48/50HJ004−014, 50HJQ004−012, 48/50HE003−006
50HEQ003−006, 48/50TM004−014
RTU−MP (Multi−Protocol) 2.x Controller
BACnet, Modbus, Johnson N2, and LonWorks

Carrier®
Turn to the Experts℠

Controls, Start−Up, Operation and Troubleshooting Instructions

TABLE OF CONTENTS

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform the basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves.

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies a hazard which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

Disconnect all power to the unit before performing maintenance or service. Unit may automatically start if power is not disconnected.

GENERAL

The RTU-MP controller is an integrated component of the Carrier rooftop unit. Its internal application programming provides optimum performance and energy efficiency. RTU-MP enables the unit to run in 100% stand-alone control mode or it can communicate to the Building Automation System (BAS). On-board DIP switches allow you to select your protocol (and baud rate) of choice among the four most popular protocols in use today: BACnet, Modbus, Johnson N2 and LonWorks. (See Fig. 19.)

Carrier's diagnostic display tools such as BACview^6 Handheld or Virtual BACview can be used with the RTU-MP controller. Access is available via a 5-pin J12 access port.

ACCESSORY/SENSOR INSTALLATION

Field accessories for the RTU-MP include a room sensor, communication wiring, humidistat or relative humidity sensor and indoor and outdoor air quality. All field control wiring that connects to the RTU-MP must be routed through the raceway built into the corner post as shown in Fig. 2. The raceway provides the UL required clearance between high-and low-voltage wiring. Pass the control wires through the hole provided in the corner post, then feed the wires thorough the raceway to the RTU-MP. Connect the wires to the removable Phoenix connectors and then reconnect the connectors to the board.

NOTE: For rooftop unit installation, refer to base unit installation instructions.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

Disconnect electrical power and use lock-out tags before wiring the RTU-MP controller.

Field-Supplied Hardware

The RTU-MP controller is configurable with the following field-supplied sensors:

NOTE: Supply air temperature sensor (33ZCSENSAT) is factory-installed.

- space temperature sensor 33ZCT55SPT, 33ZCT56SPT, or 33ZCT59SPT
- indoor air quality sensor (33ZCSENCO2, 33ZCT55CO2, 33ZCT56CO2,) required only for demand control ventilation. A dedicated 24-vac transformer is required.
- outdoor air quality sensor (33ZCTSENCO2) required only for demand control ventilation
- CO_2 aspirator box (C33ZCCASPCO2) required for CO_2 return duct/outside air applications
- outdoor air temperature sensor (33ZCSENOAT) (factory supplied with Economizer)
- outdoor air enthalpy switch (33CSENTHSW)
- return air enthalpy sensor (33CSENTSEN)
- space relative humidity sensor (33ZCSENSRH-01)
- outdoor relative humidity (332CSENORH-01)
- humidistat (TSTATCCPLH01-B)
- filter status switch (33CSFS--01)
- fan status switch (33CSAS--01 or field supplied rated at 24 VAC dry contact CRSTATUS001A00)

User Interface

- BACview^6 Handheld
- Virtual BACview

For specific details about sensors, refer to the literature supplied with the sensor.

