



BAPI-Stat 2 Sensor with Display, Setpoint, Fan or System Mode Control

BA/BS2M & BA/BS2S Temperature Sensor

Installation & Operating Instructions

15568_ins_BAPI_stat_2

rev. 07/09/15

Product Overview and Identification

The patented BAPI-Stat 2 Enclosure features a large LCD with all the visual indicators on the display itself. It provides local indication of Temperature and Setpoint with Setpoint Adjust and Override. It also has optional Fan Speed and Mode Control for applications with Fan Coils, Heat Pumps or Unit Ventilators.

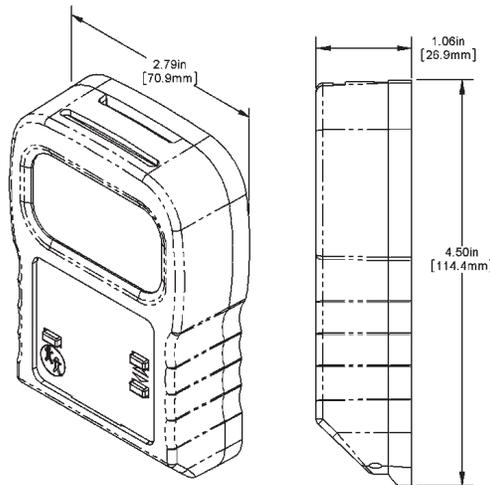


Fig. 1: BAPI-Stat 2M with optional Pushbutton Setpoint and Override

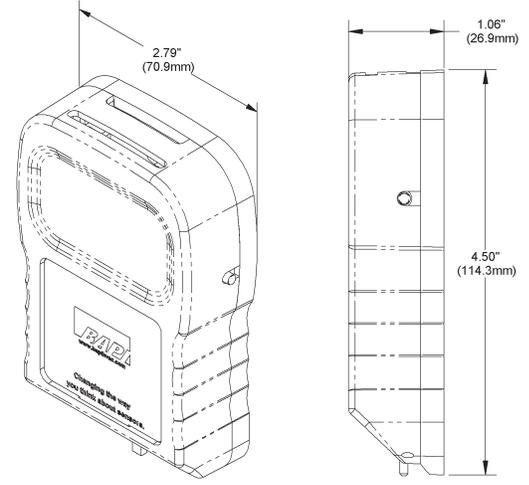


Fig. 2: BAPI-Stat 2S with optional Setpoint Slider and Override

Note: BAPI-Stat-2M is shown with 3 buttons, two to six buttons may be present.

Mounting

JUNCTION BOX

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. Attach Cover by latching it to the top of the base, rotating the cover down and snapping it into place.
6. Secure the cover by backing out the lock-down screws using a 1/16" Allen wrench until they are flush with the bottom of the cover.

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. Attach Cover by latching it to the top of the base, rotating the cover down and snapping it into place.
10. Secure the cover by backing out the lock-down screws using a 1/16" Allen wrench until they are flush with the bottom of the cover.

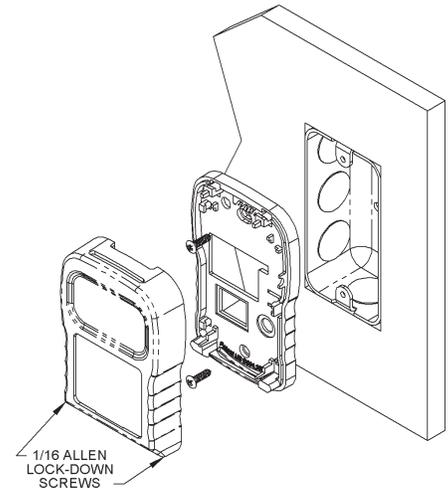


Fig. 3: Mounting hardware is provided for both junction box and drywall installation (junction box installation shown).

NOTE: In a 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.

Specifications subject to change without notice.



