Hand-Held Terminal jack, be sure that no one has a Hand-Held Terminal plugged into a CC-100 other than the one being commissioned.

The location of the service button and the method of pressing it depends on the device or controller being commissioned.

The 16AIe's Service Button

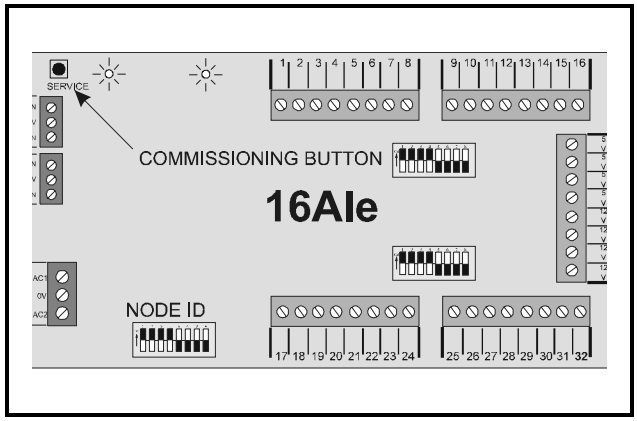


Figure 9-16 *- 16AIe Service Button Location*

The 16AIe's Service Button is located in the top left corner of the board next to the two Echelon connection sockets (***Figure 9-16***). To send the Neuron ID, press and hold the button down for five seconds.

The 8ROe's Service Button

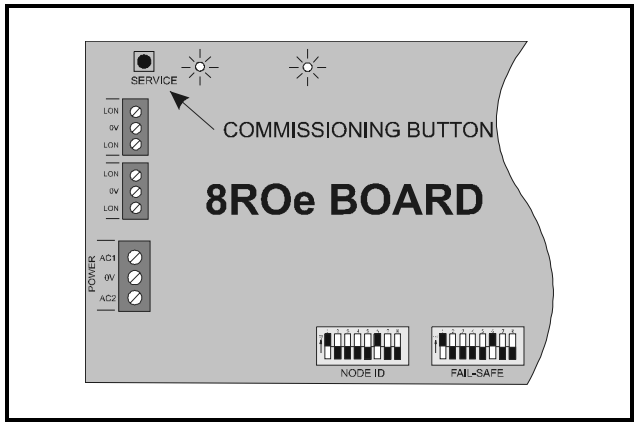


Figure 9-17 *- 8ROe Service Button Location*

The 8ROe's Service Button is located in the top left corner of the board next to the two Echelon connection sockets (***Figure 9-17***). To send the Neuron ID, press and hold the button down for five seconds.

The Manual ID Entry Method

The Manual ID Entry Method involves entering each device's twelve-digit ID number by hand. When entered, the Einstein searches the network and tries to match the ID number to the device. When the Einstein finds this device, the commissioning process is completed.

The easiest way to set up a multiple-node store using the Manual ID Entry Method is to arrange all network devices into a list that shows each device's name, subnet and node address, controller type, and corresponding Neu-

ron ID number. Once this list is complete, each device may be commissioned one at a time from the Einstein front panel.

To make a list of network devices, follow the steps below:

1. Locate *Appendix A: Pressure/Voltage and Temperature/Resistance Charts for Eclipse Transducers & CPC Temp Sensors*. Each page of this appendix may hold 25 device records (for a total of 100 nodes). If more nodes are required, photocopy as many sheets as needed.
2. For each record set up in the Controller Network Configuration/Status Screen, write down the contents of each device's Controller Name, Model, Subnet, and Node fields in the appropriate blanks on the LonWorks Network ID Chart. If desired, you may also include the model or serial numbers of the units that will be controlled, as well as a physical location.
3. When step 2 is complete, go to where each device on the list is installed and locate each device's Neuron ID sticker. Every Echelon-compatible device available from CPC has a sticker on its enclosure that shows the unit's Neuron ID number. Each sticker also has a perforated tag at the bottom that may be removed and affixed to your form. Tear this tag off and stick it in the Neuron ID blank on the form. If the perforated tag has already been removed, write the ID number in the blank.

When all Neuron ID numbers have been collected, you are ready return to the Einstein and enter the Neuron ID numbers for each device. To commission a device, move the cursor to the device to be commissioned and press the F6 - SET ADDRESS function key.

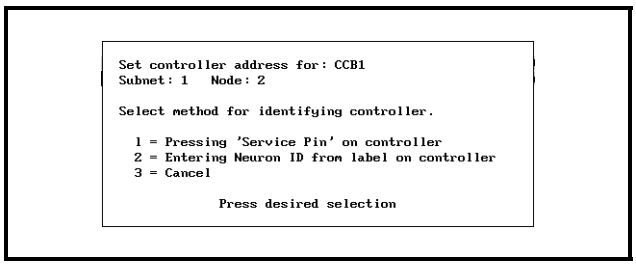


Figure 9-18 *- Commissioning Menu*

A menu will appear on the screen, giving you the option of either pressing the service button, entering the Neuron ID by hand, or cancelling and returning to the main screen. Press 2 to select the manual entry option and bring up the dialog box shown in ***Figure 9-19***.

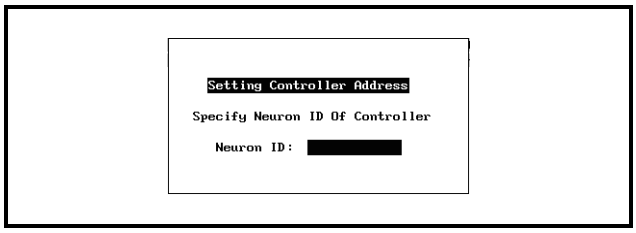


Figure 9-19 *- Setting Controller Address*

Enter the device's Neuron ID as it appears on the form you created, and press Enter. The Einstein will then look for the controller with the Neuron ID you entered. If it is found, the Einstein commissions the device, and you may move on to commissioning the next device.

If Einstein does not find it, the display will read "ERROR - Controller with specified Neuron ID did not respond." This could be caused by an improperly entered number, or it could be caused by a problem with the device's network connections or power connections.

When all devices are commissioned, keep the form with the Neuron ID stickers in an easily accessible place so that it may be referred to if necessary for board removals, replacements, or troubleshooting.

9.4.4.1 Step 3: Putting Boards On-Line

After the network boards have been commissioned, they will not go on-line until you exit the Controller Network Configuration/Status screen by pressing F9 or F10. When you exit this screen, the Einstein will automatically attempt to establish contact with each board listed in the records. If it successfully contacts the boards, they will become on-line. If it cannot find the board, it labels the board "Inactive".

Exiting the Controller Network Configuration/Status screen after creating and commissioning all the network boards in the system software is a good way of checking your work. After exiting, re-enter the screen, and look at each record's Status fields. Boards that have been set up correctly will have "Active" in this field, while boards that have not been set up correctly will be labelled "Inactive".

9.5 Dial-Out Setup

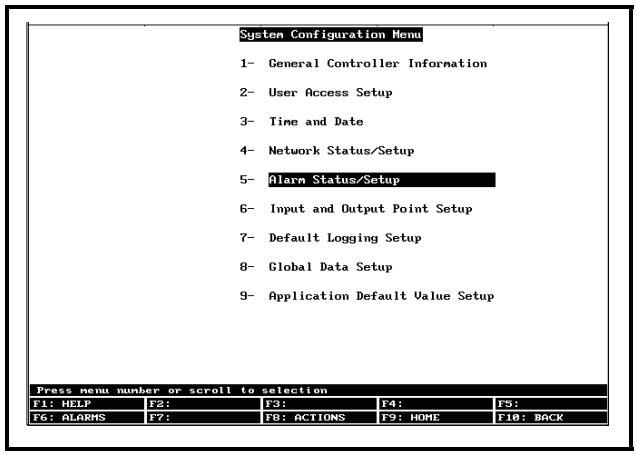


Figure 9-20 *- Dial Out Setup*

One of the Einstein's most important alarm reporting features is its ability to dial-out to remote sites whenever a serious alarm condition occurs. Each Einstein is capable of dialing out to up to three sites. The Einstein may dial out to a computer, a fax machine, a digital pager, or a printer.

Dial-out devices are set up in the Dial-out Setup screen. To reach this screen, press 5 from the System Configuration Menu followed by 1 from the Alarm Configuration Menu.

9.5.1 Screen 1: Setup

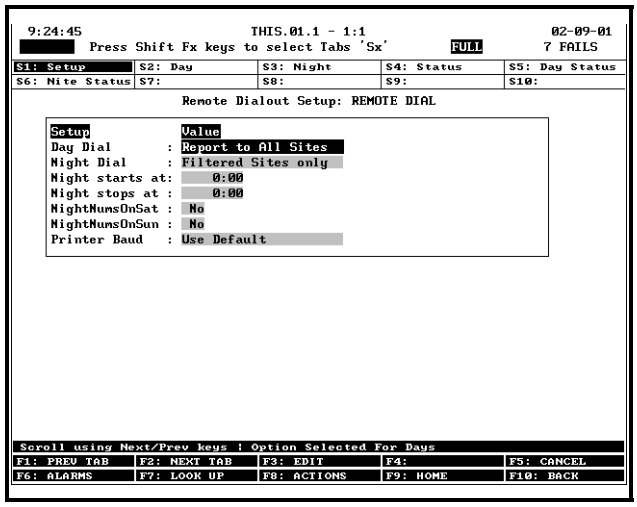


Figure 9-21 *- Dial-Out Setup*

The Dial-out Setup screen is where you specify various parameters that affect daytime and nighttime dialouts as well as setting the serial baud rate for the local printer.

Day Dial and Night Dial

Note: The Day Dial and Night Dial fields are only significant if you have more than one dial-out destination for this site. If you are not using dial-out or are only dialing out to only one site or device, you may skip these fields.

The Day Dial and Night Dial fields determine how the Einstein will contact the sites or devices you have specified in the Day (Screen 2) and Night (Screen 3) screens. Both fields may be set with one of three options:

- *Report To All Sites* - When this option is selected, Einstein will try dialing alarms out to all the sites you have selected in the Day or Night screen. The "Report To All Sites" option supports alarm priority filtering, but the filter priority level must be the same for all sites (so that either an alarm is dialed out to all the sites, or it is filtered out completely and not dialed to any sites). If you want different priority levels for your multiple sites, choose the Filtered Sites Only option (described below).
- *Filtered Sites Only* - When this option is selected, Einstein will only dial out to sites that have priority filtering numbers lower than the priority levels of the alarms being dialed out. If the alarms' priority levels do not meet a site's filtering criteria, it will not be dialed out to that site.
- *Stop After Reported* - This option allows you to use multiple sites in the Day and Night screens as "backups" in case a dial-out is unsuccessful. When this option is selected, Einstein will try to dial out to Site #1. If successful, the dial-out sequence is considered complete. If not successful, Einstein will try to contact Site #2, and then Site #3 if #2 could not be reached. Like the "Report To All Sites" option, you must set the same alarm priority filtering levels to all sites if you use the "Stop After Reported" option.

Night Starts At/Night Stops At

These two fields determine when "nighttime" begins and ends as recognized by this Einstein's alarm dial-out function. If you wish to use alternate dial-out sites during nighttime hours, enter a beginning and end time in these fields (in 24-hour format). If you do not wish to use alternate nighttime sites, leave these fields at their default values (0:00).

NightNumsOnSat and NightNumsOnSun

If you wish, you may use the alternate dial-out sites designated for nighttime use for the full 24 hours on every Saturday and/or Sunday. If NightNumsOnSat is set to Yes, it will treat every Saturday as a 24-hour "night" and use the alternate nighttime dial-out sites. Likewise, if NightNumsOnSun is set to Yes, each Sunday will be considered "night" all day.

Even if you do not have a "night" period defined for

use during the weekday, you can use the NightNumsOnSat and NightNumsOnSun fields to use the sites in the Night screen on weekends.

Printer Baud

This field determines the serial baud rate Einstein will use to communicate with the printer. In most cases, leaving this field at its default value "Use Default" will be sufficient for communicating with the printer. If a different baud rate is needed for your printer, press F7 and choose the required baud rate.

9.5.2 Screen 2: Day Dial-Out Setup

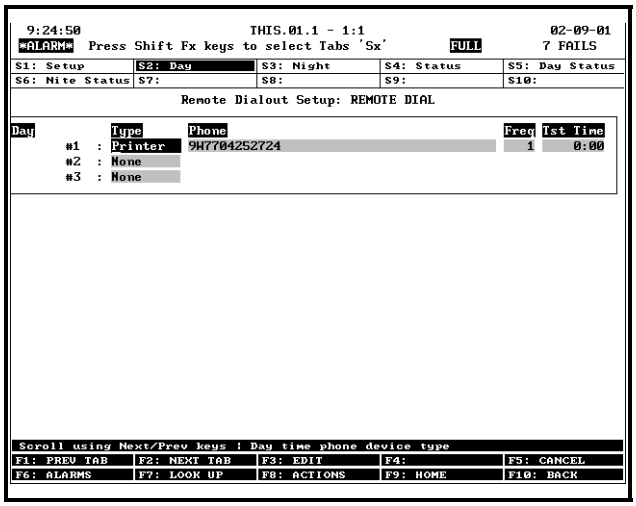


Figure 9-22 *- Screen 2: Day*

The Day Dial-Out Setup screen has three slots where dial-out sites can be specified, labeled #1, #2, and #3. Follow the instructions below to configure each dial-out site you will be using.

Note: If you specified the "Stop When Reported" option in the Day Dial field, make sure you arrange your dial-out sites in the order you want Einstein to dial out to (#1 first, #2 second, and #3 third).

9.5.2.1 Set Up Modem or Fax Dial-Out

1. With the cursor in the Type field, press F7 and select "Computer" (if dialing out to a PC running UltraSite) or "Fax" (if dialing out to a fax machine).
2. In the Phone field, enter the phone number Einstein will dial to contact the site. If Einstein must dial a "9" or other number to get an outside line, remember to include this number before the phone number. The Phone field recognizes a comma as a one-second pause, and the "W" character as a "wait for dialtone" command; therefore, a phone number of "9W8292724" will dial a 9, wait for a dialtone, and then dial 829-2724.
3. In the Freq field, enter the interval (in number of days) at which the Einstein will do test dials with the modem to ensure communications are working properly. If you do not wish Einstein to do test dial-outs, enter a 0 in this field.
4. In the Tst Time field, enter the time of day (in 24 hour format) at which the test dial-out will occur. The default is midnight.

9.5.2.2 Dial-Out To Printer

This option allows you two different dial-out options. You may print alarms on a local printer connected to the Einstein serial port, or you may use the Einstein's modem to remotely dial a printer or a PC running a serial terminal program (such as Procomm or HyperTerminal).

1. With the cursor in the Type field, press F7 and select "Printer."
2. If you will be printing alarms to a local printer, leave the Phone field blank. Otherwise, if you wish to dial out alarms to a remote printer or serial terminal, enter the phone number Einstein will dial to contact the site. If Einstein must dial a "9" or other number to get an outside line, remember to include this number before the phone number. The Phone field recognizes a comma as a one-second pause, and the "W" character as a "wait for dialtone" command; therefore, a phone number of "9W8292724" will dial a 9, wait for a dialtone, and then dial 829-2724.
3. In the Freq field, enter the interval (in number of days) at which the Einstein will do test dials with the modem or printer to ensure communications are working properly. If you do not wish Einstein to do test dial-outs, enter a 0 in this field.
4. In the Tst Time field, enter the time of day (in 24 hour format) at which the test dial-out will occur. The default is midnight.

9.5.2.3 Dial-Out To Digital Pager

The process for setting up dial-outs to a digital pager is identical to the process explained for setting up a modem or fax dial-out in **Section 9.5.2.1**, with the following differences:

- Select "Dig Pager" in the Type field.
- If you are dialing to a 1-800 number that requires a PIN number to route the page, use commas to cause a delay between dialing the phone number and the PIN number (e.g. "18008292724,,,,,,123456"). The length of the pause may vary depending on the

pager company. You may have to try several test dial-outs to determine the most appropriate pause length.

- You **must** put four commas (,,,,) at the end of the Phone Number when dialing to a pager. This includes phone numbers without PINs (e.g. “18008292724,,,,”) and those with PIN numbers (e.g. “18008292724,,,,,,,123456,,,,”).

9.5.2.4 Dial-Out via Serial IP and Internet

1. With the cursor in the Type field, press F7 and select “Serial IP” (if dialing out using an SS-100 Serial Server) or “Internet” (if dialing out using a NetCom network card).
2. In the Phone field, enter the IP address of the site you wish to dial out to. An IP address consists of a set of four numbers from 0 to 255 separated by periods (e.g. 127.0.0.55).
3. If using Serial IP, add “:3001T” to the end of the IP address you entered in the Phone field (e.g. 127.0.0.55:3001T).
4. In the Freq field, enter the interval (in number of days) at which the Einstein will do test dial-outs over the network to ensure communications are working properly. If you do not wish Einstein to do test dial-outs, enter a 0 in this field.
5. In the Tst Time field, enter the time of day (in 24 hour format) at which the test dial-out will occur. The default is midnight.

9.5.3 Screen 3: Night Dial-Out

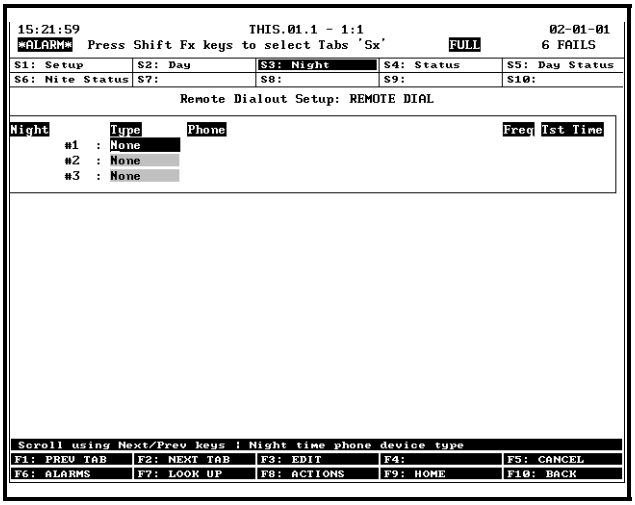


Figure 9-23 *- Screen 3: Night Dial-Out Setup*

The Night Dial-Out screen is identical to the Day Dial-Out screen described in **Section 9.5.2**, except the sites specified in this screen are used during nighttime and/or weekend hours, depending on how you have specified day, night, and weekend parameters in Screen 1 (**Section 9.5.1**).

9.5.4 Advisory Filtering Settings

Once you have configured your dial-out sites and devices, you must complete your configuration of Einstein alarm and notice dial-out by setting up alarm filtering settings for each day and night dial-out site you have configured. Refer to **Section 10** of this manual for specific instructions on setting up alarm advisory filtering.

9.6 Global Data Setup

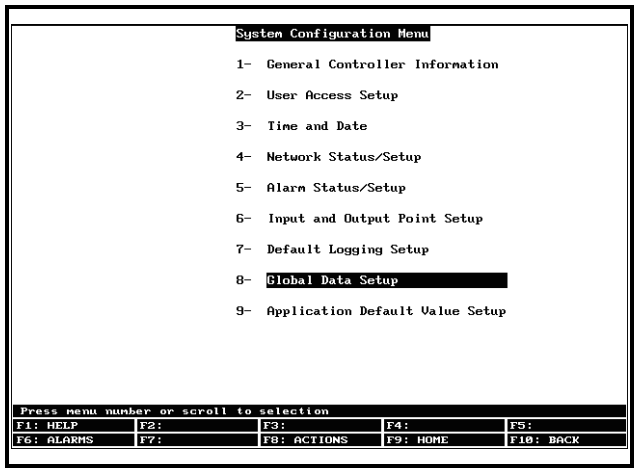


Figure 9-24 *- System Configuration Menu*

In a network with multiple Einsteins, it is often the case that certain sensors or transducer values will need to be used by all Einsteins. A good example of this is outside air temperature. There is no real need for every Einstein to have its own outside air temperature sensor, and therefore it would be beneficial if a single sensor could be used by

all Einsteins on the network.

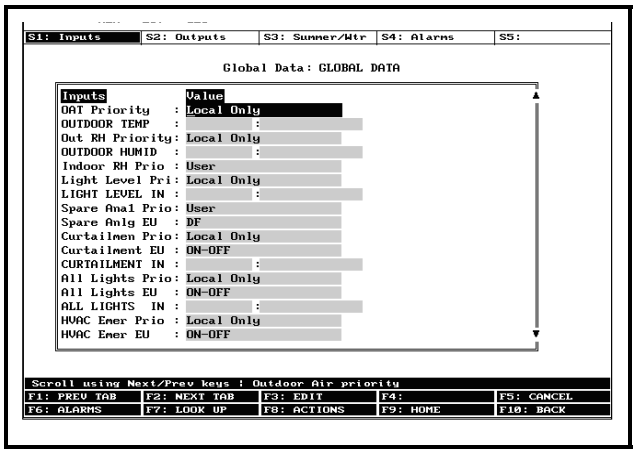


Figure 9-25 *- Global Data Setup Screen*

The Global Data feature is an enhanced method of effectively distributing commonly used input values between multiple Einsteins. Sensors such as outdoor temperature and outdoor humidity are set up on an Einstein as Global Data inputs. This Einstein then becomes the "provider" of the global sensor values to all other Global Data applications on the Einstein.

As a result, a single sensor can be used by any application in any Einstein on the network.

Unless you program it otherwise, the Einstein always assumes you will be using Global Data in all your applications. When you create new applications in the Einstein, it will always automatically connect the appropriate application inputs (except for the spares) to their corresponding Global Data outputs.

9.6.1 Priority Settings

When selecting the priority for a global sensor input, there are four settings to choose from.

Primary Primary inputs are the highest priority inputs. If a sensor is set up with a primary priority, it is recognized by all Global Data applications on the network as the highest priority. The primary provider sends this input value to the other Global Data applications in the other Einsteins, and each Einstein immediately sends that value to all of its own applications that use the Global Data input.

Only one input of each type may be designated as a primary on the Einstein network. In other words, if one Einstein is acting as the primary provider of the global Outdoor Air Temp, no other Einstein on the network may have a global Outdoor Air Temp sensor with a "primary" priority.

If using this priority setting, you must enter board and point settings.

Secondary Sensors that are set up with secondary priorities are backup sensors that will be used by all Global Data applications if the primary sensor fails.

If a global input is set up on an Einstein with a secondary priority, the Einstein will not send its value to the other Global Data applications as long as it is receiving a primary value of that type from another Einstein on the network. If a secondary provider does not receive a primary value update at least once every five minutes, the secondary provider will assume the primary sensor has failed, and it will send the secondary value to all other Global Data applications on the network. These applications will then use the secondary value in place of the failed primary value.

Secondary providers will continue to send the input value until the primary provider again sends a valid update to the other Global Data applications. The secondary provider would then stop sending the secondary value, and all Global Data applications would use the primary value.

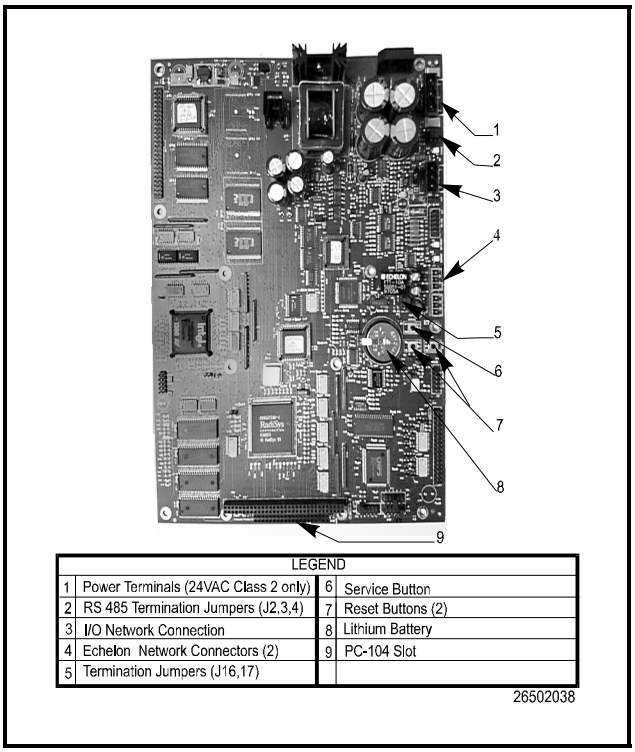
If using this priority setting, you must enter board and point settings.

Example: *Out of three Einsteins, an outside air temperature sensor on Einstein A's I/O network is set up as the primary provider of the global Outside Air Temp input. A similar sensor is set up on Einstein C with a secondary priority (see* ***Figure 9-26****).*

As long as Einstein A is capable of broadcasting a valid temperature value, all three Einsteins would use Einstein A's Outside Air Temperature value in their own Global Data applications.

However, if Einstein A loses contact with the sensor, Einstein A no longer has a valid temperature value to send to the other Global Data applications. After five minutes of no updates from Einstein A, Einstein C will consider the primary Outside Air Temp source to have failed, and it will begin sending the value of the secondary sensor to the Global Data applications of the other two Einsteins. All Einsteins would then use

this secondary value as Outside Air Temperature.



LEGEND			
1	Power Terminals (24VAC Class 2 only)	6	Service Button
2	RS 485 Termination Jumpers (J2,3,4)	7	Reset Buttons (2)
3	I/O Network Connection	8	Lithium Battery
4	Echelon Network Connectors (2)	9	PC-104 Slot
5	Termination Jumpers (J16,17)		

26502038

Figure 9-26 *- Global Data Priority Example*

Just as there may be only one primary provider for each input type, there may be only one secondary for each input type. It is recommended that secondaries be set up on different Einsteins than primaries; this way, if a single controller fails or loses communication with the other Einsteins, there will still be a usable input source for the other Einsteins.

User This setting means the Einstein's global data will read (or be a "User" of) all values coming from the network. This setting is for Einsteins that are not connected to the sensor itself, but read the data that comes from it.

If the application in this Einstein will be using primary or secondary inputs from other Einsteins, then set the priority to "USER."

Local Only This setting specifies that the input to the global data is read and sent only to within the Einstein you are programming. Also, this means that this Einstein will not read any Primary or Secondary providers from the network.

If using this priority setting, you must enter board and point settings.

To Setup an Outdoor Temperature Sensor

1. Press 8 (Global Data Setup) and the Setup screen will come up.
2. Move the cursor to the Outdoor Air Temperature (OAT) Priority, and then choose the priority by scrolling with the Prev and Next keys.
3. Press the down arrow button once to the Board and Point section and enter the board and point locations for the sensor.
4. Press F10 (BACK) to return to the Main Status screen.

The Outdoor Air Temperature sensor is now set up as a global device in the Einstein. Other global inputs can be set up using the same method as above.

Einstein is now ready to be programmed with applications.

10 Alarm Advisory Setup

Section 9 of this manual showed how to set up Einstein to report alarms that occur within the box to external devices such as computers, fax machines, printers, and so forth. However, it is likely you will want to prevent certain types of alarms from being reported on one or all of your dial-out sites (particularly low-priority alarms and notices). This section shows how to set up alarm filtering for the Einstein's dial-out sites.

10.1 Introduction

Before discussing how to set up alarm filtering, it would be helpful to understand how alarming works in Einstein.

10.1.1 What is an Alarm?

An **alarm** (also called an "advisory" in some parts of the interface) is a type of message generated by Einstein whenever an abnormal event or condition is detected. There are three different classifications of alarms: **alarms**, **notices**, and **failures**.

Alarms are warnings about important system conditions that need immediate attention. These are generally high priority and are of immediate interest to site managers or maintenance personnel.

Notices are general warnings that serve mainly to notify a user of system changes, minor errors, and/or conditions that might become problems in the near future. They are generally low priority, and only certain notices are of immediate interest to site managers or maintenance personnel.

Failures are pre-programmed alarms that are generated when a controller or device failure occurs (such as a board going off-line or a sensor short). These types of alarms tend to be high-priority and of immediate interest to site managers and maintenance personnel.

Note: Throughout this manual, the word "alarm" is sometimes used as a general term to refer to alarms, notices, and/or failures. "Alarm control," for example, actually refers to control of all alarms, notices, and failures.

10.1.2 Alarm Priority

An alarm message always contains a number from 1 to 99 that represents its **priority.** The priority number indicates how severe or minor the condition represented by the alarm is. Priority "1" is the highest alarm priority, while "99" is the lowest.

The priority of an alarm depends on the alarm type. For most types of alarms, notices, and failures, the priority level is fixed. For others, the priority level can be programmed by the user. *Appendix C: Alarm Advisory Messages* shows which alarm types have priority levels that are fixed or configurable.

10.1.3 The Alarm Advisory Log

Each individual Einstein keeps a special kind of log, called an Alarm Advisory Log, that records the last 200 alarms and notices that have occurred in the Einstein or on any of its I/O boards or controllers. If there are other Einsteins on the network and they have been configured to send their alarms to a controller, then that controller's Alarm Advisory Log will also display alarms that occur on other Einstein systems.

From the Alarm Advisory Log screen, users may acknowledge, clear, and reset alarms, as well as view additional details about each alarm (such as the date and time of the alarm, and whether or not the condition that caused the alarm still exists).

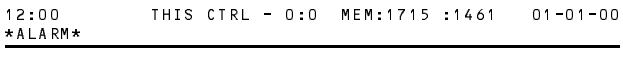
The specific details of how to read and operate the Alarm Advisory Log are not given in this section. Refer to **Section 20.4,** *Alarms.*

10.1.4 Alarm Annunciating and Reporting

Apart from storing alarms it generates in its own Alarm Advisory Log, Einstein can also annunciate alarms it generates or receives in order to notify personnel. Einstein can annunciate and report alarms in several different ways.

The Display Line

Alarms that occur within a Einstein (or which are received by an Alarm Annunciator from another Einstein) may be reported to the header display at the top of the screen. When an alarm is reported to the display, the word "*ALARM*" flashes underneath the time at the top of the screen, allowing site managers or supervisors to see that one or more alarms are active for the Einstein.



The Alarm Output

Each Einstein has a single digital output that reacts to alarm reports. An alarm can be reported to this output, in which case the output turns ON and remains on until the

alarm condition has returned to normal.

Dial-Out

Alarms may be sent to remote alarm receivers via the modem defined for the controller. Possible dialout devices include a PC running UltraSite, a printer, a fax machine, and a digital pager. Dial-out sites are configured in **Section 9.5,** *Dial-Out Setup.*

The Echelon Network (The Alarm Annunciator)

If multiple Einsteins exist on a network, you may choose to send alarms from all Einsteins across the Echelon network so that they may be picked up by the Alarm Annunciator.

The Alarm Annunciator is the primary alarm reporting device in a multiple-device Einstein network. The Alarm Annunciator gathers all alarms posted by all devices on the Echelon network, records them in its own advisory log, and applies its own set of alarm filters to determine if the alarms should be dialed out, reported to its display, or sent to its Advisory Output.

There are several benefits to having an Alarm Annunciator:

1. An Alarm Annunciator makes it possible to handle all alarm dialouts for all controllers with a single modem or network card.
2. Users can view alarm notifications and alarm logs for all controllers from the Alarm Annunciator.
3. Only the Alarm Annunciator needs to be programmed with alarm filter settings for dial-out, output, and display. All other controllers may be programmed to simply send all alarms to the Alarm Master via the LonWorks network.

10.2 Navigating to the Alarm Filtering Setup Screens

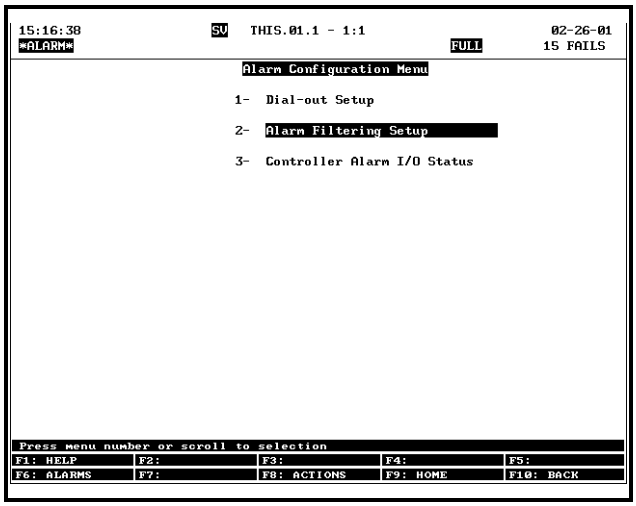


Figure 10-1 *- System Configuration Menu*

The Alarm Filtering Setup screens are accessible from the System Configuration menu.

1. Press F8 followed by Y to access the System Configuration Menu.
2. Press 5 to access the Alarm Configuration Menu.
3. Press 2 to enter the first Alarm Filtering Setup screen.

10.2.1 Screen 1: Advisory Services General Setup

General setup of alarm reporting capabilities, such as the configuration of the Alarm Enable input and the Advisory Output, are specified in the Advisory Services General Setup screen.

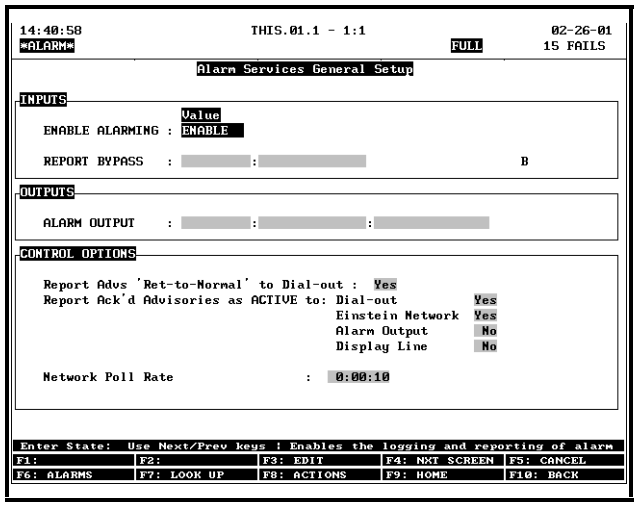


Figure 10-2 *- General Setup Screen*

Inputs

ENABLE ALARMING [Enable/Disable -or- Digital] [Enable]

You may enable or disable the generation of alarms throughout the entire controller by changing the value of Advisory Enable. Setting this value to ENABLE will enable generation of alarms; DISABLE will prevent alarms from being generated.

By default, Advisory Enable is a fixed value that may be defined by pressing the Prev or Next keys. However, Advisory Enable may be connected to a digital input, either from an input point on a 16AI or other input board, or from the digital output of another Einstein application such as Global Data.

To connect Enable Alarming to a digital input, move the cursor to the Advisory Enable field, press F3 to bring up the Edit Menu, and press 1 to select Alternate I/O Formats. From the menu that appears, press 1 to select a Board:Point input, or 2 to select a Controller:Application:Property input. In the input definition that appears, enter the location of the input source.

REPORT BYPASS [Digital]

The reporting of alarms for this controller may be temporarily disabled by using the Report Bypass input. When this input is ON, a bypass begins, during which alarms will not be reported to the Einstein display, the LonWorks network, remote sites, or the Advisory Output (described below). Alarms will still be recorded to the controller's alarm log, however.

To configure a report bypass, enter the board and point address of the digital source in the Report Bypass input definition. The source for Report Bypass may also come from the output of another application; to set this up, press F3 1 and 2, and enter the source location in the definition that appears.

After setting up this input with a Board:Point address or a Controller:Application:Property address, you must decide what type of bypass will be initiated by this input. Press F8 followed by 8 to set up the bypass options.

The Bypass Configuration Setup screen contains two fields: Bypass Type, and Bypass Duration.

Bypass Type [Momentary, Level, No Bypass] [Momentary]

- *Momentary* - the bypass begins when Report Bypass turns ON and continues for a fixed amount of time afterwards. The time interval must be entered in the Bypass Time-out field (see below).
- *Level* - the bypass remains active for as long as the Report Bypass input is ON, and turns off when the input turns OFF or when the Bypass Duration time period has passed.
- *No Bypass* - the Einstein ignores the value of the Report Bypass input, and does not allow report bypasses to occur.

Bypass Duration [0:00 - 72:00] [0:30]

The Bypass Duration value may serve either of two functions, depending upon what you selected as the Bypass Type.

If the Bypass Type field is set to "Momentary", the Bypass Duration field is the amount of time the bypass will continue after Report Bypass turns ON.

If the Bypass Duration field is set to "Level", the Bypass Duration field is used as a maximum bypass duration. If the Report Bypass input remains ON longer than the Bypass Duration, the Einstein will discontinue the report bypass, and alarms will be reported as normal. This fail-safe duration would be practical if, for example, the Report Bypass input were hooked to a wall switch; if someone were to flip this switch and forget to set it back, the Einstein would disable the bypass after a certain amount of time, allowing alarm reporting to resume.

Outputs

ALARM OUTPUT [Digital]

The Alarm Output is one of the devices to which alarms may be reported. When setting up alarm filtering, you may send certain types and/or priorities of alarms to the Alarm Output. This output turns ON whenever an alarm is reported to it. It remains ON until the alarm is acknowledged and/or reset.

Specify the input or device that will receive the Alarm

Output by entering its location in the output definition. You will also need to enter alarm filtering options for this output in the Advisory Services Filtering Setup screen (see **Section 10.2.2**), otherwise all alarms above priority 20 will be reported to this device.

Control Options

Report Advs 'Ret-to-Normal' to Dial-Out [Yes/No] [Yes]

By default, the Einstein sends alarms that have normalized (such as a high input level that has gone back down to a normal level, or a controller failure that is automatically reset by the Einstein) to a modem for dial-out. This may cause "nuisance alarms" to be dialed out to your designated modem, fax, or digital pager.

If you would like to disable normalized alarms from being dialed out, set this field to "N" by pressing [N].

When all the fields in this screen have been set up, press [F4] to access the screen where alarm filtering options are set up.

Report Ack'd Advisories as ACTIVE to

These four fields determine how Einstein reports or doesn't report alarms that have been acknowledged by a user in the Alarm Advisory Log. Typically, when an alarm is "acknowledged," annunciation of the alarm is silenced at a local level (i.e. the Einstein's Display Header stops flashing "ALARM," and the Alarm Output is turned OFF), but reporting of the alarm to the Alarm Annunciator and the dial-out sites still occurs. This behavior may be customized by changing the Yes/No values of each of the four fields:

- ***Dial-Out*** - Set to "Yes" if you want acknowledged alarms to be dialed out to the Einstein's designated dial-out sites or devices. Otherwise, set to "No."
- ***Einstein Network*** - Set to "Yes" to report acknowledged alarms to the Alarm Annunciator. If set to "Yes," the Alarm Annunciator will use its own set of alarm filtering parameters to determine if the alarm should be dialed out via modem or TCP/IP.
- ***Alarm Output*** - Set to "Yes" to report acknowledged alarms to the local Einstein's Alarm Output.
- ***Display Line*** - Set to "Yes" if you want acknowledged alarms to be reported to the Display Line (i.e. to make the *ALARM* message flash at the top of the screen.

Advanced User Options (press [F8] + [Q])

Network Poll Rate [0:00:00 - 23:59:59] [0:00:10]

If this controller is the Alarm Annunciator, the Network Poll Rate is the rate at which this controller will look for alarms being reported on the LonWorks network from other controllers. By default, the controller will look for new alarms every ten seconds. If a different poll rate is needed, enter it in this field.

10.2.2 Screen 2: Advisory Services Filter Setup

The alarm filtering options used for this controller are set up in the Advisory Services Filter Setup screen. To access this screen, press [F4] from the Alarm Services General Setup screen.

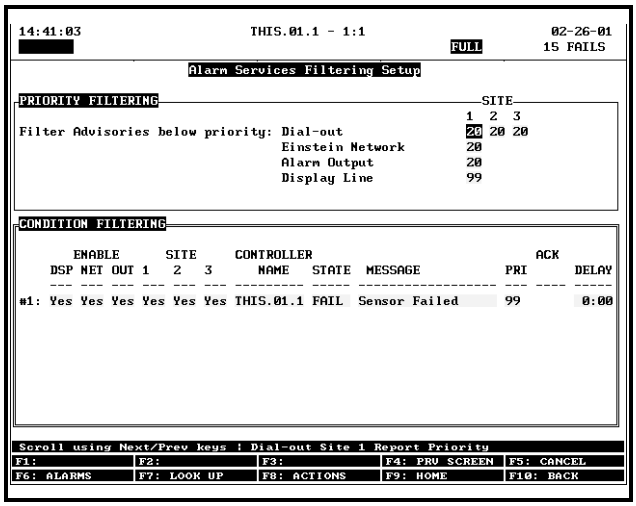


Figure 10-3 *- Advisory Filtering Setup*

Alarm filtering is divided into two different sections: priority filtering and condition filtering. In priority filtering, the Einstein filters out all alarms except those whose priority level is above a certain number from 1 to 99. In condition filtering, the user may filter alarms by priority level, type, controller source, or even the advisory message. Either or both types of alarm filtering may be used.

Priority Filtering

Filter Advisories Below Priority [1 - 99] [99 for Display, 20 for all others]

For each of the four devices that may receive alarm reports (DIAL OUT, NETWORK, OUTPUT, and DISPLAY), a different Filter Priority number may be specified. When an alarm's priority is below a device's Filter Priority, the alarm will not be reported to the device.

Each of the three sites that receive dial-outs can be given a different filter priority. These are specified in the fields labeled 1, 2, and 3.

Priorities for alarms that pertain to inputs and outputs are specified by the user. Einstein internal alarms (failures, etc.) have fixed priority levels that follow a certain convention. See ***Appendix C: Alarm Advisory Messages*** for the guidelines that should be followed when setting up priority filtering

Condition Filtering

Condition filtering is used to match exact types of alarms to the devices they will be reported to. Up to 50 sets of filter conditions may be specified for each controller. Follow the instructions below to set up a condition filter set. When finished, you may enter a new set by pressing the Add Record function key (F1).

ENABLE DSP/NET/OUT/SITE [Yes/No] [No]

Each of the devices to which an alarm may be reported (DSP=display, NET=LonWorks network, OUT=Advisory Output, SITE 1/2/3=dial-out sites 1,2, and 3) have an Enable field. You will need to enter a "Yes" in the Enable fields of all devices to which the alarm filter conditions are to be applied. In other words, if you are trying to set up a filter condition that applies to dial-out site 1 (e.g. send all priority 1 failures to dial-out site 1), select "Yes" in the Site 1 Enable field.

Users may toggle "Yes" and "No" in these fields by using the Prev and Next keys.

Controller Name [9 characters max] [NONE]

The Controller Name is one of the filter conditions that may be applied. This condition filters out all alarms that do not pertain to the controller named in this field. In other words, if "INPUT #1" is entered in this field, only alarms that come from a device defined as "INPUT #1" will be allowed through the filter.

You may type the name in this field, or select the desired controller from the Look-Up Table (F7). If you do not wish to filter alarms by controller name, leave this field blank.

State [NONE, FAIL, ALRM, NTCE] [NONE]

The State field is used to filter out all but one of the three alarm states: failures, alarms, and notices. When FAIL, ALRM, or NTCE is selected in this field, only failures, alarms, or notices will be allowed through the filter.

To use the State filter condition, select either FAIL, ALRM, or NTCE in this field using the Prev and Next keys. If you do not wish to filter by alarm state, set this field to NONE.

Message [options] [NONE]

The Advisory Message filter condition is an extension of the State filter. When either FAIL, ALRM, or NTCE is specified in the State field, you may go into the Advisory Message field and select a specific type of failure, alarm, or notice to filter. You may also choose All Failures, All Notices, or All Alarms to have your filter conditions apply to all failures, notices, and/or alarms.

Priority Level [1 - 99] [99]

This condition will filter out all alarms that have a priority level below the value entered in the field. Entering a 20 in this field, for example, will only pass along alarms that are priority level 20 or higher; alarms with a priority of 21 or lower will be filtered out. The default value (99) means that all alarm priorities will be allowed through the filter.

Acknowledge Disable (ACK DSBL) [Yes/No] [No]

The Acknowledge Disable feature allows disabling of alarm reporting whenever an alarm is acknowledged by a user in the Alarm Log screen. This feature applies to all alarm types specified by the filter conditions in the Controller Name, State, Advisory Message, and/or Pri fields.

To disable alarm reporting after user acknowledgment, enter "Yes" in this field by pressing Y.

Delay [0:00 - 4:00] [0:00]

The Delay field applies a delay period to all the alarm types not blocked out by the filter conditions in the Controller Name, State, Advisory Message, and/or Pri fields. Before any of these alarms will be reported as instructed by the Enable fields, the Einstein will wait until the specified delay period has passed. If during this time the condition has returned to normal, the alarm will not be reported.

When used in conjunction with the Acknowledge Disable feature, the Delay becomes the amount of time after generation of the alarm during which an alarm may be acknowledged without report. For example, if the delay is set to two hours (2:00), a user would have two hours after generation of an alarm to acknowledge the alarm, after which the alarm would be reported to the devices specified in the Enable fields.

To use a delay, enter a time in hours:minutes format in the Delay field.

