



24632\_ins\_BS4SCOM

# BAPI-Com, Two Wire Multifunction Sensor BA/BS4SCOM Temperature/Humidity Sensor Installation and Operating Instructions

rev.11/04/10

## Product Identification

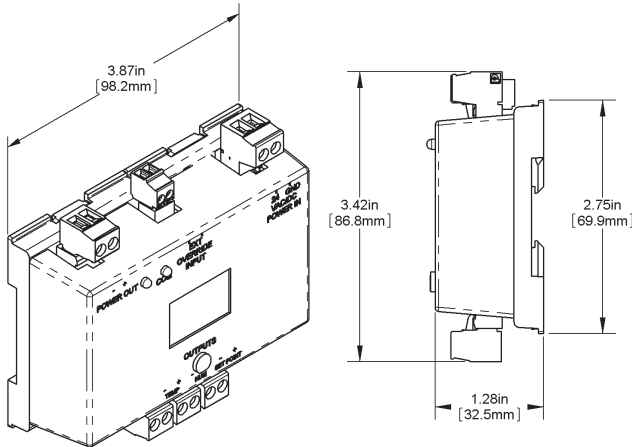


Fig 1. BAPI-Com Communication Output Module

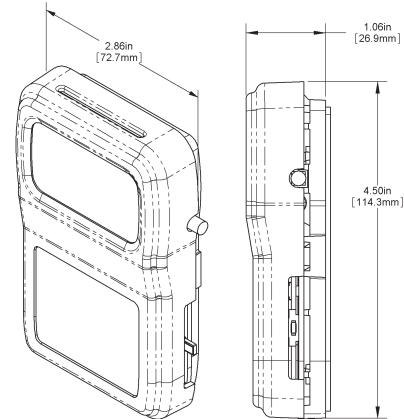


Fig 2. BAPI-Com Room Sensor, BA/BS4SCOM

## Operations Overview

The BAPI-Com sensor is designed to be used in retrofit applications on just 2 existing or new wires. The BAPI-Com consists of two modules, the Room Sensor and the Communication Output module. The Communication Output Module is externally powered and then powers the Remote Sensor on two wires. It also communicates with the Remote Sensor over those same two power wires to receive the local temperature, humidity, setpoint and override signals as well as powering the LCD display. The Communication Output module then sends each parameter (Temperature, Humidity, Setpoint & Override) to individual output terminals for the BAS controller to receive and interpret. An Occupied/Un-occupied (Occ/Un-occ) input is also available on the Communication Output Module to indicate to the Remote Sensor that the control zone is in Occupied or Un-occupied mode for display indication.

**Note:** Not all wires are guaranteed to work. The system has been tested with wires meeting the wire spec of Belden 9841 cable. The units should work to a distance of 500 feet and possibly more on 22AWG to 14AWG wire. Electrical noise is unpredictable but can be limited with wire that is twisted to limit noise imbalance and shielded to limit overall induced noise. If a shield is used, BAPI recommends to only ground the shield at one end to avoid induced ground loop noise. The preferred earth grounding location should be at the Communication Output Module or BAS controller end.

## Specifications

### ROOM SENSOR

<b>Power:</b>	15 to 18 VDC @9mA, Supplied from the Communication Output Module
<b>Wiring:</b>	2 wires, Up to 500ft
AWG gauge	22-14AWG
Twist per foot	5 per ft preferred
Shielding	Preferred
Wire spec typical	Belden 9841
External sensor	22-18 AWG, TSP, shield grounded, 25' max
<b>Sensors:</b>	
Temperature	Thermistor, 10K-2
Accuracy	±0.36°F, (±0.2°C)
External Sensor	10K-2 thermistor (Purchased separately)
	Wired 25' maximum from sensor
Humidity	Capacitive Polymer
Accuracy	±2% RH, (10% to 90%) @ 25°C
<b>Communication:</b>	Polling system (All messages are confirming)
Baud rate	1200 baud
Poll Rate	400 ms
Type	FSK
<b>Indication OPT.:</b>	LCD, (Temp/Humd/Setpoint/Occupied)
Window	2.5"x1.5"
Main digit	3.5 digits, 0.6" high, ±99.9
<b>Options:</b>	
Setpoint	Slide POT, Rev. Acting (RA), or Direct Acting (DA)
Display	Fahrenheit or Celsius
Override	Pushbutton
<b>Test &amp; Balance:</b>	Available with display only
Adjust	Low Temp/Normal/High Temp
<b>Material:</b>	ABS Plastic, UL94V-0
<b>Ambient:</b>	32° to 122°F (0° to 50°C)
	0-95% RH Non-condensing
<b>Agency:</b>	RoHS