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15568_ins_BAPI_stat_2

rev. 07/09/15

Termination

BAPI recommends using twisted pair of at least 22AWG and sealant filled connectors for all wire connections. Larger gauge wire may be required for long runs. 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 AC power wiring. BAPI's tests show fluctuating and inaccurate signals are possible when AC power wiring is in the same conduit as the signal lines. If you are experiencing any of these difficulties, please contact your BAPI representative.



BAPI recommends wiring the product with power disconnected. Proper supply voltage, polarity and wiring connections are important to a successful installation. Not observing these recommendations may damage the product and void the warranty.

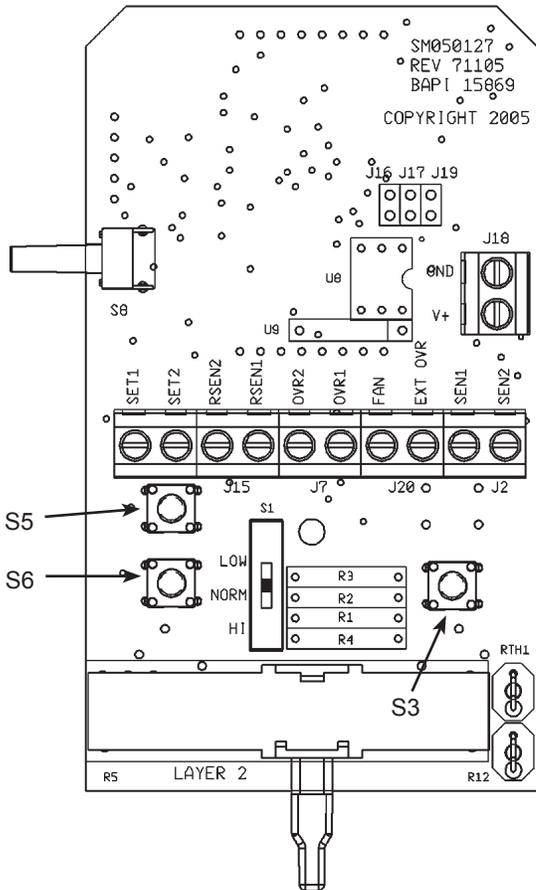


Fig. 4: BAPI-Stat 2 Circuit Board
(See Circuit Board Note below)

- GND** To Ground (Common) of controller
- V+** Unit power (See specifications for voltage details.)
- SET1 & SET2** A) Setpoint output per order (resistive). No polarity. *If the unit is a common ground configuration (-CG), see "Grounding Note" below.
B) Setpoint output per order (voltage). SET1 is "+", SET2 is "-". *If the unit is a common ground configuration (-CG), see "Grounding Note" below.
- RSEN1 & RSEN2**... Remote sensor option (-ES). No polarity. *If the unit is a common ground configuration (-CG), see "Grounding Note" below. A 10K-2 thermistor sensor must be ordered separately and the temperature value is displayed on the LCD. Note: If a temperature reading is needed at the controller, then a second sensor must be ordered and wired independently.
- OVR1 & OVR2** Override output (Dry contact) The contact can be ordered as a momentary shunt across the sensor (-N) or as a momentary shunt across the setpoint (-P) or as a separate momentary contact (-J) or as a separate latching contact (L#). *If the unit is a common ground configuration (-CG), see "Grounding Note" below.
- FAN** Fan Speed/System Mode (Resistive Output)
- EXT OVR** BAPI-Man Occ/Un-Occ Indicator Input. Ground the terminal to fill in the BAPI-Man icon for Occupied.
- SEN1 & SEN2** Sensor output per order (resistive). No polarity. *If the unit is a common ground configuration (-CG), see "Grounding Note" below.

Circuit Board Note on Switches S3, S5 & S6:

Switch S3 will only be present if the unit is ordered without Override. Switches S5 & S6 will only be present if the unit is ordered without Setpoint adjustment. These switches are only used to make programming changes - See "Optional Technician Adjustments".