10.3 Changing System Advisory Priorities (Einstein

1.6 and above)

System advisories are alarms, notices, or failures that Einstein is pre-programmed to generate when certain conditions occur. System advisories do not require any extra setup or configuration from the user, unlike input and output alarms (see **Section 11.2,** *Introduction to Alarm Control*), which require users to designate whether an input or output should be alarming, and to configure the required set points.

For all Einstein versions before 1.6, the priority levels of system alarms are fixed, pre-programmed values that can not be altered by the user. For versions 1.6 and above, you may customize the priority levels of all system alarms, notices, and failure advisory types.

10.3.1 Navigating to the System Advisory Screens

To access the System Alarms, System Notices, and System Failures screens, you must be logged in as at least a level 4 Einstein user.

1. Press F8 Y to enter the System Configuration menu.
2. Press 1 to select General Controller Information.
3. Press Shift + F5 to navigate to the System Alarms screen (***Figure 10-4***).

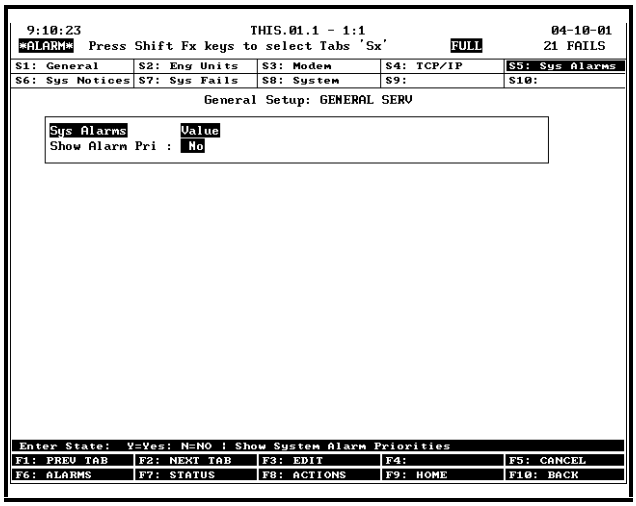


Figure 10-4 *- The System Alarms Screen*

4. Move the cursor to the **Show Alarm Pri** field. Press Y to change the value of this field to "Yes." Press the DOWN ARROW key.

After changing the Show Alarm Pri field to Yes, a list of alarm message types should appear in the System Alarms screen, along with the default priorities of the system alarms. Also, by pressing F2, you may tab over to the System Notices and System Failures screens to view and change the priorities of notice and fail advisories.

For each alarm type, notice type, or failure type you wish to change the priority for, enter a priority level from 1 to 99 in the appropriate field. The following sections describe each alarm, notice, and fail type that may be generated by the Einstein, in the order in which they appear in the System Alarm, System Notice, and System Fail screens.

10.3.2 System Alarms

Field Name	Alarm Name	Default Priority	Definition
AllConfigCleard	All config/logs were cleared	30	A user has performed a clean out on this Einstein, removing all programming and stored data.
BattBckdMemLost	Battery Backed Memory Lost	30	Memory that is retained by battery power (i.e. is not erased when the Einstein is powered down) was lost, indicating a problem with the battery.
DirtyFilter	Dirty Filter Detected	30	A filter-checking device connected to an ARTC is detecting a dirty filter.

Field Name	Alarm Name	Default Priority	Definition
DRAMHeapCorrupt	DRAM Heap Corrupted -- Reboot	30	A corruption in the DRAM memory of Einstein has caused the unit to reboot.
FaxInitStringIn	Fax init string is not valid	30	The fax initialization string for the Einstein's modem is incorrect and may need editing.
FreezeStat	A FreezeStat input is too low	30	A temperature sensor on an HVAC cooling stage is lower than the programmed freezestat set point, indicating possible coil freeze.
HighLimitAlarm	High Limit Alarm	30	An HVAC application (AHU, Zone, RT-100, or ARTC) has a temperature above one of its cooling set points.
InvdCellIDinPad	Invalid Cell ID in Scratch Pad	30	An internal error has occurred in the Einstein.
InvdNextPinPad	Invalid Nxt Ptr in Scratch Pad	30	An internal error has occurred in the Einstein.
InvdScrtchBlSz	Invalid Scratch Pad Block Size	30	An internal error has occurred in the Einstein.
LostLogData	Lost Log Data-CRC Error	30	An internal error has occurred in Einstein, resulting in lost log data.
LowBatteryVolt	Low Battery Voltage	99	The backup battery that keeps the time and date resident on the Einstein processor board may need to be replaced.
LowLimitAlarm	Low Limit Alarm	30	An HVAC application (AHU, Zone, RT-100, or ARTC) has a temperature below one of its heating set points.
ModemInitStrInv	Modem init string is not valid	30	The dial-out initialization string for the Einstein's modem is incorrect and may need editing.
OccHighLimit	Occupied Hi Limit Exceeded	30	An analog value has risen above its defined high limit set point during OCCUPIED mode.
OccLowLimit	Occupied Low Limit Exceeded	30	An analog value has fallen below its defined low limit set point during the OCCUPIED mode.
PadHeapCorruptd	Pad heap corrupted - Reboot	30	A problem with memory has resulted in a reset of the Einstein.
SmokeDetected	Smoke Detected	30	A smoke detector input on an ARTC has detected smoke.
SRAMHeapCorrupt	SRAM memory corrupted - Reboot	30	A problem with memory has resulted in a reset of the Einstein.

Field Name	Alarm Name	Default Priority	Definition
StatusConfigLoss	Status Config Loss-CRC Error	30	An internal error has occurred in the Einstein.
UnoccHighLimit	Unoccupied Hi Limit Exceeded	30	An analog value has risen above its defined high limit set point during UNOCCUPIED mode.
UnoccLowLimit	Unoccupied Low Limit Exceeded	30	An analog value has fallen below its defined low limit set point during UNOCCUPIED mode.

10.3.3 System Notices

Field Name	Notice Name	Default Priority	Definition
AlarmsCleared	Alarm(s) were cleared	50	A user has erased one or more alarms from the alarm advisory log using the Clear Alarms or Clear All Alarms command.
AlarmsReset	Alarm(s) were reset	99	A user has reset one or more alarms from the alarm advisory log using the Reset Alarms or Reset All Alarms command.
ApplChanged	Application config has changed	99	A user has changed the configuration of one of Einstein's applications.
ApplCreated	Application was created	99	A user has created a new application in this Einstein.
ApplDeleted	Application was deleted	99	A user has deleted an existing application in this Einstein.
ApplSetptChange	Application setpoint has changed	99	A user has changed a set point in one of Einstein's applications.
ARTCResetPower	ARTC Reset From Power Failure	50	An ARTC lost power and reset when power was restored.
BIOSUpdated	BIOS/BIOS extension updated	50	The Einstein's BIOS was successfully updated.
CtrlReset	Controller Reset	50	An ARTC has undergone a reset.
CtrlShutdown	Controller shutdown	50	The Einstein underwent a shutdown.
CtrlStartup	Controller startup	50	The Einstein has re-started after a shutdown.
CtrlWarmBoot	Controller was warm-booted	50	A user has reset the Einstein using the "reset" button on the processor board.

Field Name	Notice Name	Default Priority	Definition
FailedBind	Failed attempt to bind Input	50	A valid link could not be made between an Einstein application and an input assigned to it.
FileNotFound	File not found	50	An internal error has occurred in the Einstein.
FlashErased	Too many reboots: Flash erased	50	A number of successive reboots has erased the Flash RAM.
FlashFileBad	Flash File has a bad CRC Error	50	An internal error has occurred in the Einstein.
ForcedReset	User/Appl. forced reset	50	A user or an application has forced a reset of this Einstein.
FwUpdtComplete	RX/BX firmware was updated	50	The Einstein's firmware was successfully updated.
FWUpdtComplete	Completed firmware update	50	The Einstein's firmware was successfully updated.
FwUpdtTimeout	Timed out waiting for FW updt.	50	The Einstein waited for a firmware update to begin, and it never did.
LinkToOutBad	Link to Output bad-no output	50	A valid link could not be made between an Einstein application and an output assigned to it.
NoActiveSetpt	Relativ Adv: No Active Setpt	99	An application that is supposed to be generating an alarm for a specified input has no active set point to use for alarming. This usually occurs when alarm set points are supplied by other applications or inputs, and the application or input fails.
NotEnoughPad	Not enough scatch pad memory	50	The Einstein tried to save data to the scratch pad memory, but the memory was full.
OvNotRestored	Override State not Restored	50	An overridden input or output has remained in the override state longer than its programmed time.
PressureTblLost	Pressure Table Lost-being rblt	50	A Suction Group's internal list of possible compressor combinations became temporarily invalid, requiring a rebuild.
SRAMErased	Too many reboots: SRAM erased	50	A number of successive reboots has erased the SRAM.
TestDialSuccess	Test Dial Successful	50	Einstein performed a test dial-out with its modem, and the dial-out was successful.

Field Name	Notice Name	Default Priority	Definition
TimeUpdtByUser	Time updated by a user	99	A user changed the time in the current Einstein.
TimeUpdtOverNet	Time updated over network	99	The time in the current Einstein was updated by another controller or user on the network.
UnknownFWUpdt	Unknown FW update attempted	20	An error has occured during a firmware update of Einstein. Call CPC service for assistance.
UserCleared	User cleared all applications	50	A user has cleared out all data from all applications in this Einstein.

10.3.4 System Fails

Field Name	Fail Name	Default Priority	Definition
AccessLogLost	Access Log lost - CRC Error	20	An internal error has caused the loss of Einstein's user access log.
AdvisoryLogLost	Advisory Log lost - CRC Error	20	An internal error has caused the loss of Einstein's alarm advisory log.
AllNetConUsed	All Network Connections Used	50	A network connection to Einstein was attempted at a time when the maximum number of network connections had been reached.
AppCellLost	Application Cell is Lost	15	An internal error has caused the loss of an entire application cell.
ARTCOvrdSwitch	ARTC Override Switch Stuck	20	An override switch on an ARTC has been ON for a prolonged period of time, suggesting a possible switch failure.
AvgLogStuck	Average Log Stuck-No Memory	15	The Average Log cannot be written because there is not enough memory.
BadModem	Bad Modem	20	The modem on this Einstein is not functioning properly.
BIOSUpdateFail	BIOS/BIOS ext. update failed	20	An update to the Einstein's BIOS has failed.
CantSetHWClk	Can't set Hardware Clock	20	The Einstein is unable to change the time on its hardware clock.
CellCreateFail	Cell create failed for restore	20	Einstein attempted to create new applications as part of the configuration restoration process and failed to do so successfully.
CellNotRestored	Cell config not restored	15	Einstein's attempt to restore configuration data to its applications has failed.

Field Name	Fail Name	Default Priority	Definition
CntrlTypeMis	Controller Type Mismatch	20	A device on the Echelon network is of a different type than the user has specified. In other words, a user might have wired a device such as a CC-100P to the network but set it up in the Einstein software as a CC-100LS. Check your network setup and if necessary reconfigure the device with the correct type.
Comm1Down	Communication Port 1 is down	20	Einstein cannot communicate with the RS232 port on the Einstein processor board. The Einstein processor board likely needs repair or replacement.
Comm2Down	Communication Port 2 is down	20	Einstein cannot communicate with the RS485 network port on the Einstein processor board. The Einstein processor board likely needs repair or replacement.
Comm3Down	Communication Port 3 is down	20	Einstein cannot communicate with the PC-104 (modem) slot on the Einstein processor board. The Einstein processor board likely needs repair or replacement.
Comm4Down	Communication Port 4 is down	20	COM4 is used by service personnel to attach hardware used in test or debug functions. This alarm indicates the port that allows Einstein to communicate with these devices is faulty. The Einstein board likely needs repair or replacement.
CommisionFailed	Commission Failed - Check Network	50	An Echelon device was not successfully commissioned. Check all Echelon network connections and re-try commissioning.
ConfigLossCRC	Config Loss-CRC Error	15	Due to an internal error, Einstein has lost configuration data.
ConfigLossFile	Config Loss-File CRC Error	15	Due to an internal error, Einstein has lost configuration data.
ConfigLossTmpl	Config Loss - Chg in tmpl rev.	15	Due to a difference between configuration templates in a previous Einstein version and templates in the current version, configuration data could not be restored.
ConfigNotSaved	Config not saved to Flash	20	Einstein could not save configuration data to flash memory.

Field Name	Fail Name	Default Priority	Definition
ControllerAbsnt	Controller absent from network	20	The current Einstein could not find the specified Einstein, I/O board, or Echelon controller
DateNeedsReset	System date needs manual reset	20	The system date requires a manual reset.
DiagRateChgFail	Diagnostic rate change failed	20	An internal error has occurred in Einstein.
DialDay1Fail	Dial to Day Time Site 1 Failed	20	Einstein tried to dial out to the site listed as Day Time Site 1 and was unsuccessful.
DialDay2Fail	Dial to Day Time Site 2 Failed	20	Einstein tried to dial out to the site listed as Day Time Site 2 and was unsuccessful.
DialDay3Fail	Dial to Day Time Site 3 Failed	20	Einstein tried to dial out to the site listed as Day Time Site 3 and was unsuccessful.
DialNight1Fail	Dial to Night Site 1 Failed	20	Einstein tried to dial out to the site listed as Night Site 1 and was unsuccessful.
DialNight2Fail	Dial to Night Site 2 Failed	20	Einstein tried to dial out to the site listed as Night Site 2 and was unsuccessful.
DialNight3Fail	Dial to Night Site 3 Failed	20	Einstein tried to dial out to the site listed as Night Site 3 and was unsuccessful.
DupControllerNm	Duplicate Controller Names	20	Two controllers on the network have the same names. One of them will need to be renamed to prevent communications problems.
FailCreateLog	Failed to create logging	20	Einstein is unable to create logs for the input or output shown.
FailedSensor	Failed Sensor or Bad Wiring	20	Einstein is unable to get a valid sensor value due to a possible hardware problem.
FwBadAI200	Firmware File bad - AI200	15	A 16AIe has corrupted firmware.
FwBadCC100L	Firmware File bad - CC100 Liq	15	A CC-100P or CC-100LS has corrupted firmware.
FwBadCC100S	Firmware File bad - CC100 Suct	15	A CC-100H has corrupted firmware.
FwBadCS100	Firmware File bad - CS100 Ckt	15	A CS-100 has corrupted firmware.
FwBadEC2	Firmware File bad - EC2	15	An EC2 has corrupted firmware.

Field Name	Fail Name	Default Priority	Definition
FwBadESR8	Firmware File bad - ESR8	15	An ESR8 has corrupted firmware.
FwBadRO200	Firmware File bad - RO200	15	An 8ROe has corrupted firmware.
FwBadRT100	Firmware File bad - RT100	15	An RT-100 has corrupted firmware.
FwBadTD3	Firmware File bad - TD3	15	A TD3 has corrupted firmware.
FwIncompatible	Firmware is not compatible	20	The firmware in a unit controller is not compatible with the current version of Einstein.
FwUpdtFail	Firmware update failed	10	The firmware on a unit controller was not successfully updated.
FWUpdtFail	RX/BX firmware update failed	20	The Einstein's firmware update was not successful.
IncAdvSetup	Incomplete Advisory Setup	15	An important setting used in advisory and/or dial-out set up were not configured correctly.
InputBypFail	Input Bypass Failure	15	A command to bypass an input was not successfully carried out.
IRLDSAbsorption	IRLDS: Absorption data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDSADC	IRLDS: ADC error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDSDataError	IRLDS: Data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDSDetector	IRLDS: Detector data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDSDriftFault	IRLDS: Drift fault	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDSGenFault	IRLDS: General fault	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.

Field Name	Fail Name	Default Priority	Definition
IRLDSLineFlow	IRLDS: Line/filter flow fault	20	A zone on an IRLDS unit has a dirty filter or a crimped tube.
IRLDSPressure	IRLDS: Pressure data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDSSelfTest	IRLDS: Self-test failure	20	An IRLDS has failed its self-test procedure.
IRLDSTempData	IRLDS: Temperature data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDSUnknown	IRLDS: Unknown error	20	The IRLDS has experienced an error not recognized by the Einstein.
IRLDSVoltage	IRLDS: Voltage data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
LineClockBad	50/60 Hz Line clock is bad	20	Einstein is not successfully synchronizing its clock with the 50/60 Hz pulse of its incoming power.
LinksLost	X300<->X300 links lost-CRC Err	20	An internal error has caused a loss of communication between Einsteins.
ModemNotInit	Modem didn't initialize	20	Einstein attempted to initialize the modem but failed.
NoConfTemplate	No Configuration Template	15	There is an internal error in the Einstein software. Notify CPC service.
NoFileHandle	Couldn't get file handle	20	Einstein tried to get a file from its memory and failed to do so. This alarm likely indicates one or more templates in the Einstein software have been corrupted. Contact CPC service for further assistance.
NotEnoughBck-Mem	Not enough backed memory	10	The Einstein tried to save data to the battery-backed memory, but the memory was full.
NotEnoughFlash	Not enough Flash memory	20	The Einstein tried to save data to the flash memory, but the memory was full.
NotEnoughMem	Not enough memory	10	The Einstein tried to save data to unbacked memory, but the memory was full.
OverrideFail	Override operation didn't take	20	The Einstein tried to carry out an override and was unsuccessful.

Field Name	Fail Name	Default Priority	Definition
OverrideLost	Override lost output cleared	20	A user tried to override an output on a CC-100, RT-100, or similar Echelon device, but the override was not performed successfully. Try the override command again. If this alarm persists, call CPC service.
OvLogLost	Override Log lost - CRC Error	20	An internal error in the Einstein has resulted in a loss of the override log.
PartConfigLoss	Part Cnfg Loss-Ptr	15	Due to an internal error, part of Einstein's configuration data has been lost.
PointLogsLost	Point Logs not restored	15	The point logs stored in memory were not restored after the last reset or upgrade.
ProofFailure	Proof failure Occurred	User	A proof checking device is registering a failure in one of the Application's control devices.
RuntimeLogsLost	Runtime Logs not restored	15	The runtime logs stored in memory were not restored after the last reset or upgrade.
RuntimeLogStuck	Runtime Log Stuck-No Memory	15	A Runtime Log is unable to save new data because there is not enough memory.
SensorOpen	Input Sensor is Open	20	An analog input sensor is OPEN, possibly due to a severed connection or sensor failure.
SensorShort	Input Sensor is Short	20	An analog input sensor is CLOSED, possibly due to a short-circuit or sensor failure.
TmBadCC100L	Template File bad - CC100 Liq	15	A template file in Einstein for a CC-100P or CC-100LS is bad.
TmBadCC100S	Template File bad - CC100 Suct	15	A template file in Einstein for a CC-100H is bad.
TmBadCS100	Template File bad - CS100 Ckt	15	A template file in Einstein for a CS-100 is bad.
UCCreateFail	Unit ctlr cell create failed	20	The Einstein unsuccessfully tried to create a unit controller cell.
WatchdogTimer	Watchdog reset timer failed	20	Einstein tried to reset itself to clear a hung task, but the "watchdog" feature on the Einstein was disabled. Check the jumper J18 labeled "Watch Dog" on the Einstein processor board. This jumper should be either be set to "ENABLE" or it should not be present at all.

11 Input & Output Alarm Setup

11.1 Overview

This section of the manual shows how to set up alarm set points for an input or output in an Einstein application. If you have not yet read **Section 10,** *Alarm Advisory Setup*, read it before reading this section. Many of the fundamental alarm control concepts, such as alarm filtering, reporting, and priorities, are explained in **Section 10**.

11.2 Introduction to Alarm Control

There are two main categories of alarm advisories generated by Einstein.

A majority of alarm advisories are **system alarms**. System alarms are alarms pre-programmed to be generated by Einstein when certain conditions occur. System alarms can be anything from advisories of overall system events (such as power failures or off-line I/O boards) to alarms that are tied to specific types of applications (such as a High Suction Pressure alarm, pre-programmed as an alarm type in Suction Group applications). You do not have to tell Einstein to generate system alarms; it is automatically configured to do so. **Section 10.3** of this manual covers information about system alarms and their priorities.

The second category of alarm advisories is **input and output alarms.** These are alarm parameters programmed for individual inputs and outputs that are not tied to a specific application. This allows Einstein users to program alarm and notice parameters for any definable inputs and outputs in the software. Unlike system alarms, you must configure Einstein inputs and outputs to generate input and output alarms.

This section of the manual covers configuring input and output alarms.

11.2.1 Einstein Alarm Types

The Einstein may generate three different types of warnings: alarms, notices, and failures.

Alarms are warnings about important system conditions that need immediate attention.

Notices are general warnings that serve mainly to notify a user of system changes, minor errors, and/or conditions that might become problems in the near future.

Failures are pre-programmed alarms that are generated when a controller or device failure occurs (such as a board going off-line or a sensor short).

Throughout this manual, the word "alarm" is sometimes used as a general term to refer to alarms, notices, and/or failures. "Alarm control," for example, actually refers to control of all alarms, notices, and failures.

11.2.2 Input and Output Alarm Priorities and Filtering

Einstein programmers may filter the types of alarms that get reported by either applying alarm priority levels to individual alarms (from 1 to 99), or by simply choosing the types of alarms that are reported. Different alarm filtering options may be chosen for each device that receives reports.

Priority levels are assigned as part of the input and output alarm setup process. Filtering by priority and type is a global function that is set up in the Alarm Advisory Setup screen (**Section 13.4,** ***Alarm Reporting and Filtering***).

11.2.3 Alarm Set Point Types

As mentioned in the introduction to this section, every input and output that may be set up in the Einstein may be configured to generate an alarm.

For analog inputs and outputs, you may configure alarms when the value becomes too high or too low, or when the value changes too quickly over a certain period of time. You may also specify different alarm set points for occupied and unoccupied building times.

For digital inputs and outputs, you may set up alarms that generate when one or more conditions occur.

11.3 Configuring Alarms for an Input or Output

You may configure alarms for an input or output from the Setup Editor.

1. Navigate to the status screen of the application that has the input or output you wish to set alarm on (from the Main Status Screen, press F5 and choose the application type from the menu that appears).
2. Press F8 *B to enter the Setup Editor.
3. Use the F1 and F2 keys to scroll through the

Setup Editor screens until you locate the input or output definition for the point you wish to alarm on.

4. Use the arrowk keys to move the cursor into the input or output definition.
5. Press F8 and 6 to select “Generic Alarm Setup” from the Actions Menu.

Depending on the type of input or output , the Einstein will bring up either the Analog Advisory Configuration Setup screen (if analog) or the Digital Advisory Configuration Setup screen (if digital).

11.3.1 Analog Advisory Configuration

Advisory Method Field [options] [No Alarming]

The Advisory Method appears at the top of every Analog Advisory Configuration Setup screen. This field determines the types of conditions that will generate alarms. The options available for alarming in the Analog Advisory Configuration Setup screen depend heavily on the chosen value of the Advisory Method field; therefore, each option will be discussed in the sections below, along with descriptions for each of the screen’s parameters.

11.3.1.1 No Alarming

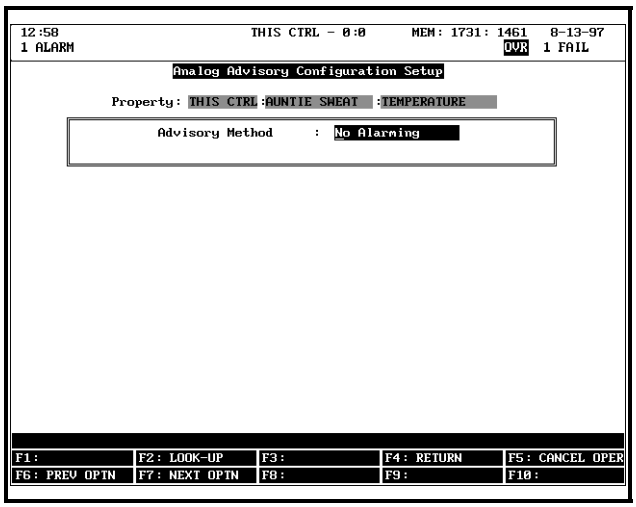


Figure 11-1 *- Analog Advisory Configuration (No Alarming)*

When the No Alarming option is chosen in the Advisory Method screen, no alarms will be generated by the chosen analog value. As a result, the screen below this field will be blank.

11.3.1.2 Absolute Levels

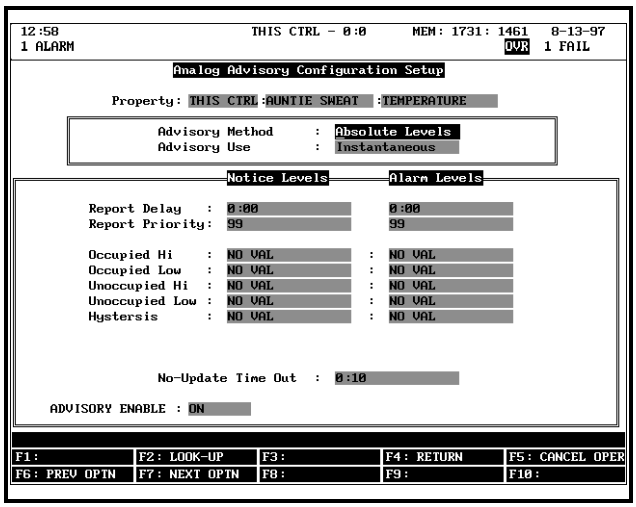


Figure 11-2 *- Analog Advisory Configuration (Absolute Levels)*

The Absolute Levels method of alarm control compares the input or output value to a set of fixed-value set points, and generates alarms or notices when the value is above a high-level set point or below a low-level set point.

Advisory Use [Instantaneous/Averaging] [Instantaneous]

Averaging, as is described in **Section 21.2**, may be applied to alarm control as well as logging and control. When “Averaging” is chosen in this field, the average value of the input over an interval of time is used as the alarm control value.

If you wish to use Averaging for alarm control, press Prev or Next to change this field to “Averaging”. You will also need to go into the Analog Auxiliary Configuration Log Setup screen for this input to select an Average Window.

If you wish to use the instantaneous value as the alarm control value, this field should be set to “Instantaneous.”

Notice Levels and Alarm Levels

Two different sets of set points may be entered; one set is used to generate notices, while the other is used to generate alarms. Define your notice and alarm set points by filling in the fields as described below.

Report Delay [0:00 - 4:15] [0:00]

When the input or output meets one or more of the alarm generating conditions specified in this screen, the Einstein will wait for an amount of time equal to the Report Delay before it generates an alarm or notice. The value must remain above a high-level set point or below a low-level set point for the entire delay period before the alarm or notice is generated.

Once the alarm or notice is generated, it is recorded in

the Alarm Log, and alarm filtering parameters are applied to it to see if the alarm or notice needs to be passed on to a report device.

If you want a report delay after an alarm or notice is generated, enter the number of hours and minutes in the Report Delay field.

Report Priority [1 - 99] [99]

The Report Priority corresponds to the importance of the alarm or notice—specifically as it relates to filtering alarms. Priority level 1 is the highest priority, and priority 99 is the lowest. In alarm filtering, alarms and notices are screened by priority level so that only alarms of a specific priority level or higher are reported.

Choose the priority level that is appropriate for the type of alarm you are setting up and for the alarm filtering parameters you entered in **Section 13.4**. In other words, if the alarm or notice you are setting up is an alarm you wish to report to an external device, make sure the priority level is high enough to be allowed through the filtering parameters you specified for your reporting devices.

The Einstein has a number of internally generated alarms, notices, and failures. Each of these have a fixed priority level determined by a set of conventions listed in ***Table 11-1***. In general, when choosing priority levels for your alarms and notices, you should not stray too far from the conventions used by the Einstein.

Level	Type of Condition
1	Life-threatening condition (highest priority).
3	Fire or other hazardous/destructive condition.
5	Security alarm (break-in, etc.).
10	Controller/Sub System has shut-down (i.e. an entire controller has gone down, or an entire compressor rack or rooftop unit has shut down).
15	Partial System shut-downs (losing part of a controller, such as an outside air temp sensor for an AHU).
20	General Failure Condition
30	General Alarm Condition
50	General Notice Level/General Warning
99	Events and/or changes to be recorded in the Alarm Log (usually not worth reporting)

Table 11-1 *- Recommended Priority Guidelines*

Occupied Hi [number] [0]

The Occupied Hi set point is the high-level set point used when the input or output's application is operating in Occupied mode. When the value goes above this set point for longer than the Report Delay (see above), an alarm or notice will be generated.

If you wish to set a high-level occupied alarm or notice set point, enter the set point in this field.

Occupied Lo [number] [0]

The Occupied Lo set point is the low-level set point used when the input or output's application is operating in Occupied mode. When the value goes below this set point for longer than the Report Delay (see above), an alarm or notice will be generated.

If you wish to set a low-level occupied alarm or notice set point, enter the set point in this field.

Unoccupied Hi and Unoccupied Lo[number] [0]

These set points are exactly like the Occupied Hi and Occupied Lo set points described above, except they are used when the input or output's application is operating in Unoccupied mode.

Hysteresis [number] [0]

The Hysteresis determines what an input value must do after an alarm or notice condition is generated before the condition is considered "normal" again.

If a high-level alarm or notice was generated, the Einstein will consider the alarm "normalized" when the value has fallen below the set point **minus** the Hysteresis value. If a low-level alarm or notice was generated, the Einstein will consider the alarm "normalized" when the value has risen above the set point **plus** the Hysteresis value.

Example: an input has High and Low alarm set points of 80 and 50, respectively, and an alarm Hysteresis value of 2. For this input, high-level alarms will normalize when the input drops below 78 (80 - 2), and low-level alarms will normalize when the input rises above 52 (50 + 2).

Enter a hysteresis value in the Hysteresis field.

No-Update Time Out [0:00 - 4:15] [0:10]

The No-Update Time Out is a delay period between when an input or output stops sending new values (due to network or sensor failure, for example) and when the Einstein generates a failure condition.

The No-Update Time Out delay essentially begins every time the input or output sends a new value to alarm control. If, after the No-Update Time Out is expired, a new value has not been sent, the Einstein generates a failure alarm and attempts to re-establish contact with the failed device(s).

Enter a No-Update Time Out value in hours:minutes format.

Advisory Enable [ON/OFF/NotAct -or- Digital] [ON]

The Advisory Enable simple enables or disables the generation of alarms and notices for this particular input or output. The Advisory Enable value may either be set with a fixed value (default) or it may be provided by a digital input (press F8 to expand the definition and enter the digital source's location).

11.3.1.3 Relative Levels

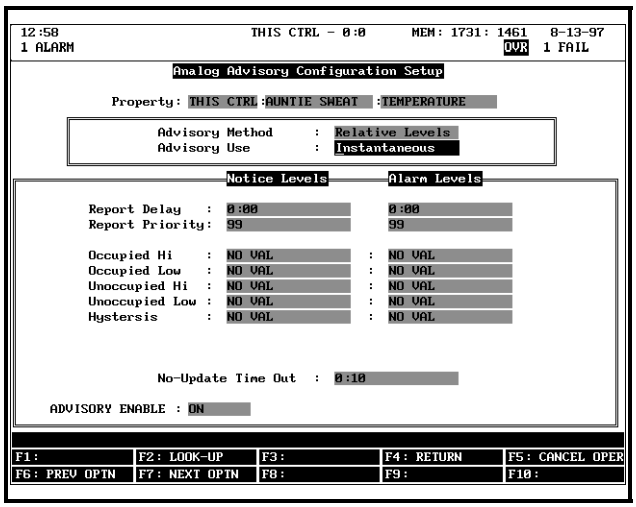


Figure 11-3 *- Analog Advisory Configuration (Relative Levels)*

The options that appear when Relative Levels is chosen in the Advisory Method field is exactly the same as the Absolute Levels field. The difference between the two screens is in the way the alarm and notice set points are determined.

The Relative Levels method of alarm control does not use fixed values for set points. Instead, set point values are relative to the control set point(s) of the application. For example, if you are setting up Relative Levels control on an input in Sensor Control, the alarm and notice set points would be relative to the Sensor Control application's cut-in and cut-out set points.

Relative levels should be used when the following two conditions are true:

1. You are setting up alarming for an application's primary control input (e.g. space temperature for an HVAC unit or discharge temperature for a condenser).
2. The control set points for the input's application are determined by inputs instead of user-defined fixed values.

When these two conditions are true, the Relative Levels method allows the control input's alarm and notice set points to change along with the set point value, resulting in more effective alarm control.

The Einstein automatically determines what control set point(s) the relative set points will be relative to.

When an input is relative to a dual set of set points (Cut In/Cut Out, for example), the high-level alarm or notice set point will be relative to whichever control set point is higher, and the low-level alarm or notice set point will be relative to the lowest control set point.

Programming

Program the Relative Levels screen exactly as described in **Section 11.3.1.2,** *Absolute Levels.* However, enter a plus sign (+) or a minus sign (-) as the first character in the occupied and unoccupied alarm and notice set points. This designates the set points as values relative to the control set points.

For example, if you wish to set up alarming on a Condenser Control CONTROL IN input so that the alarm set point is 20 PSI above the current Condenser Control set point, enter "+20" in the alarm set point field.

11.3.1.4 Gradual Change

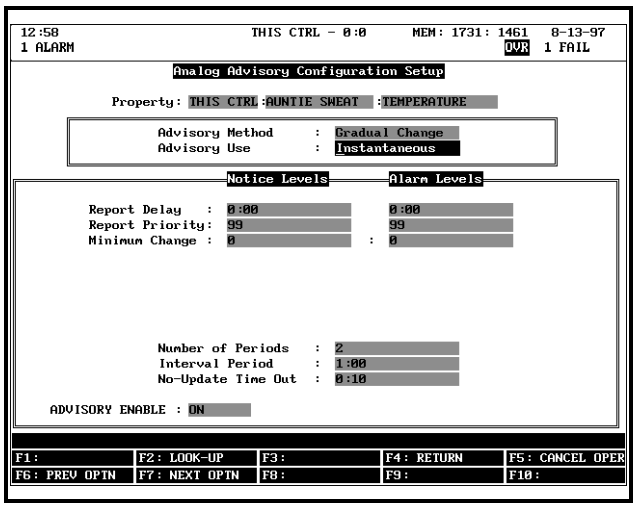


Figure 11-4 *- Analog Advisory Configuration (Gradual Change)*

The Gradual Change method generates alarms and notices whenever the value of the input or output rises or falls too quickly over a user-defined period of time.

As is the case with all advisory methods used in alarm control, different control set points may be used for alarms and notices.

Advisory Use [Averaging/Instantaneous] [Instantaneous]

See "Advisory Use" under **Section 11.3.1.2,** *Absolute Levels.*

Report Delay [0:00 - 4:15] [0:00]

See "Report Delay" under **Section 11.3.1.2,** *Absolute Levels.*

Report Priority [1 - 99] [99]

See "Report Priority" under **Section 11.3.1.2,** *Absolute Levels.*

Minimum Change [-999 — 999] [0]

The Minimum Change is one of the two set points required to make the Gradual Change alarm method work (the other, Number of Periods, is described below).

If the Minimum Change set point is positive, then the Einstein will generate an alarm or notice whenever the value rises more than the Minimum Change value during the user-specified number of time periods. For example, if the Minimum Change value is 10, then an alarm or notice will be generated when the input or output value rises higher than 10 points during the user-defined period.

The same is true for a negative Minimum Change set point, except that alarming occurs when the input or output value falls more than the Minimum Change set point.

Specify either a positive or a negative Minimum Change set point in this field.

Number of Periods [2 - 10] [2] and Interval Period [1:00 - 24:00] [1:00]

The Number of Periods is the number of time intervals to which the Minimum Change set point will be applied. The length of these periods is determined by the value of the Interval Period field.

At the beginning of each time period, the Einstein looks at the input or output value and applies the Minimum Change set point to it. If, at any time during the specified number of time periods, the value rises above or falls below the Minimum Change value, an alarm or notice is generated.

Note that when multiple time periods are specified, the Einstein begins a new gradual-change-checking process each time a new Interval Period begins. The example in ***Figure 11-5*** shows a case where there are ten periods, each one hour long. The first interval period shown begins with the value at 80°F. At this time, the Einstein applies the Minimum Change set point (+10) to the value, creating the rule, "If the value rises to 90°F within the next 10 hours (10 periods of one hour each), generate an alarm."

An hour later, the value climbs to 83°F. At this time, the Einstein creates a new rule: "If the value rises to 93°F within the next 10 hours, generate an alarm." The old rule created an hour ago remains in effect; in other words, if at any time during the next 9 periods the value reached 90°F, an alarm would still be generated.

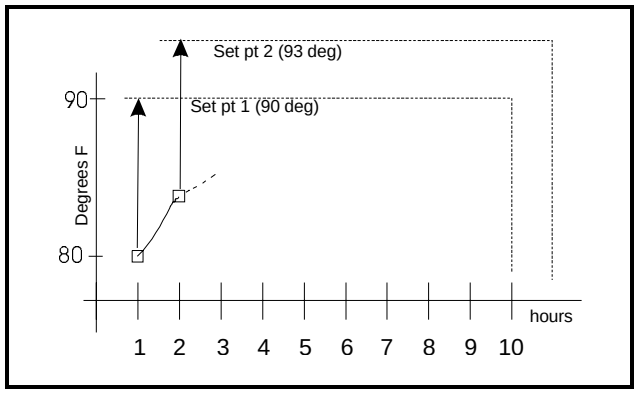


Figure 11-5 *- Example of Gradual Change Application*

Specify an interval period in hours:minutes format in the Interval Period field. Specify a number of periods in the Number of Periods field.

No-Update Time Out [0:00 - 4:15] [0:10]

See "No-Update Time Out" under **Section 11.3.1.2,** *Absolute Levels*.

Advisory Enable [ON/OFF/NotAct] [ON]

See "Advisory Enable" under **Section 11.3.1.2,** *Absolute Levels.*

11.4 Digital Advisory Configuration Setup

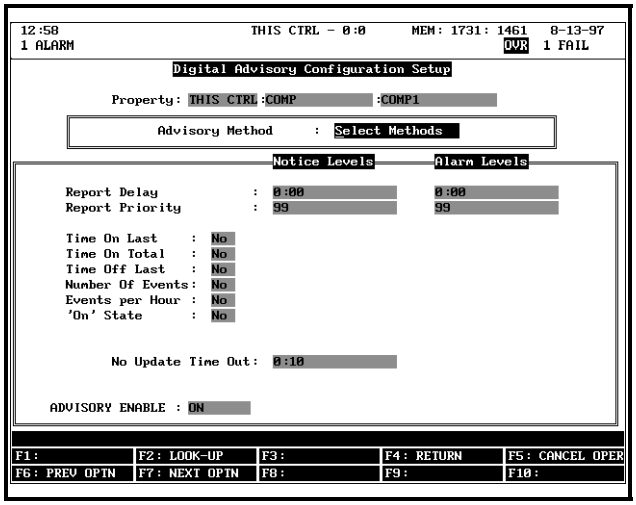


Figure 11-6 *- Digital Advisory Configuration (No Alarming)*

Advisory Method [No Alarming or Select Methods] [No Alarming]

The Advisory Method determines which alarm control options will be available in the bottom half of the screen. There only two options: "No Alarming" and "Select Methods." When "No Alarming" is chosen, no alarm control options are available, and thus no alarms or notices will be generated. When "Select Methods" is chosen, the alarm control options appear at the bottom of the screen.

To begin setting up digital alarm control, change this field to "Select Methods" using the Prev or Next keys.

Report Delay [0:00 - 4:15] [0:00]

See "Report Delay" under **Section 11.3.1.2,** *Absolute Levels.*

Report Priority

See "Report Priority" under **Section 11.3.1.2,** *Absolute Levels.*

Time On Last [Yes/No] [No] [0:00 - 999:59] [0:00]

Time On Last is an alarm condition that is used to generate an alarm or notice when a digital value stays ON for longer than a user-specified alarm period. When this field is set to "Yes", fields appear under the Notice and Alarm columns where you may enter the alarm and notice time periods.

The Einstein checks the Time On Last condition after the input or output value changes from ON to OFF. The amount of time the value remained ON is compared to the alarm and notice set points; if greater than the set points, an alarm or notice will be generated.

If you wish to set up a Time On Last condition, select "Yes" in the Time On Last field, and enter alarm or notice set points in the fields that appear to the right.

Time On Total [Yes/No] [No] [number] [0:00]

The Time On Total is an alarm condition that is used to generate an alarm or notice when the total cumulative ON time of the input or output exceeds a user-defined number of hours. When this field is set to "Yes", fields appear under the Notice and Alarm columns where you may enter the alarm or notice ON time set points.

This alarm condition uses the cumulative run time that is already set up to be recorded and displayed in the application's Status Screen. When you select this input or output in its status screen and press F8 to show expanded info, the cumulative run time may be viewed and, if desired, reset to zero.

If you wish to set up Time On Total alarms, enter "Yes" in the Time On Total field, and enter the alarm and notice set points in the fields that appear to the right.

Time Off Last [Yes/No] [No] [0:00 — 999:59] [0:00]

Time Off Last is an alarm condition that is used to generate an alarm or notice when a digital value stays OFF for longer than a user-specified alarm period. When this field is set to "Yes", fields appear under the Notice and Alarm columns where you may enter the alarm and notice time periods.

The Einstein checks the Time Off Last condition after the input or output value changes from OFF to ON. The amount of time the value remained OFF is compared to the alarm and notice set points; if greater than the set points, an alarm or notice will be generated.

If you wish to set up a Time Off Last condition, select "Yes" in this field, and enter alarm or notice set points in the fields that appear to the right.

Number of Events [Yes/No] [No] [number] [0]

Number of Events is an alarm condition that is used to generate an alarm or notice when the total cumulative number of ON events exceeds a user-defined amount. When this field is set to "Yes", fields appear under the Notice and Alarm columns where you may enter the alarm or notice set points.

This alarm condition uses the cumulative number of ON events count that is already set up to be recorded and displayed in the application's Status Screen. When you select the input or output in the status screen and press F8 to view expanded information, the total number of ON events may be viewed and, if desired, reset to zero.

If you wish to set up Number of Events alarms, enter "Yes" in the Number of Events field, and enter the alarm

and notice set points in the fields that appear to the right.

Events Per Hour [Yes/No] [No] [number] [0]

Events Per Hour is an alarm condition that is used to generate an alarm or notice when a digital value turns ON more than a user-specified number of times within a 60-minute period. When this field is set to "Yes", fields appear under the Notice and Alarm columns where you may enter the alarm and notice event set points.

The Einstein counts a transition from OFF to ON as an "event" for purposes of this alarm condition. If the total number of events exceeds a user-defined alarm or notice set point, an alarm or notice is generated.

If you wish to set up Events Per Hour alarms, enter "Yes" in the Events Per Hour field, and enter the alarm and notice set points in the fields that appear to the right.

'ON' State [Yes/No] [No] [ON/OFF/NotAct]

The 'ON' State alarm condition may only be used to generate alarms. It may not be used to generate notices.

The 'ON' State alarm condition simply generates an alarm when the input or output value equals the value specified by the user in the set point field. When "Yes" is selected in this field, a field appears under the Alarm column where you may enter ON, OFF, or NotAct as the alarm condition.

If you wish to set up an 'ON' State alarm for this input or output, select "Yes" in the 'ON' State field, and choose the desired alarm state in the field that appears to the right.

No Update Time Out [0:00 — 4:15] [0:00]

See "No Update Time Out" under **Section 11.3.1.2,** *Absolute Levels*.

Advisory Enable [ON/OFF/NotAct -or- Digital] [ON]

See "Advisory Enable" under **Section 11.3.1.2,** *Absolute Levels*.

11.5 After Alarms Are Set Up

After alarming is successfully set up for an input or output, the letter "A" will appear to the right of the input definition in all setup and status screens. This signifies that alarm control parameters are active for the input or output.

12 Time Schedules and Holidays

Most building control and refrigeration applications have separate modes of operation for occupied and unoccupied building times. To take advantage of these modes, you must set up an application called a **Time Schedule** to determine when the building is occupied and when it is unoccupied.

In addition, if your building uses special occupied times during holidays or other special days of the year, you will need to set up a **Holiday Schedule** in one of your Einstein unit's Global Data application. Holiday Schedules compare the current date to a list of user-programmed holidays. When a holiday is scheduled, Global Data will send a message to all time schedule-based applications on all Einsteins on the network telling it to ignore its usual Sunday through Saturday schedule and use its holiday schedule settings instead.

Section 12.1 below shows how to set up a Holiday Schedule that can be used by your Time Schedule. If you will not be using holidays, you may skip this section and go straight to **Section 12.2** to begin setting up your Time Schedule.

12.1 Holiday Schedules

Because a multiple-Einstein network would likely use the same holiday schedules for determining special occupied and unoccupied building hours, holiday scheduling is handled by Global Data. This means the holiday schedule can be set up in one Einstein and shared with all other Einsteins that use time scheduling.

12.1.1 Setting Up Holiday Schedule Dates

To begin setting up holiday schedules, choose an Einstein on the network that will serve as the primary provider of the holiday schedule in Global Data. It is recommended you program Holiday Schedule dates in an Einstein BX's Global Data application, if a BX is available.