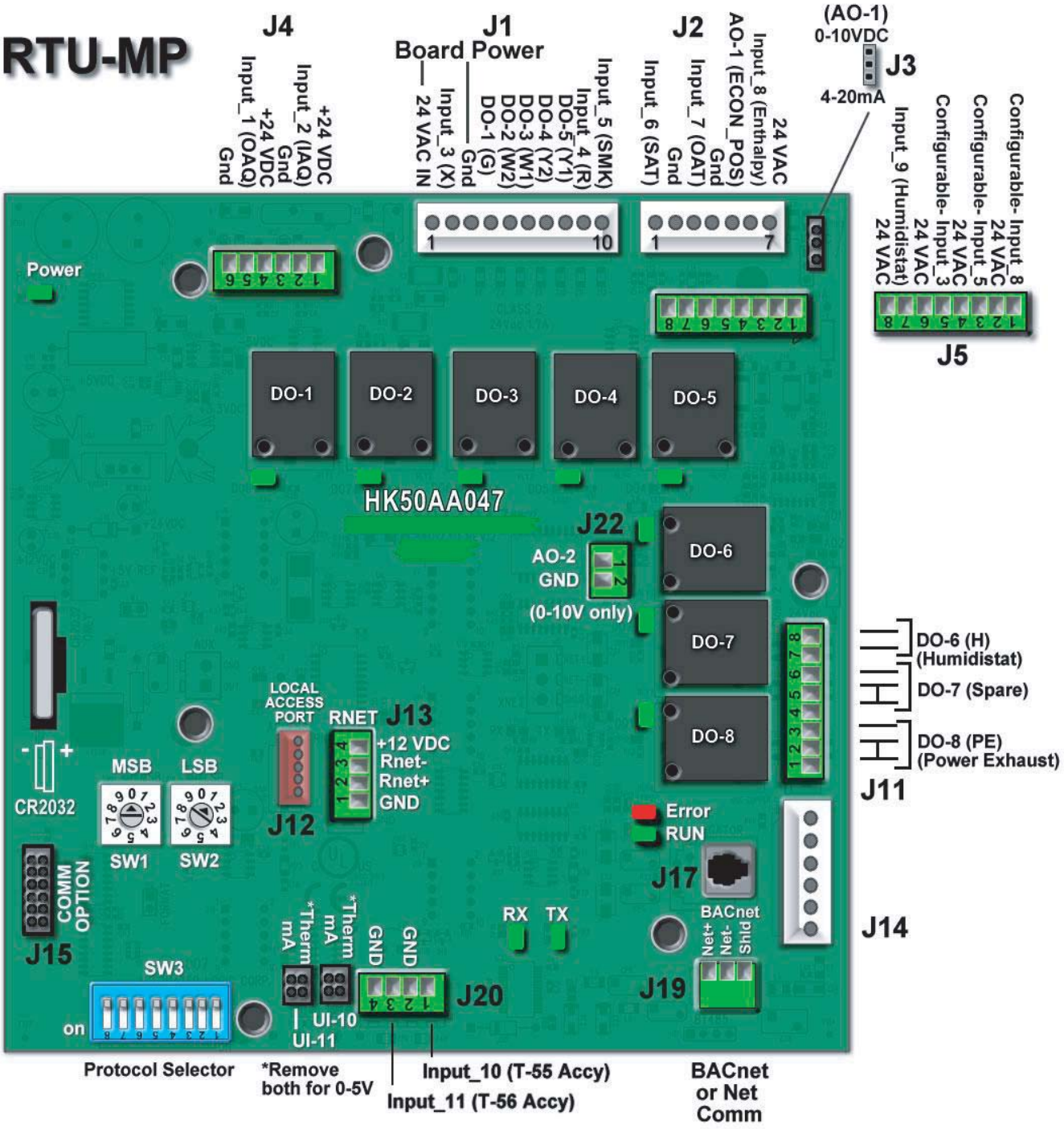

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Fig. 1 - RTU-MP Control Module

Table 1 – RTU-MP Controller Inputs and Outputs

POINT NAME	BACnet OBJECT NAME	TYPE OF I/O	CONNECTION PIN NUMBERS
INPUTS			
Space Temperature Sensor	sptsens	AI (10K Thermistor)	J20–1, 2
Supply Air Temperature	sat	AI (10K Thermistor)	J2–1, 2
Local Outside Air Temperature Sensor	oatsens	AI (10K Thermistor)	J2–3, 4
Space Temperature Offset Pot	sptopot	AI (100K Potentiometer)	J20–3
Indoor Air Quality	iaq	AI (4–20 ma)	J4–2, 3
Outdoor Air Quality	oaq	AI (4–20 ma)	J4–5, 6
Safety Chain Feedback	safety	DI (24 VAC)	J1–9
Compressor Safety	compstat	DI (24 VAC)	J1–2
Fire Shutdown	firedown	DI (24 VAC)	J1–10
Enthalpy Switch	enthalpy	DI (24 VAC)	J2–6, 7
Humidistat Input Status	humstat	DI (24 VAC)	J5–7, 8
CONFIGURABLE INPUTS*			
Space Relative Humidity	sprh	AI (4–20 ma)	J4–2,3 or J4–5,6
Outside Air Relative Humidity	oarh	AI (4–20 ma)	
Supply Fan Status	fanstat	DI (24 VAC)	J5–1,2 or J5–3,4 or J5 5,6 or J5–7,8
Filter Status	filtstat	DI (24 VAC)	
Remote Occupancy Input	remocc	DI (24 VAC)	
OUTPUTS			
Economizer Commanded Position	econocmd	4–20ma	J2–5
Supply Fan Relay State	sf	DO Relay (24VAC , 1A)	J1–4
Compressor 1 Relay State	comp_1	DO Relay (24VAC , 1A)	J1–8
Compressor 2 Relay State	comp_2	DO Relay (24VAC , 1A)	J1–7
Heat Stage 1 Relay State	heat_1	DO Relay (24VAC , 1A)	J1–6
Heat Stage 2 Relay State	heat_2	DO Relay (24VAC , 1A)	J1–5
Power Exhaust Relay State	aux_2	DO Relay (24VAC , 1A)	J11–3
Dehumidification Relay State	humizer	DO Relay (24VAC, 1A)	J11–7, 8