### COMMUNICATION OUTPUT MODULE

<b>Power in:</b>	20 to 30 VDC/AC, 25mA max 1.7VA @ 30 VAC
<b>Terminations:</b>	
Comm. & PWR	2 wires to the sensor, 22-14 AWG
Power In	2 wires, 12-28 AWG
Output	2 wires per output, 12-28 AWG
Override Input	2 wires, 16-30 AWG
<b>Outputs:</b>	Three Maximum
Volts	0-5VDC or 0-10VDC, I <sub>max</sub> =20mA, DA or RA (Factory Configured only)
	Reed switch, 0.5A@24VDC
	20K span, V <sub>max</sub> =15VDC, DA or RA (Factory Configured only)
	10K-2, 10K-3 or 10K-3 [11K] (Factory Configured)
	External dry contact connection (Closed = Occupied)
Contact	
Resistance	
Thermistor	
<b>Input (DI):</b>	
<b>Indicators:</b>	
Power	Green LED (On=Powered)
Communication	Blue LED, Blinks during normal communication
	Red LED (On=Occupied request)
Occupied	
<b>Mounting:</b>	3 EZ mount methods
DIN Rail	35mm, Quick tab release
Snap Track	4" length, 2.75" wide
Screw Mount	Four tabs w/0.125" holes
<b>Material:</b>	ABS Plastic, UL94V-0
<b>Ambient:</b>	32° to 122°F (0° to 50°C)
	0-95% RH Non-condensing
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*Installation and Operating Instructions*

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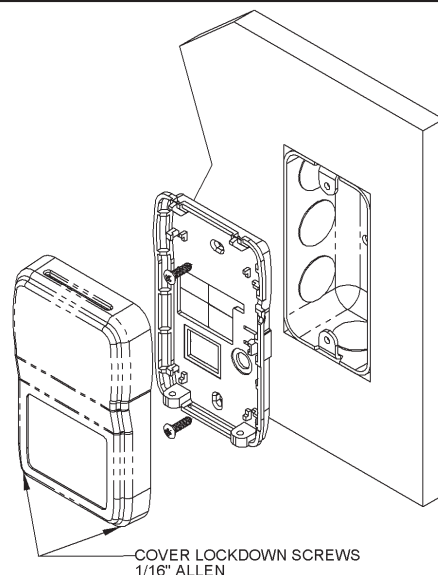
## Wall Sensor Mounting

### LOCATION:

BAPI recommends mounting to inside wall away from any heat or cooling discharge vents. Avoid baseboard radiation and any sunlit walls.

### JUNCTION BOX MOUNTING: (Fig. 3)

1. Pull the wire through the wall and out of the junction box, leaving about six inches free.
2. Pull the wire through the hole in the base plate.
3. Secure the base to the box using the #6-32 x 1/2 inch mounting screw provided.
4. Terminate the unit according to the guidelines in the Termination section.
5. Plug any back box holes or conduit with insulation to avoid wall drafts from affecting the sensor reading.
6. Attach the cover by latching it to the top of the base, rotating the cover down and snapping it into place.
7. Secure the cover by backing out the lock-down screws using a 1/16" Allen wrench until the screws are flush with the bottom of the cover.