***Grounding Note:**

Common Ground (-CG) or Differential Ground (-DF) configurations are selected per order. The Differential Ground configuration (-DF) indicates that SEN2, SET2, OVR2 and RSEN2 must all be wired separately (No internal common connection). The Common Ground configuration (-CG) indicates that SEN2, SET2, OVR2 and RSEN2 are connected to GND internally (All internally common). This is true of all Common Ground units except when ordered with the Override as a Latching Switch option (-L#). In this case, OVR2 is isolated and not internally connected to SEN2, SET2 and RSEN2.

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15568_ins_BAPI_stat_2

rev. 07/09/15

Optional Communication Jack Wiring

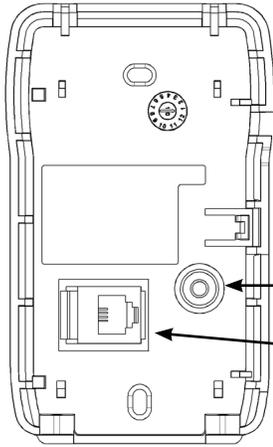
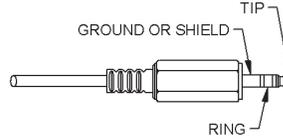


Fig. 5:
Back Plate
Comm.
Jack
Locations

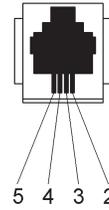
C35L
C11L/
C22L

Fig. 6: C35L
Comm. Jack
(3.5mm plug
shown for
clarity)



C35L Comm. Jack Wiring	
Location	WIRE COLOR
Ground	Black
Tip	White
Ring	Red

Fig. 7:
C11/C22
Comm.
Jack



C11L/C22L Comm. Jack Wiring	
PIN #	WIRE COLOR
1	Not Connected
2	Black
3	Red
4	Yellow
5	Green
6	Not Connected

Optional Test and Balance Switch (S1)

On the Test and Balance Switch, the NORM position allows the real sensor to be monitored. The HIGH position forces the output to a very hot reading and the LOW position forces a very cold reading (see Table below).

Test and Balance Switch (S1)

LOW: Sets the sensor value low

NORM: Sensor operates normally

HIGH: Sets the sensor value high

Sensor Type	Low Temp (40°F) Resistance Value	High Temp (105°F) Resistance Value
1000Ω RTD	1.02KΩ (41.20°F)	1.15KΩ (101.5°F)
3000Ω Thermistor	7.87KΩ (39.8°F)	1.5KΩ (106.8°F)
10K-2 Thermistor	30.1KΩ (34.9°F)	4.75Ω (109.1°F)
10K-3 Thermistor	26.7KΩ (35.9°F)	5.11KΩ (108.4°F)
10K-3(11K) Thermistor	7.32KΩ (43.7°F)	3.65Ω (105.2°F)

Optional Fan Speed and System Mode Control

The pushbutton unit is available with optional Fan Speed and System Mode Control. The resistive outputs for the various options is shown in the table at right. The option is selected at the time of order and the resistive value is output to the FAN terminal.

Option	Heat/Auto	Off /Auto	Cool/Auto	Heat/On	Off/On	Cool/On
HCF	5KΩ	10KΩ	15KΩ	20KΩ	25KΩ	30KΩ
H01	0Ω	2KΩ	4KΩ	6KΩ	8KΩ	10KΩ

Option	Heat	Cool	Auto	Off
H02	5KΩ	10KΩ	15KΩ	20KΩ

Option	OFF	AUTO	LO	MED	HI	ON
XLD	5KΩ	10KΩ	15KΩ	20KΩ	25KΩ	
X01	4.89KΩ	2.33KΩ	10.63KΩ	13.24KΩ	16.33K	
X02	2KΩ	4KΩ	6KΩ	8KΩ	10KΩ	
X03	5KΩ	10KΩ				15KΩ
X05	4.89KΩ	2.33KΩ				15.8KΩ
X06	6.5KΩ		8.5KΩ	10.5KΩ	12KΩ	
X07	5KΩ					15KΩ
X08	12.68KΩ	11.86KΩ				13.86KΩ