1. Log in to the controller that will hold the Holiday Schedule dates.
2. Press F8 Y 8 to navigate to the Global Data application.
3. In the Screen 1: Inputs screen, page down using the PgDn key until the Holiday Mode field is displayed. Move the cursor to this field.
4. Press F7, and select "Primary" from the Look-Up Table. Press Enter to select.

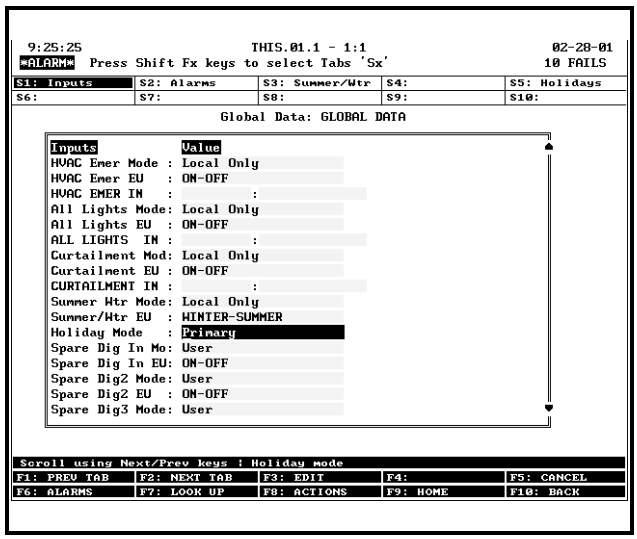


Figure 12-1 *- Holiday Mode Field*

5. Press Shift + F5 to move to Screen 5: Holidays.

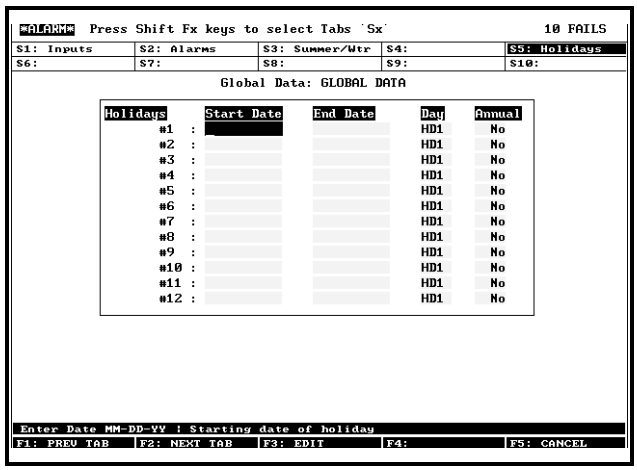


Figure 12-2 *- Holiday Screen 5: Holidays*

Before you begin changing settings on this screen, determine which days during in the current year will be periods where the occupied hours of your building will be different from the usual seven-day schedule.

For example, a department store in the United States might have certain week-end holidays, such as Labor Day or Independence Day, where the store hours will be expanded from the usual 8:00 AM - 8:00 PM schedule to 8:00 AM - midnight. On other holidays, such as Thanksgiving Day or Christmas Day, the store might be closed altogether.

After you have made a list of holidays for your building, group them together by types. For example, all holidays where the times will be expanded to the same hours would be together in one group, and all holidays where the store will be closed would be together in a separate group.

Finally, assign each group one of the four holiday day designators: HD1, HD2, HD3, or HD4. For example, expanded-hour holidays might be assigned HD1, and store-closed holidays might be assigned HD2. (During Einstein BX operation, this designator will be passed along to the Time Schedule applications to tell them to change its occupied hours during your programmed holidays).

Once you have done this, you may begin programming the holiday dates.

Required Steps

For each holiday period you wish to program:

1. Enter the day the holiday begins in the **Start Date** field.
2. Enter the last day of the holiday period in the **End Date** field. ***Note: For holidays that only last one day, the End Date will be the same date as the Start Date.***
3. Choose the holiday type by selecting either HD1, HD2, HD3, or HD4 in the **Day** field.
4. If you want this holiday to occur every year on the month and date you entered in the Date fields, choose "Yes" in the **Annual** field. Otherwise, leave this field set to "No."

12.1.2 Configuring Other Einsteins to Use Global Data Holiday Schedules

When you have a schedule of holidays programmed in an Einstein with the **Holiday Mode** field set to "Primary," you may configure other Einsteins on the network to use the same holiday schedule.

1. Log in to the Einstein that you wish to hook to the Global Data holiday schedule.
2. Press F8 Y 8 to navigate to the Global Data application.
3. In the Screen 1: Inputs screen, page down using the PgDn key until the Holiday Mode field is displayed. Move the cursor to this field.
4. Press F7 and select "User" from the Look-Up Table. Press Enter to select.

Repeat these steps for each Einstein that will use holiday scheduling.

12.2 Time Schedules

Adding a Time Schedule Application

1. Press F8 ^Z 1 to navigate to the Add Control Application screen.
2. Use the Prev and Next keys to scroll through the application types until "Time Schedule" appears in the **Type** field.
3. Enter the number of Time Schedule applications you wish to add in the "How many?" field.
4. Press n to create the new applications.

Editing a Time Schedule Application

To begin setting up your building occupancy time schedule:

1. Press F5 from the Main Status Screen to call up the Existing Applications screen.
2. Press &J to select Time Schedules. If more than one Time Schedule application has been created, you will need to select one from the menu that appears.

The Time Schedule Status screen will appear (***Figure 12-3***).

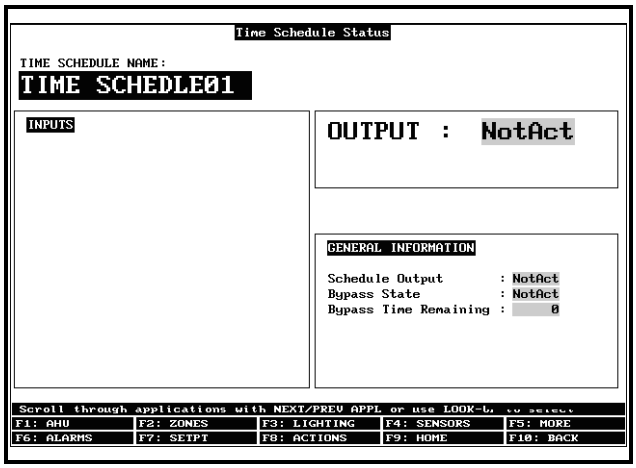


Figure 12-3 *- Time Schedule Status Screen*

During normal operation the Time Schedule Status screen will show whether the schedule is in occupied mode or unoccupied mode. Right now, the Output should say "NotAct," indicating the schedule has not yet been programmed. To begin programming the Time Schedule, press F8 followed by ^B.

12.2.1 Screen 1: General

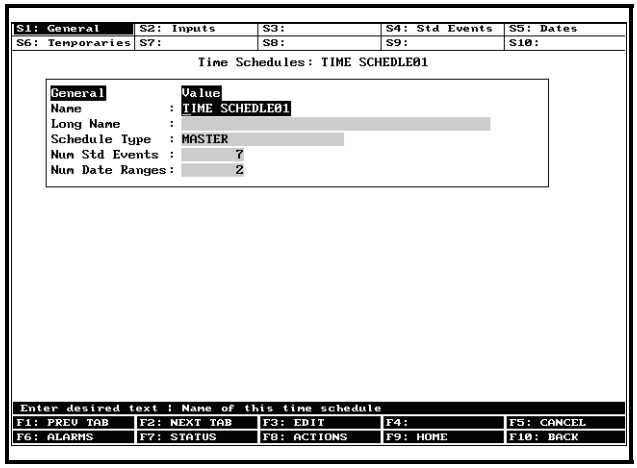


Figure 12-4 *- Time Schedule Screen 1: General*

Required Steps

1. Enter a name for this schedule in the **Name** field.
2. Enter the number of events (i.e. the total number of different occupied building times, including weekdays, weekends, and all holidays) in the **Num Std Events** field.
3. If you want this schedule to only be active during certain date ranges, enter the number of different date ranges in the **Num Date Ranges** field.

Options

Long Name If you wish, enter a description of the schedule (40 characters max) in this field.

12.2.2 Screen 2: Inputs

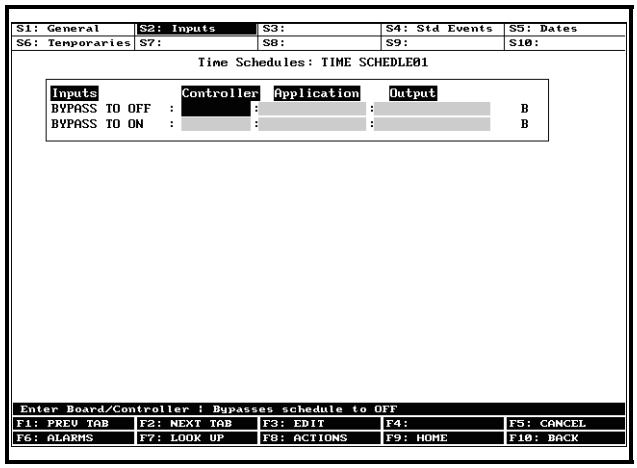


Figure 12-5 *- Time Schedules Screen 2: Inputs*

Options

BYPASS TO OFF If you wish, you may set up a switch or button to override the schedule OFF. To set up this bypass, press F3 1 1 to change the input definition format to "Board:Point," and enter the board and point address of the bypass switch.

BYPASS TO ON If you wish, you may set up a switch or button to override the schedule ON. To set up this bypass, press F3 1 1 to change the input definition format to "Board:Point," and enter the board and point address of the bypass switch.

Note: When both the Bypass to OFF and Bypass to ON inputs are CLOSED, Bypass to ON will take priority.

12.2.3 Screen 4: Std Events

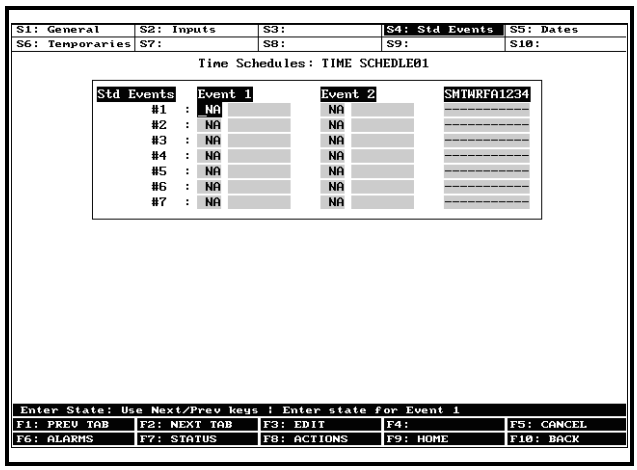


Figure 12-6 *- Time Schedule Screen 4: Std Events*

Required Steps

For each event (time period):

1. In the first **Event 1** field, use the Prev and Next keys to change the "NA" to "ON."
2. In the second **Event 1** field, enter the time of day the Einstein should begin occupied mode. Enter the time in 24-hour format (HH:MM).
3. In the first **Event 2** field, use the Prev and Next keys to change the "NA" to "OFF."
4. In the second **Event 2** field, enter the time of day the Einstein should end occupied mode and begin unoccupied mode. Enter the time in 24-hour format (HH:MM).
5. For each event, there are 11 fields under the heading **SMTWRFA1234**. Each field corresponds to a day of the week (Sunday through Saturday, plus Holidays HD1, HD2, HD3, and HD4). Starting with the Sunday (S) field, use the Prev or Next key to toggle the field value from "-" (indicating the events will be INACTIVE on that day) to "S" (indicating the programmed event pair will be

followed on that day of the week). Press the ▷ key to move to the next field, and repeat for the remaining ten fields.

Example

To better explain how multiple schedule events coincide to create a complete occupied/unoccupied schedule, here is an example of a schedule created for a building with the following occupied building times:

Weekdays (Mon - Fri)	8 AM - 8 PM
Weekends (Sat - Sun)	11 AM - 10 PM
Three-day Weekend Holidays	8 AM - 8 PM
Christmas, New Year's Day	CLOSED

Assuming the three-day weekend holidays were defined as holiday HD1 in a Holiday Schedule, and assuming that Christmas and New Year's Day were both set up as holiday HD2 in the same Holiday Schedule, here are the four events that must be programmed in this Time Schedule:

#	Event 1		Event 2		SMTWRFA1234
1	ON	08:00	OFF	20:00	-MTWRF-----
2	ON	11:00	OFF	22:00	S-----A----
3	ON	08:00	OFF	22:00	-------1---
4	OFF	00:00			--------2--

Table 12-1 *- Example of Event Programming in Time Scheduling*

The Time Schedule will follow the times in #1 on weekdays, #2 on weekends, #3 on holiday HD1, and #4 on holiday HD2.

13 Air Handling Unit Setup

13.1 Overview

The Einstein BX-300 supports the simultaneous control of up to six air handling units (AHU). AHU Control applications govern all aspects of an AHU's operations, including heating and cooling, dehumidification, fans, and economizer control.

Unlike rooftop control units (RTUs), AHUs are controlled directly by the Einstein itself and not by a separate unit control board.

An AHU Control application actually consists of three separate control algorithms. The main control algorithm monitors the indoor temperature and activates heating and cooling stages when necessary to maintain the user-defined temperature set point. Another algorithm monitors the indoor humidity and uses a desiccant wheel or additional AHU cool stages to reduce the humidity level. The third loop controls either a two-position (digital) or variable-position (analog) economizer damper based on the outside air conditions.

13.2 Temperature Control

In its most basic form, Temperature Control simply reads a control input value, compares it to the active temperature set point, and activates or deactivates heating or cooling stages in an effort to satisfy the set point. The majority of user setup that must be done in Temperature Control involves specifying which input is to be used as the control source, defining different set points for use in occupied, unoccupied, summer, and winter modes, and setting up the operating characteristics of the heating and cooling stages.

13.2.1 Alternate Set Points

For both the heating and cooling set points, you may choose to use different set points during occupied or unoccupied building times, and different set points for summer and winter seasons. In other words, AHU Control may have four different pairs of heating and cooling set points, as shown in ***Table 13-1***.

Cooling	Heating
SUMMER COOL OCC	SUMMER HEAT OCC
SUMMER COOL UOC	SUMMER HEAT UOC
WINTER COOL OCC	WINTER HEAT OCC
WINTER COOL UOC	WINTER HEAT UOC

Table 13-1 *- Possible Heating/Cooling Set Points*

AHU Control looks at the Einstein's Global Data parameters to determine whether it should run in summer or winter mode. Refer to **Section 9.6,** *Global Data Setup*, for information on how to set up summer/winter control parameters.

The AHU chooses occupied or unoccupied mode by reading an occupied state input, which is most commonly tied to the output of a Time Schedule application.

13.3 Fan Control

The Einstein BX can control three different types of AHU fans. However, only one fan can be controlled per AHU. The fan types include: single-speed, two-speed, and variable-speed. Controls for all fans are similar in that they operate in either of three modes:

- ***Continuous*** **-** The fan is always on, even when the AHU is not in heating, cooling, or dehumidification mode.
- ***Auto*** **-** The fan is only on when the AHU is in heating, cooling, or dehumidification mode.
- ***Summer ON, Winter Auto*** **-** This mode allows the AHU fan to operate in Continuous mode during the summer months and in Auto mode during the winter months.

The operation of the fans during Continuous and Auto modes is largely dependent on the fan type.

13.3.1 Single-Speed Fans

Single-speed fans require no advanced control parameters. Whether in Continuous or Auto mode, the fan will be ON when Fan Control calls for it to be ON, and OFF when it calls for it to be OFF.

13.3.2 Two-Speed Fans

Two-speed fans have a LOW and a HIGH speed set-

ting. You must specify the number of the stage that, when activated, will switch the fan from LOW to HIGH.

For example, if there are four cooling stages and you wish to have the fan switch from LOW to HIGH when stage 3 becomes active, enter a "3" as the switch-over set point. This will cause the fan to switch to HIGH speed when stage 3 is activated. Likewise, when stage 3 is deactivated, the fan speed will switch from HIGH to LOW.

You may choose a different switch-over set point for occupied heating, occupied cooling, unoccupied heating, and unoccupied cooling modes.

When the AHU is in dehumidification mode, the AHU Control application will ignore the fan speed settings of the active stages and switch to a user-specified dehumidification speed (usually LOW).

13.3.2.1 Continuous Two-Speed Fan Operation When All Stages Are OFF

When the fan is operating in Continuous mode and all heating and cooling stages are OFF, the fan speed will default to a user-specified speed. You may choose a different default speed for both occupied and unoccupied operation.

13.3.3 Variable-Speed Fans

Variable-speed fans may operate at any percentage of its maximum speed. The method AHU Control uses to determine the speed percentage is dependent on whether the heat and cool outputs are staged or modulating.

13.3.3.1 Variable-Speed Fan Operation

For staged AHU outputs, each stage must be programmed with its own speed percentage set point. The AHU Control application looks at all of the active stages, takes the highest speed percentage set point, and operates the fan at this speed.

For example, if cool stage 1 is active with a 30% speed percentage set point, the fan will likewise operate at 30% speed. If a second stage with a set point of 50% were to become active, the fan speed would increase to 50%.

For each heating and cooling stage, you may specify both occupied and unoccupied speed percentage set points.

13.3.3.2 Dehumidification with VS Fans

When in dehumidification mode, a user-defined slowdown percentage is subtracted from the variable-speed fan percentage. This percentage will continue to be subtracted until the AHU exits dehumidification mode.

13.4 Economizer Control

Economizer dampers on AHUs are used to bring outside air into the building for use in cooling. When temperature and humidity conditions are favorable, the economization dampers are opened, and outside air is allowed to flow into the AHU. Economization is generally used by the AHU just as a cool stage would be in Temperature Control; if cooling is needed, and conditions are favorable for economization, the dampers will open and economization will begin. If more cooling is needed, the cooling stages would then cycle on as normal.

The Einstein supports control of both two-position (digital) and variable-position (analog) economizer dampers.

13.4.1 Economization Enable

Before the AHU Control application may open economization dampers, it must first determine if the outdoor air conditions are favorable for economization. There are five possible ways the AHU Control may do this:

1. ***Enthalpy Switch*** - An enthalpy switch is a digital device that is pre-set to detect when the temperature and humidity levels are favorable for economization. When the conditions are favorable, this switch sends an OK (ON) signal to the AHU Control application. Otherwise, the switch sends a NOT OK (OFF) signal, and economization is disabled.
2. ***Dew Point Set Point*** - A dew point probe measuring the dew point of the outside air is compared to a set point. If the outside air dew point is less than the set point, economization is enabled. If it is higher than the set point, economization is disabled.
3. ***Calculated Enthalpy*** - The AHU Control application calculates the outside air enthalpy by reading the value of a relative humidity sensor and an outdoor air temperature sensor. If the enthalpy is greater than the set point, economization is enabled. If lower, economization is disabled.
4. ***Dew Point Fail-Safe*** - This is similar to method #2, except an outdoor temperature sensor value is compared to the set point instead of a dew point probe's value. This comparison is a poor substitute for actual dew point readings and is recommended for use as a fail-safe only. When possible, use humidity or dew point sensors.
5. ***Temperature Comparison*** - The AHU Control application simply compares the temperature of the inside air with the temperature of the outside

air. If the outside air is cooler than the inside air, economization is enabled.

6. ***In vs. Out Enthalpy*** - This strategy requires indoor and outdoor humidity sensors and also indoor and outdoor temperature sensors. The enthalpy of the outdoor air is calculated and compared to the enthalpy of the indoor air. If the outdoor air enthalpy is less than the indoor air enthalpy, economization is enabled. Otherwise, economization is disabled.

You may choose a different economization checking method for use in summer and winter months.

13.4.1.1 Economization Lockout Features

In addition to the methods listed above, there are two economization lockout features that apply to all AHUs using economization.

Max Outside Air Humidity

The Max Outside Air Humidity is the highest allowable humidity level for the outside air. If the outside relative humidity is higher than this set point, economization will not be allowed to occur.

Minimum Supply Temp

The Minimum Supply Temp is a user-defined set point that locks out economization if the supply air temperature falls below a minimum supply temperature set point. This feature ensures that the air coming from outside is not too cold.

13.4.2 Digital Economizer Control

Control of digital or two-position economizers is relatively simple. When conditions are favorable for economization, the dampers will be opened when cooling is needed. If not favorable, the dampers will be closed.

13.4.3 Analog Economizer Control

For variable-position dampers, economization is generally used by the AHU just as a cool stage would be in Temperature Control. If cooling is needed, and conditions are favorable for economization, the dampers will open and economization will begin. If more cooling is needed, the cooling stages would then cycle on as normal.

The position of the analog economizer damper is important only for the purposes of keeping the mixed air temperature (a combination of the outdoor air coming through the dampers and the return air temperature) near the user-specified set point. The damper is controlled using PID control.

13.5 Dehumidification Control

Dehumidification control uses the AHU's existing cool stages (and a separate dehumidification device such as a desiccant wheel, if available) to remove moisture from the air.

The dehumidification set point is placed at the 0% end of the dehumidification PID throttling range. In other words, the dehumidification output will start at 0% when the humidity is equal to the set point and increase to 100% when the humidity is equal to or above the set point plus the throttling range.

The dehumidification output percentage is used much like a heating or cooling output percentage is used in Temperature Control. The percentage represents the percentage of total dehumidification capacity available to the AHU (including cool stages and other dehumidification devices).

13.6 Curtailment

Some power companies offer curtailment programs that allow participating stores to disable user-defined loads during peak power times in return for discounts on utility rates.

If you are participating in a curtailment program, the power company will supply you with a digital curtailment device that must be wired to an input on the RS485 I/O Network.

To set up curtailment in the system software, you must designate which specific heating and cooling stages will be subject to curtailment.

When the power company sends a curtail command (i.e. the value of the curtailment device switches to "CLOSED"), all stages that are set up to be curtailed will be shut off and locked out.

Fan control is not directly affected by a call for curtailment. The AHU fan will still run at a speed based on the number of active, non-curtailed stages (or, if using modulated outputs, the curtailed modulating percentage). If this causes the fan to slow down or shut off during curtailment, there will be energy savings from the fans.

13.7 Optimum Start/Stop (OSS)

OSS applies only to AHU Control applications that use a time schedule to change occupancy states. Overrides initiated by the digital BYPASS TO OCC or BYPASS TO UNOCC inputs will not initiate pre-starts or pre-stops.

Optimum Start/Stop (OSS) is a feature that works alongside the AHU Control application's occupied and unoccupied temperature control modes. OSS takes control of heating and cooling several minutes before the building is scheduled to change occupancy states, and prepares the building for the upcoming change in set points. As a result, when the occupancy state changes, the temperature will be comfortably within the range of the new set point.

Figure 13-1 shows an example of how pre-starts and pre-stops work in a heating application. From unoccupied mode, the pre-start period ramps the temperature up slowly so that when the scheduled change from unoccupied to occupied mode occurs, the temperature will already be at or near the occupied heating set point. During the pre-stop, which occurs before AHU Control goes from occupied to unoccupied mode, heating is suspended and the temperature is allowed to "coast" down to the unoccupied set point.

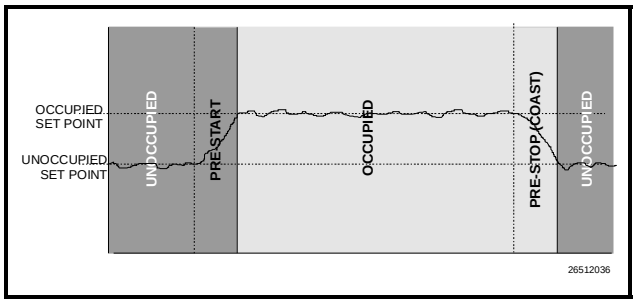


Figure 13-1 *- Diagram of Pre-Start and Pre-Stop Operation*

Intelligent Pre-Starts and Pre-Stops

OSS is designed to handle pre-starts and pre-stops in the most energy-efficient manner possible. Every time a pre-start or pre-stop occurs, OSS measures the amount of time it takes to bring the temperature from the previous set point to within the "comfort zone" of the new set point (a user-defined range of values above and below the set point within which the temperature is considered acceptable). This duration is used to determine the average rate of temperature change, called the K factor.

The K factor is stored in the memory along with the average value of the outdoor air temperature during the pre-start or pre-stop. Over time, collected K factor data will be sorted and combined into a table. As a result, by constantly observing and recording the results of previous pre-starts and pre-stops, OSS will be able to intelligently guess how much time a pre-start or pre-stop mode should last based on the outside temperature.

AHU Control keeps track of three different kinds of K factors:

- *Heat K factor* - used to guess pre-start durations for AHUs operating in heating mode.
- *Cool K factor* - used to guess pre-start durations for AHUs operating in cooling mode.
- *Coast K factor* - a measurement of the change in temperature when no heating or cooling is active. This is used to determine pre-stop durations for both heating and cooling AHUs.

13.8 AHU Zone Control

Unlike ARTC and RT-100 rooftop controller applications, AHU applications are not required to be grouped into Zone applications (AHUs are usually large enough to be "zones" in and of themselves).

However, if desired, you may associate an AHU Control application with a Zone application. The AHU will then use the Zone's temperature control set points, occupancy state, summer/winter state, and economization and dehumidification enable signals. More information on Zone control is available in **Section 14,** *HVAC Zone Setup*.

13.9 Hardware Overview

To set up an AHU for control by an Einstein, numerous temperature and humidity sensors for several different applications must be connected to the I/O network, as well as fan and cool proof checking devices, economization checking devices, curtailment devices, and all of the heating, cooling, and dehumidification outputs.

Listed below are wiring instructions for some of the inputs and outputs that are part of a typical AHU setup.

Inputs	Sensor Type	Wiring Instructions
Space Temperature	Temperature	see Table 6-1 on page 6-3
Space Humidity	Humidity	see Table 6-1 on page 6-3
Supply Air Temp	Temperature	see Table 6-1 on page 6-3
Return Air Temp	Temperature	see Table 6-1 on page 6-3
Outdoor Air Temp	Temperature	set up as Outdoor Air Provider in Global Data (see **Section 9.6**).
Outdoor Air Humid	Humidity	set up as Outdoor Humidity Provider in Global Data (see **Section 9.6**).
Curtailment Device	Digital	set up as Curtailment in Global Data (see **Section 9.6**).
Fan Proof	Digital	see Table 6-1 on page 6-3
Fan Proof Reset	Digital	see Table 6-1 on page 6-3
VS Inverter Alarm	Digital	see Table 6-1 on page 6-3
Enthalpy Switch (Indoor and/or Outdoor)	Digital	see Table 6-1 on page 6-3
Dew Point Probe (for Economization)	Dew Point	see Table 6-1 on page 6-3
Mixed Air Temp (analog economizers only)	Temperature	see Table 6-1 on page 6-3

Table 13-1 *- Suction Group Inputs*

Table 13-1 *- Suction Group Inputs*

Output Device	Wire 8RO contacts to:	Set Fail-safe Dip Switch to:	Notes
Heat / Cool Staged Outputs	see note	see note	Set up any stages you want ON when the controller is off-line as N.C. Stages you want OFF should be set as N.O.
Single-Speed Fans	see note	see note	If one or more heat or cool stages will be ON, wire fan N.C. so it will be active during controller off-line times. Otherwise, wire N.O.
Two-Speed Fans (LOW, HIGH, and fan contactor)	see note	see note	If any heat or cool stages are configured to be ON (N.C.), set the wiring and the switch to N.C., and set either the LOW or HIGH stage output to N.C. (whichever speed you want active). If no heat or cool will be active, set LOW, HIGH , and the fan contactor to N.O.
Digital Economizer	N.O.	N.O.	

Table 13-2 *- Suction Group Outputs*

13.10 Software Setup

Once the inputs and outputs for the AHUs are wired to the input/output boards, software setup for the AHUapplication can begin.

From the Main Status Screen, press F1 to begin setting up your AHUs. This will bring up the AHU Status Screen (***Figure 13-2***).

Note: If you have more than one AHU, a menu screen will appear listing all AHUs. Use the arrow keys to highlight the circuit you wish to set up, and press Enter**.**

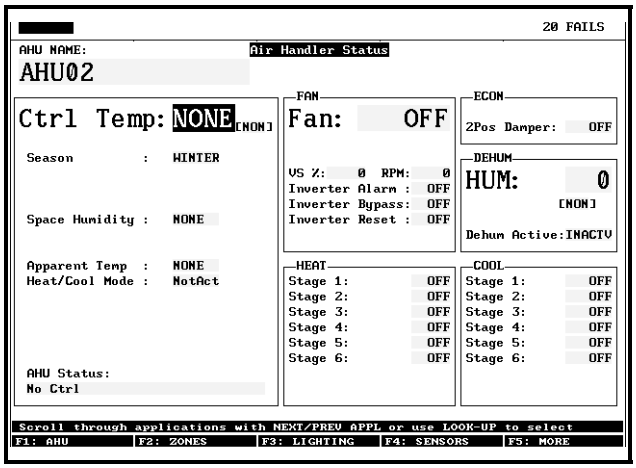


Figure 13-2 *- AHU Status Screen*

The AHU Status screen shows the operating state of the AHU (i.e. whether the AHU is heating, cooling, dehumidifying) as well as the current indoor and outdoor temperature and humidity values.

Right now, this screen should be mostly blank, since you have not yet specified any information about the circuit, such as the number of heat and cool stages or the temperature set point.

To begin setting up this AHU, press F8 followed by `B.

Note: If this AHU will be associated with an HVAC Zone, you will not need to fill in certain fields listed below because the HVAC Zone application will fill them in for you. The descriptions of the fields will indicate if they need to be filled in if you are controlling the AHU from a Zone application.

13.10.1 Screen 1: General

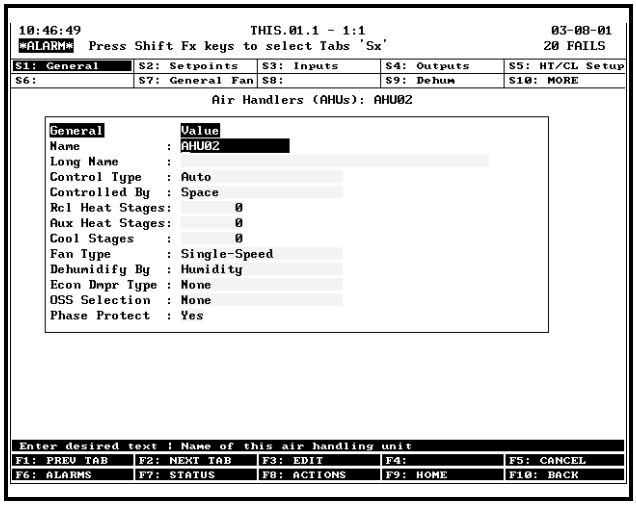


Figure 13-3 *- AHU General Setup*

Required Steps

1. Enter a name for the AHU application in the **Name** field.
2. Choose whether the AHU will be heating (HEAT), cooling (COOL), or both (AUTO) in the **Control Type** field.
3. Choose what temperature sensor value will be used to control heating and cooling in the **Controlled By** field. There are three options:
   - *Space (default)* - The space temperature input is the control input.
   - *Zone* - If this AHU is not part of a zone, don't use this option. If you are associating the AHU with a Zone application AND you wish to control the AHU off the combined space temperatures of all AHUs and ARTCs in the zone instead of the AHU's own space temperature value, choose this option.
   - *Return* - The return air temperature input will be used as the control input.
4. Enter the number of reclaim heat stages in the **Rcl Heat Stages** field.
5. Enter the number of auxiliary heat stages in the **Aux Heat Stages** field.
6. Enter the number of cool stages in the **Cool Stages** field.
7. Choose the type of fan in the **Fan Type** field. Choose either Single, Two, or Variable Speed.
8. Choose the type of dehumidification control input in the **Dehumidify By** field. There are five options:

- *Humidity* - An indoor humidity sensor will be used for dehumidification.
- *Dewpoint* - An indoor dewpoint probe will be used for dehumidification.
- *Humidistat* - An indoor digital humidistat will be used to activate and deactivate dehumidification.
- *Dewpoint Calc* - Dehumidification will be controlled by dewpoint, which will be mathematically calculated from the indoor humidity and space temperature.
- *Disable* - The AHU will not dehumidify.

9. Choose the type of economizers on the AHU in the **Econ Dmpr Type** field. Choose "Analog" if the dampers are variable-position, "Digital" if the dampers are two-position, and "None" if no economizers are present or if you are controlling economization using another application or controller.
10. If you wish to shut down the AHU during phase loss, leave the **Phase Protect** field set to "Yes." If you are not checking for phase loss or do not wish to shut down the AHU during phase loss, select "No" in this field.

Options

OSS Selection The Optimum Start-Stop feature (OSS) is used to gradually change the building temperature as the AHU transitions from unoccupied to occupied mode (or occupied to unoccupied mode). When the AHU's schedule indicates an upcoming transition from unoccupied to occupied mode, OSS will begin bumping the set points up or down to bring the temperature closer to the occupied set point, so that by the time the AHU is in occupied mode, the building temperature will be equal to the occupied set point. The reverse is true as the AHU goes from occupied to unoccupied mode; OSS will allow the temperature to "coast" in the final few minutes of occupied mode so that the temperature will be equal to the unoccupied set point the minute the AHU begins unoccupied mode.

13.10.2 Screen 2: Setpoints

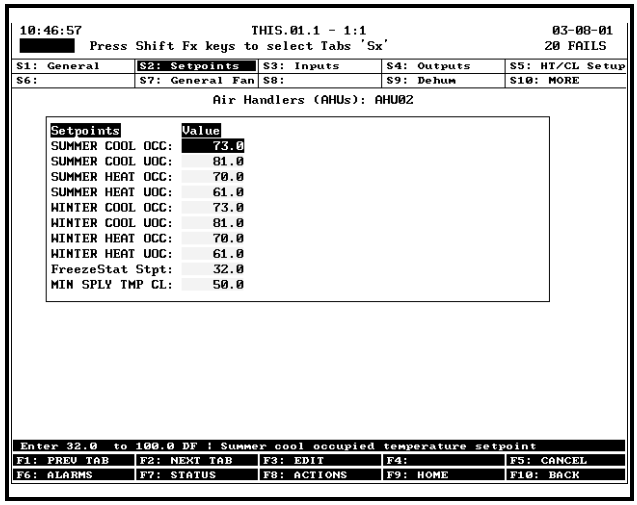


Figure 13-4 *- AHU Setpoints Screen*

Required Steps

NOTE: You will not need to program these eight set points if the AHU has been or will be associated with an HVAC Zone application. The AHU will receive its set points from the Zone application.

However, you will need to set the AHU's FreezeStat Setpoint and Min Supply Temp Cool set points if you wish to use these options.

The first eight set point fields on this screen are the eight temperature control set points that will be used by this AHU. Of these eight, only two set points (one heating set point and one cooling set point) will be active at any given time, depending on whether the AHU is operating in summer mode, winter mode, occupied mode, or unoccupied mode.

Enter the desired temperature for each of the eight set points. The names of these fields designate the modes in which they will be active:

SUMMER/WINTER Summer set points are used when the AHU is operating in Summer mode. Winter set points are used when the AHU is operating in Winter mode. Summer and Winter modes are controlled either by temperature or by date in Einstein's Global Data feature (see **Section 9.6,** *Global Data Setup*). If summer and winter mode switching is not being used for this AHU, use only the Winter set points, since the season defaults to Winter.

OCC/UOC Occupied (OCC) set points are used when the AHU is operating in occupied mode. Unoccupied (UOC) set points are used when the AHU is operating in unoccupied mode. Occupied and unoc-

cupied mode is determined by the Time Schedule application to which this AHU is associated (see **Section 12,** *Time Schedules and Holidays*). If no time schedule is being used, use only the occupied set points, since the occupied status defaults to "Occupied."

HEAT/COOL Cooling set points cause cooling to occur when the control temperature rises above the set point. Heating set points cause heating to occur when the control temperature drops below the set point. In a typical AHU with both heating and cooling stages, one heating and one cooling set point will be active at all times, and heating and cooling will take place as needed.

Options

FreezeStat Stpt Cooling stages on an AHU can be configured with special temperature sensors that detect when a coil freeze is occurring. This allows the AHU to shut down the cooling stage to prevent coil damage. If you are using this feature, enter the temperature that will be considered the coil freeze set point. When a coil's freezestat sensor value drops below this value, the stage will be temporarily disabled. The default, 32.0 degrees Fahrenheit, is the freezing temperature of water and should be sufficient in most cases.

MIN SPLY TMP CL This set point prevents air supply temperature from dropping too low during cooling mode. If the supply air temperature sensor value drops below this set point, the AHU Control application will begin deactivating cooling stages to attempt to keep the supply temperature above the set point.

13.10.3 Screen 3: Inputs

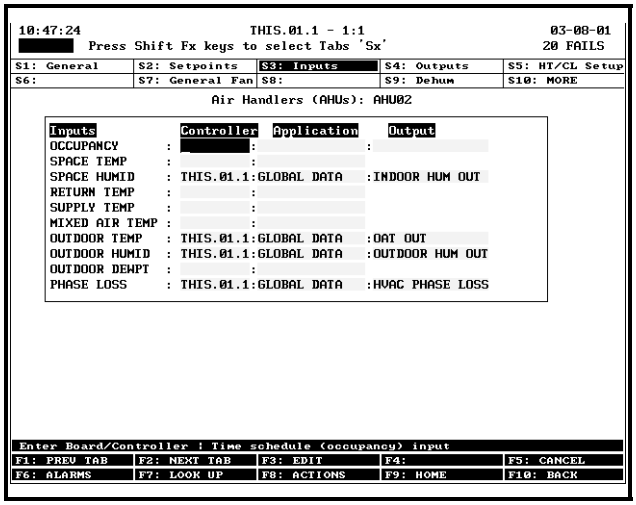


Figure 13-5 *- AHU Inputs Screen*

1. The **OCCUPANCY** field will follow the HVAC Zone's occupied/unoccupied state if the AHU is associated with a Zone. If not a part of a zone, enter the location of the occupied/unoccupied output from the Time Schedule you programmed in **Section 12.2,** *Time Schedules*.
   - In the "Controller" field, use the F7 key to select the name of the controller you are currently programming.
   - In the "Application" field, use the F7 key to select the name of the Time Schedule application you created for use as the occupied/unoccupied schedule.
   - In the "Output" field, press the F7 key and select "OUTPUT" from the list.
2. Enter the board and point address of the space temperature sensor in the **SPACE TEMP** field.
3. Enter the board and point address of the return air temperature sensor in the **RETURN TEMP** field.
4. Enter the board and point address of the supply air temperature sensor in the **SUPPLY TEMP** field.
5. If using damper control, enter the board and point address of the mixed air temperature sensor in the **MIXED AIR TEMP** field. Note that if you are using sensor control to control dampers, you do not need to define this board and point address.

Options

SPACE HUMID If you will be using dehumidification with this AHU, you will need to specify the board and point address of the space humidity sensor. By default, this definition points to the Indoor Humidity input in Global Data (**Section 9.6,** *Global Data Setup*). If you do not wish to use Global Data to supply indoor humidity, press F3 1 1 to change the definition format to "Board:Point," and enter the board and point address of the humidity sensor.

OUTDOOR TEMP The Outdoor Temp input automatically points to the OAT input in Global Data (see **Section 9.6,** *Global Data Setup*). If you do not wish to use Global Data to supply outdoor air temperature, press F3 1 1 to change the definition format to "Board:Point," and enter the board and point address of the outdoor air temperature sensor.

OUTDOOR HUMID Outdoor Humidity is only really necessary in some strategies of AHU damper control. By default, the Outdoor Humid input automatically points to the Outdoor Humidity input in Global Data (see **Section 9.6,** *Global Data Setup*). If

you do not wish to use Global Data to supply outdoor air humidity, press F3 1 1 to change the definition format to "Board:Point," and enter the board and point address of the outdoor air humidity sensor.

OUTDOOR DEWPT Outdoor Dewpoint is only really necessary in some strategies of AHU damper control. By default, the Outdoor Dewpt input automatically points to the Outdoor Dewpt input in Global Data (see **Section 9.6,** *Global Data Setup*). If you do not wish to use Global Data to supply outdoor air dewpoint, press F3 1 1 to change the definition format to "Board:Point," and enter the board and point address of the outdoor air dewpoint sensor.

PHASE LOSS If you are using phase loss protection for this AHU, you will need to enter the location of the digital phase loss checking device. By default, the Phase Loss input automatically points to the Phase Loss input in Global Data (see **Section 9.6,** *Global Data Setup*). If you do not wish to use Global Data to supply phase loss checking, press F3 1 1 to change the definition format to "Board:Point," and enter the board and point address of the phase loss device.

13.10.4 Screen 4: Outputs

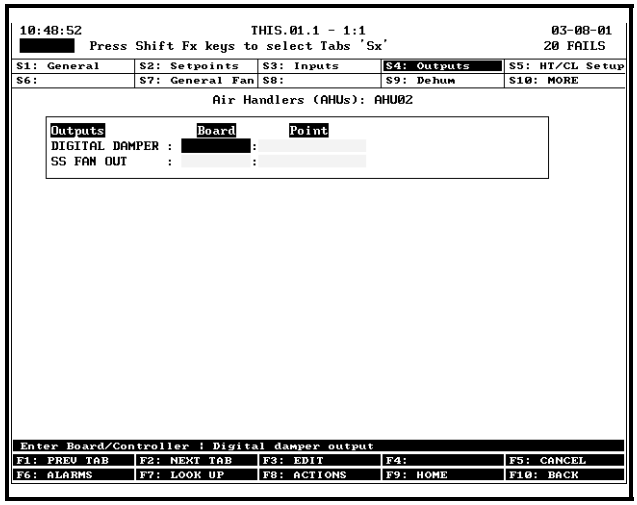


Figure 13-6 *- AHU Outputs Screen*

Required Steps

1. If the AHU has a single-speed fan, enter the board and point address of the single-speed fan in the **SS FAN OUT** input definition.
2. If the AHU has a two-speed fan:
   - Enter the board and point address of the low-speed stage in the **TS FAN OUT 1** input definition.
   - Enter the board and point address of the high-speed fan stage in the **TS FAN OUT 2** input definition.
   - Enter the board and point address of the fan contactor in the **TS FAN CONTACT** input definition.
3. If the AHU has a variable-speed fan:
   - Enter the board and point address of the output on the variable-speed fan inverter that will reset the inverter in the **VS INVTR RESET** input definition.
   - Enter the board and point address of the relay that will bypass the inverter OFF in the **VS INVTR BYPASS** input definition.
   - Enter the 4AO board and point address of the variable-speed output in the **VS FAN OUTPUT** input definition.
4. If the AHU is controlling digital economizers, enter the board and point address of the economizers in the **DIGITAL DAMPER** input definition.
5. If the AHU is controlling analog economizers, enter the 4AO board and point address of the economizers in the **ANALOG DAMPER** input definition.

13.10.5 Screen 5: Heat/Cool Setup

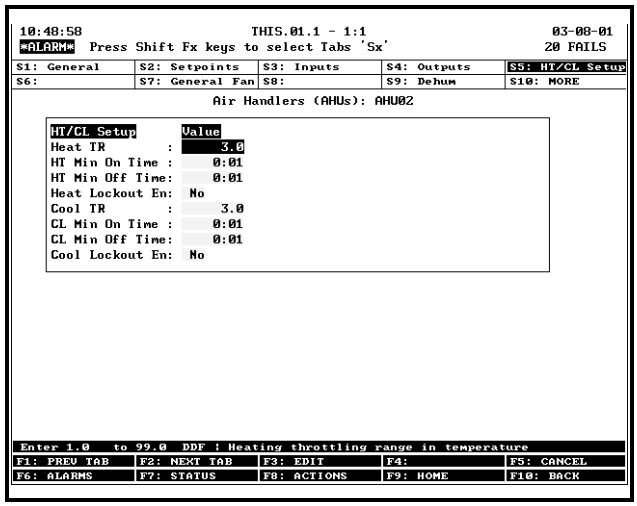


Figure 13-7 *- AHU Heat/Cool Setup*

Options

The parameters on this screen affect how heating and cooling stages are activated and deactivated during heating and cooling mode. The default values chosen for all of these fields should be sufficient for most installations; however, if you wish to fine-tune your AHU's control operation, you may choose to alter one or more of these fields.

Heat TR The heating throttling range (TR) determines how sensitive the AHU is to changes in the space temperature. It roughly corresponds to the number of degrees in between the set point and the temperature below the set point at which the heating output will be operating at 100%. Small throttling ranges result in larger responses to changes in temperature, while larger throttling ranges result in smaller responses to temperature changes. It is recommended that this value stay at its default (3.0) unless otherwise instructed by CPC.

Heat Min ON Time When a heating stage turns ON, it must remain ON for an amount of time equal to this set point, even if the AHU calls for it to be deactivated. By default, the Heat Min ON Time is set to one minute (0:01).

Heat Min OFF Time This is similar to the Heat Min ON Time explained above, except it keeps a heating stage OFF for a minimum amount of time after it is deactivated. By default, the Heat Min OFF time is set to one minute (0:01).

Heat Lockout EN If you are using summer/winter mode operation on your AHU, you may choose to lock out all heating stages when the AHU is operating in summer mode. To do this, change the value of this field to "Yes."