**Fig 3. Sensor Mounting**

*Mounting hardware is provided for both junction box and drywall installation (junction box installation shown).*

### DRYWALL MOUNTING:

1. Place the base plate against the wall where you want to mount the sensor.
2. Using a pencil, mark out the two mounting holes and the area where the wires will come through the wall.
3. Drill two 3/16" holes in the center of each marked mounting hole. Insert a drywall anchor into each hole.
4. Drill one 1/2" hole in the middle of the marked wiring area.
5. Pull the wire through the wall and out of the 1/2" hole, leaving about six inches free.
6. Pull the wire through the hole in the base plate.
7. Secure the base to the drywall anchors using the #6 x 1 inch mounting screws provided.
8. Terminate the unit according to the guidelines in the Termination section.
9. Plug any wall holes with insulation to avoid wall drafts from affecting the sensor reading.
10. Attach Cover by latching it to the top of the base, rotating the cover down and snapping it into place.
11. Secure the cover by backing out the lock-down screws using a 1/16" Allen wrench until the screws are flush with the bottom of the cover (see Figure 3).

**NOTE:** *In any wall-mount application, the mixing of room air and air from within the wall cavity can lead to erroneous readings, condensation, and premature failure of the sensor. To prevent this condition, plug the conduit hole with insulation in the junction box.*

## Diagnostics

### Problem

No display on the Sensor

No output on the output module

Output module blue led not blinking

### Possible Solution

Check the sensor power terminals for 15 to 18VDC

Check power on the output module comm. terminals for 18VDC

Check power on the output module power in terminals for 20 to 30V (AC/DC)

Check wiring, and Check power.

Check connections

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## Communication Output Module Mounting

**LOCATION:** Select an indoor location for the communication module within 500 feet of the sensor and close to the controller so that point wiring is manageable.

**General:** Blue mounting tabs on the EZ Mount Base are located on top and bottom and can be extended or pushed in by pulling or pushing on the blue tabs for each kind of mounting technique.

### Din Rail Mounting: (Figure 4)

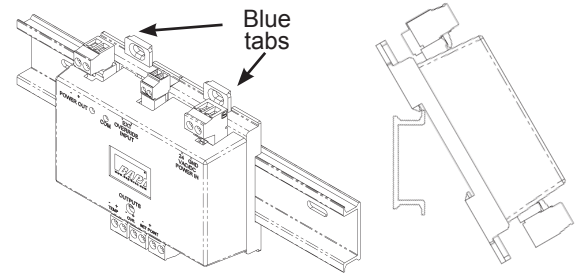
- 1 Pull the blue mounting tabs out (see figure 4).
- 2 Catch EZ mount hook on DIN rail as shown in Figure 4 and rotate the EZ module down until the bottom mounting tab snaps into place on the DIN rail.
- 3 Connect wires per the Termination Section.
- 4 To release from the rail, pull both bottom tabs simultaneously.

### Snap Track Mounting: (Figure 5)

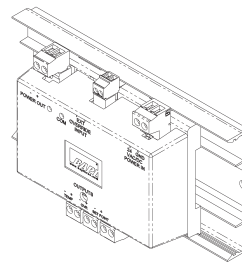
- 1 Push the blue mounting tabs in as shown in Figure 5.
- 2 The edges of the EZ Mount base will fit into the 2.75" snap track slots.
- 3 Connect wires per the Termination Section.

### Surface Screwed Mounting: (Figure 6)

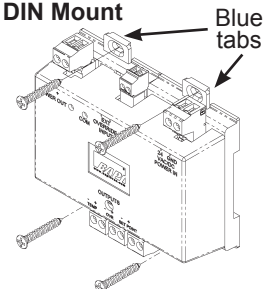
- 1 Pull the blue mounting tabs out as shown in Figure 6.
- 2 Place the EZ unit against the surface and mark the screw holes.
- 3 Drill 1/8 pilot holes for #6 flathead screws.
- 4 Screw EZ unit to surface. Note: The mounting holes are elongated to allow for alignment.
- 5 Connect wires per the Termination Section.