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15568_ins_BAPI_stat_2

rev. 07/09/15

Operation/Front Panel Description

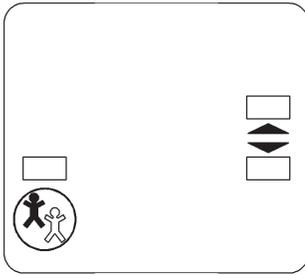


Fig. 8: 3 Button Layout

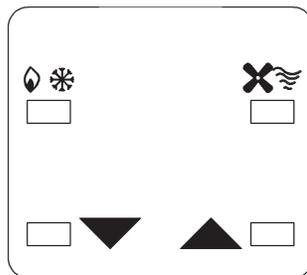


Fig. 9: 4 Button Layout

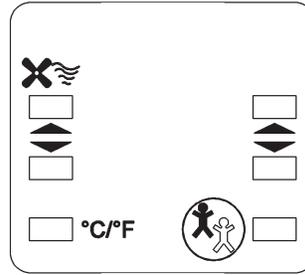


Fig. 10: 6 Button Layout

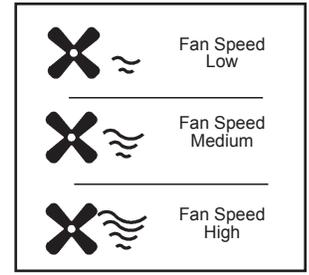


Fig. 11: Fan Speed Indicator

A display is standard for all BS2M & BS2S units. Override and setpoint adjustment are available for both units, and fan and system mode control are available for BS2M units.

NUMERICAL DISPLAY:

The default display shows current temperature. When the setpoint buttons are pressed or setpoint slider moved, then the display will show and adjust the current setpoint and hold the display for 3 to 4 seconds. Other display settings are available. See "Optional Technicians Adjustments".

BAPI-MAN ICON:

The BAPI-Man Icon shows the status of the room - Solid for Occupied, Hollow for "Unoccupied" (Fig. 12). The unit must receive a confirmation (ground) signal on the "EXT OVR" terminal for the BAPI-Man to remain visible on the screen. Pressing the Override button will light the BAPI-Man icon; however, if no confirmation signal is received, then the BAPI-Man will go blank (disappear) after 5 seconds.

Upon receiving a first confirmation (ground) signal on the "EXT OVR" terminal, the BAPI-Man will show occupied (Solid). The BAPI-Man will then show unoccupied (Hollow) whenever the confirmation signal is removed and occupied when the signal is returned. The only way to blank or remove the BAPI-Man from the display once it has received a confirmation signal is to cycle power.

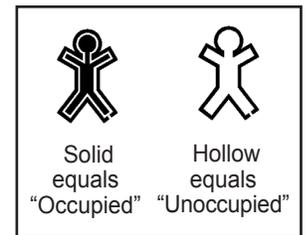


Fig. 12: BAPI-Man Icon

SETPOINT SLIDER (BS2S):

When the slide setpoint is moved enough to change the setpoint by 0.5 degrees, the setpoint will be displayed. Slide the setpoint left or right to the desired setpoint.

SETPOINT BUTTONS (BS2M):

When pressed, the setpoint will display for three to four seconds. When pressed again, the setpoint will change in one degree increments. It will only change within the setpoint range that was ordered.

OVERRIDE BUTTON:

When the override button is pressed, the BAPI-Man Icon (Fig. 12) will be displayed as "Solid" for 3-5 seconds and the override output will shunt or short for 3 seconds depending on the override option selected. (-N Option = Momentary Temperature Sensor Shunt to < 15Ω, -P Option = Momentary Setpoint Shunt to <15Ω, -J Option = Momentary Override as a Separate Shorting Contact Output, -L# Option = Override as a Latching Switch, See "Latching Override Operation" on pg. 5.) If the occupied input (EXT OVR) terminal is grounded, then the BAPI-Man will stay filled in, indicating an occupied state. If the input is open, then the BAPI-Man will revert to hollow, indicating unoccupied (or the icon will disappear completely if there has never been a ground on the EXT OVR terminal).