Cool TR This field does the same thing as the Heat TR explained above, except it applies to cooling.

Cool Min ON Time This field does the same thing as the Heat Min ON Time explained above, except it applies to cool stage activation.

Cool Min OFF Time This field does the same thing as the Heat Min OFF Time explained above, except it applies to cool stage deactivation.

Cool Lockout EN This field does the same thing as the Heat Lockout EN field, except it locks out all cooling stages when the AHU is operating in winter mode.

13.10.6 Screen 6: Heat/Cool Stages

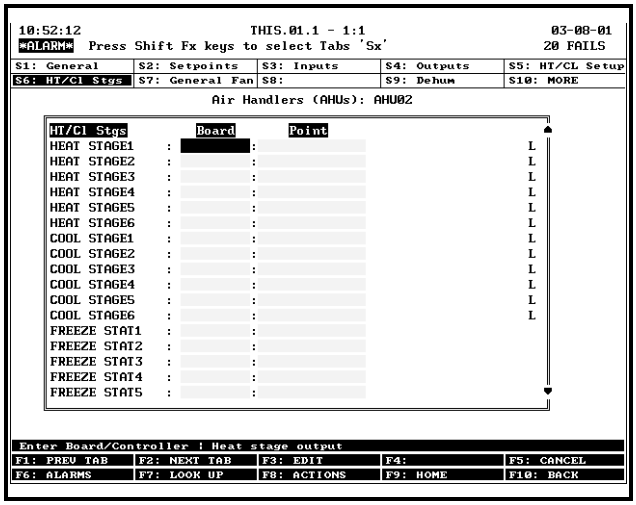


Figure 13-8 *- AHU Heat/Cool Stages*

Required Steps

1. For each **HEAT STAGE** field on this screen, enter the board and point address of the appropriately numbered heating stage. Define stage #1 as HEAT STAGE1, stage #2 as HEAT STAGE2, etc. Make sure the lowest numbered stages are all reclaim stages.
2. For each **COOL STAGE** field on this screen, enter the board and point addresses of the appropriately numbered cooling stage. Again, define stage #1 as COOL STAGE1, and so on.
3. For each cooling stage, if a freeze status sensor is present, enter its board and point address in the appropriately numbered **FREEZE STAT** field.
4. If using variable-speed fans, there will be four sets of fields visible on the screen for specifiying fan speed percentages for each stage during heating and cooling, as well as occupied and unoccupied mode. The field sets are named **VS Ht Oc St Pct** (for occupied heating mode), **VS Ht Un St Pct** (for unoccupied heating mode), **VS Cl Oc St Pct** (for occupied cooling mode), and **VS Cl Un St Pct** (for unoccupied cooling mode). Each set of fields will have 1-6 fields in it that correspond to the heat or cool stages you have set up in the AHU. Enter fan percentages for each one of these stages in each of these fields.

13.10.7 Screen 7: General Fan

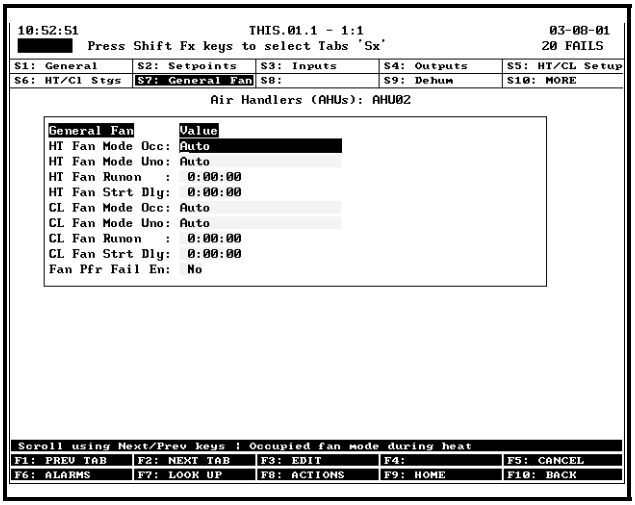


Figure 13-9 *- AHU General Fan Setup*

Required Steps

1. In the **HT Fan Mode Occ** field, choose how the fan will operate during occupied heating mode. Choose "Auto" to activate the fan only when one or more heating stages are active, "Always On" to keep the fan always on, or "Sum ON/Win Auto" to use Auto during WINTER and Always On during SUMMER.
2. In the **HT Fan Mode Uno** field, choose how the fan will operate during unoccupied heating mode.
3. In the **CL Fan Mode Occ** field, choose how the fan will operate during occupied cooling mode.
4. In the **CL Fan Mode Uno** field, choose how the fan will operate during unoccupied cooling mode.

Options

HT Fan Runon If you wish, you may program the fan to run for a fixed amount of time after the fan is called to turn OFF during heating mode. To do this, enter an amount of time (in hours:minutes:seconds format) in this field.

HT Fan Start Dly If you wish, you may program a delay period between when a fan is called to turn ON during heating mode and when the fan actually begins operation. To do this, enter an amount of time (in hours:minutes:seconds format) in this field.

CL Fan Runon This time setting serves the same function as the HT Fan Runon time, except it is used during cooling mode.

CL Fan Strt Dly This time setting serves the same function as the HT Fan Strt Dly, except it is used during cooling mode.

Fan Prf Fail En This field enables or disables fan proof checking. If you have proof checking devices for the AHU fan, select "Yes" in this field. If not, select "No."

FAN PROOF IN Enter the board and point address of the fan proof checking device in this field.

Fan Pr Fail Dly Enter the amount of time a proof checking device must read a proof failure before it is considered "failed" in this field.

13.10.8 Screen 8: Adv Fan

This screen does not appear unless you are using two-speed or variable-speed fans. The fields that appear on this screen are different based on whether you have select "Two-Speed" or "Variable-Speed" in Screen 1 (see **Section 13.10.1**).

13.10.8.1 Two-Speed Fan Parameters

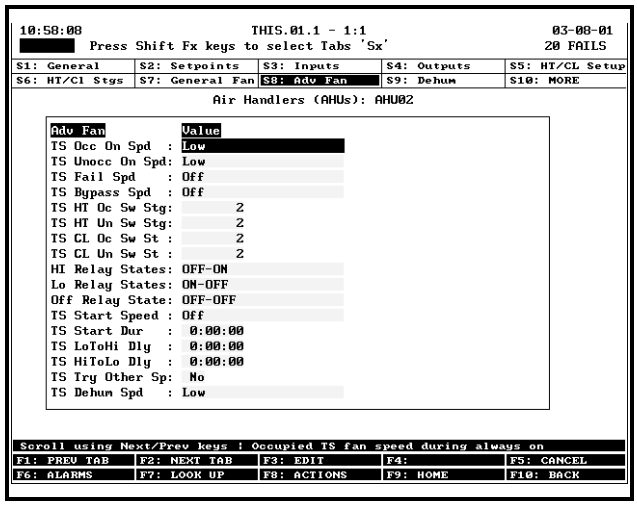


Figure 13-10 *- AHU Advanced Fan Setup - Two Speed*

Required Steps

1. If the fans will be Always On or are set to "Summer ON, Winter Auto," choose the speed you wish for the fan to run in Occupied "always on" mode in the **TS Occ On Spd** field. Choose either "Low," "High," or "Off."
2. If the fans will be Always On or are set to "Summer ON, Winter Auto," choose the speed you wish for the fan to run in Unoccupied "always on" mode in the **TS Unocc On Spd** field.
3. Enter the switch stage number to be used during occupied heating mode in the **TS HT Oc Sw Stg** field. Refer to **Section 13.3.2** for more information about this set point.
4. Enter the switch stage number to be used during unoccupied heating mode in the **TS HT Un Sw**

Stg field. Refer to **Section 13.3.2** for more information about this set point.

5. Enter the switch stage number to be used during occupied cooling mode in the **TS CL Oc Sw St** field. Refer to **Section 13.3.2** for more information about this set point.
6. Enter the switch stage number to be used during unoccupied cooling mode in the **TS CL Un Sw St** field. Refer to **Section 13.3.2** for more information about this set point.
7. Enter the speed at which you want the fan to operate during dehumidification in the **TS Dehum Spd** field.

Options

TS Fail SP This field determines the fan speed at which the AHU will operate when the AHU fails. Choose either "Low," "High," or "Off" in this field.

TS Bypass SP The Bypass Speed is the speed at which the fan will operate when the AHU is in bypass mode (i.e. when the FAN BYPASS IN input is ON). The fan will be forced to operate at this speed until the FAN BYPASS IN input is switched OFF.

HI Relay States This field determines which of the two-speed fan inputs will be ON when the AHU calls for the HIGH speed fan to be ON. The default setting, “OFF-ON,” activates output TS FAN OUT 2 and deactivates TS FAN OUT 1. If you wish, you may choose “ON-OFF” to activate TS FAN OUT 1 instead, or you may choose “ON-ON” to activate both fan outputs.

Lo Relay States This field determines which of the two-speed fan inputs will be ON when the AHU application calls for the LOW speed fan to be ON. The default setting, “ON-OFF,” activates output TS FAN OUT 1 and deactivates TS FAN OUT 2. If you wish, you may choose “OFF-ON” to activate TS FAN OUT 2 instead, or you may choose “ON-ON” to activate both fan outputs.

Off Relay State This field determines which of the two-speed fan inputs will be OFF when the AHU application calls for the fans to be OFF. By default, “OFF-OFF” turns both fan outputs off.

TS Start Speed When the AHU application calls for an inactive fan to switch ON, it can be made to operate at a user-defined Start Speed for a user-defined Start Duration before continuing operation at the speed called for by the AHU. If you wish to use this feature, choose a start speed in this field, and enter a non-zero start speed duration in the TS Start Dur field.

TS Start Dur If you specified a Low or High start speed in the TS Start Speed field, enter the amount of time you want the fan to operate at the start speed before starting operation at the speed called for by the AHU.

TS LoToHi Dly Enter the amount of time, if any, you want the AHU to wait before switching from low speed to high speed in this field.

TS HiToLo Dly Enter the amount of time, if any, you want the AHU to wait before switching from high speed to low speed in this field.

TS Try Other Sp If you are using fan proof checking and one of the fan speeds has failed its proof check, you may order the AHU application to use the other fan speed until the failure can be cleared. If you want to enable this feature, set this field to “Yes.”

13.10.8.2 Variable-Speed Fan Parameters

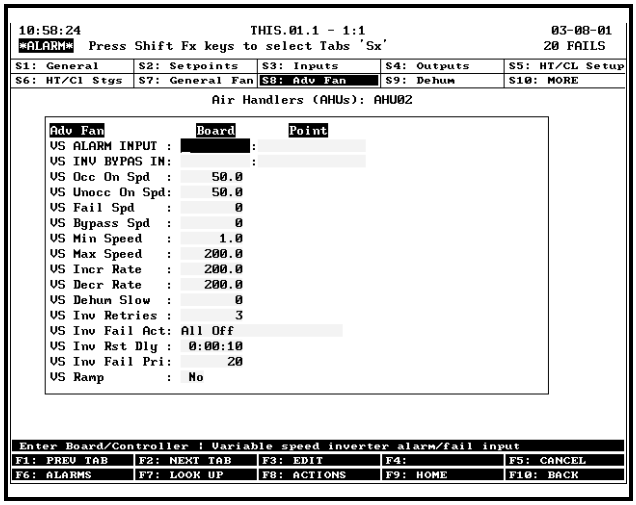


Figure 13-11 *- AHU Advanced Fan Setup - Variable*

Required Steps

1. Enter the board and point address of the relay that closes when an alarm occurs on the inverter in the **VS ALARM INPUT** input definition.
2. If using an external switch or button to bypass the inverter OFF, enter the board and point address of the bypass button or switch in the **VS INV BYPAS IN** field.
3. Enter the minimum speed of the VS fan, in RPM, in the **VS Min Speed** field.
4. Enter the maximum speed of the VS fan, in RPM, in the **VS Max Speed** field.
5. Enter the rate, in RPMs per minute, that the inverter increases fan speed in the **VS Incr Rate** field.

6. Enter the rate, in RPMs per minute, that the inverter decreases fan speed in the **VS Decr Rate** field.
7. If using "Always On" or "Sum ON/Win Auto" fan strategies, enter the percentage of maximum speed the fan will operate when it is "always ON" during Occupied mode in the **Vs Occ On Spd** field.
8. If using "Always On" or "Sum ON/Win Auto" fan strategies, enter the percentage of maximum speed the fan will operate when it is "always ON" during Unoccupied mode in the **Vs Unocc On Spd** field.

Options

VS Fail Speed By default, the fan will try to operate at 0% when the inverter is failing. If you wish to change the fail speed, enter a percentage from 0-100% in this field.

VS Bypass Spd By default, the fan operates at 0% when the inverter is bypassed. If you wish to change the bypass speed, enter a percentage from 0-100% in this field.

VS Dehum Slow You may choose to slow the VS fan speed down during dehumidification mode. To do this, enter the percentage that will be subtracted from the fan speed when dehumidification is active in this field.

VS Inv Retries This field sets the number of times the AHU will attempt to self-reset the inverter when a failure is detected.

VS Inv Fail Act This field determines how the AHU will control the fans when the inverter has failed. You may choose to have the fan OFF "All Off" or ON "All On."

VS Inv Rst Dly Enter the amount of time the inverter will wait in between reset attempts in this field.

VS Inv Fail Priority This field sets the priority level of the alarm generated when the inverter has failed. The default value, 20, represents a significant alarm condition and should be sufficient for most systems.

VS Ramp Normally, when the AHU shuts the fan down, the fan is ordered to immediately go to 0%. If desired, you may set the VS Ramp field to "Yes" to have the AHU ramp the speed down slowly to zero when shutting down.

13.10.9 Screen 9: Dehumidification Control

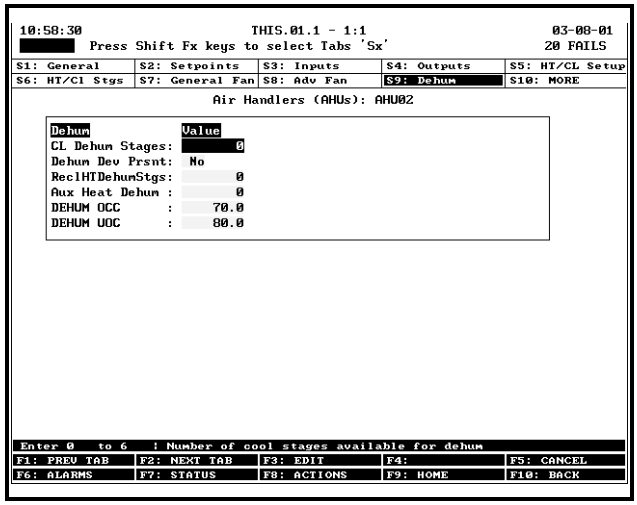


Figure 13-12 *- AHU Dehumidification Screen*

Required Steps

1. Enter the number of cool stages that will be made available for dehumidification control in the **CL Dehum Stages** field. If you wish to use only a desiccant wheel or other dehumidification device and not cool stages, select "0" in this field.
2. If a desiccant wheel or other dehumidification device is present in this AHU, enter "Yes" in the **Dehum Dev Prsnt** field.
3. Enter the number of reclaim heat stages that will be made available for supplemental heating during dehumidification in the **ReclHTDehumStgs** field.
4. Enter the number of auxiliary heat stages that will be made available for supplemental heating during dehumidification in the **Aux Heat Dehum** field.
5. Enter the indoor humidity percentage that, when exceeded during occupied mode, will start dehumidification in the **DEHUM OCC** field.
6. Enter the indoor humidity percentage that, when exceeded during unoccupied mode, will start dehumidification in the **DEHUM UOC** field.

Options

Dehum During Uno If you wish to disable dehumidification during unoccupied mode, change this field value to "No."

No Dehum Reclaim If desired, you may disable dehumidification if there are no reclaim heat stages available for use as supplemental heat. To do this, change the value of this field to "Yes."

Dehum TR This parameter is the throttling range used by the proportional ("P") mode of the dehumidification PID control loop.

Min Sup Dehum This set point is the lowest allowable supply air temperature during dehumidification. If during dehumidification the supply air temperature drops below this set point, stages will be shut down to raise the supply temperature.

Min Space Dehum This set point is the lowest allowable space temperature during dehumidification. If during dehumidification the space temperature drops below this set point, stages will be shut down to raise the space temperature.

13.10.10Screen 10: OSS

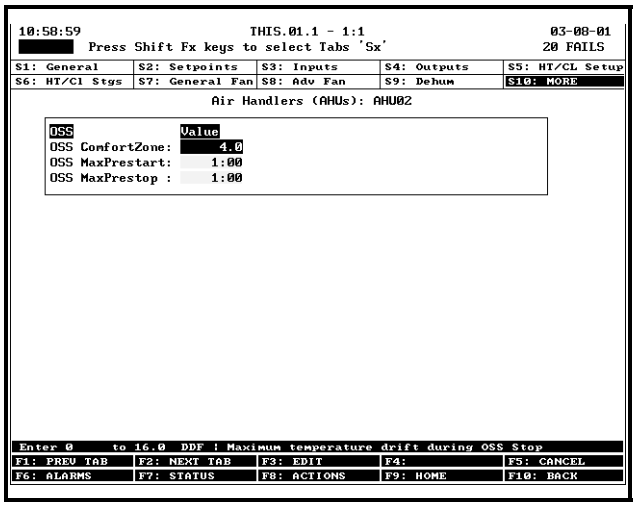


Figure 13-13 *- AHU Optimum Start/Stop Screen*

Required Steps

1. Enter the maximum desired duration of the pre-start time in the **OSS MaxPrestart** field. A pre-start period will never be longer than this set point.
2. Enter the maximum desired duration of the pre-stop time in the **OSS MaxPrestop** field. A pre-stop period will never be longer than this set point.
3. The **OSS ComfortZone** field is a "dead band" around the occupied set point (for pre-starts) or unoccupied set point (for pre-stops) that signifies the "close enough" range of temperatures. If at the end of a pre-start or pre-stop the temperature is above or below the desired set point by 1/2 the OSS ComfortZone total, the Zone will consider the prestart or prestop successful. Enter the desired ComfortZone in this field.

13.10.11Screen 11: Econ

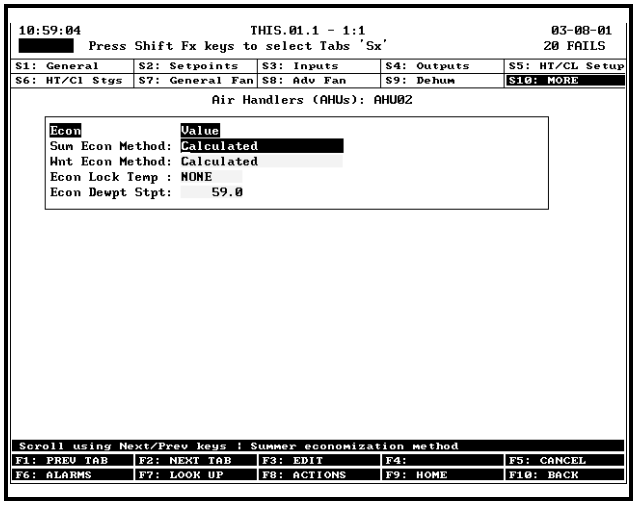


Figure 13-14 *- AHU Economization Screen*

Required Steps

1. Enter the economization control strategy to use when the AHU is is Summer Mode in the **Sum Econ Method** field. See **Section 13.4.1** for a description of the options.
2. Enter the economization control strategy to use when the AHU is in Winter Mode in the **Win Econ Method** field. See **Section 13.4.1** for a description of the options.
3. If using analog economizers, enter the minimum damper position to use during occupied and unoccupied mode in the **Occ Min Damper** and **Unocc Min Dmpr** fields.
4. If using any strategies that require enthalpy calculation (specifically "Calculated"), enter the maximum outdoor air enthalpy value that will be conidered favorable for economization in the **Econ Enth Stpt**. When enthalpy is above this set point, economization will be locked out.
5. If using any strategies that require a dewpoint set point (specifically "Dewpoint" or "Dewpoint Fail-Safe"), enter the maximum outdoor air dewpoint that is considered acceptable for economization in the **Econ Dewpt Stpt** field.

Options

Econ Lock Temp When the outdoor air temperature falls below this level, economization will be locked out regardless of the strategy being used. If you wish to use this feature, enter the desired temperature in this field. Otherwise, leave this field set to NONE.

Econ TR The Economizer TR field is the throttling

range used by analog damper's PID control. The Throttling Range determines the range of temperatures around the mixed air temp, enthalpy, or dew point set point across which the proportional ("P") segment of the PID control varies from 0% to 100%. Enter the desired range in this field.

13.10.12Screen 14: Alarms

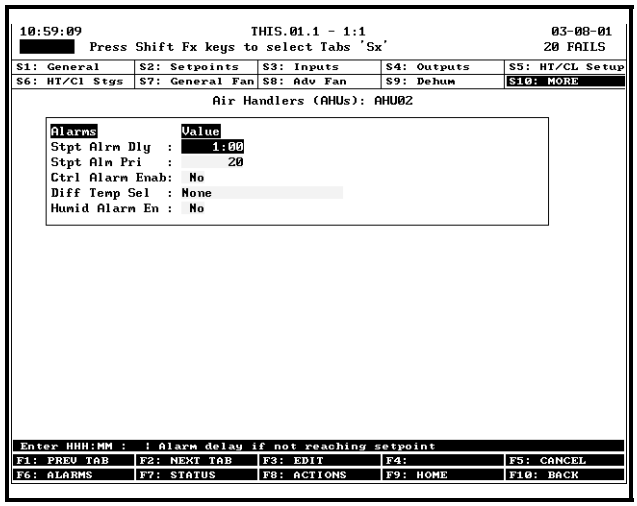


Figure 13-15 *- AHU Alarms Screen*

Options

Stpt Alrm Dly The Set Point Alarm Delay is a special alarm feature that generates an alarm if a heating or cooling set point is not satisfied after a certain amount of time after heating or cooling begins. The timer begins counting when the first stage of heat or cool comes on, and ceases counting when the heating or cooling set point is reached. If this timer exceeds the duration specified in the Set Point Alarm Time field, an alarm will be generated to warn of a possible heating or cooling problem.

Stpt Alm Pri This field sets the alarm priority level for the set point alarm described in the Stpt Alrm Dly field description above. The default value, 20, is a sufficient priority for most installations. If a different priority is desired, enter it in this field.

Ctrl Alarm Enab The Control Alarm Enable field allows you to select whether or not you want to generate alarms when the control temperature (space temperature) is too high or too low. Selecting “Yes” in this field will cause the screen to display the high and low occupied and unoccupied alarm set point fields. Selecting “No” hides these fields and disables control temperature alarming.

Hi Ctrl Tmp Occ Enter the high control temperature alarm set point for use during occupied mode in this field.

Lo Ctrl Tmp Occ Enter the low control temperature alarm set point for use during occupied mode in this field.

Hi Ctrl Tmp Unoc Enter the high control temperature alarm set point for use during unoccupied mode in this field.

Lo Ctrl Tmp Unoc Enter the low control temperature alarm set point for use during unoccupied mode in this field.

Hi Ctrl Alm Dly Enter the amount of time, in hours:minutes:seconds format, the control temperature must be higher than the active high control temperature set point before an alarm will be generated.

Lo Ctrl Alm Dly Enter the amount of time, in hours:minutes:seconds format, the control temperature must be lower than the active low control temperature set point before an alarm will be generated.

Ctrl Tmp Alm Pri This field sets the alarm priority level for the high and low control temperature alarms. The default value, 20, is a sufficient priority for most installations. If a different priority is desired, enter it in this field.

Diff Temp Sel If you wish to use differential alarms (i.e. generating alarms when the difference between the supply temperature and another sensor lower than a set point), choose the sensor whose value will be compared to the supply temperature sensor.

- *None (default)* - No differential temperature alarms will be generated.
- *Control In* - The AHU’s control temperature will be compared to the supply temperature.
- *Return* - The AHU’s return air temperature will be compared to the supply temperature.
- *Mixed Air* - The AHU’s mixed air temperature will be compared to the supply temperature.

Heat Alarm Diff This field sets the differential alarm set point for use during heating mode. When the difference between the supply temperature and the sensor you chose in the Diff Temp Sel field is lower than this set point, an alarm will be generated.

Cool Alarm Diff This field sets the differential alarm set point for use during cooling mode. When the difference between the sensor you chose in the Diff Temp Sel field and the supply temperature is lower than this set point, an alarm will be generated.

Diff Temp Dly Enter the amount of time a differential must be below the set point before an alarm will be generated. Enter the time in hours:minutes format.

Diff Alm Pri This field sets the alarm priority for the differential alarms. The default priority, 20, should be sufficient for most installations. If a different priority is desired, enter it in this field.

Humid Alarm En If you wish to generate alarms based on high indoor humidity, set this field to "Yes."

Hi Hum Stpt Occ Enter the high humidity alarm set point to be used during occupied mode in this field.

Hi Hum Stpt Uoc Enter the high humidity alarm set point to be used during occupied mode in this field.

Hi Hum Alm Dly Enter the amount of time the indoor humidity must be above the set point before an alarm will occur. Enter the time in hours:minutes:seconds.

Hi Hum Alm Pri This field sets the alarm priority for the high humidity alarm. The default priority, 20, should be sufficient for most installations. If a different priority is desired, enter it in this field.

14 HVAC Zone Setup

14.1 Overview

An **HVAC zone** is a collection of up to sixteen rooftop units or air handling units that work together to maintain the same temperature and humidity throughout a particular volume of space. The primary function of an HVAC zone is to "manage" the operation of each individual HVAC unit by providing the temperature set points that will be used in Temperature Control. Zones are also responsible for ordering HVAC units to dehumidify and determining when outside air conditions are favorable to economize.

14.1.1 How Zones Work

A zone is built by first creating a Zone application in the Einstein BX-300. Then, all HVAC unit applications that will be a part of the zone must be connected with the Zone application. This connection process is known as **association**.

When a rooftop unit or AHU is associated with a Zone, the Einstein automatically makes a series of I/O connections between the Zone application and the individual ARTC or AHU application. From that point on, the Zone is responsible for passing along the following information to the individual unit:

- The heating and cooling set points it will use during occupied and unoccupied building times,
- A command to operate in either occupied or unoccupied mode (based on the Zone application's own time schedule input),
- Outdoor air and outdoor relative humidity values,
- A signal to enable or disable economization (based on the Zone application's own economization checking method),
- A signal to begin or end dehumidification (based on the Zone application's own humidity reading and dehumidification set point),
- A signal indicating the current season is either SUMMER or WINTER,
- The combined zone temperature and zone humidity (based on a combination of each HVAC unit's space temperature and space humidity), and

14.1.2 Applications That May Be Connected To Zones

There are two different HVAC applications that may be associated with a Zone application: an ARTC application, and an AHU application. The ARTC application interfaces with the ARTC I/O network board that controls rooftop units. AHU applications use input and output points on the I/O network to control air handling units.

14.1.2.1 ARTCs

The ARTC is a control board on the Einstein's I/O network that controls the operation of a single rooftop HVAC unit. This board has an on-board processor with numerous inputs, relay outputs, and 0-10VDC analog outputs, and is designed for controlling advanced rooftop units with a large number of heat/cool stages, variable-position economizers, variable-speed fans, etc.

ARTC applications serve only two purposes: to act as an interface between the user and the ARTC processor, and to allow communications between the ARTC board and the Zone application. The ARTC depends on the Zone application to provide temperature set points, dehumidification and economization enabling, and other information.

The ARTC board also has the ability to act in stand-alone mode without help from the Zone application. The ARTC has its own fallback temperature control strategy, and even has a seven-day fallback occupancy schedule that may be substituted when communications with the Zone is lost.

14.1.2.2 AHUs

An AHU controls all aspects of an air handling unit, including up to eight stages of auxiliary or reclaim heat, six cooling stages, dehumidification, analog or digital economization, and support for single-, two-, or variable-speed fans.

Normally, since AHUs are designed to cover a wide area of space, AHU Control applications operate on their own and are not associated with Zone applications (they are large enough to be "zones" within themselves). However, if desired, an AHU may be associated with a Zone application, which will allow the AHU to use the Zone's set points, occupancy state, summer/winter state, and dehumidification and economization enabling.

14.2 Temperature Control

As mentioned, Zone applications do not "control" temperature themselves. Zone applications simply pass along the set points an HVAC unit will use, and the individual unit is responsible for controlling to the set point using its

own temperature input.

The Zone application passes along eight different set points, which are shown in ***Table 14-1***. Of these set points, the application receiving the set points will only use one cooling and one heating set point. The pair the application will use is determined by whether the current season is SUMMER or WINTER and whether the building is OCCUPIED or UNOCCUPIED (both of which is supplied by the Zone).

Cooling	Heating
SUMMER COOL OCC	SUMMER HEAT OCC
SUMMER COOL UOC	SUMMER HEAT UOC
WINTER COOL OCC	WINTER HEAT OCC
WINTER COOL UOC	WINTER HEAT UOC

Table 14-1 *- Possible Heating/Cooling Set Points*

14.2.1 Zone Temperature

Each ARTC and AHU application has a space temperature output that is equal to the unit's current control temperature. When associated with a Zone application, this space temperature output is connected to one of sixteen Zone Temperature inputs in the Zone application. These sixteen inputs are then combined using a user-defined combination method to yield the **zone temperature**.

Zone temperature provides an at-a-glance view of how well the units within the zone are doing in heating and cooling. If desired, zone temperature may also be used as a temperature control input by one or all of the Zone's HVAC applications.

14.3 Economizer Control

A Zone application is responsible for analyzing the outside air conditions and determining if the conditions are favorable for bringing in outside air. If the air condition is favorable, the Zone sends a signal to its assoicated HVAC units telling them economization is OK. If not, it sends a signal to disable economization.

It is up to the associated HVAC unit to process the economization information and open the dampers.

14.3.1 Economization Enable

There are five possible ways a Zone application may determine when conditions are favorable for economization:

1. ***Enthalpy Switch*** **-** An enthalpy switch is a digital device that is pre-set to detect when the temperature and humidity levels are favorable for economization. When the conditions are favorable, this switch sends an OK (ON) signal to the Zone application. Otherwise, the switch sends a NOT OK (OFF) signal.
2. ***Dew Point Set Point*** **-** A dew point probe measuring the dew point of the outside air is compared to a set point. If the outside air dew point is less than the set point, economization is enabled. If it is higher than the set point, economization is disabled.
3. ***Calculated Enthalpy*** **-** The Zone application calculates the outside air enthalpy by reading the value of a relative humidity sensor and an outdoor air temperature sensor. This calculated enthalpy is compared to a set point. If the enthalpy is less than the set point, economization is enabled. If greater, economization is disabled.
4. ***Dew Point Fail-Safe*** **-** This is similar to method #2, except an outdoor temperature sensor value is compared to the set point instead of a dew point probe's value. This comparison is a poor substitute for actual dew point readings and is recommended for use as a fail-safe only. When possible, use humidity or dew point sensors.
5. ***Temperature Comparison*** **-** The AHU Control application simply compares the temperature of the inside air with the temperature of the outside air. If the outside air is cooler than the inside air, economization is enabled.
6. ***In vs. Out Enthalpy*** **-** This strategy requires indoor and outdoor humidity sensors and also indoor and outdoor temperature sensors. The enthalpy of the outdoor air is calculated and compared to the enthalpy of the indoor air. If the outdoor air enthalpy is less than the indoor air enthalpy, economization is enabled. Otherwise, economization is disabled.

You may choose a different method for use in summer and winter months. Also, an alternate method may be specified that will be used as a fail-safe when the primary method is not available (due to sensor failure, etc.).

14.3.2 Effect of Enabling Economization

Both ARTC and AHU applications support the use of both two-position (digital) and variable-position (analog) economizers. Digital economizers, when enabled, behave like a first stage of cool. When analog economizers are enabled, the ARTC or AHU will modulate the opening percentage of the dampers based on its own mixed air temperature measurements.

14.4 Dehumidification Control

A Zone application is responsible for reading the relative humidity level within the zone, comparing it to a dehumidification set point, and sending a command to dehumidify when the humidity is above the set point.

Once the zone humidity level rises above the set point, dehumidification will be active in all the Zone application's associated HVAC units until the indoor relative humidity falls below the set point minus the dehumidification hysteresis value. An example of this is shown in ***Figure 14-1***.

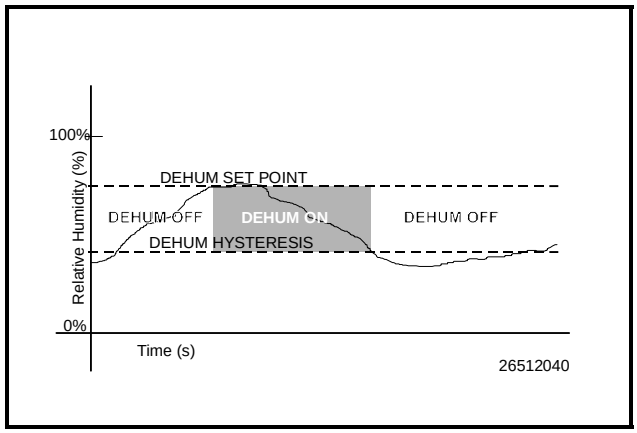


Figure 14-1 - *Dehumidification Set Point Control*

The need for dehumidification may also be determined by a digital humidistat. In this case, dehumidification is active only when the humidistat input is ON.

14.4.1 The Zone Humidity Input

Note that unlike Zone Temperature, which has sixteen inputs that combine into a single value, Zone Humidity is designed to be provided by a single input. However, there may be some instances where one or more relative humidity sensors exist within a zone (such as an installation where each ARTC has its own humidity sensor for use in stand-alone mode). If you have multiple humidity sensors in a zone and you wish to combine these humidity sensor values to calculate Zone Humidity, use an Analog Combiner application to make the combination, and tie the Zone application's Zone Humidity input to the output of the combiner. Refer to **Section 30** for Analog Combiner application programming instructions.

14.4.2 Effect of Enabling Dehumidification

When a Zone application determines that dehumidification is needed, it sends an ON signal to all its associated controllers, signaling them to begin dehumidification. It is up to the individual ARTC or AHU to perform the dehumidificiation.

14.4.2.1 ARTCs

Once the ARTC application acknowledges the signal to begin dehumidification, it will search its outputs for a dehumidification device. If one is configured, this device will be turned on. Afterwards, cool stages will be cycled ON (up to a user-defined maximum number of stages) until all stages are ON or until the Zone application signals dehumidification is complete. When dehumidification is complete, the stages will cycle OFF followed by the dehumidification device.

14.4.2.2 AHUs

AHUs use a special dehumidification algorithm based on the Proportional loop in PID control (see Appendix B). When dehumidification is enabled by the Zone application, the AHU application will activate a percentage of its total cool stage capacity, the amount of which depends on how close the current relative humidity is to the set point. See **Section 23,** ***Air Handling Unit Setup***, for more information.

14.5 Optimum Start/Stop (OSS)

OSS applies only to Zone applications that use a time schedule to change occupancy states. Overrides initiated by the digital BYPASS TO OCC or BYPASS TO UNOCC inputs will not initiate pre-starts or pre-stops.

Optimum Start/Stop (OSS) is a feature that works alongside the Zone application's occupied and unoccupied temperature control modes. OSS takes control of heating and cooling several minutes before the Zone application is scheduled to change occupancy states, and prepares the area for the upcoming change in set points. As a result, when the occupancy state changes, the temperature will be comfortably within the range of the new set point.

Figure 14-2 shows an example of how pre-starts and pre-stops work in a heating application. From unoccupied mode, the pre-start period ramps the temperature up slowly so that when the scheduled change from unoccupied to occupied mode occurs, the temperature will already be at or near the occupied heating set point. During the pre-stop, which occurs before the Zone application goes from occupied to unoccupied mode, heating is sus-

pended and the temperature is allowed to "coast" down to the unoccupied set point.

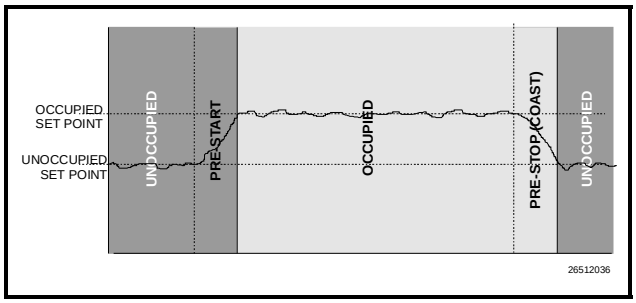


Figure 14-2 *- Diagram of Pre-Start and Pre-Stop Operation*

Intelligent Pre-Starts and Pre-Stops

OSS is designed to handle pre-starts and pre-stops in the most energy-efficient manner possible. Every time a pre-start or pre-stop occurs, OSS measures the amount of time it takes to bring the temperature from the previous set point to within the "comfort zone" of the new set point (a user-defined range of values above and below the set point within which the temperature is considered acceptable). This duration is used to determine the average rate of temperature change, called the K-factor.

The K-factor is stored in the memory along with the average value of the outdoor air temperature during the pre-start or pre-stop. Over time, collected K-factor data will be sorted and combined into a table. As a result, by constantly observing and recording the results of previous pre-starts and pre-stops, OSS will be able to intelligently guess how much time a pre-start or pre-stop mode should last based on the outside temperature.

AHU Control keeps track of three different kinds of K-factors:

- *Heat K-factor* - used to guess pre-start durations for AHUs operating in heating mode.
- *Cool K-factor* - used to guess pre-start durations for AHUs operating in cooling mode.
- *Coast K-factor* - a measurement of the change in temperature when no heating or cooling is active. This is used to determine pre-stop durations for both heating and cooling AHUs.

14.6 Losing Contact With Zone Applications

When an ARTC or AHU loses contact with the Zone application to which it was assigned, it is forced to operate in Stand-Alone Mode. Each of the different applications have different stand-alone capabilities.

14.6.1 Stand-Alone ARTCs

The ARTC uses its own occupied and unoccupied heating and cooling set points when it operates in Stand-Alone Mode. These values are programmed through the ARTC application and stored in the memory on the ARTC board itself. During Stand-Alone Mode, the ARTC uses its space temperature sensor value as the control input.

The ARTC also has a seven-day fallback occupancy schedule that it may use to determine occupied or unoccupied building status. Different times may be programmed in the ARTC application for Sunday through Saturday. Holiday scheduling is not supported.

Economization control is available if the sensor providing the economization checking is connected to an input on the ARTC. Otherwise, economization is disabled.

As it does in temperature control, the ARTC stores its own occupied and unoccupied dehumidification set points. If the ARTC has its own humidity sensor, it will continue dehumidification using the stored fallback set points.

14.6.2 Stand-Alone AHUs

Since no specialized board exists that controls AHUs, it is unlikely an AHU will lose communication with a Zone application (since both applications exist within the same Einstein). It is still possible for a Zone application to malfunction and/or send bad sensor values to an associated AHU. The AHU reacts to these failures by using its own fail-safe measures.

14.7 Assigning ARTCs and AHUs to Zones

ARTCs and AHUs are assigned to Zone applications using the RTC <-> Zone Association Screen (***Figure 14-3***). To access this screen, press F8 followed by X Z to call up the Application Configuration Menu, and press 6 to choose the RTC <-> Zone Association item.

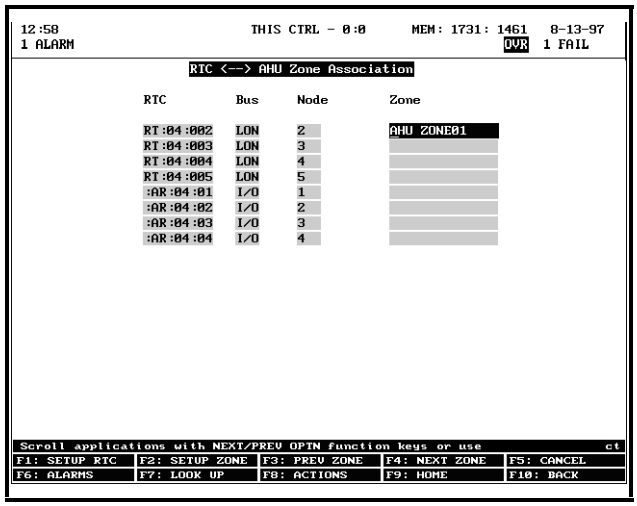


Figure 14-3 *- RTC - Zone Association Screen*

The RTC <-> Zone Association screen lists all AHUs and ARTCs that are set up on the current Einstein. To make an association, move the cursor to the Zone field of the RTC you wish to associate, and press F3 or F4 until the desired zone name appears.

From this screen, you may also choose to jump to the Setup Editor to configure an individual AHU, ARTC, or Zone application by using the SETUP RTC/AHU key (F1) or the SETUP ZONE (F2) key.

14.8 HVAC Zone Properties

14.8.1 Screen 1: General

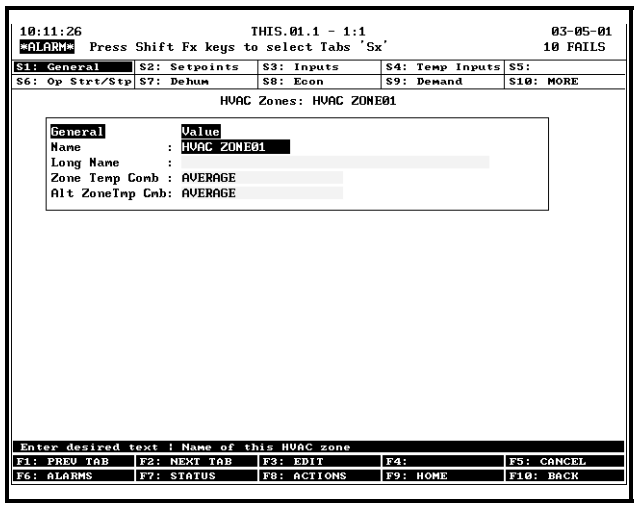


Figure 14-4 *- HVAC Zone General*

Required Steps

1. Enter a name for the HVAC Zone in the **Name** field.
2. In the **Zone Temp Comb** field, enter the strategy you wish to use to combine the Zone's associated AHU and ARTC space temperatures into a single "zone temperature" value. Choose one of the four combination strategies below:
   - AVG - the average of all space temperature inputs.
   - MIN - the lowest space temperature sensor value will be used as the zone temperature.
   - MAX - the highest space temperature sensor value will be used as the zone temperature.
   - FIRST - the lowest numbered Zone Temp input that is defined and returning a valid temperature value will be used as the zone temperature.

Options

Long Name If desired, enter a longer name or description for this zone in the **Long Name** field.

14.8.2 Screen 2: Setpoints

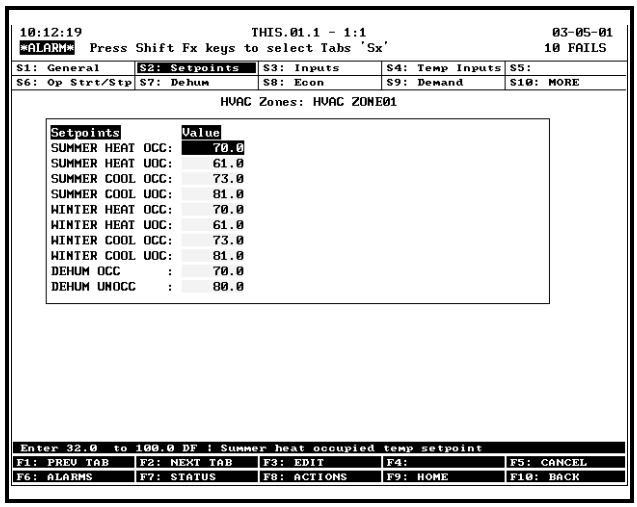


Figure 14-5 *- HVAC Zone Setpoints*

Required Steps

Enter values for all the heat, cool, and dehumidification set points listed below.

SUMMER HEAT OCC In this field, enter the set point that will be used for heating during occupied summer mode. If you wish to set up an input to supply this set point, use the Edit function key to change the definition format, and enter the location of the analog input that will supply the set point value.

SUMMER HEAT UOC In this field, enter the set point that will be used for heating during unoccupied summer mode. If you wish to set up an input to sup-

ply this set point, use the Edit function key to change the definition format, and enter the location of the analog input that will supply the set point value.

SUMMER COOL OCC In this field, enter the set point that will be used for cooling during occupied summer mode. If you wish to set up an input to supply this set point, use the Edit function key to change the definition format, and enter the location of the analog input that will supply the set point value.

SUMMER COOL UOC In this field, enter the set point that will be used for cooling during unoccupied summer mode. If you wish to set up an input to supply this set point, use the Edit function key to change the definition format, and enter the location of the analog input that will supply the set point value.

WINTER HEAT OCC In this field, enter the set point that will be used for heating during occupied winter mode. If you wish to set up an input to supply this set point, use the Edit function key to change the definition format, and enter the location of the analog input that will supply the set point value.

WINTER HEAT UOC In this field, enter the set point that will be used for heating during unoccupied winter mode. If you wish to set up an input to supply this set point, use the Edit function key to change the definition format, and enter the location of the analog input that will supply the set point value.