**Fig 4. Communication Output Module DIN Mount**

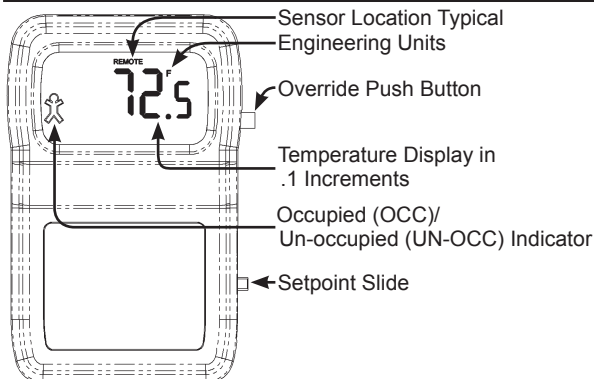


**Fig 5. Communication Output Module Snap-Track Mount**

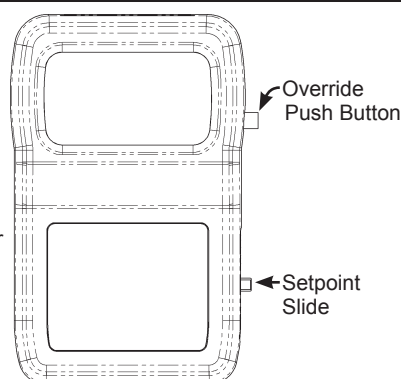


**Fig 6. Communication Output Module Screw Mount**

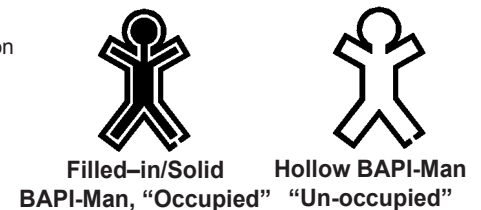
## Front Panel Control Descriptions



**Fig 7. Override, setpoint, w/ display**



**Fig 8. Override, setpoint, w/o display**



**Fig 9. Occupied/un-occupied indicator**

**Setpoint Slide-Pot:** When the slide pot is moved enough the display will show the setpoint and will change the setpoint in 0.1° degree increments. Setpoint slide up to make the setpoint go up and slide down to go down (Reverse Acting is field programmable). If there is no display, then the user relies on the side legend to show his desired setpoint. The communication output module setpoint will also change its output value but only within the setpoint range that was ordered or configured.

**Override Request Button for no display units:** When pressed, the override output at the output module will go to less than 15 ohms across the output designated (Sensor, Setpoint or Separate) override output, depending on the part number ordered.

**Override Request Button for display units:** When pressed, the BAPI-Man will be displayed (filled in) for 3-5 seconds and the override output at the output module will go to less than 15 ohms across the output designated (Sensor, Setpoint, Humidity or Separate contact) override output, depending on the part number ordered. If the communication output module occupied input is then closed, then the BAPI-Man will stay filled in, indicating an occupied state. If the input is open, then the BAPI-Man will revert to a hollow man display, indicating un-occupied. (The occupied input on the communication output module must be cycled once to show the hollow BAPI-Man)

**Display if used:** The display shows the current temperature unless the setpoint slide is pushed and then will show the current setpoint for 3 to 4 seconds. The display can also be set up for temperature display only or setpoint display only. See Firmware setup P1.0.

**BAPI-Man Display:** The BAPI-Man display depicts three different modes of operation. Figure 9 shows "Occupied" (Filled in/solid man) or "Un-occupied" (Hollow man) or not used (No BAPI-Man displayed). If a confirmation signal has never been received from the communication output module then the BAPI-Man will remain blank from the screen. On the first confirmation signal, the BAPI-Man will show occupied (Filled in/solid man) and then un-occupied (Hollow man) when the confirmation signal is off. The only way to get a blank BAPI-Man screen is to cycle power.