LEGEND

AI – Analog Input
AO – Analog Output
DI – Discrete Input
DO – Discrete Output

*These inputs (if installed) take the place of the default input on the specific channel according to schematic.

Parallel pins J5–1 = J2–6, J5–3 = J1–10, J5–5 = J1–2 are used for field installation.

Refer to the input configuration and accessory sections for more detail.

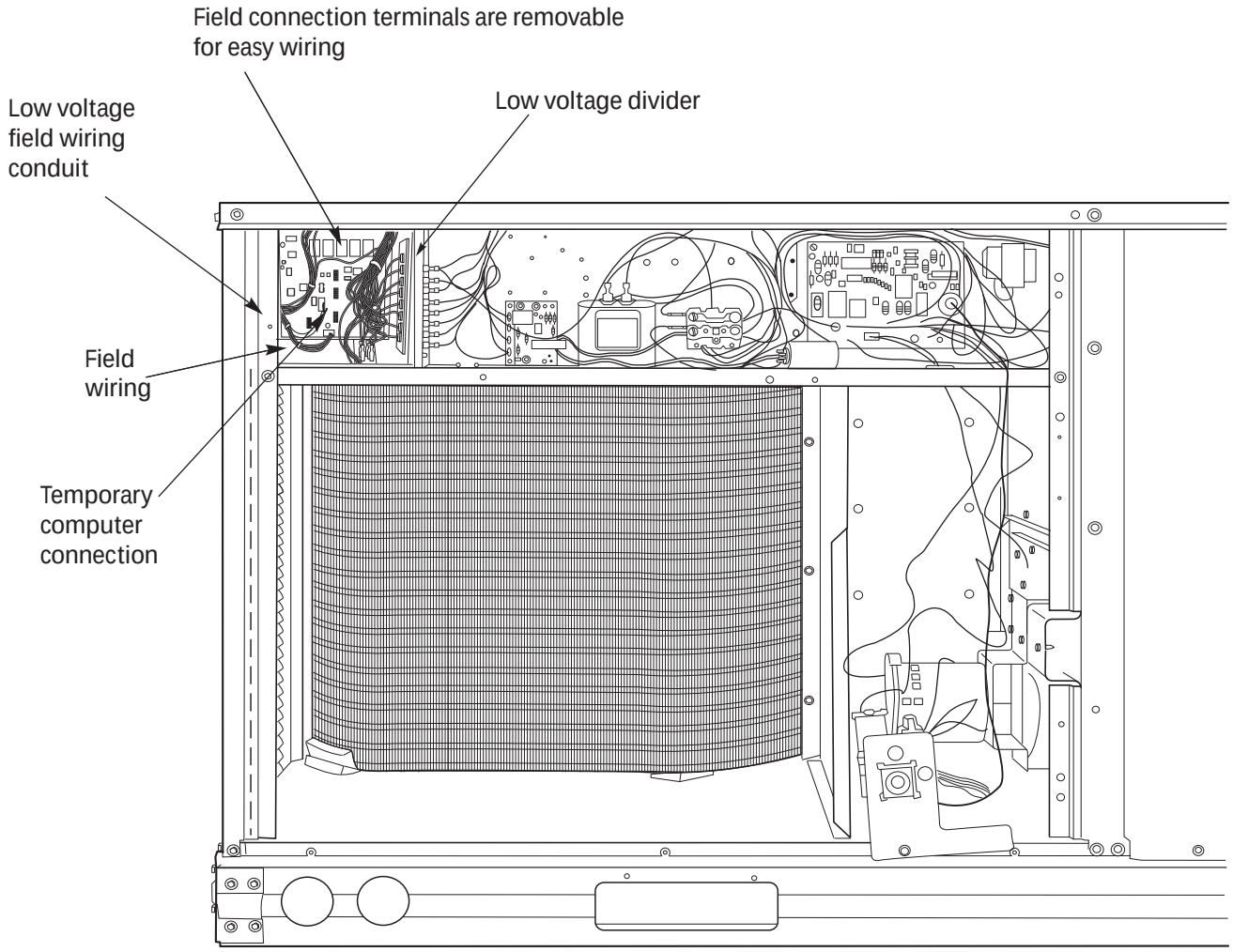

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Fig. 2 – Field Control Wiring

Install Sensors

The RTU-MP controller requires the installation of a space temperature sensor and the operation of a supply air sensor (factory installed). An outdoor air sensor is required for economizer operation. Two analog sensors can be installed and configured, which can consist of an indoor air quality, outdoor air quality, space relative humidity, or outdoor relative humidity sensor. See Fig. 1, Table 1, and Fig. 7 for wiring and pin reference. Refer to the instructions supplied with individual sensors for additional information.

NOTE: All sensors are field-installed accessories except where noted.

Space Temperature (SPT) Sensor Installation

There are three types of SPT sensors available from Carrier: the 33ZCT55SPT space temperature sensor with timed override button, the 33ZCT56SPT space temperature sensor with timed override button and set point adjustment, and the 33ZCT59SPT space temperature sensor with LCD screen, override button, and set point adjustment.