MODE BUTTON (BS2M):

Cycles through "HEAT", "OFF" and "COOL" Modes

FAN BUTTON AND FAN UP AND DOWN BUTTONS (BS2M):

The Fan Button cycles through "AUTO" and "ON" Fan Modes. The Fan Up and down Buttons control the fan speed as displayed by the Fan Speed Indicator Icon. (Fig. 11)

°C/°F °C/°F BUTTON (BS2M):

Allows for either °F or °C operation.

Specifications subject to change without notice.

**Optional Technician Adjustments**

The unit is shipped ready to install per the order and does not require any special setup or programming. The following Setup or Program Menu Changes are available if the installer decides to change the factory settings. The space temperature display may be adjusted to match a customer calibration standard. The front panel display and the front panel buttons or setpoint slider are used to enter the adjustments. Temperature may be offset $\pm 3^{\circ}$ Fahrenheit or Celsius in increments of 0.1° to 0.5° . The display units may be changed to allow either $^{\circ}\text{F}$ or $^{\circ}\text{C}$ operation, and the setpoint buttons can be disabled.

ENTERING PROGRAM MODE AND MAKING CHANGES:

1. Remove cover and install the shunt jumper across the J16 pins (see Fig. 13).
2. Use the Up and Down Buttons or Setpoint Slider (or Switches S5 & S6 on the back of the circuit board if the unit was ordered without Setpoint adjustment, See Fig. 4) to advance to the parameter to adjust. When using the setpoint slider, enter "DOWN" by moving the slider to the far left. To enter "DOWN" again, move the slider back to the middle and then back to the far left. Move the slider all the way to the right to enter "UP", then back to the middle and to the right again for a second "UP".
3. Use the Override Button (or "Enter" Switch S3 on the back of the circuit board if the unit is ordered without an Override, see Fig. 4) to select the menu parameter. This selects the currently displayed menu or selects the new parameter and stores it into memory. You can adjust and quit (remove J16) any time during this procedure. Be sure to press the Override button or Enter switch to store your selection or it will not be saved.

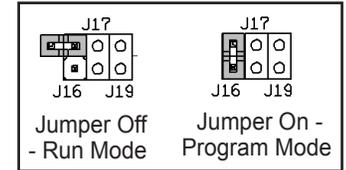


Fig. 13: J16 Program Jumper

MODE MENUS:

The setup mode consists of menu pages P0 through P4 for configuring the sensor. The following are the adjustments that can be done with the program jumper J16 installed.

- P0 - Temperature offset:** (Changes the display only. An independent reference is recommended.)
Use the Up and Down Switches to adjust the temperature $\pm 3^{\circ}$ in $.5^{\circ}$ (F or C) increments. Push the Override button or Enter switch to store the offset value.
- P1 - $^{\circ}\text{F}$ or $^{\circ}\text{C}$ Display:**
Use the Up and Down Switches to select " $^{\circ}\text{F}$ " or " $^{\circ}\text{C}$ " display. Push the Override button or Enter switch to store the value.
- P2 - Display Options or Setpoint Lockout Options:**
- SP = Setpoint Enabled (This is the default configuration). The unit displays the room temp except when the Setpoint is being adjusted by the Up and Down Pushbuttons.
 - SPL = Setpoint Lockout. Disables the setpoint display on pushbutton and slider units. On slider units, the setpoint slider operates normally. On pushbutton units, the setpoint pushbuttons are disabled. The setpoint is locked at the setpoint value that existed when the unit was placed in Setpoint Lockout mode. The unit displays room temperature only
 - SDO = Setpoint Display Only. The unit only displays the setpoint, not the room temperature.
 - SDN = Setpoint Display Disabled. The setpoint functions normally but is not displayed. Not intended for pushbutton setpoint units.
- P3 - Latching Override Option:**
This selection only can be adjusted if you have ordered the Latching Override Option (-L#). This has selections 1-10 shown in Fig. 14 and described in the "Latching Override Operation" section.
- P4 - Temperature Increments - $^{\circ}\text{F}$ or $^{\circ}\text{C}$:**
This selection adjusts the display resolution increments as $.1^{\circ}$ or $.5^{\circ}$ (in either $^{\circ}\text{F}$ or $^{\circ}\text{C}$ Mode)
- "0.1" = This will display all temperatures in 0.1 degree increments.
 - "0.5" = This will display all temperatures in 0.5 degree increments.