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## Termination

**General Wiring Note:** All wiring must comply with the National Electric Code (NEC) and local codes. Do NOT run this device's wiring in the same conduit as high or low voltage AC power wiring.

**Note:** There are two output module types depending on if you ordered the humidity output or just override output.

### DEDICATED OVERRIDE OUTPUT MODULE: Fig 10

Terminal	Description (Used w/-J Option)
24	Input power 24V(AC/DC)
GND	Input power Common
EXT	Override Input dry contact for Occ/Un-Occ
EXT	Override Input dry contact for Occ/Un-Occ
+	Power & Communication out
-	Power & Communication out (not the same as GND)
+ Temp	Temperature output (0-5V, 0-10V or resistive)
- Temp	Temperature output (temp common) (-CG same as GND), (-DF isolated resistive only)
+ OVR	Independent override contact (isolated N.O. contact)
- OVR	Independent override contact (isolated N.O. contact)
+ Setpoint	Setpoint output (0-5V, 0-10V or resistive)
- Setpoint	Setpoint output (setpoint common) (-CG same as GND), (-DF isolated resistive only)

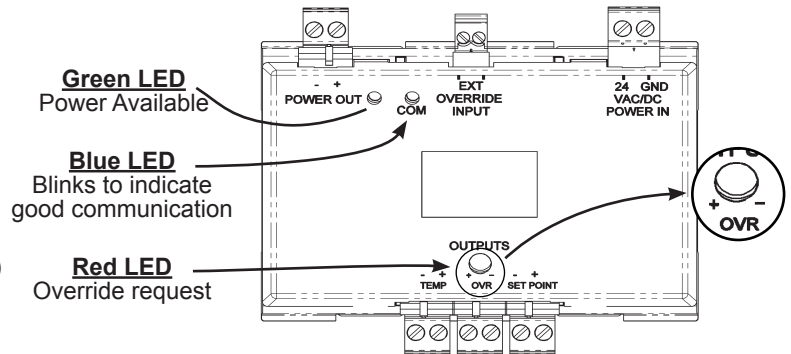


Fig 10. Communication Output Module  
Termination w/override output (-J Option)

### DEDICATED HUMIDITY OUTPUT MODULE: Fig 11

Terminal	Description
24	Input power 24V(AC/DC)
GND	Input power Common
EXT	Override Input dry contact for Occ/Un-Occ
EXT	Override Input dry contact for Occ/Un-Occ
+	Power & Communication out
-	Power & Communication out (not the same as GND)
+ Temp	Temperature output, (0-5V,0-10V or resistive)
- Temp	Temperature output, (temp common) (-CG same as GND), (-DF isolated resistive only)
+ HUM	Humidity output, (0-5V or 0-10V)
- HUM	Humidity output, (humd. common)
+ Setpoint	Setpoint output, (0-5V, 0-10V or resistive)
- Setpoint	Setpoint output, (setpoint common) (-CG same as GND), (-DF isolated resistive only)

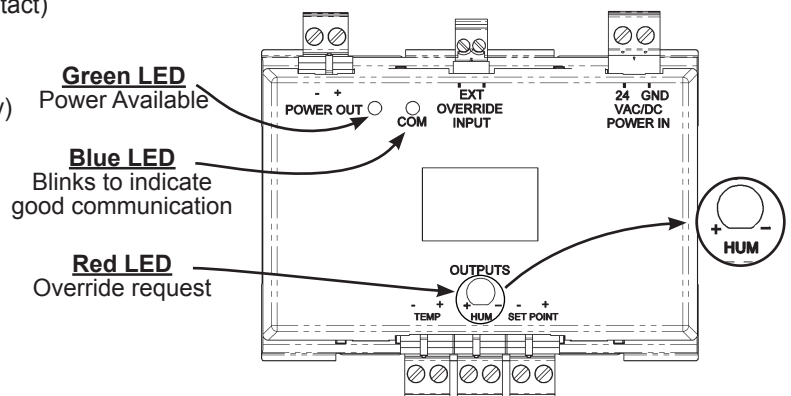


Fig 11 Communication Output Module w/Humidity  
Output (Dedicated Humidity Output)