WINTER COOL OCC In this field, enter the set point that will be used for cooling during occupied winter mode. If you wish to set up an input to supply this set point, use the Edit function key to change the definition format, and enter the location of the analog input that will supply the set point value.

WINTER COOL UOC In this field, enter the set point that will be used for cooling during unoccupied winter mode. If you wish to set up an input to supply this set point, use the Edit function key to change the definition format, and enter the location of the analog input that will supply the set point value.

DEHUM OCC This value is the dehumidification set point that will be used when the Zone is operating in occupied mode.

DEHUM UNOCC This value is the dehumidification set point that will be used when the Zone is operating in unoccupied mode.

14.8.3 Screen 3: Inputs

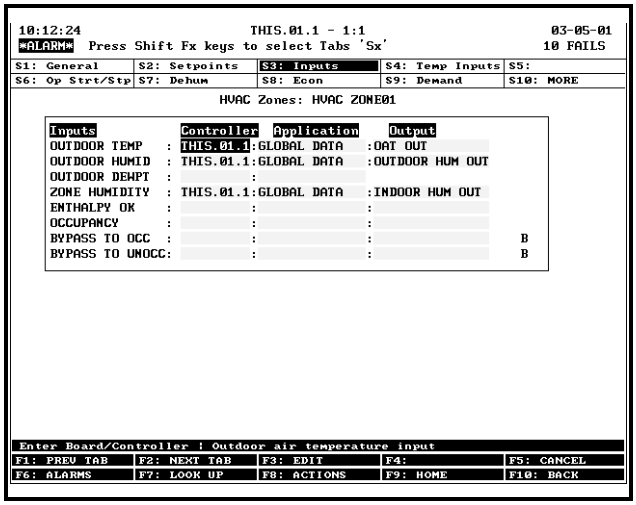


Figure 14-6 *- HVAC Zone Inputs*

Required Steps

1. In the **OCCUPANCY** input definition, enter the location of the Time Schedule output that will supply this HVAC Zone with occupied and unoccupied building times.
   - Press F7 and choose the name of the current Einstein BX in the **Controller** field.
   - Press F7 and choose the name of the Time Schedule application to be used in the **Application** field.
   - In the **Output** field, press F7 and choose "OUTPUT" from the Look-Up Table.
2. The HVAC Zone application assumes you have an outdoor temperature and outdoor humidity sensor configured in Global Data. If this is true, you do not need to change the values of the **OUTDOOR TEMP** and **OUTDOOR HUMID** fields. If you do not wish to use Global Data for these inputs, define these input definitions with the board and point addresses of the outdoor temperature and/or outdoor humidity sensors. Press F7 1 1 to change the format of each definition to Board:Point before doing this.
3. If you are using a humidistat (digital humidity sensor) instead of an indoor analog humidity sensor for use in dehumidification control, enter the board and point address of this sensor in the **HUMIDISTAT** field. In order to make this field appear on this screen, press Shift + F7 to navigate to the Dehum screen, and select "Humidis-

tat" in the Humid Snsr Type field. Then, press Shift + F3 to return to the Inputs screen.

Options

OUTDOOR DEWPT If an outdoor dewpoint probe is required for this system, enter the board and point address of the dewpoint probe in this definition.

ZONE HUMIDITY This input is connected to the Global Data application's "INDOOR HUM OUT" output.

ENTHALPY OK This input is visible only when "Enthalpy Switch" is selected as a summer, winter, or alternate economization checking method. Enter the location of the enthalpy switch that will be used for enabling economization in this field.

BYPASS TO OCC This input is used to bypass the Zone and all of its associated controllers to "occupied." When this output is ON, the Zone application will bypass itself and all associated RT-100s and ARTCs to occupied, regardless of the value of the OCC STATE input. When this output is OFF, the bypass will not be in effect.

If both the Bypass to Unocc and the Bypass to Occ inputs are ON at the same time, Bypass to Unocc will always take priority.

BYPASS TO UNOCC This input is used to bypass the Zone and all of its associated controllers to "unoccupied." When this output is ON, the Zone application will bypass itself and all associated RT-100s and ARTCs to unoccupied, regardless of the value of the OCC STATE input. When this output is OFF, the bypass will not be in effect.

If both the Bypass to Unocc and the Bypass to Occ inputs are ON at the same time, Bypass to Unocc will always take priority.

14.8.4 Screen 4: Temp Inputs

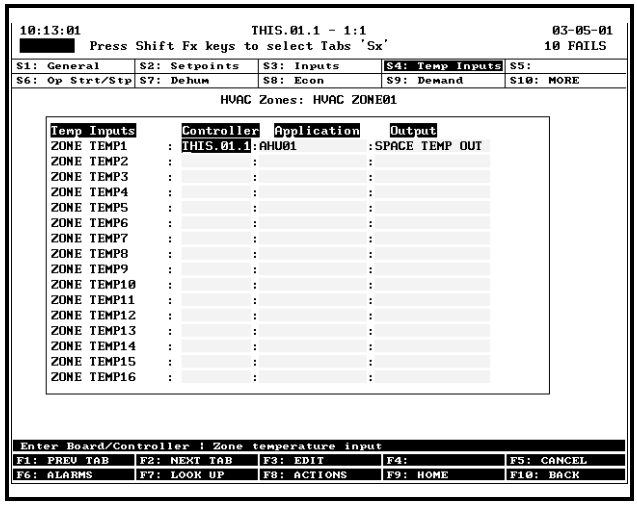


Figure 14-7 *- HVAC Zone Temp Inputs*

ZONE TEMP The sixteen Zone Temp inputs receive the space temperature values from each of its associated controllers. Each Zone Temp input is automatically connected to one of the SPACE TEMP OUT outputs of an RT-100, ARTC, or AHU in the zone. The Zone Temp inputs are then combined into a single zone temperature using the combination method defined in the Zone application.

14.8.5 Screen 6: Op Strt/Stp

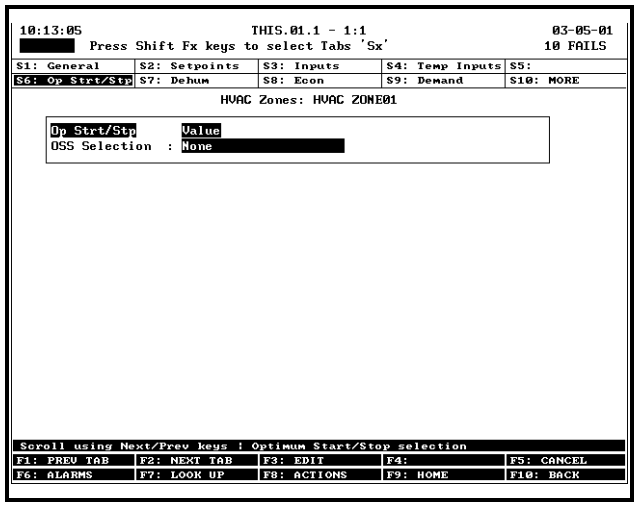


Figure 14-8 *- HVAC Zone Op Start/Stop*

Required Steps

1. Select the mode of Optimum Start/Stop you wish to use for ARTCs and AHUs that are part of this zone. This field determines the type of Optimum Start/Stop that will be used by the Zone. There are four options:
   - *None* - No OSS will be used.

- *Start/Stop* - The Zone application will use both pre-starts and pre-stops.
- *Start* - The Zone application will use pre-starts only.
- *Stop* - The Zone application will use pre-stops only.

2. Enter the maximum desired duration of the pre-start time in the **OSS MaxPrestart** field. A pre-start period will never be longer than this set point.
3. Enter the maximum desired duration of the pre-stop time in the **OSS MaxPrestop** field. A pre-stop period will never be longer than this set point.
4. The **OSS ComfortZone** field is a "dead band" around the occupied set point (for pre-starts) or unoccupied set point (for pre-stops) that signifies the "close enough" range of temperatures. If at the end of a pre-start or pre-stop the temperature is above or below the desired set point by 1/2 the OSS ComfortZone total, the Zone will consider the prestart or prestop successful. Enter the desired ComfortZone in this field.

14.8.6 Screen 7: Dehum

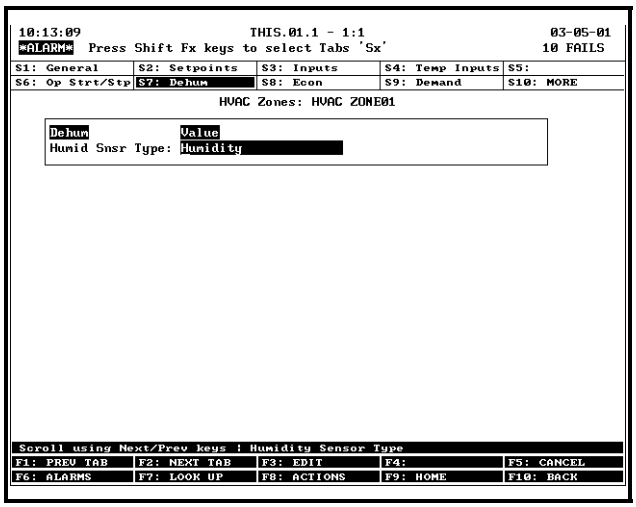


Figure 14-9 *- HVAC Zone Temp Inputs*

Required Steps

1. If any AHU or ARTC on this Zone will be duing dehumidification, choose the type of humidity sensor that will control dehumidification in the **Humid Sensor Type.**
   - ***Humidity (default)*** **-** An analog indoor humidity sensor will be used.
   - ***Dewpoint*** **-** A dewpoint probe will be used.
   - ***Humidistat*** **-** A digital humidity sensor will be used. If you select this option, press Shift + F3 to navigate back to the Inputs screen, and enter the board and point of the humidistat you wish to use.

Advanced Options (press F8 + Q to edit)

Dehum Hyst The Dehum Hyst is the number of percentage points below the currently active dehumidification set point the relative humidity must go in order to end dehumidification mode.

14.8.7 Screen 8: Econ

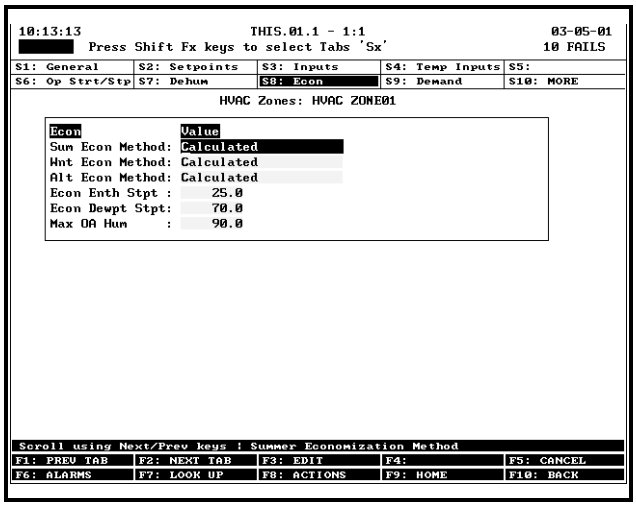


Figure 14-10 *- HVAC Zone Econ Screen*

Required Steps

1. Enter the economization control strategy to use when the Zone is is Summer Mode in the **Sum Econ Method** field. See **Section 14.3.1** for a description of the options.
2. Enter the economization control strategy to use when the Zone is in Winter Mode in the **Win Econ Method** field. See **Section 14.3.1** for a description of the options.
3. Enter the backup economization control strategy to be used if the box cannot use either the **Sum Econ Method** or **Win Econ Method**. See **Section 14.3.1** for a description of the options.
4. If using any strategies that require enthalpy calculation (specifically "Calculated"), enter the maximum outdoor air enthalpy value that will be conidered favorable for economization in the **Econ Enth Stpt**. When enthalpy is above this set point, economization will be locked out.
5. If using any strategies that require a dewpoint set point (specifically "Dewpoint" or "Dewpoint

Fail-Safe"), enter the maximum outdoor air dewpoint that is considered acceptable for economization in the **Econ Dewpt Stpt** field.

6. Enter the outdoor air humidity level above which all economization will be locked out in the **Max OA Hum** field.

14.8.8 Screen 9: Demand

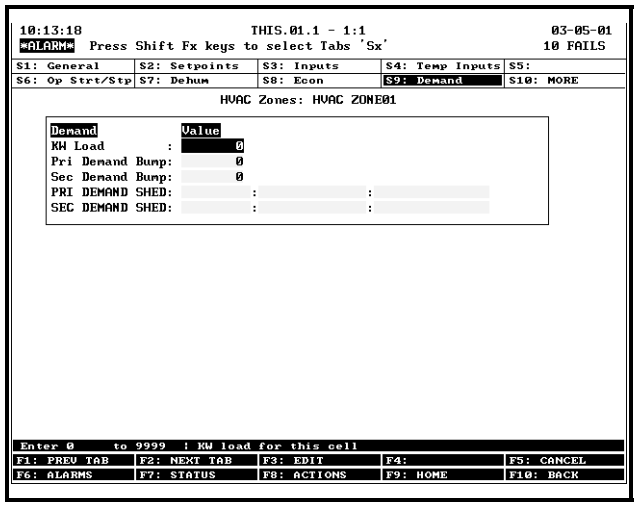


Figure 14-11 *- HVAC Zone Demand Screen*

Options

KW Load Enter the total kW load of all devices connected to the Zone application in this field. This value is used as a reference for power monitoring and demand limiting.

Pri Demand Bump The Primary Demand Bump value is the amount that will be added to the cooling set points and subtracted from the heating set points when the Pri Demand Shed input is ON.

Sec Demand Bump The Secondary Demand Bump value is the amount that will be added to the cooling set points and subtracted from the heating set points when the Sec Demand Shed input is ON.

PRI DEMAND SHED This input is used to modify all heating and cooling set points in such a way as to save energy. When this input is ON, the value entered in the Primary Demand Bump field will be added to all cooling set points and subtracted from all heating set points. When this input is OFF, the Zone application will not apply the Primary Demand Bump value to the set points.

SEC DEMAND SHED This input is used to modify all heating and cooling set points in such a way as to save energy. When this input is ON, the value entered in the Secondary Demand Bump field will be added to all cooling set points and subtracted from all heating set points. When this input is OFF, the Zone application will not apply the Secondary Demand Bump value to the set points.

14.8.9 Screen 10: Stand Alone

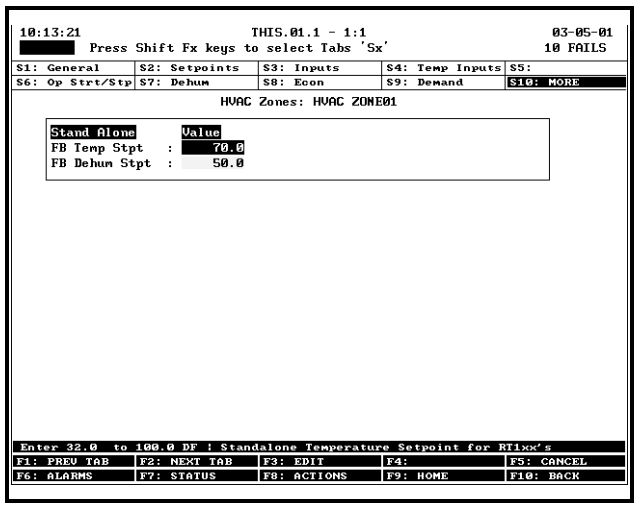


Figure 14-12 *- HVAC Zone Stand Alone Settings*

Options

FB Temp Stpt The Fallback Temperature Set Point is sent to the Zone application's associated RT-100s and ARTCs for use as the control set point in stand-alone mode. When a rooftop control board loses communications with its Zone application, the rooftop board takes the last valid sent value of the Fallback Temperature Set Point and uses it as the control set point.

FB Dehum Stpt The Fallback Dehumidification Set Point is sent to the Zone application's associated RT-100s and ARTCs for use as the control dehumidification set point in stand-alone mode. When a rooftop control board loses communications with its Zone application, the rooftop board takes the last valid sent value of the Fallback Dehumidification Set Point and uses it as the control set point.

15 ARTC Control

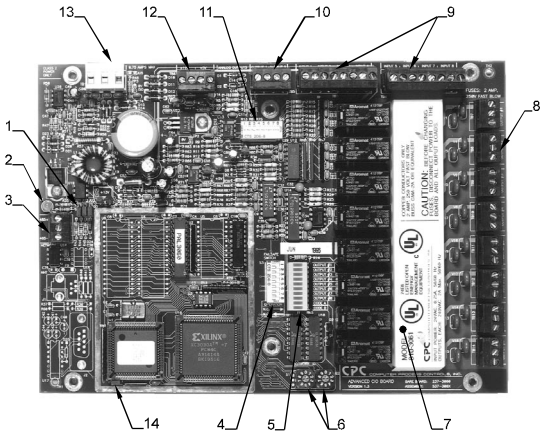
This section provides complete information on the ARTC rooftop controller board and how it works alongside the Einstein to control heating, cooling, and other systems within rooftop HVAC units.

15.1 Introduction

The Einstein BX controls rooftop HVAC units by using a special kind of control board called the Advanced Rooftop Controller (ARTC). The Einstein groups ARTCs together in zones as described in **Section 14,** *HVAC Zone Setup*. All ARTCs within a zone share the same control set points and work together to keep the temperatures in the zone within the specified set point range.

15.2 Hardware Overview

15.2.1 The ARTC



LEGEND			
1	Termination Resistance Jumpers	8	Output Connections (8 places)
2	LED Power Indicator	9	Input Connections
3	I/O Network Connection	10	Analog Outputs
4	Fail-Safe Dip Switch	11	Input Type Dip Switch
5	LED Output Indicators	12	Power Output Connection
6	Network Address Rotary Dials	13	AC Power Input Connection
7	Relay Output Fuses (under cover)	14	4AO Enable Jumper (JU4)

26501010

Figure 15-1 *- The Advanced Rooftop Controller Board*

The Advanced Rooftop Controller (ARTC) (P/N 810-3060), shown in ***Figure 15-1***, is a stand-alone version of the 8IO board, and is used to control rooftop HVAC units. The ARTC controls all functions of the HVAC rooftop control based on set points established within the Einstein. Because the ARTC is configured with a Random Access Memory (RAM) chip, microprocessor, and flash memory, it can continue to perform all controlling functions even when communication to the Einstein is lost. Furthermore, this same configuration allows the controller to download the most recent control set points to the Einstein after communication is reestablished.

Similar to the Einstein, the ARTC has various memory chips that are preprogrammed with default set points. The ARTC is capable of operating a rooftop unit as soon as the ARTC has been wired to an RTU and a single space temperature probe. Set points may be altered at any time from the hand-held terminal and are valid until a connection between the ARTC and Einstein is made.

The ARTC monitors input data from sensors connected directly to it, and can receive additional input data routed through the Einstein from sensors connected to other ARTCs or input boards.

15.3 Software Overview

15.3.1 Introduction to Zone Control

ARTCs are designed to be grouped together in **zones**. Zones are groups of ARTCs and/or AHU (air handling unit) applications that share the same heating, cooling, and dehumidification set points, as well as other control parameters. The primary purpose of zone control is to maintain a specific temperature and humidity level throughout a wide area using multiple rooftop units.

When an ARTC board is set up on the network, a control application is created in the Einstein for each board. These applications are called Rooftop Control applications. Each of the Rooftop Control applications has its own control inputs and outputs, and controls all of the systems of a single board. For zone control, a Zone application is created, and one or more of the Rooftop Control applications are assigned to the zone.

In general terms, it is best to think of the relationship between Zone applications and Rooftop Control applications as a master-slave arrangement. Each Rooftop Control application does most of the work to keep its own environmental conditions within the range specified by its master. The “master” tells each slave what conditions must be met.

15.3.2 Temperature Control

In its most basic form, Temperature Control in a Rooftop Control application simply reads the ARTC space temperature input value, compares it to the active heating or

cooling set point, and activates or deactivates heating or cooling stages in an effort to satisfy the set point.

The majority of user setup that must be done in Temperature Control involves defining different set points in the Zone for use in occupied, unoccupied, summer, and winter modes, and setting up the operating characteristics of the heating and cooling stages.

15.3.2.1 Set Points

There are two active set points in an Rooftop Control application: a cooling set point and a heating set point (both of which are supplied by the Zone application). When the input rises above the cooling set point, cooling mode begins, and when the input falls below the heating set point, heating mode begins.

Rooftop Control applications use PID control to vary the output of heating and/or cooling devices based on the value of the input in relation to the set point, and also based on the specified throttling range. Refer to ***Appendix B*** for more information on PID control.

Unlike normal PID loops that assume a 50% output is required to keep the temperature stabilized on the set point, AHUs strive to stabilize the temperature on the set point with the output at 0%. Thus, when the temperature goes below a heating set point or above a cooling set point, the heating or cooling outputs climb from 0% to 100% as determined by the throttling range (see ***Figure 15-2***).

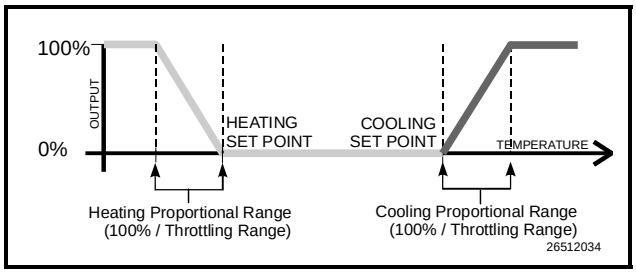


Figure 15-2 *- Example of Dual Flex Loop PID Control*

15.3.2.2 Staged Outputs

As mentioned before, Rooftop Control applications use PID to control temperature. This means that the result of the comparison of the control input and the active set point is an output percentage from 0-100%. If the rooftop unit has multiple heating and/or cooling stages, the Rooftop Control application interprets the PID output percentage as a percentage of the total heating or cooling capacity. In other words, a 28% output in heating mode corresponds to 28% of the total heating stages.

The Rooftop Control application always rounds up when determining how many stages should be on; for example, if there are four heating stages, there will be one stage on from 0-25%, two stages on from 25-50%, three stages on from 50-75%, and four stages on from 75% to 100%. If only one stage is present, this stage will be ON whenever the percentage rises above 0%.

The Rooftop Control application always activates stages sequentially, beginning with stage 1, and continuing with stages 2, 3, and so on. Likewise, stages are deactivated in reverse order, beginning with the highest numbered active stage, and ending with stage 1.

Heating and cooling stages may be set up with on and off delays as well as minimum ON and OFF times.

15.3.2.3 Unoccupied Hysteresis

When the Zone receives an indication that the building is unoccupied, the Rooftop Control applications change from the PID method described previously and use simple ON/OFF control of the heating and cooling outputs.

Rooftop Control applications in unoccupied mode make use of a hysteresis value to form a range of temperature values across which the heating and/or cooling will be applied. As shown in ***Figure 15-3***, when the temperature drops to the Unoccupied Heating Setpoint or rises to the Unoccupied Cooling Setpoint, the heat or cool outputs go to 100% ON. They remain in this state until the temperature rises above the heating setpoint plus the hysteresis, or below the cooling set point minus the hysteresis, at which time the outputs will go to 0% ON.

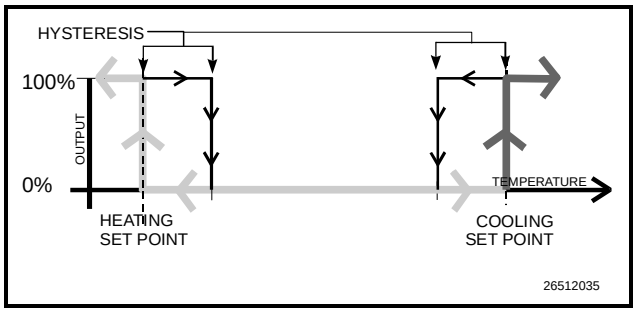


Figure 15-3 *- Unoccupied Hysteresis Mode*

15.3.3 Fan Control

The ARTC boards support control of one single-speed fan stage, a low- and a high-speed fan stage (i.e. two-speed fan control), or a variable-speed fan. The fans may be controlled in one of three ways:

- ***Continuous*** - The fan is always on, even when the Rooftop Control application is not in heating, cooling, or dehumidification mode.
- ***Auto*** - The fan is only on when the Rooftop Control application is in heating, cooling, or dehumidification mode.
- ***Summer ON, Winter Auto*** - This mode allows the fan to operate in Continuous mode during the summer months and in

Auto mode during the winter months.

If desired, activation and deactivation delays may be set up for the Rooftop Control application for both heating and cooling mode.

15.3.4 Humidity Control

Unlike Temperature Control, Humidity Control is handled entirely by Zone applications. A Zone application typically has a single humidity sensor, humidistat, or dewpoint probe input that measures relative humidity or dewpoint for the entire zone. If the zone determines that dehumidification is necessary, it notifies all Rooftop Control applications in the zone to begin dehumidification.

Rooftop Control applications dehumidify by using cool stages or auxiliary outputs that are configured on the ARTC as dehumidification devices. When the command to begin dehumidification is received, the Rooftop Control units begin by cycling on the dehumidification output (if available) or a cool stage. After a programmed delay, if dehumidification is still necessary, a new stage of cool will cycle ON. The Rooftop Control applications will continue cycling cool stages ON in this manner until 100% of its dehumidifying capacity is active (or until the set point is met). Once the set point is met, the stages will cycle OFF.

You may choose the number of cool stages that will be made available for dehumidification.

15.3.5 Economization

Economizer dampers on rooftop HVAC units are used to bring outside air into the building for use in cooling.

Before economization may occur, the Zone application must determine when the outside air conditions are favorable for economization. If economization is OK, it sends an ENABLE signal to its Rooftop Control applications. For as long as the ENABLE signal lasts, Rooftop Control applications treat the economization dampers as if they are preliminary cool stages; if cooling is needed, the dampers will open and economization will begin. If more cooling is needed, the cooling stages would then cycle on as normal.

15.3.6 Curtailment

Some power companies offer curtailment programs that allow participating stores to disable user-defined loads during peak power times in return for discounts on utility rates. Curtailment is NOT handled by the Zone application -- it is handled by individual Rooftop Control applications.

If you are participating in a curtailment program, the power company will supply you with a digital curtailment device that must be connected to the CURTAILMENT IN input in Einstein Global Data (see **Section 9.6,** *Global Data Setup*).

To set up curtailment in the Rooftop Control application, you must designate which specific heating and cooling stages will be subject to curtailment.

When the power company sends a curtail command (i.e. the value of the curtailment device switches to "CLOSED"), all stages that are set up to be curtailed will be shut off and locked out.

Fan control is not directly affected by a call for curtailment. The rooftop unit fan will still run at a speed based on the number of active, non-curtailed stages (or, if using modulated outputs, the curtailed modulating percentage). If this causes the fan to slow down or shut off during curtailment, there will be energy savings from the fans.

15.3.7 Reversing Valve Control

If reversing valves are used, the Rooftop Control application will not be allowed to bring on stages of heat to compensate for cool stage activation during dehumidification.

The Rooftop Control application supports the control of a heat reversing valve and a cool reversing valve. These valves may be wired to any auxiliary output on an ARTC.

The output is controlled as follows:

1. When no heat or cool stages are active, the coil is de-energized (N.C. contacts closed, N.O. contacts open).
2. When a cool stage comes on, the coil will be energized (N.C. contacts open, N.O. contacts closed).
3. When a heat stage comes on, the coil will be de-energized (N.C. contacts closed, N.O. contacts open).

Therefore, in order for the output to control the valve properly, heat reversing valves must be wired to the Normally Closed (N.C.) contacts, and cool reversing valves must be wired to the Normally Open (N.O.) contacts. This causes the heat valves to activate when heat stages are ON, and cool stages to activate when cool stages are ON.

15.3.8 Stand-Alone Operation

If for some reason an ARTC board loses communications with its parent Einstein unit for longer than 375 seconds, the board will go into Stand-Alone Mode.

In Stand-Alone Mode, the ARTC will continue Temperature Control as normal using the space temperature as a control input. Since an ARTC has its own stored fallback set points and a fallback occupancy schedule, will continue operating using its occupied or unoccupied heating and cooling set points.

Dehumidification and Economization will occur dur-

ing stand-alone mode only if the board is equipped with the right sensors, as described below.

Dehumidification Stand-Alone Operation

If the ARTC board has an auxiliary input defined as a relative humidity sensor, Dehumidification will continue as normal using the RH sensor as a control input.

Economization Stand-Alone Operation

The ARTC can economize in stand-alone mode as long as any type of economization checking device is present somewhere on the ARTC board.

Other Stand-Alone Operation

The ARTC will continue operating the reversing valves (if present) as normal. Other control features that rely on communication with Zones or other Einstein applications, such as Demand Shed and Curtailment, Set Point Reset and Optimum Start/Stop, will not be available.

15.3.9 Sensor Failures

In many cases, Rooftop Control and Zone applications can compensate for sensor failures by substituting other sensor values. This allows the applications to continue operating as close to normal as possible until the failed sensors can be fixed or replaced.

Space Temp Failure

If a space temperature sensor on an ARTC fails, the Rooftop Control application will use its parent Zone application's Zone Temperature value as a replacement value. A failure alarm will be generated and sent to the Alarm Advisory Log.

Outside Air Temp Failure

Failure of the outside air temperature sensor affects Economization only if "Temperature Comparison" is the chosen method of economization enabling (option #5 in **Section 14.3.1**). In this case, economization will be disabled for both normal and stand-alone operation. A failure alarm will be generated and sent to the Alarm Advisory Log.

Supply Air Temperature Failure

If the ARTC has an input set up as a supply temperature sensor, differential alarming will be disabled when this sensor fails. A failure alarm will be generated and sent to the Alarm Advisory Log.

Mixed Air Temperature Failure

If the ARTC has an input set up as a mixed air temperature sensor, economization defaults to ON or OK when this sensor fails. In other words, if Economization has no mixed air temperature sensor to help verify that economization is OK, it will assume that economization is OK.

Humidity Failure

Under normal conditions, the ARTC dehumidifies when the Zone application sends a signal to dehumidify. As long as the ARTC receives this signal from the Zone application, any failure of an on-board humidity sensor will have no effect (since this sensor is not being used as the direct control value).

When communications with the Zone application are lost, the only way an ARTC may dehumidify without help from the Zone application is if a humidity sensor is present on the board itself. If no sensor is present, or if the sensor has failed, dehumidification will not take place.

15.4 Hardware Setup

15.4.1 Mounting and Power

Mounting and power wiring instructions for the ARTC are given in **Section 3.2.3.1,** *8IOs/ARTCs Without Enclosures Mounting*, and **Section 4.2.6,** *Powering the I/O Boards*.

15.4.2 Network Setup

The ARTC is an RS485 I/O network board. Refer to **Section 4.2,** *The I/O Network*, for information about wiring the ARTC to the network.

15.4.3 Inputs

The inputs for the ARTC are in two terminal blocks in the top right corner of the board. Most of the functions of these inputs are reserved for certain types of sensors, with the exception of the AUX1 and AUX2 inputs. Connect the sensors to the inputs as follows:

- ***SPACE TEMP*** - wire the leads from the space temperature sensor to this point.
- ***SUPPLY AIR*** - wire the leads from the supply air temperature sensor to this point.
- ***RETURN AIR*** - wire the leads from the return air temperature sensor to this point.
- ***COMP 1 PROOF*** - wire the proof checking device for cool stage #1 to this point.
- ***COMP 2 PROOF*** - wire the proof checking device for cool stage #2 to this point.
- ***AIR FLOW*** - if a fan proof checking device is present, wire it to this point.

Auxiliary Inputs

A number of different sensor and other input device types may be connected to inputs AUX1 and AUX2.

- Mixed Air - temperature sensor measuring the temperature of air from the economizer mixed with the return air.

- Outside Air - an outside air temperature sensor.
- Space 2 - a second space temperature sensor.
- Comp #3 Proof - proof checking device for cool stage #3 (if present).
- Comp #4 Proof - proof checking device for cool stage #4 (if present).
- Outside Humidity - an outdoor relative humidity sensor.
- Indoor Humidity - an indoor relative humidity sensor.
- Humidistat - a digital humidity sensor.
- Enthalpy Switch - a digital enthalpy switch used for economization checking.
- Light Sensor - a light level sensor.
- Light Switch - a digital light level checker.
- FreezeStat - a digital temperature sensor used to detect coil freezes.
- SmokeStat - a digital smoke detecting device.
- Dirty Filter - a digital device that detects blocked filter conditions.
- Temp - General temperature sensor.
- Override Switch - an override switch.

Figure 15-4 shows how to wire devices to the ARTC. Temperature sensors and digital devices are connected to ARTC points by simply wiring one lead to each of the two point terminals. Light level sensors and humidity sensors are wired as shown.

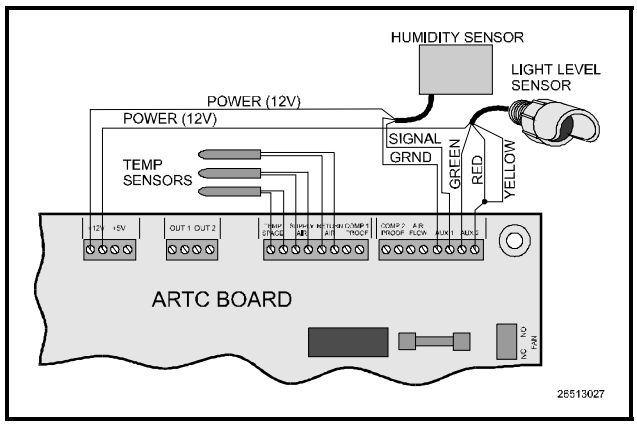


Figure 15-4 *- ARTC Input Wiring*

15.4.4 Relay Outputs

The eight outputs on an ARTC board are located on the right-hand side of the ARTC board. Most of these outputs, except for AUX1 and AUX2, have pre-defined functions. All outputs have Form C contacts; therefore, you will need to connect one lead to the middle terminal and the other to either the N.C. or N.O. terminal, depending on whether you want the relay to be CLOSED or OPEN when a power or network failure occurs.

Connect these outputs to the devices they will operate as follows:

- ***FAN*** - connect the fan to this point. If this rooftop unit has two fan stages, connect the low speed fan stage to this point.
- ***HEAT 1*** - connect heat stage #1 to this point.
- ***HEAT 2*** - connect heat stage #2 to this point.
- ***COOL 1*** - connect cool stage #1 to this point.
- ***COOL 2*** - connect cool stage #2 to this point.
- ***ECON*** - connect the economizer to this point.

Auxiliary Outputs

The AUX1 and AUX2 outputs may be configured to operate a number of different types of outputs.

- Cool 3 - cool stage #3.
- Cool 4 - cool stage #4.
- Heat 3 - heat stage #3.
- Heat 4 - heat stage #4.
- Fan 2 - high-speed fan stage.
- Cool Rev Valve - cool reversing valve (this must be wired Normally Open).
- Alarm - digital alarm output (turns ON when an alarm condition exists on the ARTC).
- Humidifier - humidification device (will be supported in future Einstein revisions).
- Heat Rev Valve - heat reversing valve (this must be wired Normally Closed).
- Econ Shadow - mirrors the state of the ECON output.
- Dehumidifier - dehumidification device.
- Sat. Control - a satellite output device controlled through the ARTC by the Zone application.

15.4.5 Analog Outputs

The two analog outputs on the ARTC board are used to control the positions of analog economizers and the speeds of variable-speed fans. If these devices are present on the RTU, connect them to the OUT 1 and OUT 2 points. The positive lead should be connected to the terminal labelled "+," and the negative lead should be connected to the terminal labelled "-".

15.5 Software Setup

15.5.1 Zone Association

Before setting up the parameters of the Rooftop Application that will interface the ARTC with the Zone application, you should first associate the ARTC with a preconfigured Zone.

To access the Setup Editor screens for an ARTC, access the "AHU <--> AHU Zone Associaton" by pressing F8 X Z 6. Highlight the ARTC you wish to configure and press the SETUP AHU (F1) key.

15.5.2 Defining I/O Points

A lot of the required setup of the Rooftop Control application will depend on what input and output points are present on the ARTC board. Because of this, the first step in software setup should be to jump to the Define I/O screen of the Rooftop Control application and specify the I/O configuration of the ARTC board.

1. From the ARTC status screen, press F8 * B to enter the Setup Editor.
2. Press Shift + F5 followed by A to jump to the Define I/O screen.

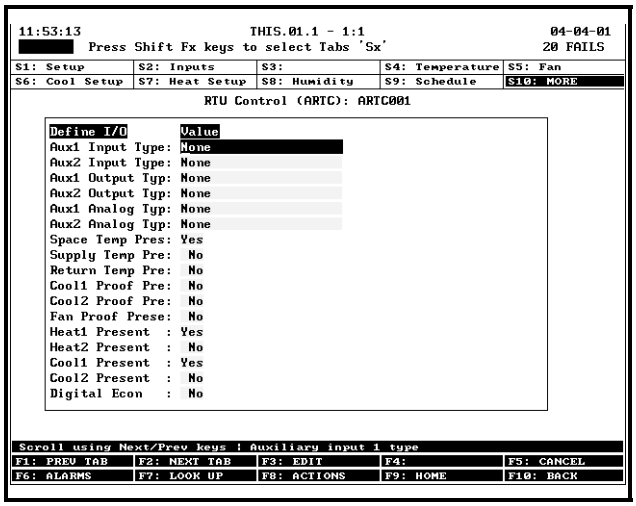


Figure 15-5 *- ARTC/Rooftop Setup*

Define each field in this screen based on what is physically connected to the ARTC board I/O points.

Aux1 Input Type Press F7 with the cursor in this field, and select the type of input device connected to input point AUX1 on the ARTC board. Refer to "Auxiliary Inputs" in **Section 15.3.3,** *Fan Control* for a description of the options in the Look-Up Table.

Aux2 Input Type Press F7 with the cursor in this field, and select the type of input device connected to input point AUX2 on the ARTC board. Refer to "Auxiliary Inputs" in **Section 15.3.3,** *Fan Control* for a description of the options in the Look-Up Table.

Aux1 Output Type Press F7 with the cursor in this field, and select the type of input device connected to output point AUX1 on the ARTC board. Refer to "Auxiliary Outputs" in **Section 15.4.4,** *Relay Outputs* for a description of the options in the Look-Up table.

Aux2 Output Type Press F7 with the cursor in this field, and select the type of input device connected to output point AUX2 on the ARTC board. Refer to "Auxiliary Outputs" in **Section 15.4.4,** *Relay Outputs* for a description of the options in the Look-Up table.

Aux1 Analog Type Press F7 with the cursor in this field, and select the type of input device connected to analog output point AUX1 on the ARTC board. Refer to "Auxiliary Outputs" in **Section 15.4.5,** *Analog Outputs* for a description of the options in the Look-Up table.

Aux2 Analog Type Press F7 with the cursor in this field, and select the type of input device connected to analog output point AUX2 on the ARTC board. Refer to "Auxiliary Outputs" in **Section 15.4.5,** *Analog Outputs* for a description of the options in the Look-Up table.

Space Temp Pres If a space temperature sensor is connected to the SPACE TEMP input, set this field to "Yes."

Supply Temp Pre If a supply air temperature sensor is connected to the SUPPLY TEMP input, set this field to "Yes."

Return Temp Pre If a return air temperature sensor is connected to the RETURN TEMP input, set this field to "Yes."

Cool1 Proof Pre If a compressor proof checking device is present for cooling stage #1 and is connected to the COMP 1 PROOF input, set this field to "Yes."

Cool2 Proof Pre If a compressor proof checking device is present for cooling stage #2 and is connected to the COMP 2 PROOF input, set this field to "Yes."

Fan Proof Prese If a fan proof checking device is connected to the AIR FLOW input on the ARTC, set this field to "Yes."

Heat1 Present If a heat stage is connected to the HEAT 1 relay output on the ARTC, set this field to "Yes."

Heat2 Present If a heat stage is connected to the HEAT 2 relay output on the ARTC, set this field to "Yes."

Cool1 Present If a cool stage is connected to the COOL 1 relay output on the ARTC, set this field to "Yes."

Cool2 Present If a cool stage is connected to the COOL 2 relay output on the ARTC, set this field to "Yes."

Digital Econ If a digital economizer is connected to the ECON relay output on the ARTC, set this field to "Yes."

15.5.3 Screen 1: Setup

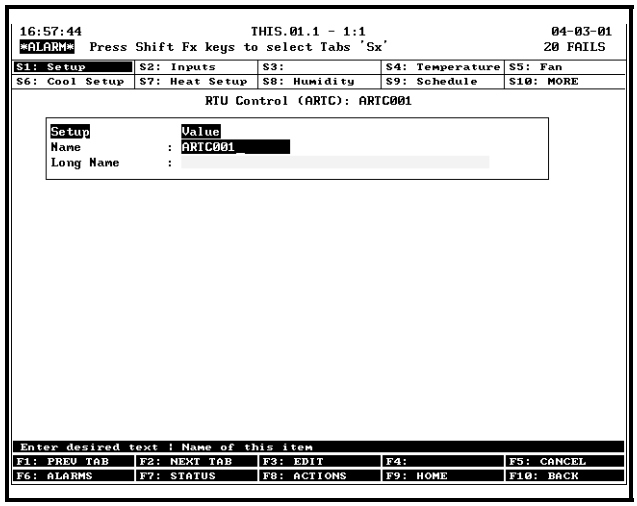


Figure 15-6 *- ARTC/Rooftop Setup*

Required Steps

Enter a name for the Rooftop Control application in the **Name** field. For easier reference, choose a name that corresponds to the ARTC it will be associated with.

Options

Long Name If a longer descriptive name is required for this Rooftop Control application, enter it in the Long Name field.

15.5.4 Screen 2: Inputs

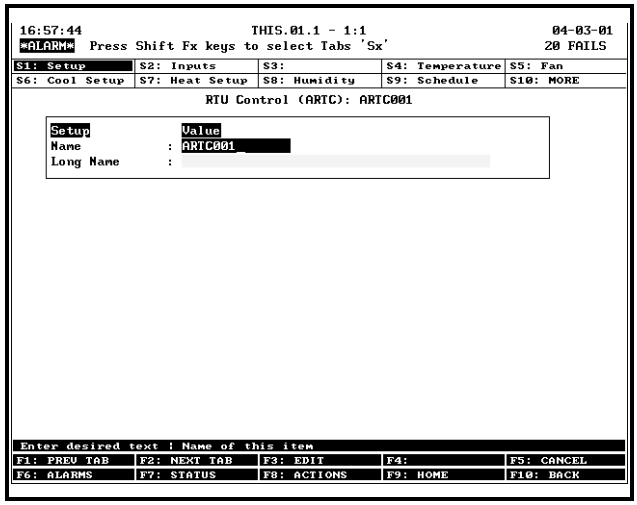


Figure 15-7 *- ARTC/Rooftop Inputs*

NOTE: The majority of inputs shown in this screen are automatically tied to the approproate outputs of the Zone application. These outputs should not be altered unless instructed by CPC.

Options

OCC HUMIDITY This set point is the humidity control set point the ARTC will use when humidifying during occupied building times. This input does not receive a humidification set point from the Zone, and therefore this input must be defined to point to an input source if humidification is to be controlled by this ARTC. To enter a fixed value as the occupied humidification set point, press F3 1 3, and enter the desired set point.

UNOCC HUMIDITY This set point is the humidity control set point the ARTC will use when humidifying during unoccupied building times. This input does not receive a humidification set point from the Zone, and therefore this input must be defined to point to an input source if humidification is to be controlled by this ARTC. To enter a fixed value as the unoccupied humidification set point, press F3 1 3, and enter the desired set point

OUTDOOR TEMP This input is the outdoor air temperature, used by the ARTC in determining summer/winter mode, economization, and other HVAC functions. This input is automatically tied to Global Data's "OAT OUT" output.

CURTAIL This input is tied to the curtailment device that curtails power for this and all HVAC units. Depending on the settings for this ARTC, a certain

number of heating and cooling stages will be locked off when the curtailment device sends an ON signal via this input.

OCC HEAT The value of this input is used as the heating control set point during occupied building times. By default, this input is set up to receive its Zone application's occupied set point value.

UNOCC HEAT The value of this input is used as the heating control set point during unoccupied building times. By default, this input is set up to receive its Zone application's unoccupied set point value.

OCC COOL The value of this input is used as the cooling control set point during occupied building times. By default, this input is set up to receive its Zone application's occupied set point value.

UNOCC COOL The value of this input is used as the cooling control set point during unoccupied building times. By default, this input is set up to receive its Zone application's occupied set point value.

OCCUPANCY This input tells the ARTC application whether the building is occupied or unoccupied. An ON signal signifies occupied, and an OFF signal signifies unoccupied. This input is automatically tied to the ARTC's Zone application during association.

SEASON This input tells the ARTC application whether the current season is summer or winter. An ON signal signifies summer, while an OFF signal signifies winter. This input is automatically tied to the ARTC's Zone application during association.

ECONOMIZE When using an enthalpy switch as the economization checking method, this digital input tells the ARTC application whether or not conditions are favorable for economization. When an ON signal is detected on this input, economization will be enabled. When an OFF signal is detected, economization will be locked out.

When an ARTC is associated with a Zone application, this input is automatically defined so that the economization signal is read from the Zone.