The space temperature sensors are used to measure the building interior temperature. Sensors should be located on an interior building wall. The sensor wall plate accommodates the NEMA (National Electrical Manufacturers Association) standard 2 x 4 junction box. The sensor can be mounted directly on the wall surface if acceptable by local codes.

Do not mount the sensor in drafty locations such as near air conditioning or heating ducts, over heat sources such as baseboard heaters, radiators, or directly above wall-mounted lighting dimmers. Do not mount the sensor near a window which may be opened, near a wall corner, or a door. Do not mount the sensor in direct sunlight. Sensors mounted in these areas will have inaccurate and erratic sensor readings.

The sensor should be mounted approximately 5 ft from the floor, in an area representing the average temperature in the space. Allow at least 4 ft between the sensor and any corner and mount the sensor at least 2 ft from an open doorway. The SPT sensor wires are to be connected to terminals in the unit main control board.

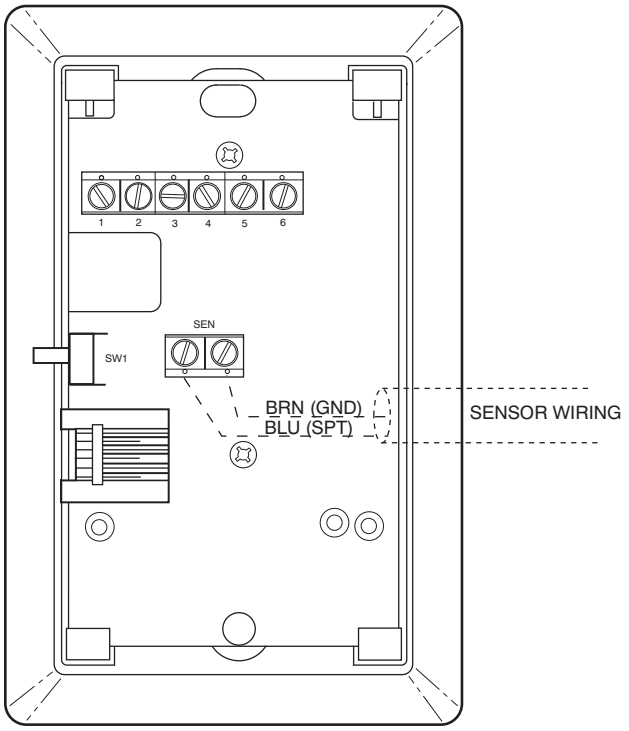

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Fig. 3 - Space Temperature Sensor Typical Wiring (33ZCT55SPT)