### ROOM SENSOR: Fig 12

Terminal	Description
+	Power & Communication out
-	Power & Communication out
EXT SEN	External sensor if used (No Polarity)
EXT SEN	External sensor if used (No Polarity) (purchase 10K-2 sensor separately)

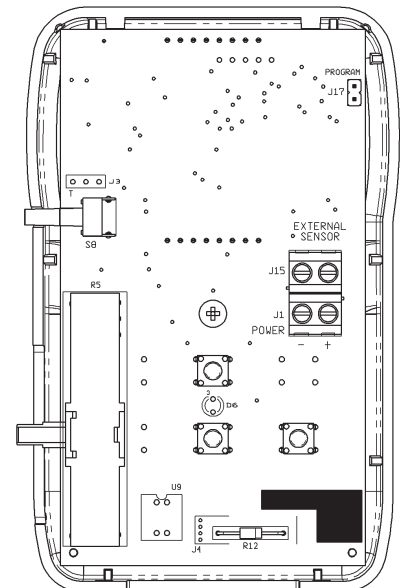


Fig 12. Room Sensor Termination

Specifications subject to change without notice.



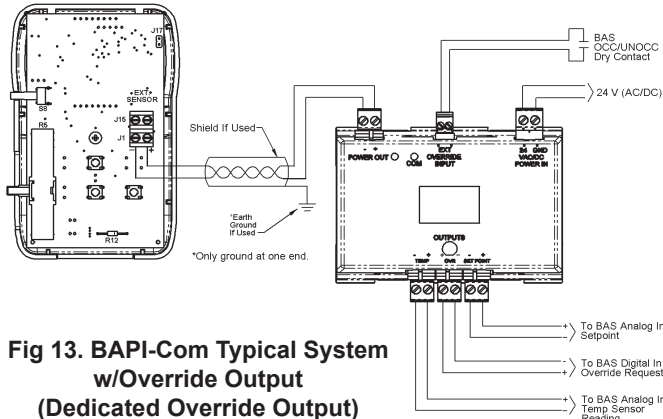


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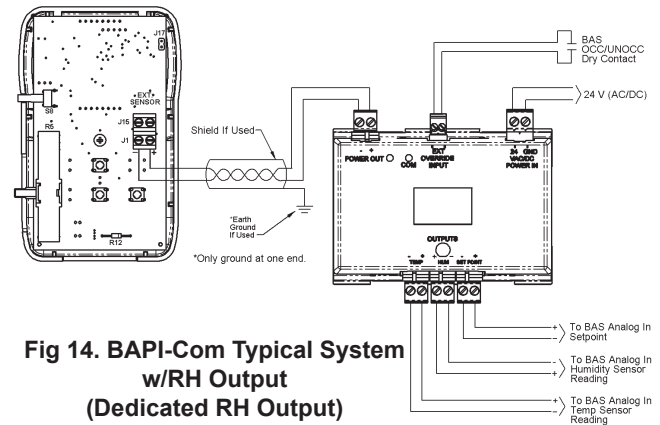
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## Typical System Termination Layout