Specifications subject to change without notice.

Latching Override Operation

The unit can be ordered with an “Override as a Latching Switch” by selecting the -L# option. The # (1-10) represents the display the user may want to use and is shown below. This can be changed by a technicians adjustment.

In the “Override as Latching Switch” Option, pressing the Override button closes the override relay contacts (Terminals OVR1 & OVR2). They will remain closed until the “Override” button is pressed again, then they will open and remain open until the Override button is pressed again. See Fig. 15 below for examples of “Override as a Latching Switch” circuits.

Ten display options (Fig. 14) are available to indicate when the latching relay is open and when the latching relay is closed. Note: If one of the “Fan Speed/Mode” options is selected from the ordering grid, then you MUST use the latching display Option 9.

BAPI-MAN ICON

On **Options 2, 4, 6, 8 & 10**, the BAPI-Man Icon is disabled and will not show on the display, even when the Override button is pushed.

On **Options 1, 3, 5 & 7**, the BAPI-Man Icon is filled or solid for 3 to 5 seconds after the Override button is pushed, but it will only remain solid or filled when there is a ground signal to the EXT OVR terminal of the unit.

For **Option 9**, the BAPI-Man Icon stays filled or solid when the relay is closed and hollow when the relay is open.

For **Option 10**, the BAPI-Man Icon is disabled but the “ON” or “OFF” Dot on the display is controlled by the EXT OVR terminal. When there is a ground signal at the EXT OVR terminal, the “ON” dot is lit. Otherwise the “OFF” and hollow dot are lit. **Note: The Override Terminals OVR1 and OVR2 are NOT latching in Option 10. These terminals close MOMENTARILY in this option.**

Option	Override Relay Open	Override Relay Closed
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Fig. 14: Latching Switch Display Options

The 10 “Override as a Latching Switch” display options are shown above for when the relay is open and when the relay is closed.

Note 1: If the unit is ordered with “Fan Speed/Mode” Options, then you must use the latching display Option 9.

Note 2: On Options 1, 3, 5 & 7, the BAPI-Man Icon is filled or solid for 3 to 5 seconds after the Override button is pushed, but it will only remain solid or filled when there is a ground signal to the EXT OVR terminal of the unit.