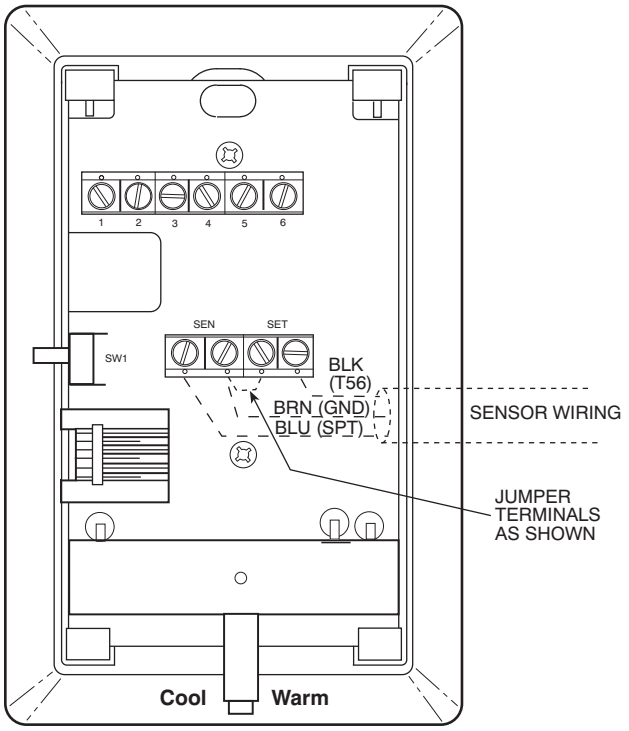

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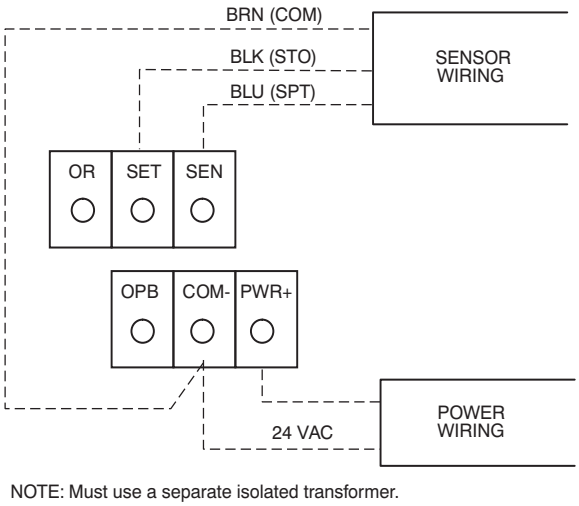
Fig. 4 - Space Temperature Sensor Typical Wiring (33ZCT56SPT)



NOTE: Must use a separate isolated transformer.

C07132

Fig. 5 - Space Temperature Sensor Typical Wiring (33ZCT59SPT)

Install the sensor as follows:

1. Locate the two Allen type screws at the bottom of the sensor.
2. Turn the two screws clockwise to release the cover from the sensor wall mounting plate.
3. Lift the cover from the bottom and then release it from the top fasteners.
4. Feed the wires from the electrical box through the opening in the center of the sensor mounting plate.
5. Using two no. 6-32 x 1 mounting screws (provided with the sensor), secure the sensor to the electrical box.

NOTE: Sensor may also be mounted directly on the wall using 2 plastic anchors and 2 sheet metal screws (field-supplied).

6. Use 20 gauge wire to connect the sensor to the controller. The wire is suitable for distances of up to 500 ft. Use a three-conductor shielded cable for the sensor and set point adjustment connections. If the set point adjustment (slide-bar) is not required, then an unshielded, 18 or 20 gauge, two-conductor, twisted pair cable may be used.
7. Replace the cover by inserting the cover at the top of the mounting plate first, then swing the cover down over the lower portion. Rotate the two Allen head screws counter-clockwise until the cover is secured to the mounting plate and locked in position.

NOTE: See Table 2 for thermistor resistance vs temperature values.