SHUTDOWN This input is used to force OFF the ARTC application's heat and cool stages or modulating control outputs. When this input is ON, the ARTC application sends an override command to the ARTC board telling it to ignore the current settings and shut off all stages.

If you wish to use this input to shut down the ARTC, enter the source of the shutdown signal in this definition.

ZONE TEMP The Zone Temp input is automatically connected to the ARTC's Zone application during association. The Zone Temp value is equal to the combined space temperatures of all other AHUs, RT-100s, and ARTCs in the same zone as the ARTC.

OCC DEHUM This is the dehumidification control set point to be used when the ARTC is operating in occupied mode. When the ARTC is associated with a zone, this input is automatically configured to read the set point value from the Zone application.

Note that the ARTC uses this set point only when it loses contact with its Zone application and it has an on-board space humidity sensor to use as a backup.

UNOCC DEHUM This is the dehumidification control set point to be used when the ARTC is operating in unoccupied mode. When the ARTC is associated with a zone, this input is automatically configured to read the set point value from the Zone application.

Note that the ARTC uses this set point only when it loses contact with its Zone application and it has an on-board space humidity sensor to use as a backup.

DEHUMIDIFY This input is automatically tied to the ARTC's Zone application during association. This input commands the ARTC application to begin dehumidification in the rooftop unit. An ON signal initiates dehumidification in the ARTC. An OFF signal means dehumidification should not be active.

HUMIDIFY This input is automatically tied to the ARTC's Zone application during association. This input commands the ARTC application to begin humidification in the rooftop unit. An ON signal initiates humidification in the ARTC. An OFF signal means humidification should not be active.

USE ZONE TEMP This digital signal determines whether the ARTC application will use the space temperature input on the ARTC or the zone temperature from the Zone application as the control input. When this input is ON, the zone temperature will be the control input. When this input is OFF, the ARTC will use the space temperature input value for temperature control.

15.5.5 Screen 4: Temperature

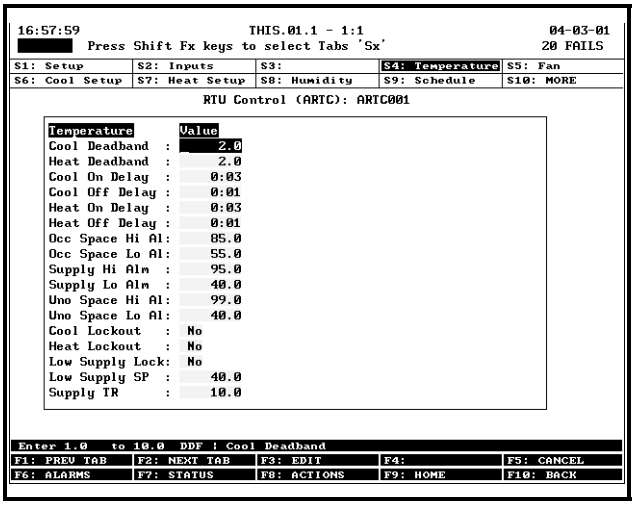


Figure 15-8 *- ARTC/Rooftop Temperature Screen*

Advanced Options

Cool Deadband The Cool Deadband is a range of temperatures equally above and below the active cooling set point within which the temperature is considered to be acceptable. Cooling mode in the ARTC will not begin unless the control temperature rises above the cooling set point plus one-half of the Cool Deadband value. Similarly, cooling mode will continue to be active until the control temperature falls below the set point minus one-half the dead band.

Heat Deadband The Heat Deadband is a range of temperatures equally above and below the active heating set point within which the temperature is considered to be acceptable. Heating mode in the ARTC will not begin unless the control temperature falls below the heating set point minus one-half of the Heat Deadband value. Similarly, heating mode will continue to be active until the control temperature rises above the set point plus one-half the dead band.

Cool On Delay The Cool On Delay is the amount of time between when the ARTC determines a cool stage should become active and when the stage actually turns ON. During this delay, if the ARTC determines the cool stage activation is no longer necessary, the call for cool stage activation will be cancelled.

Cool Off Delay The Cool Off Delay is the amount of time between when the ARTC determines a cool stage should be shut down and when the stage actually turns OFF. During this delay, if the ARTC determines the stage should remain ON, the call for cool stage deactivation will be cancelled.

Heat On Delay The Heat On Delay is the amount of time between when the ARTC determines a heat stage should become active and when the stage actually turns ON. During this delay, if the ARTC determines the heat stage activation is no longer necessary, the call for heat stage activation will be cancelled.

Heat Off Delay The Heat Off Delay is the amount of time between when the ARTC determines a heat stage should be shut down and when the stage actually turns OFF. During this delay, if the ARTC determines the stage should remain ON, the call for heat stage deactivation will be cancelled.

Occ Space Hi Al This set point generates an alarm whenever the space temperature rises above a certain temperature during occupied mode. This alarm is recorded to the Alarm Advisory Log.

Occ Space Lo Al This set point generates an alarm whenever the space temperature falls below a certain temperature during occupied mode. This alarm is recorded to the Alarm Advisory Log.

Supply Hi Alm This set point generates an alarm whenever the supply air temperature rises above a certain temperature. This alarm is recorded to the Alarm Advisory Log.

Supply Lo Alm This set point generates an alarm whenever the supply air temperature falls below a certain temperature. This alarm is recorded to the Alarm Advisory Log.

Uno Space Hi Al This set point generates an alarm whenever the space temperature rises above a certain temperature during unoccupied mode. This alarm is recorded to the Alarm Advisory Log.

Uno Space Lo Al This set point generates an alarm whenever the space temperature falls below a certain temperature during unoccupied mode. This alarm is recorded to the Alarm Advisory Log.

Cool Lockout When this parameter is set to "Yes," all cool stages will be locked out when the ARTC is operating in winter mode. Otherwise, when this parameter is set to "No," cool stages will be allowed to activate regardless of the current season.

Heat Lockout When this parameter is set to "Yes," all heat stages will be locked out when the ARTC is operating in summer mode. Otherwise, when this parameter is set to "No," heat stages will be allowed to activate regardless of the current season.

Low Supply Lock This parameter enables or disables the low supply lockout feature. When this

parameter is set to "Yes," the ARTC will lock out all inactive cool stages when the supply temperature is below a user-defined set point (thus keeping the supply temperature from dropping any further).

If you do not wish to use the low supply lockout feature, set this field to "No."

Low Supply SP The Supply Lotemp is the lowest acceptable supply temperature for this ARTC. When the supply temperature falls below this set point, no further cooling stages will be allowed to activate until the temperature rises above the set point.

Supply TR When the throttling range is set, the ARTC will look at the supply air temperature to see if the supply air temperature is below the supply air set point. If the supply air temperature is below the supply air set point plus one-half the throttling range, no additional compressors will be alowed to stage ON because the supply temperature is within the modulating range of the economizer.

During this lockout, no compressors that were previously running will be shut off.

After the supply temperature rises above the lockout set point plus one-half of the throttling range, the additional compressors may be allowed to come ON if the ARTC calls for them.

15.5.6 Screen 5: Fan

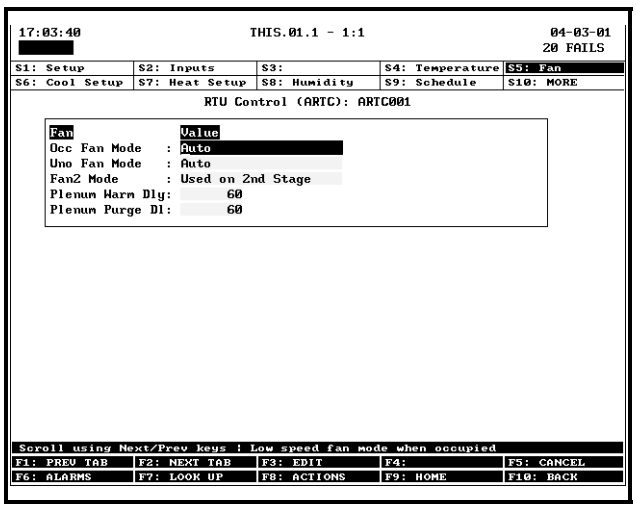


Figure 15-9 *- ARTC/Rooftop Fan Screen*

Required Steps

1. Choose which mode the fans will run in when in Occupied mode in the **Occupied Fan Mode** field. Choose “Auto” to activate the fan only when a heating or cooling stage is active, “On” to keep the fan always ON, or “Summer ON/Winter Auto” to keep the fan always ON during summer and in Auto mode during winter.
2. Choose which mode the fans will run in when in Unoccupied mode in the **Unoccupied Fan Mode** field. Choose “Auto,” “On,” or “Summer ON/ Winter Auto.”
3. If using an auxiliary output on the ARTC to control a high-speed fan stage, choose how the second fan stage will be activated in the **Fan2 Mode** field. There are three options:
   - *Use on 2nd Stage* - When any second stage of heat or cool activates, the Fan2 output turns ON.
   - *Use on 2nd Stage Cool* - When a second stage of cool activates, the Fan2 output turns ON. During heating mode, the Fan2 output will never come ON.
   - *Use on Any Stage Cool* - The Fan2 output will always be active during cooling mode.
4. In the **Plenum Warm Dly** field, enter the number of seconds the fan will delay turning ON during the activation of heating mode to allow the heat stage(s) to warm up.
5. In the **Plenum Purge Dl** field, enter the number of seconds the fan will continue running after all heating stages have been deactivated at the end of heating mode to purge heated air from the system.

Options

VS Fan Minimum If using an auxiliary analog output on the ARTC to control a variable-speed fan, enter the lowest percentage at which the fan will operate when ON in this field. This percentage does not affect the fan speed when the fan is called upon to be OFF (OFF is always 0%).

VS Fan Default The VS Fan Default field is the fail-safe fan speed. When the Rooftop Control application or the ARTC is unable to compute fan speed due to a malfunction or sensor failure, the ARTC will control the fan at the VS Fan Default percentage.

VS Fan Dehum The VS Fan Dehum field is the amount that will be **subtracted** from the VS fan speed when the ARTC is operating in dehumidification mode. If, for example, you want the fan to slow down by 20% during dehumidification mode, enter a “20” in this field. Note this will not cause the VS fan speed to ever go below the VS Fan Minimum percentage.

You may choose to speed up fan speed during dehumidification instead of slowing it down. To do this, enter a negative number in the VS Fan Dehum

15.5.7 Screen 6: Cool Setup

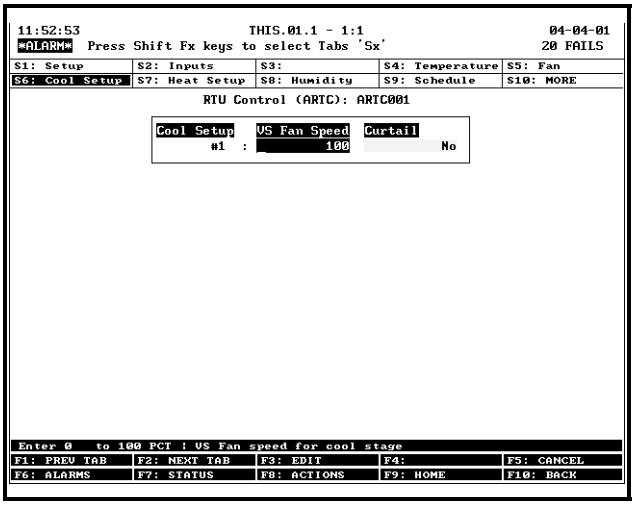


Figure 15-10 *- ARTC/Rooftop Cool Stages Screen*

Required Steps

Follow the steps below to set up each cool stage controlled by the ARTC:

1. If using a variable-speed fan, enter the fan speed percentage at which the fan will operate when this stage is the highest-numbered active cool stage in the **VS Fan Speed** field.
2. If this stage of cooling will be curtailed when the site's curtailment device is ON, set the **Curtail** field to "Yes."

15.5.8 Screen 7: Heat Setup

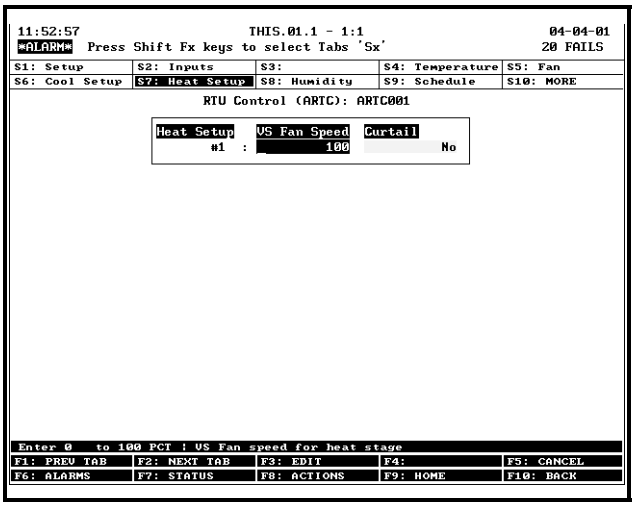


Figure 15-11 *- ARTC/Rooftop Heat Stages Screen*

Required Steps

Follow the steps below to set up each heat stage controlled by the ARTC:

1. If using a variable-speed fan, enter the fan speed percentage at which the fan will operate when this stage is the highest-numbered active heat stage in the **VS Fan Speed** field.
2. If this stage of heating will be curtailed when the site's curtailment device is ON, set the **Curtail** field to "Yes."

15.5.9 Screen 8: Humidity

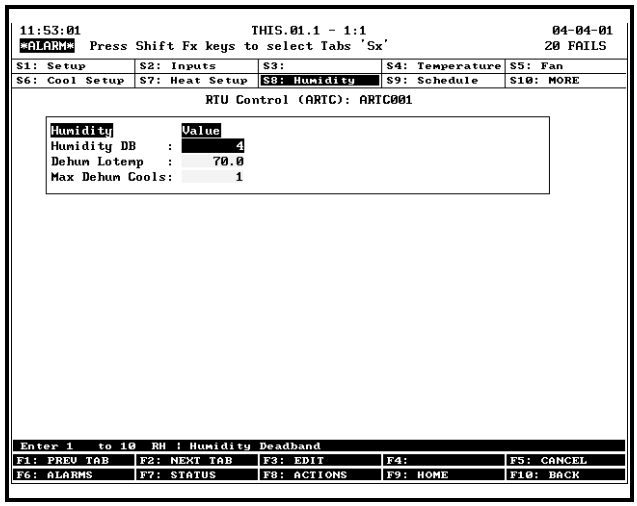


Figure 15-12 *- ARTC/Rooftop Heat Stages Screen*

Options

Humidity DB The Humidity Deadband is a range of relative humidity values equally above and below the humidification or dehumidification set point within which the space humidity level is considered to be acceptable.

Dehumidification mode begins in an ARTC when the relative humidity rises above the dehumidification set point plus one-half the Humidity Deadband, and ends when the relative humidity falls below the dehumidification set point minus one-half the dead band.

Dehum Lotemp The Dehumidification Low Temperature is a set point that limits dehumidification when the space temperature falls too low.

If during dehumidification the space temperature drops below the value of this set point, cool stages will be rolled back in order to keep the temperature equal to or above the set point.

Max Dehum Cools This parameter limits the number of cool stages that may be used for dehumidification. The ARTC will not activate any cool stage whose number is higher than this value during dehumidification mode.

15.5.10 Screen 9: Schedule

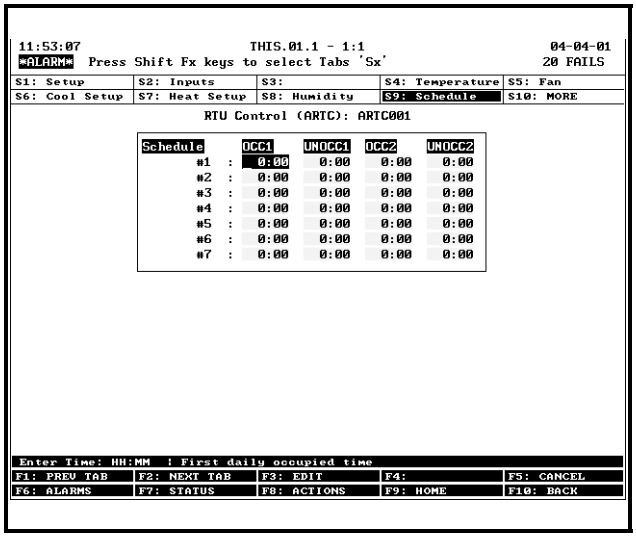


Figure 15-13 *- ARTC/Rooftop Schedule Screen*

Options

The Schedule screen allows you to set the fallback occupied/unoccupied schedule used by the ARTC if the board cannot get the occupancy status information from the Rooftop Control application. The Schedule times entered or altered in this screen are written to the ARTC's on-board memory and used when the ARTC is operating in Stand-Alone Mode.

The schedule shown in this screen has seven rows. Each row corresponds to a day of the week (1=Sunday, 2=Monday, 3=Tuesday, 4=Wednesday, 5=Thursday, 6=Friday, 7=Saturday).

Each numbered row contains four different fields: OCC1, UNOCC1, OCC2, and UNOCC2. These fields set the occupied and unoccupied switch-over times that will be observed for each day.

Occ1 Time The Occ1 Time is the first time during the day that the building will switch from unoccupied to occupied mode. For example, if Tuesday's Occ1 Time is set for 06:30, then the ARTC will switch from unoccupied to occupied at 6:30 a.m. every Tuesday.

The Occ1 Time is paired with the Unocc1 Time to determine how long the ARTC will remain in occupied mode over the course of a day.

Unocc1 Time The Unocc1 Time ends the occupied building event started by the Occ1 Time set point. When the current time is equal to the Unocc1 Time field, the ARTC exits occupied mode and enters unoccupied mode.

Occ2 Time The Occ2 Time is the second time during the day that the building will switch from unoccupied to occupied mode. Occ2 times are scheduled after the first occupied event (started by the Occ1 Time set point) is ended (by the Unocc1 Time set point). For example, if Tuesday's Occ2 Time is set for 13:30, then the ARTC will switch from unoccupied to occupied at 1:30 p.m. every Tuesday.

The Occ2 Time is paired with the Unocc2 Time to determine how long the ARTC will remain in occupied mode.

Unocc2 Time The Unocc2 Time ends the occupied building event started by the Occ2 Time set point. When the current time is equal to the Unocc2 Time field, the ARTC exits occupied mode and enters unoccupied mode.

16 Enhanced Lighting

This document explains the function of the Enhanced Lighting application included in Einstein 1.5 and above. It includes an overview of how the application works and instructions on how to program it.

16.1 Enhanced Lighting vs. Lighting Control

There are two different types of Lighting Control applications that may be created and programmed in Einstein: one called **Enhanced Lighting** and another called **Lighting Control.**

The Enhanced Lighting application is an improved version of the Lighting Control application, and therefore CPC recommends you use Enhanced Lighting for all newly programmed Einstein BX installations.

Lighting Control applications should only be used in sites upgrading from pre-1.5 versions that already use Lighting Control applications.

16.2 Overview

The Enhanced Lighting application is an improved version of the Lighting Control application that has been specially designed for use with light level sensors. The Enhanced Lighting application provides an interface for cut-in/cut-off control based on light level, simple time scheduling with or without use of external Time Schedule applications, proofing and minimum on/off times.

Generally, the Enhanced Lighting application is designed to follow a digital command from a time schedule to determine when the lights should be ON or OFF. At the same time, Enhanced Lighting looks at the value of a light level sensor, compares it to a set of cut-in and cut-out set points, and overrides the schedule as the real-time lighting conditions warrant. As a result, the light level sensor and schedule both working to provide adequate light when needed AND saving energy by keeping lights OFF when they are not necessary.

16.3 Functions of the Enhanced Lighting Application

Figure 16-1 shows a flowchart diagram of the Enhanced Lighting application and the five cells that work together to control the lights. A description of each cell and the functions they perform are given below.

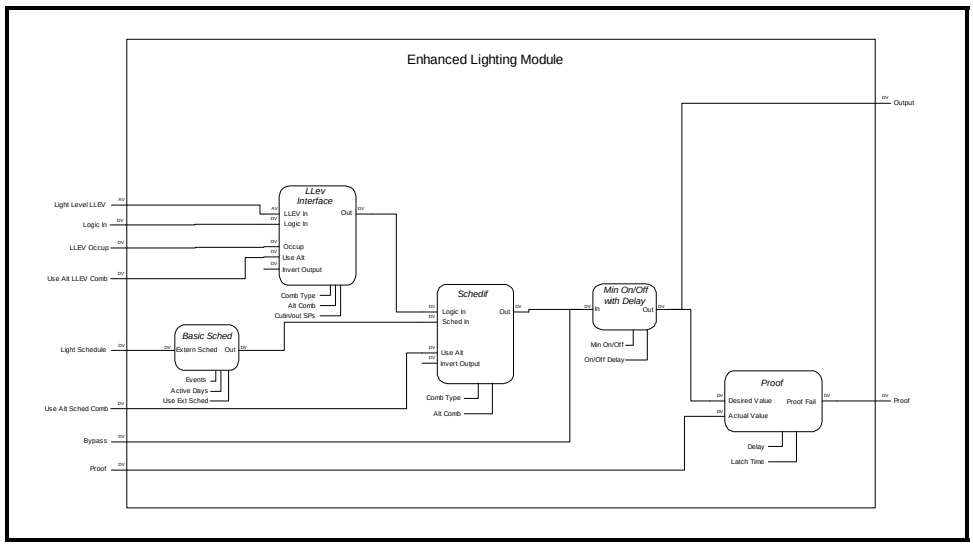


Figure 16-1 *- Enhanced Lighting Module Cell Diagram*

16.3.1 The Light Level Interface Cell (LLEV INTERFACE)

The Light Level Interface cell of the Enhanced Lighting application translates the value of the light level sensor into an ON or OFF command by comparing the analog

light level to a set of cut-in and cut-out set points.

From an OFF state, when the light level falls below the cut-in set point, the result of the light level comparison will be an ON state. When the light level rises above the cut-out set point, the state will transition from ON to OFF.

The ON/OFF state determined by the light level can be logically combined with LOGIC IN, a digital input from an input point or another application in Einstein. The result of this comparison will be the final ON/OFF light state command that is sent from the Light Level Interface cell to the Schedule Interface cell (explained below).

16.3.1.1 Logical Combination Strategies

There are several different strategies for combining the light level ON/OFF state with the value of the LOGIC IN input:

- *Logic Only* - The cell will read only the LOGIC IN input and ignore the light level sensor reading.
- *LLEV Only* - The cell will read only the light level sensor and ignore the value of the LOGIC IN input.
- *Both ON/Both OFF* - From an output=OFF state, when both the light level state and the LOGIC IN input are ON, the resulting output command will be ON. The output command will remain ON until both the light level state and the LOGIC IN input turn OFF.
- *Both ON/LLEV OFF* - Like the Both ON/ Both OFF strategy, except only the light level state must turn OFF in order to turn the output from ON to OFF.
- *LLEV ON/Both OFF* - Like the Both ON/ Both OFF strategy, except only the light level state must turn ON in order to turn the output from OFF to ON.
- *Both ON/Any OFF* - Like the Both ON/Both OFF strategy, except any of the two states that turn from ON to OFF will result in the output turning OFF.

The LOGIC IN input should not be used to compare the light level state to a Time Schedule output or a similar digital state that represents OCCUPIED/UNOCCUPIED. Schedule comparisons are handled by the Schedule Interface cell. If a schedule input value is the only digital value you will be using to combine with the light level sensor value, choose the “LLEV ONLY” combination for this cell.

16.3.1.2 Occupied/Unoccupied and Alternate Settings

If desired, the Light Level Interface cell can be set up with a set of unoccupied cut-in and cut-out set points. To do this, the Light Level Interface cell relies on a separate digital input to tell it when to use occupied or unoccupied set points.

The Light Level Interface cell can also be set up with a set of alternate occupied and unoccupied set points, used only when the value of the input called USE ALT LLEV COMB is ON.

16.3.2 The Basic Schedule Cell

The Basic Schedule cell has two main functions:

- If a Time Schedule application is set up in Einstein to provide ON/OFF times for the lights, the Basic Schedule cell passes the occupied/unoccupied state from this time schedule to the Schedule Interface cell.
- If no Time Schedule application is set up in Einstein for light scheduling, the Basic Schedule allows you to configure a schedule for the Enhanced Lighting application. This custom schedule will pass along a digital occupied/unoccupied state to the Schedule Interface cell.

If an external Time Schedule will be used, you will only need to configure the Basic Schedule by linking the schedule output to the input of the Basic Schedule cell and setting the Use External Schedule parameter to “Yes.”

If no external Time Schedule is being used, you may configure a set of schedule events and date ranges to be used by the Enhanced Lighting application. Up to 15 ON/ OFF schedule events can be programmed, as well as up to 12 date ranges.

Schedule events and date ranges programmed into the Basic Schedule cell are used only by the Enhanced Lighting application. If more than one Lighting Control or Enhanced Lighting application will be using the same schedule, it is recommended you configure an external Time Schedule application so you won’t have to re-enter event and date information for each lighting application.

16.3.2.1 Slave Scheduling

If you have an external Time Schedule application providing occupied/unoccupied times, but you want to alter this schedule slightly for the Enhanced Lighting application, you can designate the Basic Schedule cell’s schedule

as a **slave schedule.**

A slave schedule differs from a master schedule in that its events are relative to the events of a master schedule. A master schedule's events are absolute times (like 08:00 ON, 23:00 OFF). A slave schedule contains a set of times that are added to or subtracted from its master schedule's events (like +00:30 ON, -01:00 OFF). As a result, the behavior of the output of the slave schedule is altered slightly from that of the master schedule.

Slave scheduling is most often used in cases where the master schedule represents the occupied/unoccupied times of a building, and slave schedules are used to control loads that need activation or deactivation earlier or later than the occupied/unoccupied times.

Slave scheduling is discussed in more detail in the Time Schedules section of your Einstein manual (*P/N 026-1602).*

16.3.3 The Schedule Interface Cell (SCHEDIF)

The Schedule Interface cell is similar in function to the Light Level Interface cell, except it is used to logically combine the output of the Light Level Interface cell with that of the Basic Schedule cell. The Schedule Interface cell allows you to choose how the light level sensor and the time schedule work together to control the lights.

16.3.3.1 Logical Combinations

The output of the Schedule Interface cell represents the final ON/OFF state of the lights. It determines this state by performing one of the logical combinations listed below:

- *LLEV/Logic Only* - The Schedule Interface cell uses the input from the Light Level Interface cell as its output, ignoring the value passed to it from the Basic Schedule cell.
- *Sched Only* - The Schedule Interface cell uses the input from the Basic Schedule cell as its output, ignoring the value passed to it from the Light Level Interface cell.
- *Both ON/Both OFF* - From an output=OFF state, when both the Light Level Interface input and the Basic Schedule input are ON, the resulting output command will be ON. The output command will remain ON until both the Light Level and Basic Schedule inputs turn OFF.
- *Both ON/Sched OFF* - Like the Both ON/ Both OFF strategy, except when the Schedule Interface output is ON, it will turn off only when the Basic Schedule input turns OFF.
- *Sch ON/Both OFF* - Like the Both ON/Both OFF strategy, except when the Schedule Interface output is OFF, it will turn ON only when the Basic Schedule input turns ON.
- *Both ON/Any OFF* - Like the Both ON/Both OFF strategy, except when the Schedule Interface output is ON, it will turn OFF if any input turns OFF.

If desired, the final result of any of the above combinations can be inverted by setting a parameter.

16.3.3.2 Alternate Schedule Interface Combinations

If desired, you can specify an alternate means of combining the Schedule Interface cell inputs that is used only when the Use Alt Sched Comb input is ON.

16.3.4 The Min ON/OFF Cell

The Minimum ON/OFF cell has three important functions:

- It receives the light state requested by the Schedule Interface cell, and applies this state to a set of minimum ON and OFF times. If the requested light state turns ON the lights before the prescribed minimum ON time, or turns OFF the lights before the prescribed minimum OFF time, the Minimum ON/OFF cell will delay the command until the minimum ON or minimum OFF time has elapsed.
- If ON and OFF delays are specified, the cell delays ON/OFF commands it receives from the Schedule Interface cell.
- It processes commands for manual bypassing of the light state. When the Bypass input is any value other than NONE, the cell ignores the light state command input, all minimum ON/OFF times, and all ON/OFF delays, and bypasses the light state to the digital value of the Bypass input.

The digital output of this cell controls the I/O board output point that activates and deactivates the lights.

16.3.5 The Proof Cell

The Proof cell verifies that the lights are turning ON and OFF as commanded by the Enhanced Lighting application. The Proof cell compares the digital command sent to the I/O output that controls the lights with a digital input from a proof checking device (like a digital light level sensor). If the two inputs are not equal for an amount of time longer than the programmed proof delay, the Proof cell turns its Proof output ON to signify a failure has occurred.

The Proof cell will deactivate the Proof output if the proof failure has been cleared longer than the programmed

proof latch time.

16.4 Programming an Enhanced Lighting Application

16.4.1 Adding Enhanced Lighting Applications

When the Einstein was first initialized, you were given the option of creating all of the applications necessary for your refrigeration system. If you still need to add an Enhanced Lighting application to the Einstein:

1. Press F8 to bring up the Actions Menu.
2. Press X Z - Control Appl Setup.
3. Press 1 - Add Control Application.
4. Choose "Enhanced Lighting" in the Type field by using the Prev and Next keys.
5. Enter the total number of applications you wish to add in the "How many?" field.
6. Press Enter.

The Einstein will then add the specified number of Enhanced Lighting applications.

7. Press F10 to exit this screen.

16.4.2 Changing/Configuring an Enhanced Lighting Application

From the Main Status Screen, press F3 to access the status screen for the Enhanced Lighting application you wish to set up. If more than one application was created, pressing F3 will bring up a menu of all Enhanced Lighting and Lighting Control applications. Highlight the one you wish to program, and press Enter.

If Enhanced Lighting and regular Lighting Control applications exist on the same Einstein, both types will be shown on the menu when you press F3. Lighting Control applications will have the default name "LIGHT CKT xx", and Enhanced Lighting applications will have the default name "LIGHTSxx", where xx is a number from 01 to 48.

16.4.2.1 The Enhanced Lighting Control Status Screen

The Enhanced Lighting Control Status Screen displays important information about your Enhanced Lighting application, including the light state, the current value of the light level sensor, and the occupied/unoccupied state of the schedule.

To begin configuring this application, press F8 followed by B to access the Setup Editor. screens.

16.4.3 Screen 1: Setup

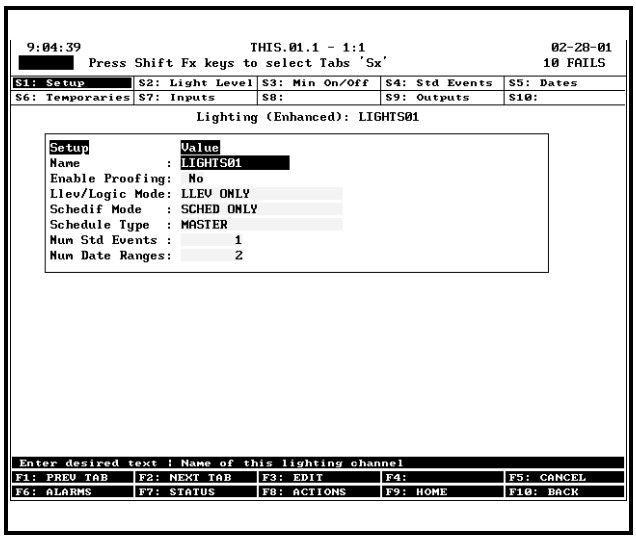


Figure 16-2 *- Enhanced Lighting Screen 1 - Setup*

Required Steps

1. Enter a name for the Enhanced Lighting application in the **Name** field.
2. If you will be combining the ON/OFF state from the light level sensor's cut-in/cut-out set points with another digital input, choose the strategy you want to use to combine them in the **Llev/ Logic Mode** field. See "Logical Combination Strategies" on page 16-2.
3. If you will be combining the output of the Light Level Interface cell with a schedule from the Basic Schedule cell, choose the strategy you want to use to combine them in the **Schedif Mode** field. See "Logical Combinations" on page 16-3.

Options

Enable Proofing If you will be doing any proof checking for the Enhanced Lighting application, set the value of this field to "Yes."

Schedule Type If you need to program a schedule in the Enhanced Lighting application, choose whether you want the schedule to be a master schedule or a slave schedule in the Schedule Type field. (Note: if you are using an external Time Schedule application, see the Use External Sched field in the "Advanced Options" section).

Num Std Events Enter the number of ON/OFF event pairs you wish to program into the Enhanced Lighting application's schedule.

Num Date Ranges Enter the number of date ranges you wish to program into the Enhanced Lighting application's schedule.

Advanced Options (Press F8 + Q to Display)

Use External Schedule If you are using an external Time Schedule in the Enhanced Lighting application's control strategy, you must set this field to "Yes" to disable the application's internal schedule and display the Time Schedule input in the Inputs screen.

Alt Lt/Logic Mode The strategy specified in this field replaces the Llev/Logic Mode strategy when the Use Alt LL Comb input is ON. If you are not using the alternate combination feature, you do not need to change the value of this field.

Alt Schedif Mode The strategy specified in this field replaces the Schedif Mode strategy when the Use Alt Sched Comb input is ON. If you are not using the alternate combination feature, you do not need to change the value of this field.

KW Load If you are using Demand Control or Power Monitoring in conjunction with this application, enter the total amount of KW controlled by this application.

16.4.4 Screen 2: Light Level

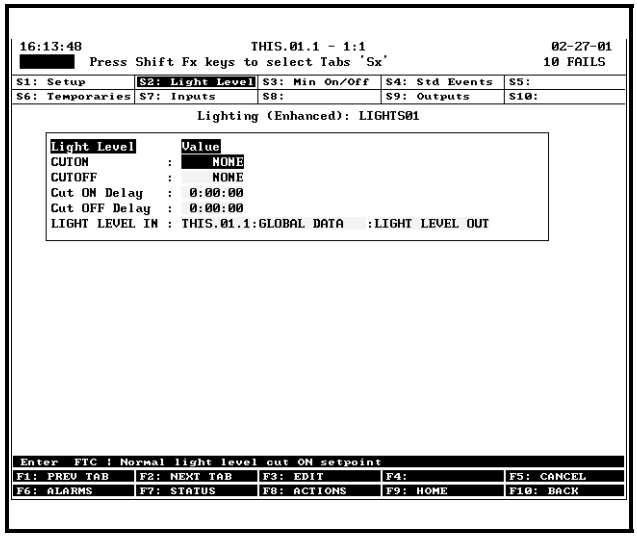


Figure 16-3 *- Enhanced Lighting Screen 2 - Light Level*

This screen is visible only if you chose a combination strategy in the **Llev/Logic Mode** field of Screen 1 that uses a light level sensor. Follow the instructions below to set up the required set points for light-level based lighting control.

Required Steps

1. Enter the light level at which you want the lights to turn ON in the **CUTON** field.
2. Enter the light level at which you want the lights to turn OFF in the **CUTOFF** field.
3. Enter the amount of time the light level must be above the CUTON set point before the lights will be turned ON in the **Cut ON Delay** field.
4. Enter the amount of time the light level must be below the CUTOFF set point before the lights will be turned OFF in the **Cut OFF Delay** field.
5. The **LIGHT LEVEL IN** input, which is the input to which the light level sensor is connected, is by default connected to Global Data's **LIGHT LEVEL OUT** output. If you do not have an Einstein on the network with a light level sensor connected to Global Data, you will need to set it up. Refer to the "Global Data" section of your Einstein User's Guide (*P/N 026-1602*).

Advanced Options (Press F8 + Q to Display)

UNOCC CUTON and UNOCC CUTOFF You may specify different cut-on and cut-off set points for use during unoccupied building times.

LLEV OCCUP If using unoccupied cut-on and cut-off set points, connect the LLEV OCCUP input to the output of a Time Schedule or another digital signal that represents an occupied/unoccupied building state.

USE ALT LL COMB If you specified an alternate light level/logic combination strategy in Screen 1: Setup, enter the address of the digital input that will select the combination strategy.

Cut ON Dly UNOC and Cut OFF Dly UNO

These fields set the cut-on and cut-off delays used when the building is unoccupied.

16.4.5 Screen 3: Min ON/OFF

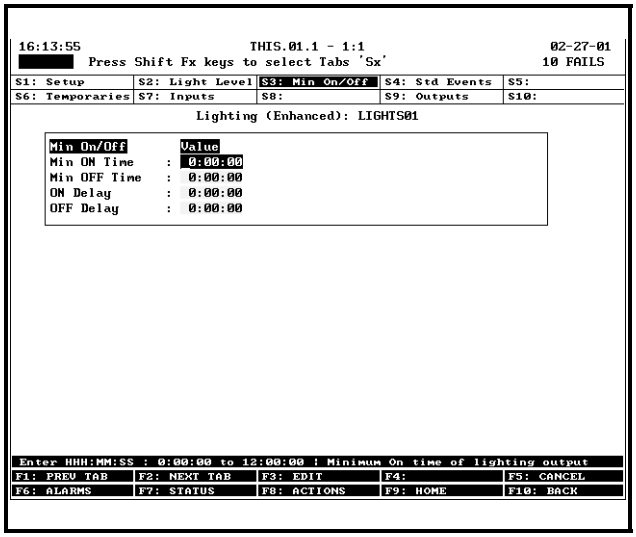


Figure 16-4 *- Enhanced Lighting Screen 3 - Min ON/OFF*

Options

Min ON Time The Minimum ON Time is the amount of time the lights must remain ON after being activated before they will be allowed to turn OFF.

Min OFF Time The Minimum OFF Time is the amount of time the lights must remain OFF after being deactivated before they will be allowed to turn ON.

ON Delay The ON Delay is the amount of time the application will wait before turning ON the lights after determining the lights should come ON.

OFF Delay The OFF Delay is the amount of time the application will wait before turning OFF the lights after determining the lights should turn OFF.

16.4.6 Screen 4: Std. Events

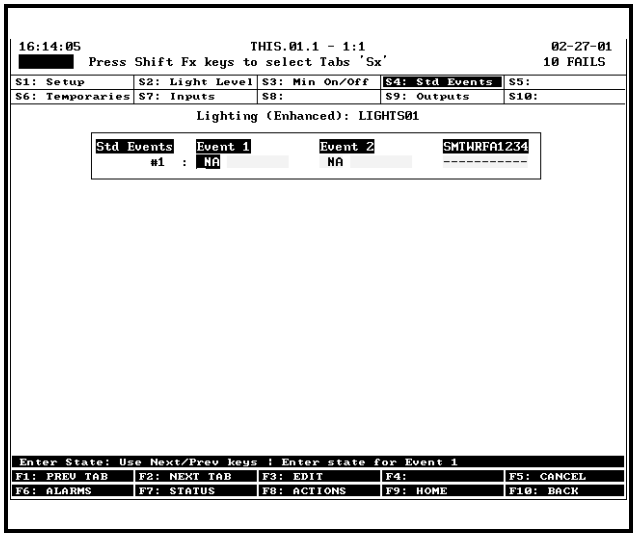


Figure 16-5 *- Enhanced Lighting Screen 4 - Std. Eventl*

Required Steps

For each event (time period):

1. In the first **Event 1** field, use the Prev and Next keys to change the "NA" to "ON."
2. In the second **Event 1** field, enter the time of day the Einstein should begin occupied mode. Enter the time in 24-hour format (HH:MM).
3. In the first **Event 2** field, use the Prev and Next keys to change the "NA" to "OFF."
4. In the second **Event 2** field, enter the time of day the Einstein should end occupied mode and begin unoccupied mode. Enter the time in 24-hour format (HH:MM).
5. For each event, there are 11 fields under the heading **SMTWRFA1234**. Each field corresponds to a day of the week (Sunday through Saturday, plus Holidays HD1, HD2, HD3, and HD4). Starting with the Sunday (S) field, use the Prev or Next key to toggle the field value from "-" (indicating the events will be INACTIVE on that day) to "S" (indicating the programmed event pair will be followed on that day of the week). Press the ▷ key to move to the next field, and repeat for the remaining ten fields.

Example

To better explain how multiple schedule events coincide to create a complete occupied/unoccupied schedule, here is an example of a schedule created for a building with the following occupied building times:

Weekdays (Mon - Fri)8 AM - 8 PM

Weekends (Sat - Sun)11 AM - 10 PM

Three-day Weekend Holidays8 AM - 10 PM

Christmas, New Year's DayCLOSED

Assuming the three-day weekend holidays were defined as holiday HD1 in Global Data's "Holidays" Schedule, and assuming that Christmas and New Year's Day were both set up as holiday HD2 in the same Holiday Schedule, here are the four events that must be programmed in this Time Schedule:

#	Event 1		Event 2		SMTWRFA1234
1	ON	08:00	OFF	20:00	-MTWRF-----
2	ON	11:00	OFF	22:00	S-----A----
3	ON	08:00	OFF	22:00	-------1---
4	OFF	00:00			--------2--

Table 16-1 *- Example of Event Programming in Time Scheduling*

The Time Schedule will follow the times in #1 on weekdays, #2 on weekends, #3 on holiday HD1, and #4 on holiday HD2.

16.4.7 Screen 5: Dates

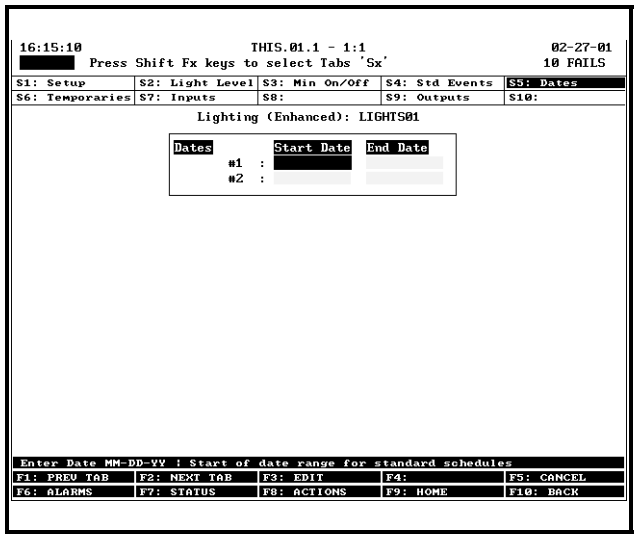


Figure 16-6 *- Enhanced Lighting Screen 5 - Dates*

This screen will not be visible if the value of the Num Date Ranges field in Screen 1 is "0".

Date ranges determine the dates in which the schedule is active. When the current date is within one or more of the date ranges in the schedule, the schedule operates as normal. When the current date is outside all of the date ranges in the schedule, the schedule's value is NONE.

Enter the desired date ranges in MM-DD-YY format.

16.4.8 Screen 6: Temporaries

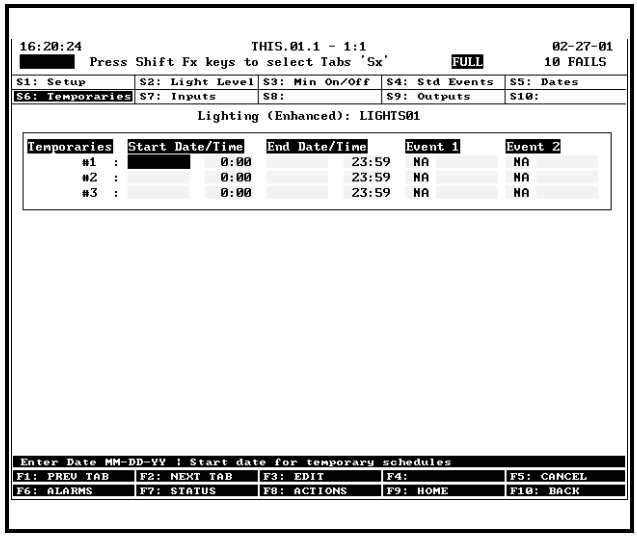


Figure 16-7 *- Enhanced Lighting Screen 6 - Temporariesl*

Temporary schedules are one-time schedule events that override the standard schedule events during specified dates and times. To enter a temporary schedule time, fill in all of the fields listed below.

Start Date/Time

Enter the date and the time the Enhanced Lighting application will begin following the temporary schedule, in MM-DD-YY, HH:MM format.

End Date/Time

Enter the date and the time the Enhanced Lighting application will stop following the temporary schedule and resume following the normal schedule, in MM-DD-YY, HH:MM format.

Event 1 and Event 2

Enter a set of ON/OFF events in the Event 1 and Event 2 fields. For each even, specify an event type (ON or OFF) and a time at which the event will occur (in HH:MM format).