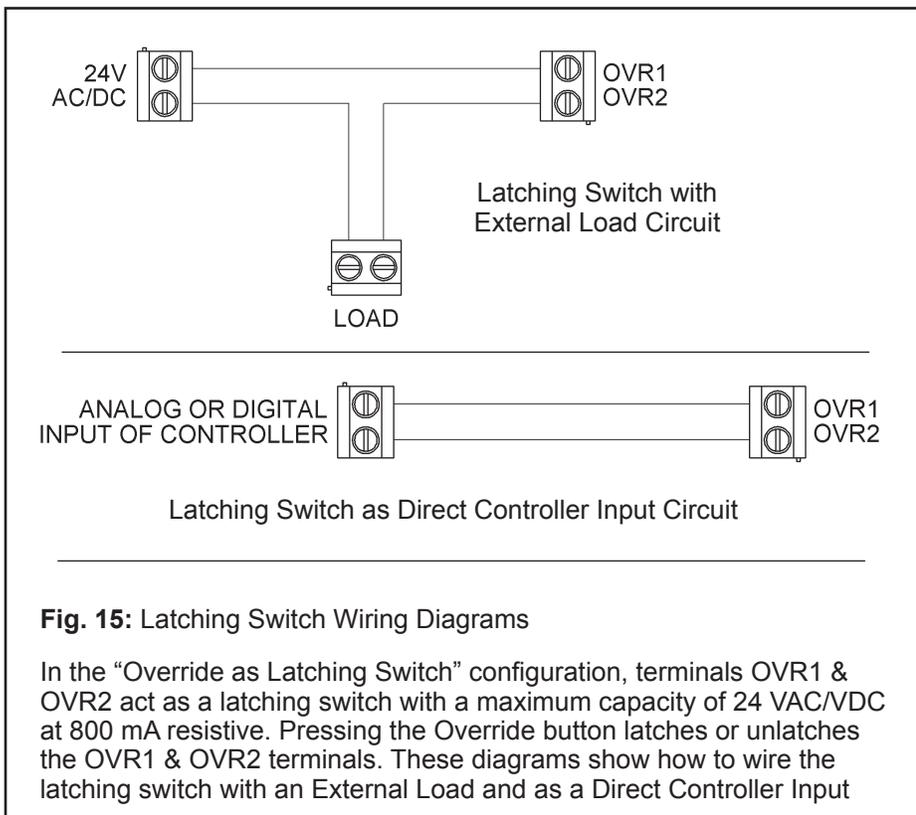


Fig. 15: Latching Switch Wiring Diagrams

In the “Override as Latching Switch” configuration, terminals OVR1 & OVR2 act as a latching switch with a maximum capacity of 24 VAC/VDC at 800 mA resistive. Pressing the Override button latches or unlatches the OVR1 & OVR2 terminals. These diagrams show how to wire the latching switch with an External Load and as a Direct Controller Input

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Non-Latching Override Operation

When the Override pushbutton is pressed, the BAPI-Man (Fig. 12) will be displayed as “Solid” for 3-5 seconds and the override output will shunt or short for 3 seconds depending on the override option selected. The various options are described below.

- N Option = Momentary Temperature Sensor Shunt to $< 15\Omega$
- P Option = Momentary Setpoint Shunt to $<15\Omega$
- J Option = Momentary Override as a Separate Shorting Contact Output on OVR1 & OVR2
- L# Option = Override as a Latching Switch (See “Latching Override Operation” below)

BAPI-MAN ICON:

The BAPI-Man Icon shows the status of the room - Solid for Occupied, Hollow for “Unoccupied” (Fig. 12).

The unit must receive a confirmation (ground) signal on the “EXT OVR” terminal for the BAPI-Man to remain visible on the screen. Pressing the Override button will light the BAPI-Man icon; however, if no confirmation signal is received, then the BAPI-Man will go blank (disappear) after 5 seconds. Upon receiving a first confirmation (ground) signal on the “EXT OVR” terminal, the BAPI-Man will show occupied (Solid). The BAPI-Man will then show unoccupied (Hollow) whenever the confirmation signal is removed and occupied when the signal is returned. The only way to blank or remove the BAPI-Man from the display once it has received a confirmation signal is to cycle power.

General Diagnostics

POSSIBLE PROBLEM:

POSSIBLE SOLUTIONS:

- | | |
|-----------------------------------|---|
| Temperature reading is incorrect | <ul style="list-style-type: none">- Determine that the input is set up correctly in the controller’s and BAS software.- Check wiring for proper termination. Wire resistance should be less than 10Ω.- Check for corrosion at either the controller or the sensor.- Measure the physical temperature at the temperature sensor’s location using an accurate temperature standard. Compare the temperature sensor’s resistance to the appropriate temperature sensor table on the BAPI website. (Go to www.bapivac.com and click on “Resource Library” and “Sensor Specs” then click on the sensor that you have.) If the measured resistance is different from the temperature table by more than 5%, call BAPI technical support.- Make sure that the test and balance switch is in the correct position. |
| Setpoint reading is incorrect | <ul style="list-style-type: none">- Make sure that the setpoint output is correct. Remove the setpoint output wire and check the output for the correct resistance or voltage output. See the product label for your specific range. Don’t forget to reconnect the wire. |
| Override is not working correctly | <ul style="list-style-type: none">- Check that the resistance across the override output is less than 5 ohms when the override switch is pushed |
| Fan Mode not correct | <ul style="list-style-type: none">- Make sure that the fan mode output is correct. Remove the fan mode output wire and check the output for the correct resistance. See the product label for your specific range and compare it to the resistance chart at the bottom of page 3. Don’t forget to reconnect the wire. |

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Specifications

Power for 5VDC Power Units:

0 to 5 VDC Setpoint or Resistive Setpoint: 5V \pm 1% (5 VDC nominal, Input regulation affects accuracy)

Power for 24VDC Power Units:

0 to 5 VDC Setpoint9 to 40 VDC (24 VDC nominal)
 0 to 10 VDC Setpoint ...15 to 40 VDC (24 VDC nominal)
 Resistive Setpoint9 to 40 VDC (24 VDC nominal)
 Any Allowed Setpoint ...15 to 28 VAC (24 VAC nominal)
 Note: AC power requires a separate pair of shielded wires

Power Consumption: 7 mA max DC; .17 VA maximum AC

Wiring:See Wiring & Termination Section
 Terminals.....22-14AWG

Mounting:Standard 2 x 4 box or drywall direct (Screws provided)

Outputs:

Passive Sensor.....See order grid for thermistor or RTD
 Thermistor, \pm 0.36°F (\pm 0.2°C), [XP] \pm 0.18°F (\pm 0.1°C)
 Platinum RTD, \pm 0.12%, [A] \pm 0.06%
 Nickel RTD, 1000 Ω @70°F, JCI curve
 External Sensor.....10K-2 thermistor (-ES), Purchased separately, Wired 25' maximum from sensor
 Setpoint.....Resistive per order or voltage (0-10VDC limit per order)
 *Isolated Contact.....24VDC, VAC @800mA resistive

Inputs:.....Dry contact (24V, <1mA)
 OccupiedEXT OVR "Grounded"
 UnoccupiedEXT OVR "Open to Ground"

Display:LCD, Overall, 2"W x 1.1"H (Temp/Setpoint/Occupied)
 LCD3.5 Digits @0.6"H
 Occ/UnoccBAPI-Man Icon, (Filled in man is occupied)
 Display limits0.1° (F/C) increments • Setpoints in 0.5° steps
 Display Set-up.....Temp. & Setpoint, Temp. only, or Setpoint only or °F or °C
 Optional.....Fan Speed, System Mode, Override

Options:.....Factory set options
 SetpointUp & Down buttons or Slider
 OverridePushbutton
 Override Operation.....Factory set: Momentary shunt across sensor, Momentary shunt across setpoint,
 Momentary isolated contact or Latching isolated contact
 Fan Speed.....Off, Auto, Lo, Med, Hi (BS2M)
 System ModeHeat/Off/Cool, Auto/On Fan (BS2M)

Setup Options:

Offset..... \pm 3°
 Temp Display.....Display in °F or °C
 SetpointDisabled or Setpoint display only
 ResolutionDisplay in 0.1° or 0.5° increments

Other Options:

Comm. jack3.5mm phone jack, 3 wires (-C35) • RJ11 jack, 4 wires (-C11) • RJ22 jack, 4 wires (-C22)
 Test & BalanceThree position switch (-TB), High Temp/Normal/Low temp)
 Common Ground.....Internal common connection (-CG)
 Differential GND.Each output terminal is isolated (-DF)

Environmental Ambient:

Temperature32 to 122°F (0 to 50°C)
 Humidity0 to 95% RH Non-condensing

Material:.....ABS Plastic, UL94V-0

Agency:RoHS

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