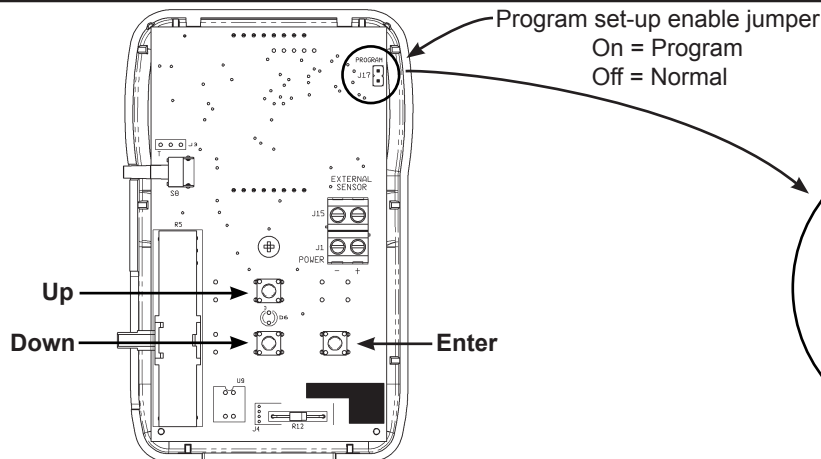


**Fig 13. BAPI-Com Typical System w/Override Output (Dedicated Override Output)**

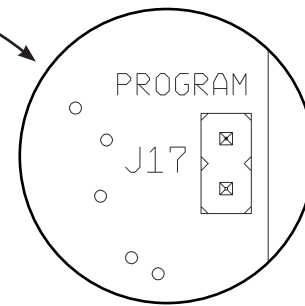


**Fig 14. BAPI-Com Typical System w/RH Output (Dedicated RH Output)**

## User Firmware Set-Up Adjustments (The set-up is factory set per your order. Set-up adjustments are not required)



**Fig 15. BA/BS4SCOM-F Set-up buttons (Select and Up/Down buttons)**



**Fig 16. Jumper J17 close-up**

## Optional Technician Adjustments (The sensor set-up is factory set per your order. Set-up adjustments are not required)