16.4.9 Screen 7: Inputs

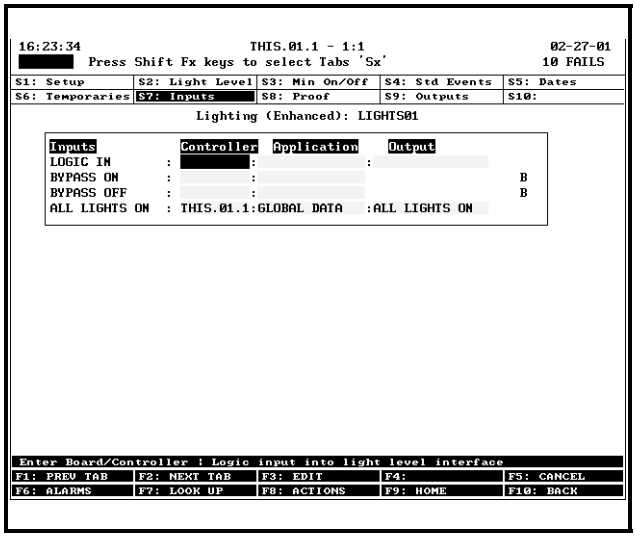


Figure 16-8 *- Enhanced Lighting Screen 7 - Inputs*

Required Steps

1. If combining the light level sensor ON/OFF state with a logical input, enter the location of the logical input in the **LOGIC IN** input definition.

Options

BYPASS ON If you wish to bypass the lights ON manually using a digital switch or input, enter the address of the digital input in the BYPASS ON input definition.

BYPASS OFF If you wish to bypass the lights OFF manually using a digital switch or input, enter the address of the digital input in the BYPASS OFF input definition.

ALL LIGHTS ON This input allows the Enhanced Lighting application to use Global Data's "ALL LIGHTS ON" feature, which overrides this and all other lighting applications ON. If you wish to use this feature, you will not need to change the value of this field. Refer to the Einstein BX User's Guide for more information about the ALL LIGHTS ON feature.

Advanced Options

USE ALT SCHIF If you specified an alternate schedule interface combination strategy in Screen 1, enter the location of the digital signal that will select the active strategy.

PRI DEMAND SHED This input is used by Demand Control and Power Monitoring applications to turn the lights off during load shedding. Generally, this input is defined when configuring the Demand Control and Power Monitoring application(s).

16.4.10 Screen 8: Proof

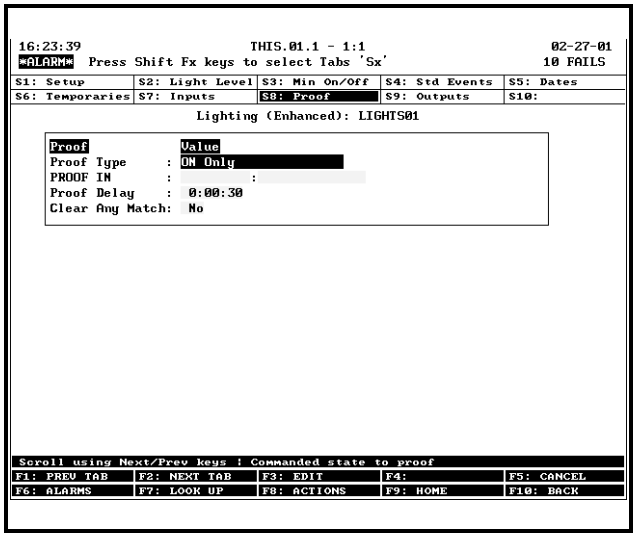


Figure 16-9 *- Enhanced Lighting Screen 8 - Proof*

This screen is visible only when the "Enable Proofing" field in Screen 1 is set to "Yes."

Required Steps

1. Choose what light state(s) the application will use proof checking for in the **Proof Type** field. There are three options:
   - *ALL Values* - Proof checking will verify the lights come ON when called to be ON and OFF when called to be OFF.
   - *ON Values* - Proof checking will verify only that the lights have turned ON when called to be ON.
   - *OFF Values* - Proof checking will verify only that the lights have turned OFF when called to be OFF.
2. Enter the board and point address of the proof checking device in the **PROOF IN** input definition.
3. Enter the amount of time the output state must be different from the proof state before the proof is considered failed in the **Proof Delay** field.

Options

Clear Any Match If you want a proof failure to be cleared whenever a match of any kind is made between the proof input and the light state, set this field to "Yes." If you want the proof failure to be cleared only when a match of the type listed in the Proof Type field is made, set this field to "No."

Advanced Options

Proof Latch Before a proof is cleared, the proof

input and the light state must match each other for a duration of time equal to the Proof Latch field. When the Proof Latch time period has passed, the Proof output will turn OFF.

Pr Fail Adv Pri This field sets the alarm priority level of the alarm generated when a proof failure has occurred. The default value, 20, should be sufficient for most applications.

16.4.11 Screen 9: Outputs

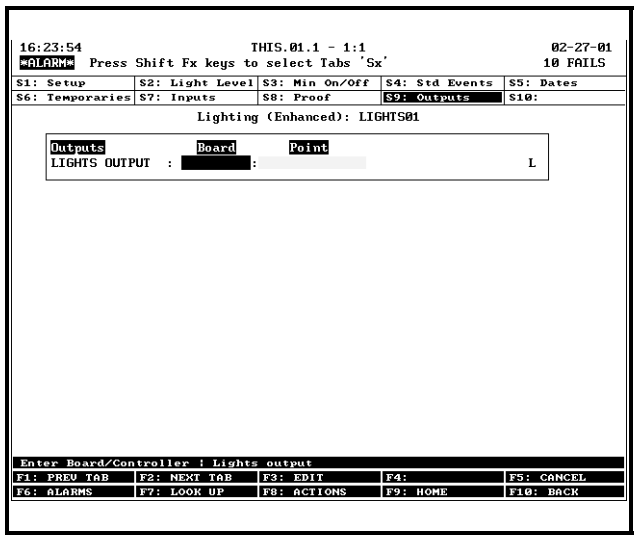


Figure 16-10 *- Enhanced Lighting Screen 9 - Outputs*

Required Steps

1. Enter the board and point address of the I/O output that controls the lights in the LIGHTS OUTPUT output definition.

17 Analog and Digital Sensor Setup

17.1 Overview

The Einstein is equipped with numerous generic control modules that may be used both for simple monitoring of an analog or digital sensor and for simple cut-on/cut-off control of a digital output. These modules are called Sensor Control modules.

There are two different Sensor Control Module types. **Analog Sensor Control modules** read the values from one or more analog sensors, compare them to a set of cut-on/cut-off set points, and operate a digital output (such as a relay) based on the analog input in relation to the set points.

Digital Sensor Control modules read the values from one or more digital sensors, combine them using a series of logical commands, and operate a digital output (such as a relay) based on the result of the logical combination.

17.2 Analog Sensor Control

On a basic level, an Analog Sensor Control module performs three functions:

- COMBINER: Up to four analog inputs are combined into a single analog value.
- CUT-IN/CUT-OUT CONTROL: The combined input value is compared to a cut-in and a cut-out set point. Based on this comparison, a digital output will be turned ON or OFF.
- ALARMING: Alarms and notices can be generated based on the combined value of the inputs and its relation to a set of high and low alarm and notice set points.

17.2.1 Cut-In/Cut-Out Set Point Control

Cut-in and cut-out set points work differently depending upon whether the cut-in or cut-out set point is higher.

Cut-In Higher Than Cut-Out

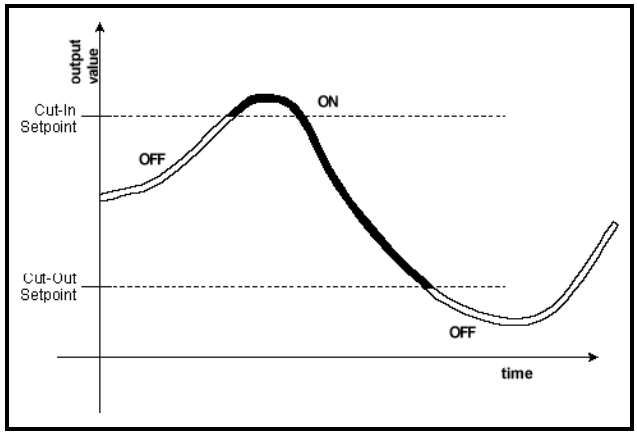


Figure 17-1 *- Cut-In Setpoint Higher than Cut-Out*

When the cut-in set point is higher than the cut-out set point, the Sensor Control output turns ON when the sensor input goes higher than the cut-in set point. The Sensor Control output remains ON until the input falls below the cut-out set point, at which time the output turns OFF. (See ***Figure 17-1*** for an illustration).

Cut-In Lower Than Cut-Out

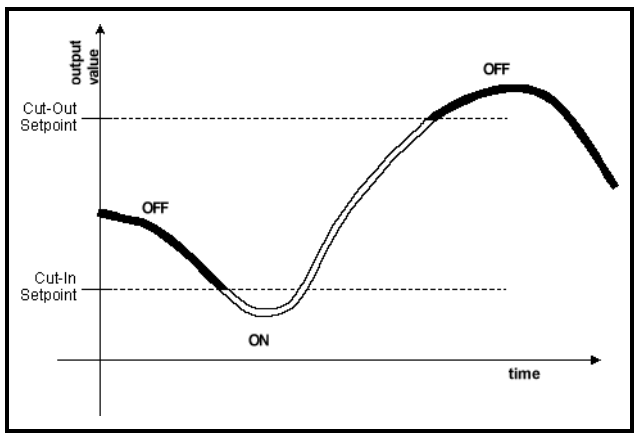


Figure 17-2 *- Cut-In Setpoint Lower Than Cut-Out*

When the cut-in set point is lower than the cut-out set point, the Sensor Control output turns ON when the sensor input goes lower than the cut-in set point. The Sensor Control output remains ON until the input rises above the cut-out set point, at which time the output turns OFF. (See ***Figure 17-2*** for an illustration).

17.3 Digital Sensor Control

The Digital Sensor Control module performs two basic functions:

- LOGICAL COMBINATION: Up to four inputs may be combined using standard logical combination methods (such as AND, OR, XOR, etc.) The result is the **command output value**, which can be used to operate a relay.
- BYPASS: The command output may be configured to be bypassed to a fixed value by a switch or button press.

17.3.1 Logical Combination

A Digital Sensor Control module has four inputs numbered 1 through 4. The logical combination of the Digital Sensor Control modules follows one of the following strategies:

- ***FIRST*** **-** The first of the four digital inputs received will be used as the logical input value. This combination first looks at input #1. If the value of this input is undefined, it looks for other valid inputs, starting with #2 and descending in numerical order to #4.
- ***SELECT*** **-** The sensor module reads an analog input, which provides a numerical value from 1 to 4. This number determines
- ***AND*** **-** The logical input value will be ON only when all sensor control inputs are ON. If one or more of them are OFF, then the logical input value will also be OFF.
- ***OR*** **-** The logical input value will be ON if one or more sensor control inputs are ON. If all of them are OFF, the logical input value will also be OFF.
- ***XOR*** **-** This combination strategy is exactly the same as OR, except when all sensor control inputs are ON, the logical input value will be OFF instead of ON.
- ***VOTE*** **-** If more than half of the sensor control inputs are ON, the logical input value will be ON. Otherwise, if 50% or less of the sensor control inputs are OFF, the logical input value will be OFF.

17.4 Setting Up Analog Sensors

From the Main Status Screen, press F4 to begin setting up your sensors. This will bring up the Sensor Status Screen (***Figure 17-3***).

Note: If you have more than one sensor, a menu screen will appear listing all analog AND digital sensors. To select an analog sensor for setup, use the arrow keys to highlight one of the sensors named "ANALOG SENS(number)," and press Enter***.***

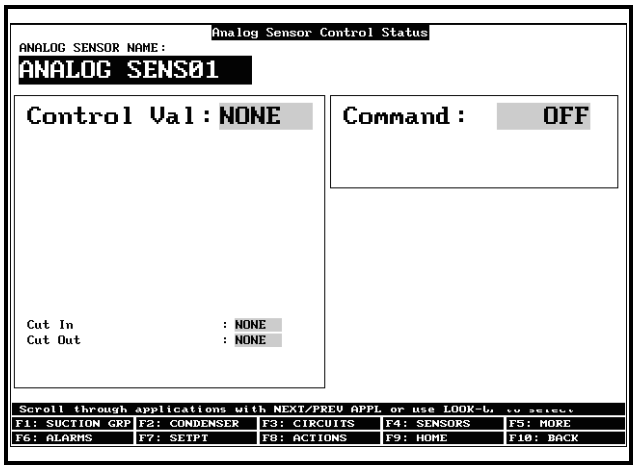


Figure 17-3 *- Analog Sensor Status Screen*

The Analog Sensor Status screen shows the current sensor value, and if applicable the ON/OFF state of the digital output controlled by the sensor.

Right now, this screen should be mostly blank, since you have not yet specified any information about the sensor.

To begin setting up this sensor, press F8 followed by 'B.

17.4.1 Screen 1: General

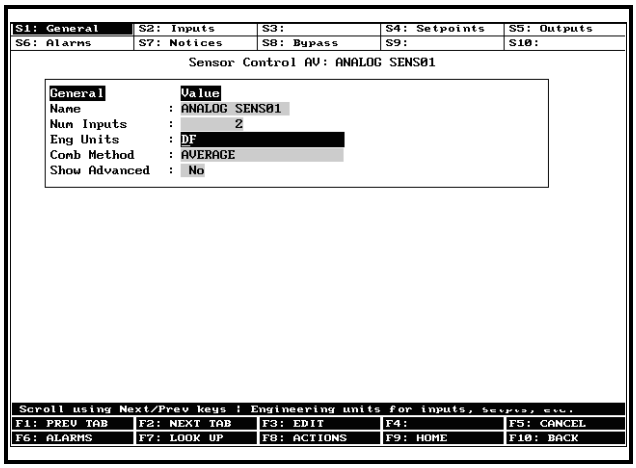


Figure 17-4 *- Analog Screen 1: General*

Required Steps

1. Enter a name for this analog sensor in the **Name**

field.

2. Enter the total number of inputs that will be used in the sensor control module in the **Num Inputs** field. You may specify up to four.
3. Enter the appropriate engineering units for the sensor type in the **Eng Units** field. For example, choose "PSI" or "BAR" if the sensor is a pressure transducer, "DF" or "DC" if the sensor is a temperature sensor, etc. Use the Look-Up Table (F7) to select.
4. If you chose more than one input for the sensor control module, choose how the multiple sensors will be combined into a single value in the **Comb Method** field. Use the Look-Up Table (F7) to select. There are several combination options, only five of which are commonly used for Sensor Control Purposes:

- ***AVERAGE*** - All sensor inputs will be averaged.
- ***MAX*** - The sensor with the highest value will be used as the combined value.
- ***MIN*** - The sensor with the lowest value will be used as the combined value.
- ***FIRST*** - The first sensor input (i.e. the lowest-numbered sensor input that has a valid value) will be used as the combined value.
- ***MIX*** - This strategy adds x% of Input #1 to 100-x% of Input #2, resulting in a value that is a mixture of both inputs.

Options

Show Advanced The Show Advanced field enables or disables some of the more advanced analog sensor control functions. For simple analog sensor control modules with straight cut in/cut out output control, it is recommended you leave this field set to "No."

If you have need of some of the advanced features of an Analog Sensor Control module, consult *P/N 026-1603, Einstein RX Programmer's Guide* for full documentation of all sensor control parameters.

Mix Ratio If you selected "Mix" as the combination strategy for the Analog Sensor Control module, you must specify the ratio at which the two sensor inputs will be compared.

17.4.2 Screen 2: Inputs

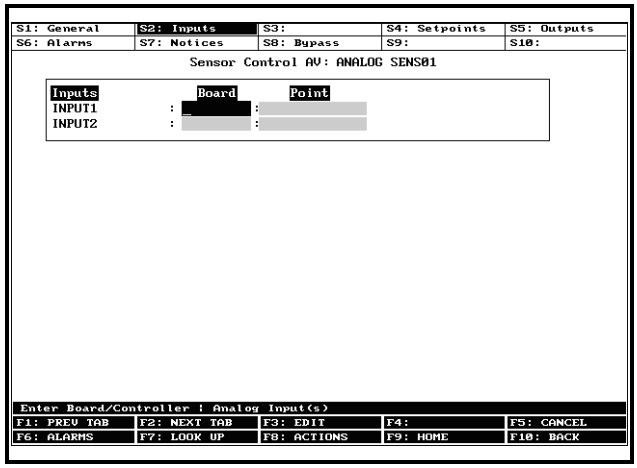


Figure 17-5 *- Analog Screen 2: Inputs*

Required Steps

For each sensor input, enter the board and point address of the sensor inputs in the appropriately numbered **INPUT** field.

For each board and point address you enter, the Einstein will prompt you to specify the type of sensor being used. Refer to **Section 7.1.2.1,** *Setup Analog Input Screen* for instructions on how to do this.

17.4.3 Screen 4: Setpoints

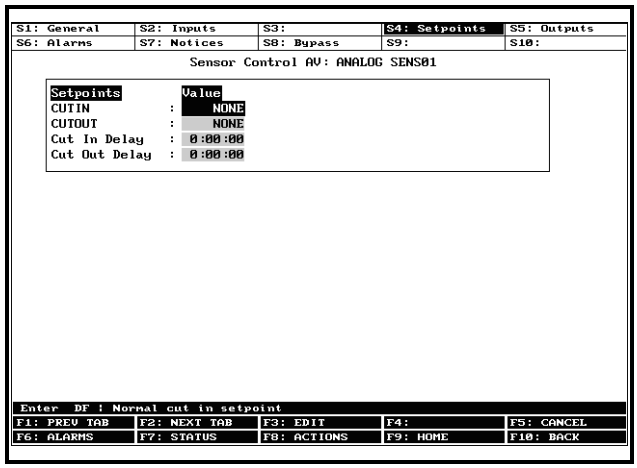


Figure 17-6 *- Analog Screen 4: Setpoints*

NOTE: If you will not be controlling a device using this analog sensor's value, skip to Screen 6.

Required Steps

1. Enter the set point at which the sensor application's digital command output will turn ON in the **CUTIN** field.
2. Enter the set point at which the sensor application's digital command output will turn OFF in

the **CUTOUT** field.

Options

CUT IN DELAY The Cut In Delay keeps the command output from turning on for a fixed amount of time after it has been deactivated. By default, the cut-in delay is 0:00:00. If you wish to specify a cut-in delay, enter it in this field.

CUT OUT DELAY The Cut Out Delay keeps the command output from turning off for a fixed amount of time after it has been activated. By default, the cut-out delay is 0:00:00. If you wish to specify a cut-out delay, enter it in this field.

17.4.4 Screen 5: Outputs

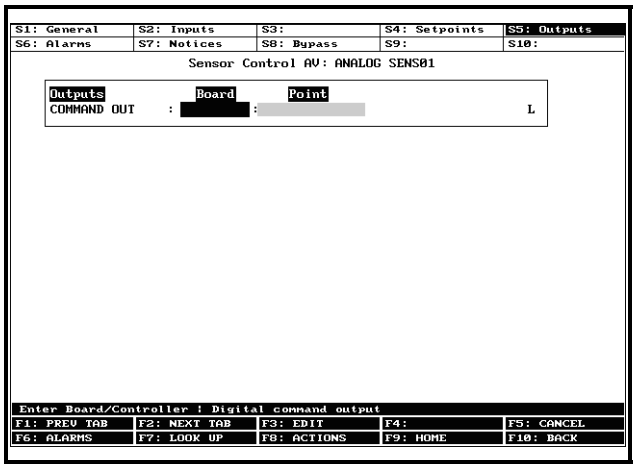


Figure 17-7 *- Analog Screen 5: Outputs*

NOTE: If you will not be controlling a device using this analog sensor's value, skip to Screen 6.

Required Steps

1. Enter the board and point address of the command output in the **COMMAND OUT** field.

17.4.5 Screen 6: Alarms

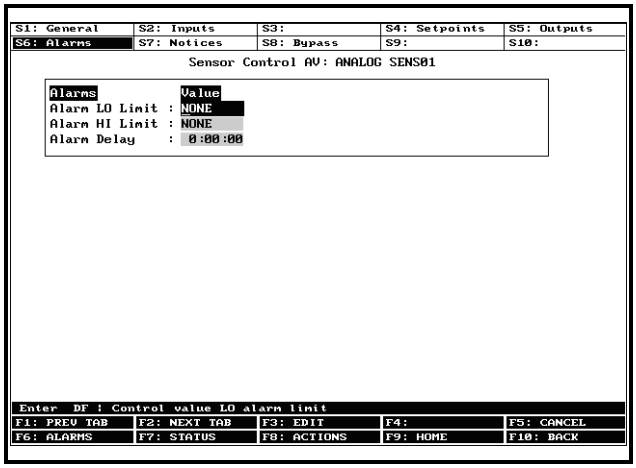


Figure 17-8 *- Analog Screen 6: Alarms*

Required Steps

1. If you wish to generate an alarm when the sensor value goes below a pre-defined limit, enter the low limit set point in the **Alarm LO Limit.**
2. If you wish to generate an alarm when the sensor value goes above a pre-defined limit, enter the high limit set point in the **Alarm HI Limit.**
3. Enter the amount of time the sensor value must be below a LO limit or above a HI limit before an alarm will be generated in the **Alarm Delay** field.

17.4.6 Screen 7: Notices

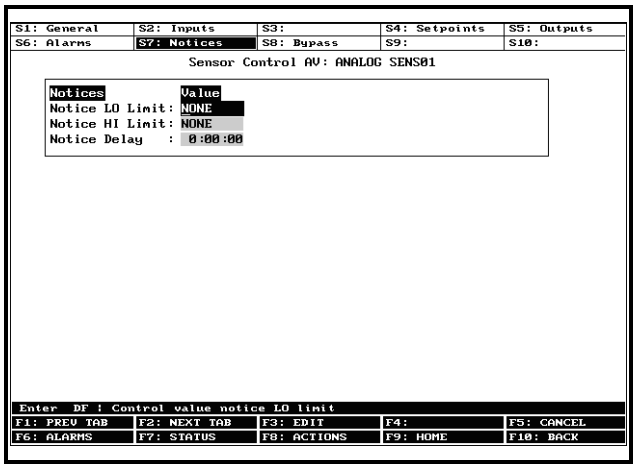


Figure 17-9 *- Analog Screen 7: Notices*

Required Steps

1. If you wish to generate a notice when the sensor value goes below a pre-defined limit, enter the low limit set point in the **Notice LO Limit.**
2. If you wish to generate a notice when the sensor value goes above a pre-defined limit, enter the

high limit set point in the **Notice HI Limit.**

3. Enter the amount of time the sensor value must be below a LO limit or above a HI limit before a notice will be generated in the **Notice Delay** field.

17.4.7 Screen 8: Bypass

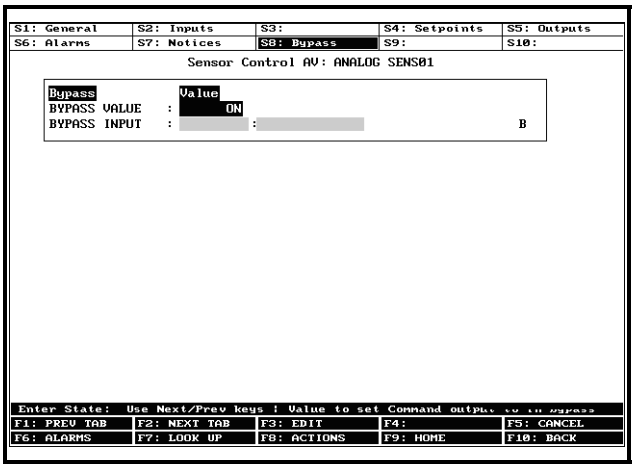


Figure 17-10 *- Analog Screen 8: Bypass*

Options

Bypass Input If you wish to set up a physical input (such as a switch or push button) that will bypass the command output to a fixed digital state, enter the board and point address of the input in the Bypass Input definition. The bypass will be active whenever this input is CLOSED.

Bypass Value In this field, choose the value to which the command output will be bypassed when the Bypass Input is CLOSED. Use the Look-Up Table (F7) to select.

17.5 Setting Up Digital Sensors

Accessing digital sensors for setup is similar to analog sensors. From the Main Status Screen, press F4 to begin setting up your sensors. This will bring up the Sensor Status Screen (***Figure 17-11***).

Note: If you have more than one sensor, a menu screen will appear listing all analog AND digital sensors. To select a digital sensor for setup, choose one of the sensors named "DIGITAL SENS(number)," and press Enter.

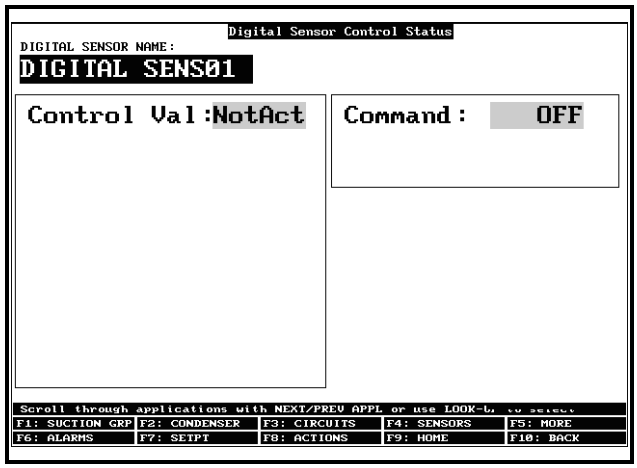


Figure 17-11 *- Digital Sensor Status Screen*

The Digital Sensor Status screen shows the current sensor value, and if applicable, the ON/OFF state of the digital output controlled by the sensor.

Right now, this screen should be mostly blank, since you have not yet specified any information about the sensor.

To begin setting up this sensor, press F8 followed by B.

17.5.1 Screen 1: General

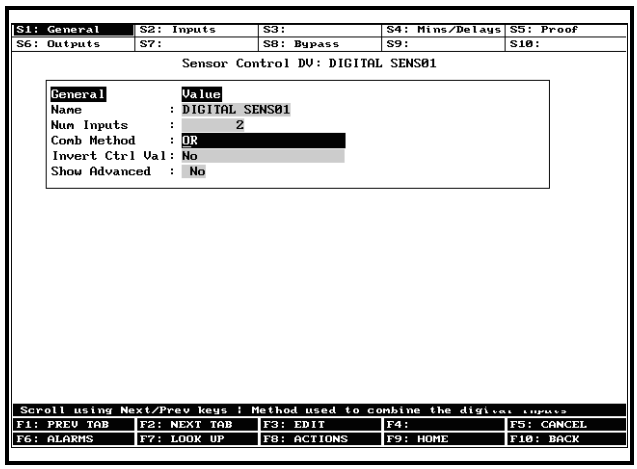


Figure 17-12 *- Digital Screen 1: General*

Required Steps

1. Enter a name for the digital sensor module in the **Name** field.
2. Enter the number of digital inputs that will be combined into the control input value in the **Num Inputs** field. You may specify up to four inputs.
3. If you are combining more than one sensor (i.e. the Num Inputs field is defined with a number

higher than one), choose the logic that will combine the multiple inputs into a single digital state in the **Comb Method** field. Use the Look-Up Table (F7) to select. Refer to **Section 17.3.1,** *Logical Combination*, for a description of the various logical combinations.

4. If you wish to invert the combined value after it has been combined by the Comb Method, press Y to change the **Invert Ctrl Method** field to "Yes."

Options

Show Advanced The Show Advanced field enables or disables some of the more advanced analog sensor control functions. For now, leave this field set to "No."

17.5.2 Screen 2: Inputs

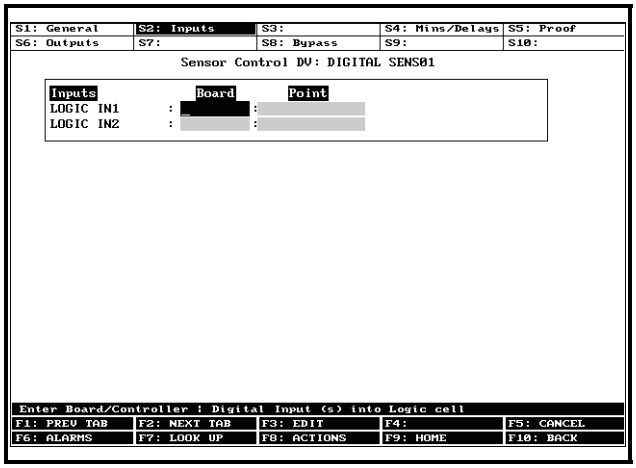


Figure 17-13 *- Digital Screen 2: Inputs*

Required Steps

1. Enter the board and point address of each logical input in the appropriately numbered **LOGIC IN** input.

17.5.3 Screen 4: Mins/Delays

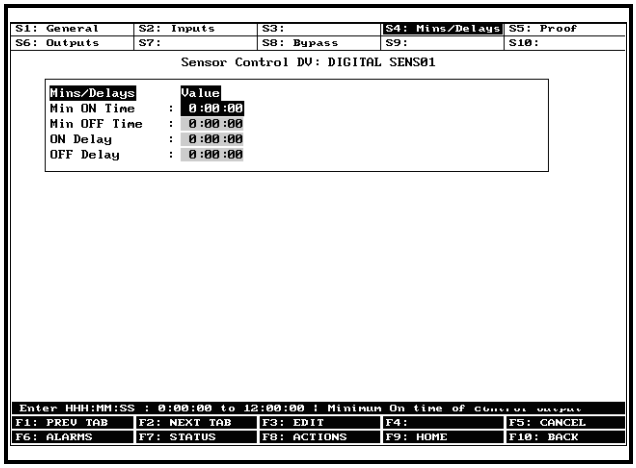


Figure 17-14 *- Digital Screen 4: Mins/Delays*

Options

Min ON Time The Minimum ON time forces the Sensor Control module's command output to remain ON for a minimum amount of time before it may be turned OFF. If you wish to specify a minimum ON time, enter it in this field (HH:MM:SS format).

Min OFF Time The Minimum OFF time forces the Sensor Control module's command output to remain OFF for a minimum amount of time before it may be turned ON. If you wish to specify a minimum OFF time, enter it in this field (HH:MM:SS format).

ON Delay Before the command output may transition from OFF to ON, the Sensor Control module must wait for an amount of time equal to the ON delay. If you wish to specify an ON delay, enter it in this field (HH:MM:SS format).

OFF Delay Before the command output may transition from ON to OFF, the Sensor Control module must wait for an amount of time equal to the OFF delay. If you wish to specify an OFF delay, enter it in this field (HH:MM:SS format).

17.5.4 Screen 5: Proof

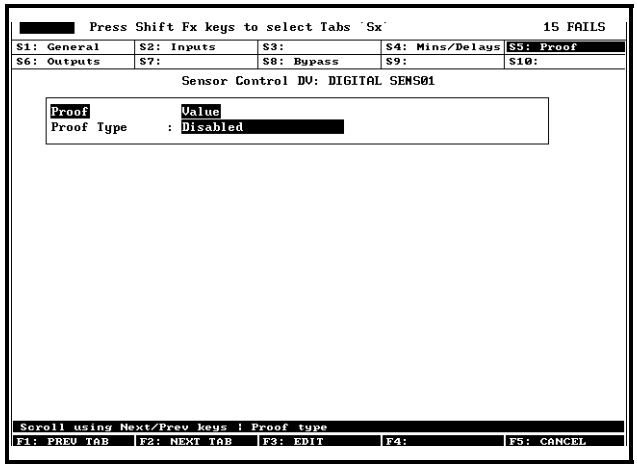


Figure 17-15 *- Digital Screen 2: Inputs*

Options

Proof Type If you will not be using proof checking for this digital sensor control application, leave this field set to "Disabled." Otherwise, choose which output value from the Sensor Control application will be used to compare to the Proof input. There are two options:

- ***Logical Value*** **-** The Proof input will be compared to the output state the Sensor Control algorithm is requesting, NOT the actual value of the Sensor Control output. This means any overrides or bypasses that are active on the output will be ignored by proof checking.
- ***Actual Value*** **-** The Proof input will be compared to the actual state of the output, including any bypasses or overrides.

Proof On Value You may choose under what conditions proof checking will be active.

- ***ON only (default)*** **-** The application will do proof checking only when the output is supposed to be ON. When it is supposed to be OFF, the application will not check the Proof input to verify it is OFF.
- ***OFF only*** **-** The application will do proof checking only when the output is supposed to be OFF. When it is supposed to be ON, the application will not check the Proof input to verify it is ON.
- ***ANY value*** **-** The application will do proof checking for both ON and OFF values of the Sensor Control output.

PROOF IN Enter the board and point address of the proof checking device in this input definition.

Proof Delay Enter the amount of time the Proof input must register a failure before the application considers the application "failed." Enter a time in HH:MM:SS format.

Proof Latch Enter the amount of time the proof input must register a "return-to-normal" after proof failure before the failure is cleared.

17.5.5 Screen 6: Outputs

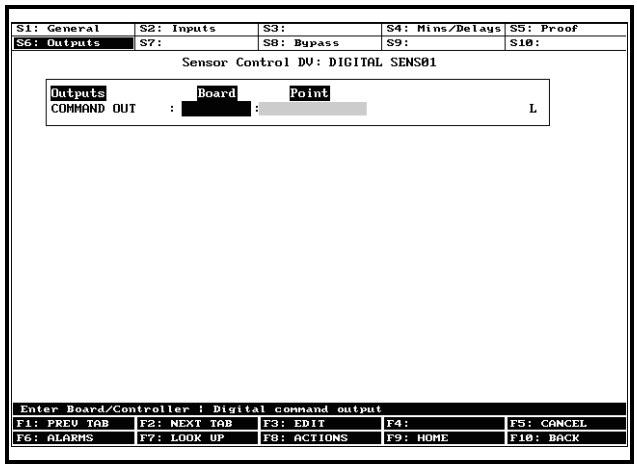


Figure 17-16 *- Digital Screen 6: Outputs*

Required Fields

1. Enter the board and point address of the relay that the Sensor Control module will control in the **COMMAND OUT** definition.

17.5.6 Screen 8: Bypass

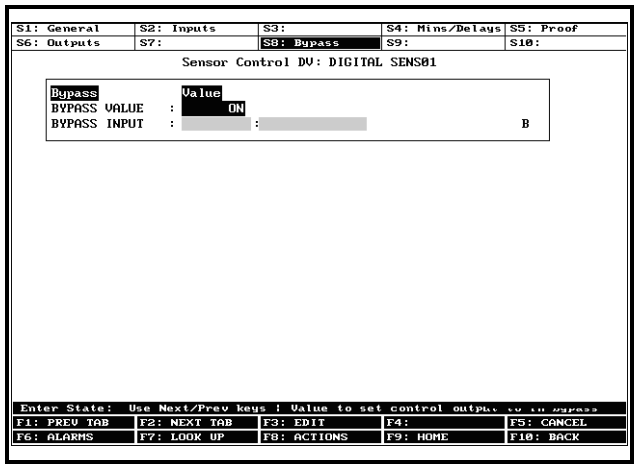


Figure 17-17 *- Digital Screen 8: Bypass*

Options

Bypass Input If you wish to set up a physical input (such as a switch or push button) that will bypass the command output to a fixed digital state, enter the board and point address of the input in the Bypass Input definition. The bypass will be active whenever

this input is CLOSED (ON).

Bypass Value In this field, choose the value to which the command output will be bypassed when the Bypass Input is CLOSED. Use the Look-Up Table (F7) to select.

18 Power Monitoring

A Power Monitoring application is used primarily for monitoring, recording, and to a lesser degree controlling kW usage in a building.

18.1 Overview

Explanation of "Demand"

Power companies supply power to consumers at a fixed rate per kilowatt hour until a pre-defined level of energy consumption is reached. This level is called the "**demand limit**." When the demand limit is exceeded, the rate is greatly increased as a penalty for high power demand by the consumer. Generally, once the demand limit is exceeded, the increased rate is charged for the remainder of the year.

To determine if you have reached the demand limit, the power company arbitrarily monitors a consumer's energy consumption for a fixed period of time. This monitoring period is called a "**demand window**." Power companies can generally tell you how long a demand window period lasts, but you'll never know when the measurement will take place.

How Power Monitoring Calculates Demand

To help you make sure you do not use more power than the demand limit, the Einstein's Power Monitoring applications determine your current kW usage in much the same way as your power company. Power Monitoring uses a watt-hour transducer input to determine the current kW usage. Multiple kW values are averaged together into "demand windows," much like the ones power companies use.

Then, depending on how the application is configured, the most current kW value is compared to a demand set point. The "current kW value" in this case may be either the instantaneous value read by the power transducer, or it may be the average of all kW transducer readings taken over 1-minute intervals. This set point should be equal to or slightly lower than the demand limit set by your power company.

In short, since Einstein doesn't know when the power company's demand window will begin, the Einstein measures power as if the demand window could happen at any time. This way, Einstein can more accurately determine when your site is approaching or exceeding the demand limit.

Shed Mode

If the kW usage is higher than the demand set point, Power Monitoring goes into Shed Mode. During Shed Mode, Power Monitoring turns on a digital output called SHED OUT. This output may be connected to the demand shed inputs of one or more Einstein applications, which will in turn shut down or otherwise curb the power usage of the overall system. The SHED OUT output remains ON until the kW usage falls below the demand set point.

In short, the purpose of Shed Mode is to get the total kW usage below the demand set point as soon as possible.

Note: If you do not wish to use load shedding for your building, simply do not connect anything to the SHED OUT output.

18.1.1 Logging

Power Monitoring applications are pre-programmed with extensive logging capabilities that record the hourly, daily, and monthly power usage statistics.

Hourly

The hourly log contains a list of power usage summaries of the previous 48 hours. An hourly log entry contains:

- The time and date of the entry,
- The kWH for that hour,
- The maximum average kW that occured within any demand window for that hour,
- The highest instantaneous kW reading taken for that hour, and the time that reading was taken.

Daily

The daily log contains a list of power usage summaries for the previous 48 days. A daily log entry contains:

- The date of the entry,
- The kWH for that day,
- The maximum average kW within any demand window for that day,
- The highest instantaneous kW reading taken for that day, and the time that reading was taken,
- The total number of minutes the Power Monitoring application was in Shed Mode,
- The Heat Degree Days for that day, and
- The Cool Degree Days for that day.

Monthly

The monthly log contains a list of power usage summaries for the previous 24 months. A monthly log entry contains:

- The month and year of the entry,
- The kWH for that month,
- The maximum average kW within any demand window for that month,
- The highest instantaneous kW reading taken for that month, and the date and time the reading was taken,
- The total number of minutes the Power Monitoring application was in Shed Mode,
- The Heat Degree Days for that month, and
- The Cool Degree Days for that month.

Definition of Heat and Cool Degree Days

Heat degree-days and cool degree-days are standard industry measurements of the demand for heating and cooling. This measurement is based on the daily average outdoor air temperature.

If the daily average temperature is **below 65°F**, then the number of heat degree-days for that day is equal to 65 minus the day's average temperature in degrees Fahrenheit. Example: if the day's average temperature is 54°F, the number of heat degree-days for that day is 65-54= 9 heat degree-days.

If the daily average temperature is **above 65°F**, then the number of cool degree-days for that day is equal to the day's average temperature in degrees Fahrenheit minus 65. Example: if the day's average temperature is 71°F, the number of cool degree-days for that day is 71-65= 6 cool degree-days.

Larger degree-day numbers indicate a larger demand for heating or cooling. Degree-day totals may be added together to indicate heating and cooling demand for weeks, months, or years. Einstein does this to keep monthly logs of heat and cool degree-days.

18.2 Setting Up Power Monitoring Circuits

From the main status screen, press F5 followed by *E to begin setting up your power monitoring circuits. This will bring up the Power Monitoring Status Screen (***Figure 18-1***).

Note: If you have more than one power monitoring circuit, a menu screen will appear listing all power monitoring circuits. To select a power monitoring circuit for setup, use the arrow keys to highlight one of the circuits and press Enter.

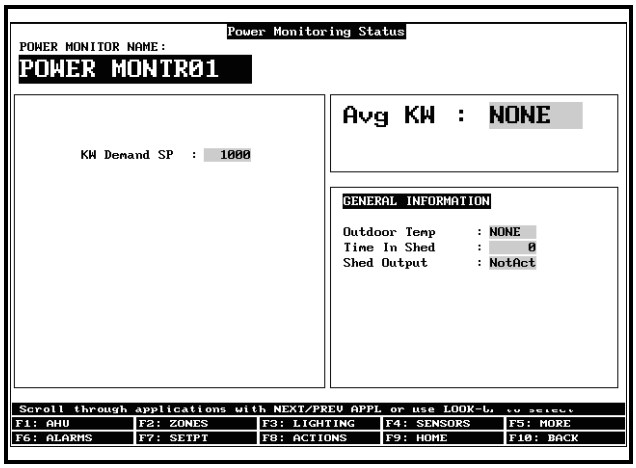


Figure 18-1 *- Power Monitoring Status Screen*

The Power Monitoring Status Screen shows the current average KW usage value as well as the demand set point and the status of the shed output. Right now, this screen should be mostly blank, since you have not yet configured the circuit. To begin configuration, press F8 followed by *B.

18.2.1 Screen 1: General

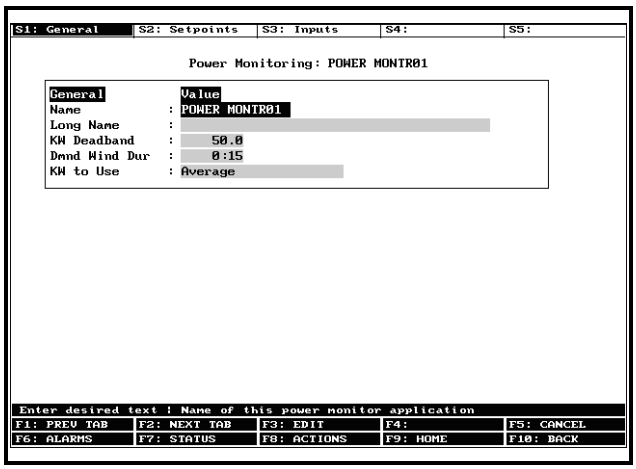


Figure 18-2 *- Power Monitor Screen #1: General*

Required Steps

1. Enter a name for the power monitoring circuit in the **Name** field.
2. Enter the demand window time period used by your power company to measure your site's demand usage in the **Demand Wind Dur** field. Enter this time in hours:minutes format.
3. In the **KW to Use** field, choose whether you want the KW value shown by the Power Monitoring circuit to be an "average" KW or an "real" KW. Selecting "Average" will average all the KW

transducer readings taken during the previous demand window and use the result as the KW output. Selecting "Real" will simply take the raw value from the KW transducer and use it as the KW output.

Options

KW Deadband The KW deadband is an amount of KW equally above and below the KW demand set point in the Power Monitoring circuit. If the KW value is above the set point plus one-half the dead band, the Power Monitoring circuit will consider the demand set point to be exceeded and the Shed Out output will turn ON. The KW value must drop below the KW set point minus one-half the dead band to turn the Shed Out output OFF and cancel the demand state.

18.3 Screen 2: Setpoints

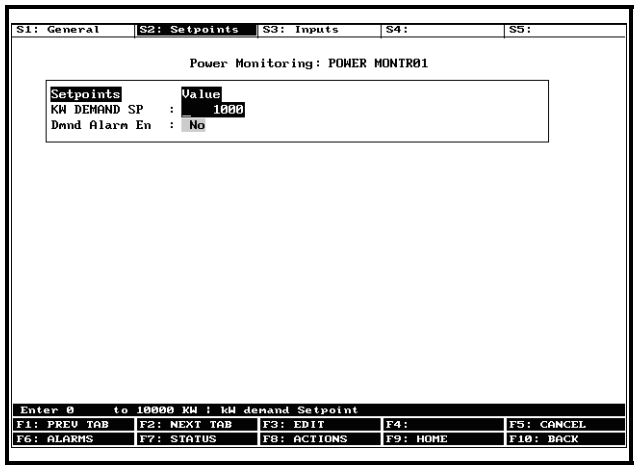


Figure 18-3 *- Screen 2: Power Monitor Setpoints*

Required Steps

1. Enter the demand set point in the **KW DEMAND SP** field.
2. If you wish to generate alarms when the demand set point is exceeded, select "Yes" in the **Dmnd Alarm En** field.

18.4 Screen 3: Inputs

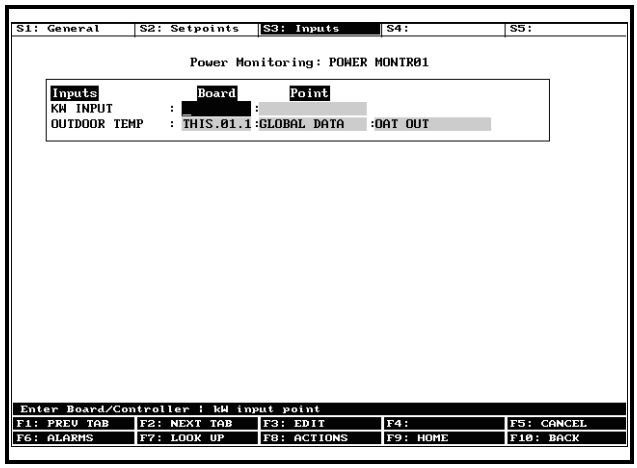


Figure 18-4 *- Power Monitoring Screen 3: Inputs*

Required Steps

1. Enter the board and point address of the watt or watt-hour transducer in the **KW INPUT** definition.
2. Enter the location of the outdoor temperature input in the **Outdoor Temp** definition. The Power Monitoring application uses the outdoor air temperature to calculate heat and cool degree-day values. By default, this input is configured to look at Global Data's Outdoor Temp provider. If you would prefer to not use Global Data and simply enter a board and point address, press F3 1 1 to change the definition format to "Board:Point."

18.5 Viewing Power Monitoring Logs

The method for viewing average KW and degree-day information for a Power Monitoring application is different from the way logs of standard input and output values are viewed. The Power Monitoring application keeps these logs as **application logs,** which are accessible from the Actions Menu when viewing the Power Monitoring Status Screen.

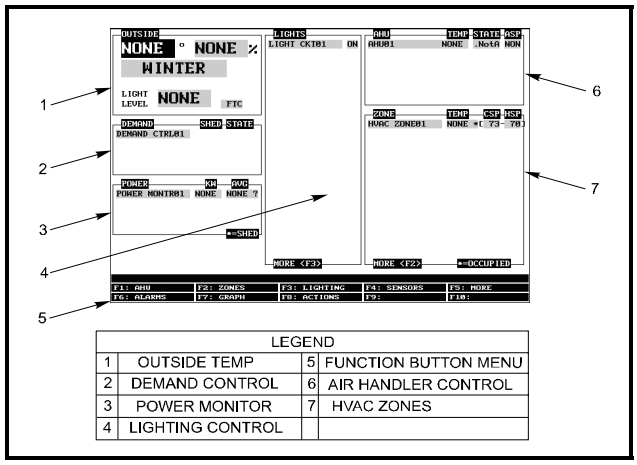
Navigate to the Power Monitoring Status Screen by pressing F5 E from the Main Status Screen, and choosing the name of the Power Monitoring application from the list that appears. From the Power Monitoring Status Screen, press F8 E. Then, from the menu that appears, choose which log or graph you'd like to view.

19 Trouble Shooting

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
I/O Network Problems	I/O board getting no power.	Reset power to board.
	I/O board not communicating.	Check I/O network connections. a. Check wire polarity b. check for broken or loose wires.
	Dip switches set wrong.	Check I/O board network dip switches. (If switches are wrong, make changes and then reset the controller.)
	Terminating resistance jumpers set wrong.	Check for proper setting of terminating resistance jumpers. (Up for beginning/end and down for middle of network.
	Boards not powered.	Check Network/Power voltages.
Problems with Global Actions	Information cannot be read from another Einstein controller.	Verify that the controller with the sensor is set up as the Primary and the controller receiving the information is set up as the User (both controllers default as local).
Echelon Network Problems	Faulty Wiring.	Check connections. Check for wire damage.
	Termination Jumpers set Wrong.	Refer to **Section 4.2.5,** *Setting the Terminating Resistance Jumpers*
	Subnet (Unit #) set Wrong.	Each controller must have its own subnet address. Refer to **Section 9.4.3,** *Subnet/Node Assignment*
Problems with Temp Sensor Displaying Proper Value	16AI Input dip switches set improperly.	The 16 dip switches on the 16AI board correspond to each of the inputs. If dips up, temp sensor. If dips down, pressure trans.
	Incorrect board and point address.	Verify proper board and point address.
No Heat or Air will Come On	Incorrect board and points assignment.	Make sure that your board and points are assigned to the to the correct compressors and heat stages.
	Check the heat and cool OAT lockout temps.	From the Main Status screen, F1 (AHU), F8 (Actions), *B (Setup), Shift + F5 (HT/CL Setup).

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
Dehumidification Problems	Number of stages not set up or set up incorrectly.	From the Main Status screen, F1 (AHU), F8 (Actions), *B (Setup), Shift + F9 (Dehum). Check for correct # of cool stages for dehumidification.
	Dehumidifier source not set up.	From the same screen, verify what the sensor source is.
	Temp setting for DEHUM OCC or DEHUM UOC too high.	From the same screen, check the minimum temp setting.
Lighting Control Problems	Lights will not come on.	Make sure you have a time schedule set up. A time schedule is not lighting control. You can use the same time schedule for several lighting controls. Set up the time schedule first and then assign it to a lighting control.
		Set up a time schedule and go to lighting control. Choose which one and press F8 and *B. Press F2 (Inputs). Highlight the board field, press F7 (Lookup), and choose the input device (Enter). Highlight the point field and press F7. Select the type of schedule using the Prev and Next keys and press Enter.
		Make sure the Lighting control output is assigned.
Lights Will Not Come On with the Photocell	Photocell not recognized by controller.	Make sure the photocell is configured as an analog input.
		Verify that the type of light sensor is correct.
		If using a light level sensor from another Einstein controller, set it up on the controller it is associated with in the global data section.

20 Operator's Guide to Using the Einstein



LEGEND			
1	OUTSIDE TEMP	5	FUNCTION BUTTON MENU
2	DEMAND CONTROL	6	AIR HANDLER CONTROL
3	POWER MONITOR	7	HVAC ZONES
4	LIGHTING CONTROL		

Figure 20-1 *- Main Status Screen*

The Main Status screen (***Figure 20-1***) is divided into sections that display the current status in areas of importance in the system (i.e. outside temperature, lighting control, air handler circuits, and HVAC zones). The time, date and alarm status are displayed as well. The display is backlit, but will dim to save energy after a determined amount of time.

The Main Status Screen acts as a master and default screen for all the functions of Einstein. This screen is divided into different sections, displaying important areas in the system.

Outside Conditions

The first section of the Main Status screen is the Outside Conditions screen located in the top left corner. Information such as outside temperature, outside relative humidity, season, and light level value

Demand Section

This section displays the current status of the demand circuit(s). It also shows if the controller has placed the unit in shed mode.

Power Monitoring Section

This screen located at the bottom left of the screen and contains information on the status of the power monitors, such as the current kilowatt values and average kilowatt values.

Lights Section

The Lights Section displays the name of each light circuit and the current on/off status for each.

Air Handler Unit Section

This section contains information on the air handlers such as the names of the air handlers, their temperature setpoints, current states, and active setpoint states.

HVAC Section

The HVAC section contains information on the HVAC zones, current temperature, occupied status, and cooling and heating set points.

20.1 Navigation

The Cursor

The Einstein includes arrow keys for the user to easily navigate the cursor around each screen. Areas can be accessed for detailed information and certain functions by guiding the cursor with the arrow keys.

The F7 Key

Certain functions may be performed from the Main Status screen. Functions such as graphing, overriding, and expanded information can be initiated without moving from the Main Status screen. These functions appear (and change as the cursor moves about the screen) in the Function Button menu in the F7 box.

Depending on where the cursor is pointed, this key will offer different functions (displayed in the function button menu) based on the type of field that is highlighted. The user may initiate the F7 key from the Main Status screen to call up these functions. For example, if one of the light control circuits were highlighted, the menu space for F7 would indicate "OVERRIDE," meaning that by pressing F7, the override update screen would come up for that particular light circuit.

20.2 Checking Boards Online

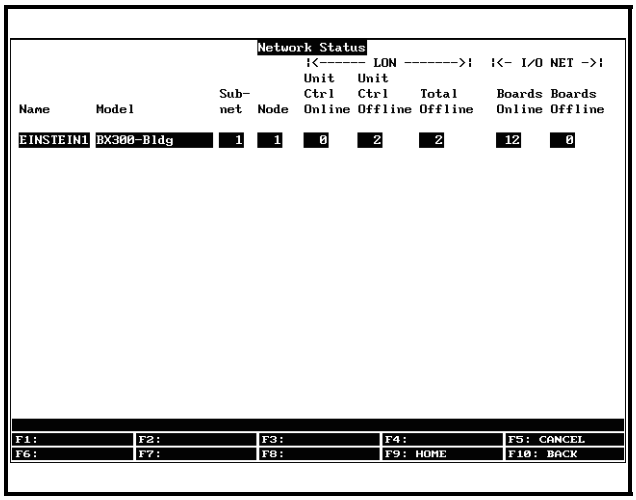


Figure 20-2 *- Network Status Screen*

You can check all boards that are on either the Echelon network (Einstein controllers) or the I/O network from the Network Status screen (See ***Figure 20-2***). This screen displays information such as the Subnet and Node addresses for each board, the number of Echelon controllers (Einsteins) that are online or offline, and the number of I/O boards online or offline.

To get to the Network Status Screen:

3. From the Main Status screen, press F8 (ACTIONS).
4. Press `S (Network Status).

The Network Status screen will display several items:

- The names, descriptions, and subnet and node addresses for each controlling device in the network (RX & BX).
- All Echelon devices (Einstein), online and offline.
- Number of I/O Network devices (16AIs,8ROs, etc.) associated with each controller online and offline.

If Boards are Offline

If there are boards offline, the Network Status screen will not identify them. It will state how many are on or offline. To determine which boards are inactive:

1. From the Main Status screen, press F8 (ACTIONS), and then Y (System Setup).
2. Press 4 (Network Status/Setup) and then 3 (Controller Status)

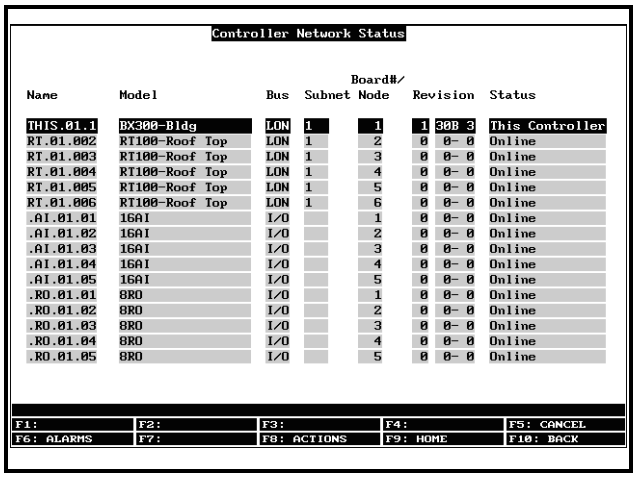


Figure 20-3 *- Network Status Screen*

This screen will list all of the Echelon (Einsteins, signified by LON) and I/O (16AIs, 8ROs,etc.) boards that have been programmed into the system. The screen also includes the current statuses of each board, so after determining which board is offline, move onto **Section 19,** *Trouble Shooting*.

20.3 Checking Status Screens

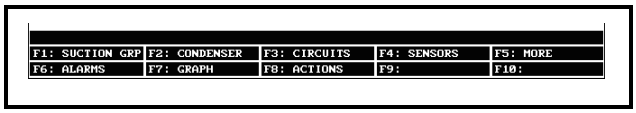


Figure 20-4 *- Function Button Menu*

The Einstein controller has four status screens that each are accessible (from the Main Status Screen) by pressing one function key (see ***Figure 20-4***). The AHU status screen, the Zones status screen, the Lighting status screen, and the Power Monitor status screen all can be accessed by pressing one of the function keys.

AHU Screen

Press F1 . The AHU selected will be displayed with information such as control temperature, fan status, humidity value, heat and cool settings, and other general information.

Zone Status Screen

Press F2 . Select which zone status to view with the arrow buttons and press Enter. Information on the zones such as zone temperature output, economy mode, temperature combining methods, dehumidifier status, and other general information will be displayed.

Lighting Status Display

Press F3. Select which lighting schedule to view with the arrow buttons and press Enter. Information such as current output status, proof activity, bypass/shed status, and other information are given.

Power Monitor Display

Press F4. Select a power monitor circuit and press Enter. Information such as the kilowatt demand value, and shed out activity will be displayed.

Other Status Screens

Other status screens in the Einstein controller may be accessed by pressing F5. This menu shows screens such as RT-100 Rooftop Units, Anti-sweat circuits, Demand Control, Time Schedules, and Leak Detection. To gain access to any of the given applications, select the corresponding number or letter.

20.3.1 Logging into Other Einstein Controllers on the Network

Remote Login allows the user to log into any Einstein controller in the system and perform actions in the controller without physically being in front of that controller.

To log on to another Einstein controller in the system:

1. Log onto the Einstein controller.
2. Press F8 (ACTIONS). Press T (Choose Controller).

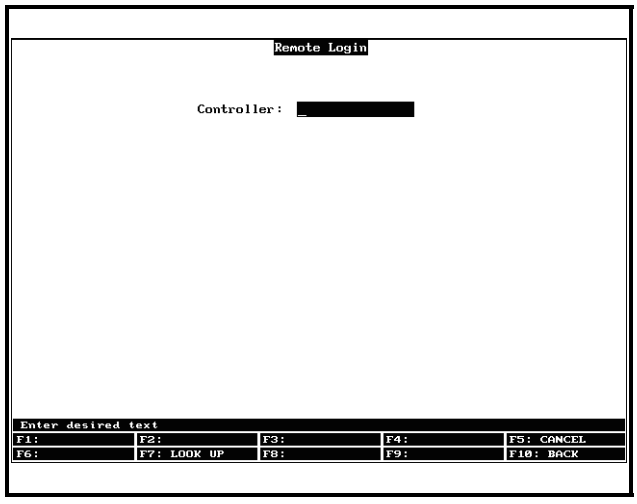


Figure 20-5 *- Remote Login Screen*

3. The Remote Login screen will appear (See ***Figure 20-5***). To choose the controller, press F7 (LOOK UP).
4. A list of all the associated Einstein controllers on the network will come up. Choose the controller using the arrow keys and press Enter.
5. The Remote Login screen will appear again with the controller name that was selected. Verify that the controller name is the correct and press Enter.
6. The "WAIT" indicator will appear in the top left corner of the screen. **Do not make any keystrokes while this indicator is displayed.** In 10 - 15 seconds the Main Status screen form the chosen controller will be displayed.

To log off from the Remote Login:

1. Press F8 (ACTIONS).
2. Press Shift X Z (Log Off).

The Einstein controller will be off the Remote Login mode.

20.4 Alarms

This section describes how to view and use the Alarm Advisory Log.

20.4.1 Accessing the Alarm Advisory Log

The Alarm Advisory Log can be accessed by pressing F6 from the main status screen or any other screen where ALARMS is displayed in the F6 menu box.

20.4.2 Viewing the Controller Advisory Log

The current number of advisory log entries (the log that is highlighted) is displayed at the top right of the Controller Advisory Log Screen. The total number of alarms and/or notices in the Controller Advisory Log is displayed below the current field. To move between Controller Advisory Log entries, press the ▲ or ▼ key.

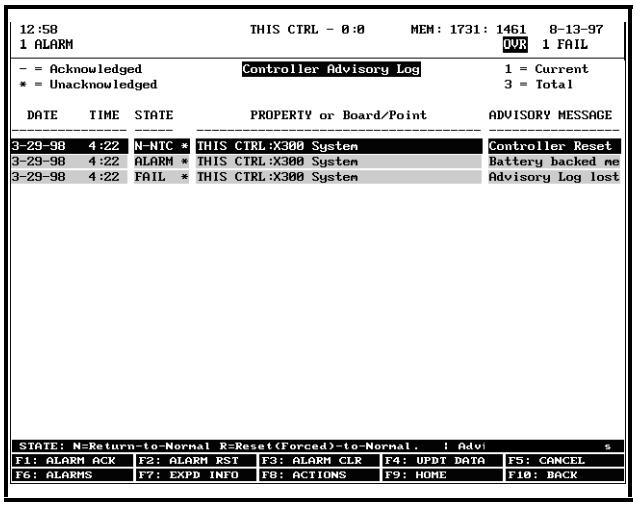


Figure 20-6 *- Alarm Advisory Screen*

The Controller Advisory Log is divided into four categories:

- Date & Time
- State
- Property or Board/Point
- Advisory Message

20.4.3 Date & Time

The Date & Time column simply displays the date and time when the alarm or notice was generated and logged into the controller.

20.4.4 State

The State column describes the alarm type, the current alarm state, and whether or not the alarm has been acknowledged. There are three possible alarm states:

- ALARM - A high-priority warning, usually signifying a condition that requires attention.
- NOTICE - A low-priority message, usually signifying a condition or a system change that requires no attention or may require attention in the future.
- FAIL - A failure is a special kind of message that signifies a failure in an Einstein system, an application, or in an input or output device controlled by an application (such as a sensor or fan).

20.4.4.1 Returned-To-Normal and Forced-To-Normal Alarms

For as long as the condition that caused the alarm message exists, the State field will show either ALARM, NOTICE, or FAIL as appropriate to the alarm type. However, if the condition that caused the alarm, notice, or failure is corrected, the message shown in the State field will change to signify the correction.

There are two ways an alarm, notice, or failure condition may be corrected:

- ***Return-To-Normal*** - "Return-To-Normal" means the condition that generated the alarm, notice, or failure has returned to normal on its own, or the Einstein has automatically corrected the condition. If an alarm returns to normal, a "N-" will appear in front of the alarm state in the State field.
- ***Reset (Forced)-To-Normal*** - "Reset-To-Normal" means the Einstein has been forced by a user to consider the condition "normalized" for purposes of alarm control. A Reset-To-Normal occurs when an alarm is reset using the Alarm Reset button (F2). If an alarm is forced to normal, a "R-" will appear in front of the alarm state in the State field.

Table 20-1 lists the nine possible state messages as they appear in the State field.

Advisory Type	Condition Still Exists	Condition Returned To Normal	Condition Reset to Normal
Alarms	**ALARM**	**N-ALM**	**R-ALM**
Notices	**NOTCE**	**N-NTC**	**R-NTC**
Failures	**FAIL**	**N-FL**	**R-FL**

Table 20-1 *- Alarm States*

20.4.5 Acknowledged State

The State field also shows whether or not an advisory record has been acknowledged or reset by a user. If an alarm has been acknowledged or reset, a dash "—" will appear at the end of the State field. If an alarm has not been acknowledged or reset, an asterisk "*" will appear at the end of the State field.

20.4.6 Property or Board/Point

This column describes where the alarm, notice, or failure was generated from. Alarms and notices can either be generated within the Einstein system or from an input value that is higher or lower than an alarm or notice setpoint defined during the system configuration process.

20.4.7 Advisory Message

The Advisory Message column is a brief description of the alarm, notice, or failure. Because of screen size constraints, it is often the case that the full advisory message will not be displayed in the Advisory Message field. To view the full advisory message, as well as the alarm prior-

ity and other important alarm information, press F7 for Expanded Information.

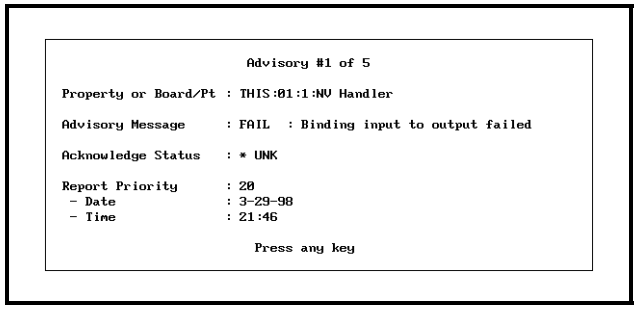


Figure 20-7 *- Expanded Info Screen*

20.4.8 Acknowledging, Resetting, & Clearing Log Entries

20.4.8.1 Acknowledging

When an alarm, notice, or failure is acknowledged, the log entry remains in the Controller Advisory Log. The only thing that changes is the state of the alarm or notice. An acknowledged alarm or notice returns the Einstein to a normal state of operation.

To acknowledge an alarm or notice, highlight the desired log entry and press F1 (ALARM ACK). A screen will come up prompting the user to either acknowledge the selected advisory, acknowledge all advisories or to cancel the operation.

1. Press /A to acknowledge the selected advisory.
2. Press *B to acknowledge all advisories.
3. Press -C to cancel the operation.

20.4.8.2 Resetting

When a log entry is reset, it is forced to a normal condition and the log entry remains in the Controller Advisory Log.

An alarm, notice, or failure can be reset by highlighting a log entry and pressing F2 (ALARM RST) while at the Controller Advisory Log screen. A screen will come up prompting the user to either reset the selected advisory, reset all advisories or to cancel the operation.

1. Press /A to reset the selected advisory.
2. Press *B to reset all advisories.
3. Press -C to cancel the operation.

20.4.8.3 Clearing

The option to clear logs completely removes a log entry from the Controller Advisory Log.

Controller Advisory Log entries may be cleared by highlighting the log entry and pressing F3 (ALARM CLR) while viewing the Controller Advisory Log screen. A screen will come up prompting the user to either clear the selected advisory, clear all advisories or to cancel the operation.

1. Press /A to clear the selected advisory.
2. Press *B to clear all advisories.
3. Press -C to cancel the operation.

20.4.9 Updating the Controller Advisory Log

After a log entry has been acknowledged, reset, or cleared, the Controller Advisory Log can be updated by

pressing F4 (UPDT DATA). When F4 is pressed, the Controller Advisory Log is re-generated and any changes that have been made since the last generation will occur.

20.4.10 Expanding Advisory Information

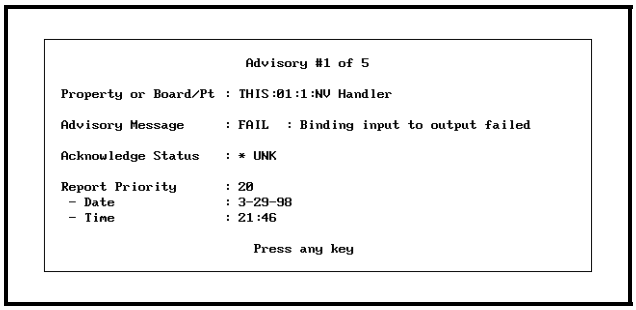


Figure 20-8 *- Expanded Info Screen*

To view expanded information on a log entry, highlight the desired log and press F7. A screen will come up telling the user what advisory is being viewed out of a total number of advisories.

Property or Board/Point

This message shows the location where the advisory was generated. This will be a board and point address or an application input or output (in Controller:Application:Property) format.

Advisory Message

The advisory message is displayed below the Property or Board/Point. The Advisory Message describes the advisory log entry (what went wrong in the system).

Acknowledge Status

Acknowledge Status describes the state of the advisory. If an advisory has been acknowledged or reset, the user name or the person who acknowledged or reset the alarm will appear below the acknowledge status. The date and time when the advisory was acknowledged or reset will also be displayed below the user's name.

If the advisory has not been acknowledged or reset, this field will display an asterisk "*" along with the work "UNK."

Report Priority

The report priority fields describe the priority level of the advisory, as well as the date and time the advisory occurred.

Return To Normal

If the advisory has returned to a normal state, either on its own or because of a user-ordered alarm reset, the date and time on which the reset occurred will be shown beside the report priority.

Appendix A: Pressure/Voltage and Temperature/Resistance Charts for Eclipse Transducers & CPC Temp Sensors

CPC Temperature Sensors	
Resistance (ohms)	**Temperature (F)**
336,450	-40
234,170	-30
165,210	-20
118,060	-10
85,399	0
62,493	10
46,235	20
34,565	30
26,100	40
19,899	50
15,311	60
11,883	70
9,299	80
7,334	90

Table 20-1 *- Temp Sensor Temperature/Resistance Chart*

Eclipse Transducers			
Voltage (VDC)	**Pressure (PSI)**		
	100 lb. xducer	**200 lb. xducer**	**500 lb. xducer**
0.5	0	0	0
0.7	5	10	25
0.9	10	20	50
1.1	15	30	75
1.3	20	40	100
1.5	25	50	125
1.7	30	60	150
1.9	35	70	175
2.1	40	80	200
2.3	45	90	225
2.5	50	100	250
2.7	55	110	275
2.9	60	120	300
3.1	65	130	325
3.3	70	140	350
3.5	75	150	375
3.7	80	160	400
3.9	85	170	425
4.1	90	180	450
4.3	95	190	475
4.5	100	200	500

Table 20-2 *- Eclipse Voltage to Pressure Chart*

Appendix B: Echelon Network ID Chart

Controller Name	Model	Subnet Number	Node Number	Neuron ID sticker/number	Controlled Unit's Model, Serial #, and/or Location
MEATCASE #1	CC-100L	1	2	010598279400	12' MULTI-DECK MEAT

LIST OF LONWORKS NETWORK DEVICES (PAGE ___ of ___)

Photocopy this page for use in recording Echelon numbers and Echelon network information.
Keep records on-site for servicing and troubleshooting purposes.

LIST OF LONWORKS NETWORK DEVICES (PAGE ___ of ___)

Photocopy this page for use in recording Echelon numbers and Echelon network information.
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LIST OF LONWORKS NETWORK DEVICES (PAGE ___ of ___)

Photocopy this page for use in recording Echelon numbers and Echelon network information.
Keep records on-site for servicing and troubleshooting purposes.

Appendix C: Alarm Advisory Messages

The table below is a list of all alarm messages that may appear in Einstein's Alarm Advisory Log. Each alarm message is listed by its Alarm Name, which is the text recorded in the Alarm Advisory Log when the error occurs, and the Default Priority, which is the default priority value for the alarm. A Default Priority of "User" indicates the alarm type's priority is programmed by the user during application setup.

Alarm Name	Default Priority	Definition
# of Events Exceeded Limit	User	A digital value has transitioned ON more times than its defined Number of Events set point.
50/60 Hz Line clock is bad	20	Einstein is not successfully synchronizing its clock with the 50/60 Hz pulse of its incoming power.
A FreezeStat input is too low	User	A temperature sensor on an HVAC cooling stage is lower than the programmed freezestat set point, indicating possible coil freeze.
Access Log lost - CRC Error	20	An internal error has caused the loss of Einstein's user access log.
Advisory Log lost - CRC Error	20	An internal error has caused the loss of Einstein's alarm advisory log.
Alarm Limit Exceeded	User	An Analog Sensor or a Suction Group has an input value greater than one of its high limit set points.
Alarm(s) were cleared	99	A user has erased one or more alarms from the alarm advisory log.
Alarm(s) were reset	99	A user has reset one or more alarms from the alarm advisory log.
All config/logs were cleared	30	A user has performed a clean out on this Einstein, removing all programming and stored data.
All Lights On	User	A Global Data application's All Lights On input has turned ON to switch on all the lights.
Alternate Hi Limit Exceeded	User	An analog value in an application using "alternate" set points has risen above its programmed Hi Limit set point.
Alternate Low Limit Exceeded	User	An analog value in an application using "alternate" set points has risen above its programmed Lo Limit set point.
Appl not keeping set point	User	An Air Handling Unit or Heat/Cool Flex Loop application has not achieved set point for a prolonged period of time.
Application Cell is Lost	15	An internal error has caused the loss of an entire application cell.
Application config has changed	99	A user has changed the configuration of one of Einstein's applications.
Application setpoint has changed	99	A user has changed a set point in one of Einstein's applications.
Application was created	99	A user has created a new application in this Einstein.

Alarm Name	Default Priority	Definition
Application was deleted	99	A user has deleted an existing application in this Einstein.
ARTC Override Switch Stuck	20	An override switch on an ARTC has been ON for a prolonged period of time, suggesting a possible switch failure.
ARTC Reset From Power Failure	50	An ARTC lost power and reset when power was restored.
Attempt to write past mem. EOB	50	The Einstein attempted to write data to memory, but the memory was full.
Average Log Stuck-No Memory	15	The Average Log cannot be written because there is not enough memory.
Bad Modem	20	The modem on this Einstein is not functioning properly.
Binding input to output failed	20	A valid connection could not be made between an input and an output.
BIOS/BIOS ext. update failed	20	An update to the Einstein's BIOS has failed.
BIOS/BIOS extension updated	50	The Einstein's BIOS was successfully updated.
Can't set Hardware Clock	20	The Einstein is unable to change the time on its hardware clock.
Case cleaning was started	User	A case circuit has entered clean mode.
Case Temp Hi Limit Exceeded	User	A single temperature sensor in a Standard Circuit or Case Control Circuit is recording a temperature higher than its defined case temperature high set point.
Case Temp Low Limit Exceeded	User	A single temperature sensor in a Standard Circuit or Case Control Circuit is recording a temperature lower than its defined case temperature low set point.
Cell config not restored	15	Einstein's attempt to restore configuration data to its applications has failed.
Cell create failed for restore	20	Einstein attempted to create new applications as part of the configuration restoration process and failed to do so successfully.
Checkit Sensor has Failed	User	A Checkit sensor is returning an invalid temperature value, indicating a sensor failure.
Checkit Sensor is Alarming	User	A Checkit sensor on a Suction Group application is recording a high temperature.
Checkit Sensor is in Notice	User	A Checkit sensor's temperature is above its programmed notice set point.
Comb Temp Hi Limit Exceeded	User	The combined temperature of an entire Standard Circuit or Case Control Circuit has risen above its programmed high temperature set point.
Comb Temp Low Limit Exceeded	User	The combined temperature of an entire Standard Circuit or Case Control Circuit has fallen below its programmed low temperature set point.

Alarm Name	Default Priority	Definition
Communication Port 1 is down	20	Einstein cannot communicate with the RS232 port on the Einstein processor board. The Einstein processor board likely needs repair or replacement.
Communication Port 2 is down	20	Einstein cannot communicate with the RS485 network port on the Einstein processor board. The Einstein processor board likely needs repair or replacement.
Communication Port 3 is down	20	Einstein cannot communicate with the PC-104 (modem) slot on the Einstein processor board. The Einstein processor board likely needs repair or replacement.
Communication Port 4 is down	20	COM4 is used by service personnel to attach hardware used in test or debug functions. This alarm indicates the port that allows Einstein to communicate with these devices is faulty. The Einstein board likely needs repair or replacement.
Completed firmware update	50	The Einstein's firmware was successfully updated.
Config Loss - Chg in tmpl rev.	15	Due to a difference between configuration templates in a previous Einstein version and templates in the current version, configuration data could not be restored.
Config Loss-CRC Error	15	Due to an internal error, Einstein has lost configuration data.
Config Loss-File CRC Error	15	Due to an internal error, Einstein has lost configuration data.
Config not saved to Flash	20	Einstein could not save configuration data to flash memory.
Controller absent from network	20	The current Einstein could not find the specified Einstein, I/O board, or Echelon controller
Controller Reset	50	An ARTC has undergone a reset.
Controller shutdown	50	The Einstein underwent a shutdown.
Controller startup	50	The Einstein has re-started after a shutdown.
Controller Type Mismatch	20	A device on the Echelon network is of a different type than the user has specified. In other words, a user might have wired a device such as a CC-100P to the network but set it up in the Einstein software as a CC-100LS. Check your network setup and if necessary reconfigure the device with the correct type.
Controller was warm-booted	50	A user has reset the Einstein using the "reset" button on the processor board.
Couldn't get file handle	20	Einstein tried to get a file from its memory and failed to do so. This alarm likely indicates one or more templates in the Einstein software have been corrupted. Contact CPC service for further assistance.

Alarm Name	Default Priority	Definition
Curtail On	User	A Curtailment device set up in Global Data has activated to begin curtail.
Dest. mem. not allocated block	50	An internal error has occurred in the Einstein.
Dest. mem. out of stack bounds	50	An internal error has occurred in the Einstein.
Diagnostic rate change failed	20	A user tried to change the update rate of a CC-100, RT-100, or similar Echelon device, but the change was not accepted. Try the update rate change again. If this alarm persists, call CPC service.
Dial to Day Time Site 1 Failed	20	Einstein tried to dial out to the site listed as Day Time Site 1 and was unsuccessful.
Dial to Day Time Site 2 Failed	20	Einstein tried to dial out to the site listed as Day Time Site 2 and was unsuccessful.
Dial to Day Time Site 3 Failed	20	Einstein tried to dial out to the site listed as Day Time Site 3 and was unsuccessful.
Dial to Night Site 1 Failed	20	Einstein tried to dial out to the site listed as Night Site 1 and was unsuccessful.
Dial to Night Site 2 Failed	20	Einstein tried to dial out to the site listed as Night Site 2 and was unsuccessful.
Dial to Night Site 3 Failed	20	Einstein tried to dial out to the site listed as Night Site 3 and was unsuccessful.
Did not Defrost	User	A case circuit did not enter defrost at its scheduled time.
Did not exit Defrost	User	A CC-100 or CS-100 that entered defrost did not terminate or exit defrost at its programmed time.
Did not exit Wait	User	A CC-100 or CS-100 terminated defrost and entered the WAIT state, but did not exit the WAIT state when refrigeration re-started.
Did not exit Wash	User	A CC-100 or CS-100 did not exit clean mode.
Did not respond to command	User	A CC-100 or CS-100 did not respond to an Einstein command.
Did not Terminate Defrost	User	Defrost in a standard circuit lasted for its entire programmed time duration and did not terminate. Usually this means the termination sensor did not record a temperature higher than its set point, but it could also mean sensor failure has occurred.
Did not Wash	User	A case circuit that was ordered to go into cleaning mode did not successfully enter cleaning mode.
Differential Limit Exceeded	User	The difference between the supply air temperature and the return air temperature in an HVAC application was less than the programmed heating or cooling differential set point. This might indicate a problem with cooling or heating.
Dirty Filter Detected	30	A filter-checking device connected to an ARTC is detecting a dirty filter.

Alarm Name	Default Priority	Definition
Discharge Trip	User	A high discharge pressure detected by a Suction Group application has caused an emergency shut-down of the compressor rack.
Duplicate Controller Names	20	Two controllers on the network have the same names. One of them will need to be renamed to prevent communications problems.
Events Per Hour Exceeded Limit	User	A digital value has transitioned ON more times in the past hour than its defined Events Per Hour set point.
Failed attempt to bind Input	50	A valid link could not be made between an Einstein application and an input assigned to it.
Failed Sensor or Bad Wiring	20	Einstein is unable to get a valid sensor value due to a possible hardware problem.
Failed to create logging	20	Einstein is unable to create logs for the input or output shown.
Fax init string is not valid	30	The fax initialization string for the Einstein's modem is incorrect and may need editing.
File not found	50	An internal error has occurred in the Einstein.
Firmware File bad - AI200	15	A 16AIe has corrupted firmware.
Firmware File bad - RO200	15	An 8ROe has corrupted firmware.
Firmware File bad - CC100 Liq	15	A CC-100P or CC-100LS has corrupted firmware.
Firmware File bad - CC100 Suct	15	A CC-100H has corrupted firmware.
Firmware File bad - CS100 Ckt	15	A CS-100 has corrupted firmware.
Firmware File bad - ESR8	15	An ESR8 has corrupted firmware.
Firmware File bad - RT100	15	An RT-100 has corrupted firmware.
Firmware is not compatible	20	The firmware in a unit controller is not compatible with the current version of Einstein.
Firmware update failed	10	The firmware on a unit controller was not successfully updated.
Flash File has a bad CRC Error	50	An internal error has occurred in the Einstein.
Fuse is blown - ESR8	20	A fuse has blown on an ESR8 board and will require replacement.
Global Spare Dig1 On	User	The Spare Dig 1 input in Global Data has switched ON.
Gradual Change Limit Exceeded	User	An analog value has undergone a gradual change greater than its programmed Minimum Change set point.
Heap memory corrupted - Reboot	30	A problem with memory has resulted in a reset of the Einstein.
High Discharge Limit Exceeded	User	A high discharge pressure detected by a Suction Group application is causing the suction group to operate at a reduced capacity.
High Limit Alarm	User	An HVAC application (AHU, Zone, RT-100, or ARTC) has a temperature above one of its cooling set points.

Alarm Name	Default Priority	Definition
High Suction Limit Exceeded	User	The suction pressure has risen above a Suction Group's high suction set point.
HVAC Phase Loss	User	A phase loss device connected to Global Data has switched ON to shut down all HVAC systems.
HVAC Shutdown	User	A Global Data application's HVAC Shutdown input has turned ON to shut down all HVAC systems.
Incomplete Advisory Setup	15, 99	An important setting used in advisory and/or dial-out set up were not configured correctly.
Inhibit Sensor Failed	User	A Demand Defrost Inhibit sensor on a case circuit is not functioning correctly.
Input Bypass Failure	15	A command to bypass an input was not successfully carried out.
Input Sensor is Open	20	An analog input sensor is OPEN, possibly due to a severed connection or sensor failure.
Input Sensor is Short	20	An analog input sensor is CLOSED, possibly due to a short-circuit or sensor failure.
Invalid Cell ID in Scratch Pad	30	An internal error has occurred in the Einstein.
Invalid Nxt Ptr in Scratch Pad	30	An internal error has occurred in the Einstein.
Invalid Scratch Pad Block Size	30	An internal error has occurred in the Einstein.
IRLDS: Absorption data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDS: ADC error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDS: Data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDS: Detector data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDS: Drift fault	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDS: General fault	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDS: Line/filter flow fault	20	A zone on an IRLDS unit has a dirty filter or a crimped tube.
IRLDS: Pressure data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDS: Self-test failure	20	An IRLDS has failed its self-test procedure.

Alarm Name	Default Priority	Definition
IRLDS: Temperature data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
IRLDS: Unknown error	20	The IRLDS has experienced an error not recognized by the Einstein.
IRLDS: Voltage data error	20	An internal error has occurred in the IRLDS. Check the IRLDS display for error code information, and call CPC service.
KW Demand Limit Exceeded	User	The power measurement taken by a Power Monitoring or Demand Control application is higher than the programmed demand set point.
Link to Output bad-no output	50	A valid link could not be made between an Einstein application and an output assigned to it.
Log Data Loss-SRAM Data Bad	50	A memory error has resulted in lost log data.
Log Stamp Loss-Flash Data Bad	50	A memory error has resulted in lost log time stamp data.
Log Stamp Loss-SRAM Data Bad	50	A memory error has resulted in lost log time stamp data.
Logging Group Stuck-No Memory	15	A Logging Group is unable to save logging data because there is not enough memory.
Lost Log Data-CRC Error	30	An internal error has occurred in Einstein, resulting in lost log data.
Low Battery Voltage	99	The backup battery that keeps the time and date resident on the Einstein processor board may need to be replaced.
Low Limit Alarm	User	An HVAC application (AHU, Zone, RT-100, or ARTC) has a temperature below one of its heating set points.
Low Suction Limit Exceeded	User	The suction pressure has fallen below a Suction Group’s low suction set point.
MIP receive buffer overflow	20	Messages from the Echelon network are coming into Einstein too fast for the controller to process. This might be caused by an Einstein having too many applications and/or logs running, or there may be too many Echelon devices on the same segment as the Einstein (i.e. more than 63). If this message persists, call CPC service.
Modem didn't initialize	20	Einstein attempted to initialize the modem but failed.
Modem init string is not valid	30	The dial-out initialization string for the Einstein’s modem is incorrect and may need editing.
Neuron not responding	20	The chip that handles Echelon networking on the Einstein is either defective or in a mode that makes it non-responsive. Contact CPC service for assistance.

Alarm Name	Default Priority	Definition
No Configuration Template	15	There is an internal error in the Einstein software. Notify CPC service.
Normal Hi Limit Exceeded	User	An analog value has risen above its programmed Hi Limit set point.
Normal Low Limit Exceeded	User	An analog value has fallen below its programmed Lo Limit set point.
Not enough backed memory	10	The Einstein tried to save data to the battery-backed memory, but the memory was full.
Not enough Flash memory	20	The Einstein tried to save data to the flash memory, but the memory was full.
Not enough memory	10	The Einstein tried to save data to unbacked memory, but the memory was full.
Not enough scatch pad memory	50	The Einstein tried to save data to the scratch pad memory, but the memory was full.
Notice Limit Exceeded	User	An analog sensor's programmed notice limit has been exceeded.
Num. of Events Exceeded Limit	User	A digital value has transitioned ON more times than its defined Number of Events set point.
Occupied Hi Limit Exceeded	User	An analog value has risen above its defined high limit set point during OCCUPIED mode.
Occupied Low Limit Exceeded	User	An analog value has fallen below its defined low limit set point during the OCCUPIED mode.
Off Time Exceeded Limit	User	A digital value has been OFF longer than its defined Time Off Last set point.
Oil failure Occurred	User	An oil sensor for a compressor has detected a failure.
On Time Exceeded Limit	User	A digital value has been ON longer than its defined Time On Last set point.
Override Log lost - CRC Error	20	An internal error in the Einstein has resulted in a loss of the override log.
Override lost output cleared	20	A user tried to override an output on a CC-100, RT-100, or similar Echelon device, but the override was not performed successfully. Try the override command again. If this alarm persists, call CPC service.
Override operation didn't take	20	The Einstein tried to carry out an override and was unsuccessful.
Override State not Restored	50	An overridden input or output has remained in the override state longer than its programmed time.
Pad memory corrupted - Reboot	30	A problem with memory has resulted in a reset of the Einstein.
Part Cnfg Loss-Ptr	15	Due to an internal error, part of Einstein's configuration data has been lost.

Alarm Name	Default Priority	Definition
Point Log Cleared-Stamps Ahead	50	After a power failure or reset, Einstein tried to recover log data from its memory, but the log data was corrupted. Einstein cleared all data from its point logs and started over.
Point Log Stuck-No Memory	15	A Point Log is unable to save new values because there is not enough memory.
Point Logs not restored	15	The point logs stored in memory were not restored after the last reset or upgrade.
Pressure Table Lost-being rblt	50	A Suction Group's internal list of possible compressor combinations became temporarily invalid, requiring a rebuild.
Product Temp Hi Limit Exceeded	User	A product temperature probe in a standard or case-controlled circuit has measured a product temperature above the low limit set point.
Product Temp Lo Limit Exceeded	User	A product temperature probe in a standard or case-controlled circuit has measured a product temperature below the low limit set point.
Proof Fail	User	A proof checking device is registering a failure in one of the Application's control devices.
Proof failure Occurred	User	A proof checking device is registering a failure in one of the Application's control devices.
Proof Reset-Stage in retry	50	Due to a FAIL signal from a proof checking device, the Einstein is attempting to reset the proof failure.
Rack failure Occurred	User	A Suction Group application is registering a total rack failure.
REFR Phase Loss	User	A phase loss device connected to Global Data has switched ON to shut down all refrigeration systems.
REFR Shutdown	User	A Global Data application's REFR Shutdown input has turned ON to shut down all suction groups, condensers, and circuits.
Relativ Adv: No Active Setpt	99	An application that is supposed to be generating an alarm for a specified input has no active set point to use for alarming. This usually occurs when alarm set points are supplied by other applications or inputs, and the application or input fails.
Runtime Log Stuck-No Memory	15	A Runtime Log is unable to save new data because there is not enough memory.
Runtime Logs not restored	15	The runtime logs stored in memory were not restored after the last reset or upgrade.
RX/BX firmware update failed	20	The Einstein's firmware update was not successful.
RX/BX firmware was updated	50	The Einstein's firmware was successfully updated.
Smoke Detected	30	A smoke detector input on an ARTC has detected smoke.

Alarm Name	Default Priority	Definition
SRAM memory corrupted - Reboot	30	A problem with memory has resulted in a reset of the Einstein.
State switched 'On'	User	A digital value that has been set up to alarm when ON has switched ON.
Status Config Loss-CRC Error	30	An internal error has occurred in the Einstein.
System in Pump Down	User	The suction pressure has fallen below the pump down set point for a Suction Group, causing shutdown of the rack.
Template File bad - CC100 Liq	15	A template file in Einstein for a CC-100P or CC-100LS is bad.
Template File bad - CC100 Suct	15	A template file in Einstein for a CC-100H is bad.
Template File bad - CS100 Ckt	15	A template file in Einstein for a CS-100 is bad.
Test Dial Successful	50	Einstein performed a test dial-out with its modem, and the dial-out was successful.
Time updated by a user	99	A user changed the time in the current Einstein.
Time updated over network	99	The time in the current Einstein was updated by another controller or user on the network.
Timed out waiting for FW updt.	50	The Einstein waited for a firmware update to begin, and it never did.
Too many reboots: Flash erased	50	A number of successive reboots has erased the Flash RAM.
Too many reboots: SRAM erased	50	A number of successive reboots has erased the SRAM.
Total On Time Exceeded Limit	User	A digital value's total ON time has exceeded its defined Time ON Total set point.
Unit ctlr cell create failed	20	The Einstein unsuccessfully tried to create a unit controller cell.
Unknown FW update attempted	50	An error has occured during a firmware update of Einstein. Call CPC service for assistance.
Unknown heap operation error	50	There is an internal error in the Einstein software. Notify CPC service.
Unoccupied Hi Limit Exceeded	User	An analog value has risen above its defined high limit set point during UNOCCUPIED mode.
Unoccupied Low Limit Exceeded	User	An analog value has fallen below its defined low limit set point during UNOCCUPIED mode.
User cleared all applications	50	A user has cleared out all data from all applications in this Einstein.
User/Appl. forced reset	50	A user or an application has forced a reset of this Einstein.
VS Inverter fail	User	A variable-speed inverter driving a variable-speed fan or compressor has failed.

Alarm Name	Default Priority	Definition
Watchdog countdown hit zero	20	Einstein locked up while trying to perform a task. If this alarm occurs often, there may be a problem with your system. Contact CPC service.
Watchdog reset timer failed	20	Einstein tried to reset itself to clear a hung task, but the "watchdog" feature on the Einstein was disabled. Check the jumper J18 labeled "Watch Dog" on the Einstein processor board. This jumper should be either be set to "ENABLE" or it should not be present at all.
X300<->X300 links lost-CRC Err	20	An internal error has caused a loss of communication between Einsteins.

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