- Note: A display is required to adjust any of the user field adjustments. Non-display sensors must to be set up at the factory.
- A The set-up mode consists of menu pages P0 through P11 for configuring the sensor. The following are the adjustments that can be done with the program jumper J17 installed.
- (P0) Fahrenheit °F or Celsius °C display selection.
  - (P1) Display mode indicates what is shown on the display. (Temperature, and/or Humidity, and/or Setpoint)
  - (P2) Temperature Offset. Changes the display and output value. An independent reference is recommended.
  - (P3) Temperature Max setting. Sets the maximum output temperature value.
  - (P4) Temperature Min setting. Sets the minimum output temperature value.
  - (P5) Setpoint Max setting. Sets the maximum output setpoint value.
  - (P6) Setpoint Min setting. Sets the minimum output setpoint value.
  - (P7) Humidity Max setting. Sets the maximum output humidity value.
  - (P8) Humidity Min setting. Sets the minimum output humidity value.
  - (P9) Humidity Offset. Changes the display and output value. An independent reference is recommended.
  - (P10) Test & Balance. Used during system commissioning to force the system to heating or cooling.
  - (P11) Sensor location indication on the LCD. (Blank, "Inside", "Outside", or "Remote")
  - (P12) Allow voltage and resistance outputs to be Reverse Acting (RA).
- B Operational directions for adjustment set-up (See figure 15):
- Enter Button The Enter button either selects the currently displayed menu or selects the new parameter and stores it into memory.
  - Up Button The Up button either moves Up from menu page to menu page or from setting to setting.
  - Down Button The Down button either moves Down from menu page to menu page or from setting to setting.
- C Adjustment Step Procedure:
- 1 Remove cover and install the J17 shunt across the J17 pins. See figure 15 and 16.
  - 2 Use the Up and Down keys to advance to the parameter you wish to adjust.
  - 3 Push the Enter key to select the menu parameter.
  - 4 See menu selections below and adjust the parameters you desire.
  - 5 Push the enter key to save the adjusted parameter and return to the menu selection.
  - 6 Finish the adjustment session by removing J17 and place it on just one of the program pins for future use.
- Note: Be sure to press the "Enter" button, before removing J17, to store your selected parameter or it will not be saved.
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Menu	Description	Action
P0.0	°F or °C display:	Adjust the up/down key to advance to the engineering unit you wish. "0" Setting for degrees Celsius, °C "1" Setting for degrees Fahrenheit, °F
P1.0	Display Mode:	Push the Enter key to store the desired engineering unit Indicates what is displayed on the LCD. "0" Not used (Do not select) "1" Temperature only (no setpoint or humidity) "2" Setpoint only (no temp or humidity) "3" Temperature and Setpoint alternately every 5 seconds (no humidity) "4" Humidity only (no temperature or setpoint) "5" Temperature and Humidity alternately every 5 seconds (no setpoint) "6" Setpoint and Humidity alternately every 5 seconds (no temperature) "7" Temperature, Setpoint and Humidity alternately every 5 seconds Push the Enter key to store the desired setting.
P2.0	Temperature Offset:	Pushing the up button adds up to 10°F or 10°C in .1° increments. Pushing the down button subtracts down to -10°F or -10°C in .1° increments. Push the Enter key to store the desired setting.
P3.0	Temperature Max	Pushing the up button adds up to 99.9°F or 99.9°C in .1° increments. Pushing the down button subtracts down to -99.9°F or -99.9°C in .1° increments.
P4.0	Temperature Min	Pushing the up button adds up to 99.9°F or 99.9°C in .1° increments. Pushing the down button subtracts down to -99.9°F or -99.9°C in .1° increments. Push the Enter key to store the desired setting.
P5.0	Setpoint Max	<b>Note:</b> The span should not exceed 122°F or 50°C to maintain a resolution of 0.1° steps. Pushing the up button adds up to 99.9°F or 99.9°C in .1° increments. Pushing the down button subtracts down to -99.9°F or -99.9°C in .1° increments. Push the Enter key to store the desired setting.
P6.0	Setpoint Min	Pushing the up button adds up to 99.9°F or 99.9°C in .1° increments. Pushing the down button subtracts down to -99.9°F or -99.9°C in .1° increments. Push the Enter key to store the desired setting.
P7.0	Humidity Max	Pushing the up button adds up to 99.9% RH in .1% increments. Pushing the down button subtracts down to 0% RH in .1% increments. Push the Enter key to store the desired setting.
P8.0	Humidity Min	Pushing the up button adds up to 99.9% RH in .1% increments. Pushing the down button subtracts down to 0% RH in .1% increments. Push the Enter key to store the desired setting.
P9.0	Humidity Offset:	Pushing the up button adds up to 10% in .1% increments. Pushing the down button subtracts down to -10% in .1% increments. Push the Enter key to store the desired setting.
P10.0	Test & Balance:	This tests the heating and cooling system to the maximum temperature setpoint readings "0" Low- Makes the output go to the Temperature Min setting (P4). "1" Normal- Make the output read the Temperature Actual temperature reading including the Temperature Offset if any (P2). "2" High- Makes the output go to the Temperature Max setting (P3). Push the Enter key to back out of the page
P11.0	Sensor Location:	<b>Note:</b> Leaving this page automatically puts the Test & Balance to the Normal mode This shows, on the LCD, where the sensor is located when the temperature is displayed. "0" Blank location indication. Typically means sensor is inside the display enclosure. "1" "Inside" location indication. Typically means the sensor is installed away from the sensor display location. Possibly an adjacent clean room or operating room. Requires the (-ES) option. "2" "Outside" location indication. Typically means the sensor is installed away from the sensor display location. Possibly outside air, intake duct or adjacent to a control room. Requires the (-ES) option. "3" "Remote" location indication. Typically means the sensor is installed away from the sensor display location. Requires the (-ES) option.
P12.0	Reverse Acting:	Push the Enter key to store the desired setting. This makes the voltage or resistance out operate as Reverse Acting (RA). "0" All outputs are direct acting. "1" Temperature output is reverse acting. "2" Setpoint output is reverse acting. "3" Temperature and setpoint outputs are reverse acting. "4" Humidity output is reverse acting. "5" Temperature and humidity outputs are reverse acting. "6" Setpoint and humidity outputs are reverse acting. "7" Temperature, setpoint and humidity outputs are reverse acting.

Specifications subject to change without notice.