Table 2 – Thermistor Resistance vs Temperature Values for Space Temperature Sensor, Supply Air Temperature Sensor, and Outdoor Air Temperature Sensor

TEMP (C)	TEMP (F)	RESISTANCE (Ohms)
–40	–40	335,651
–35	–31	242,195
–30	–22	176,683
–25	–13	130,243
–20	–4	96,974
–15	5	72,895
–10	14	55,298
–5	23	42,315
0	32	32,651
5	41	25,395
10	50	19,903
15	59	15,714
20	68	12,494
25	77	10,000
30	86	8,056
35	95	6,530
40	104	5,325
45	113	4,367
50	122	3,601
55	131	2,985
60	140	2,487
65	149	2,082
70	158	1,752

Wiring the Space Temperature Sensor

To wire the sensor, perform the following (See Fig. 3, 4 and 5.):

1. Identify which cable is for the sensor wiring.
2. Strip back the jacket from the cables for at least 3 inches. Strip $^1/_4$-in. of insulation from each conductor. Cut the shield and drain wire from the sensor end of the cable.
3. Connect the sensor cable as follows:
   a. Connect one wire from the cable to (BLU) wire on J20-1 analog connector on the controller. Connect the other end of the wire to the left terminal on the SEN terminal block of the sensor.
   b. Connect another wire from the cable to (BRN) J20-2 analog connector on the controller. Connect the other end of the wire to the remaining open terminal on the SEN terminal block. On the 33ZCT59SPT sensor, connect this cable to the 24-v COM terminal. A separate 24-vac transformer is required for this sensor. (See Fig. 5.)
   c. On 33ZCT56SPT and 33ZCT59SPT sensors, connect the remaining wire to the (BLK) SPTO on J20-3 connector on the controller. Connect the other end of the wire to the SET terminal on the sensor.
   d. In the control box, install a no. 10 ring type crimp lug on the shield drain wire. Install this lug under the mounting screw of the RTU-MP controller.
   e. On 33ZCT56SPT sensors, install a jumper between the two center terminals (right SEN and left SET). (See Fig. 4.)

NOTE: See Fig. 6 for space temperature sensor averaging. T55/56 Override button will no longer function when sensors are averaged. Only Sensor 1 T56 STO input can be used.

Do not mount the sensor in direct sunlight. Inaccurate readings may result. Do not mount the sensor near the exhaust from air-handling units or compressors, near leakage drafts of indoor air, or near shrubbery or trees, or under direct water runoff.

Indoor Air Quality CO_2 Sensor Installation (IAQ)

The indoor air quality sensor accessory monitors carbon dioxide CO_2 levels. This information is used to monitor IAQ levels. Three types of sensors are provided. The wall sensor can be used to monitor the conditioned air space. Sensors use infrared technology to measure the levels of CO_2 present in the air. The wall sensor is available with or without an LCD readout to display the CO_2 level in ppm.

The CO_2 sensors are all factory set for a range of 0 to 2000 ppm and a linear mA output of 4 to 20. Refer to the instructions supplied with the CO_2 sensor for electrical requirements and terminal locations.

To accurately monitor the quality of the air in the conditioned air space, locate the sensor near a return air grille (if present) so it senses the concentration of CO_2 leaving the space. The sensor should be mounted in a location to avoid direct breath contact.

Do not mount the IAQ sensor in drafty areas such as near supply ducts, open windows, fans, or over heat sources. Allow at least 3 ft between the sensor and any corner. Avoid mounting the sensor where it is influenced by the supply air; the sensor gives inaccurate readings if the supply air is blown directly onto the sensor or if the supply air does not have a chance to mix with the room air before it is drawn into the return airstream.

Wiring the Indoor Air Quality Sensor

To wire the sensors after they are mounted in the conditioned air space or outdoor location, see the instructions shipped with the sensors. For each sensor, use two 2-conductor 18 AWG (American Wire Gauge) twisted-pair cables (unshielded) to connect the separate isolated 24 vac power source to the sensor and to connect the sensor to the control board terminals. To connect the sensor to the control, identify the positive (4 to 20 mA) and ground (SIG COM) terminals on the sensor. Connect the 4-20 mA terminal to terminal IAQ (J4-2) and connect the SIG COM terminal to terminal GND (J4-3).

Combination Temperature and CO_2 Sensor

If using a combination temperature and CO_2 sensor (33ZCT55CO2 or 33ZCT56CO2), refer to the installation instructions provided with the sensor. See Fig. 2 and 7 for wiring.

Outdoor Air Quality CO_2 Sensor Installation (OAQ)

The Outdoor Air CO_2 sensor is designed to monitor carbon dioxide (CO_2) levels in the air and interface with the ventilation damper in an HVAC system. The OAQ sensor is packaged with an outdoor cover. (See Fig. 8 and 9.)

The outdoor air CO_2 sensor must be placed in an area that is representative of the outdoor air not affected by building exhaust air or vehicle exhaust.

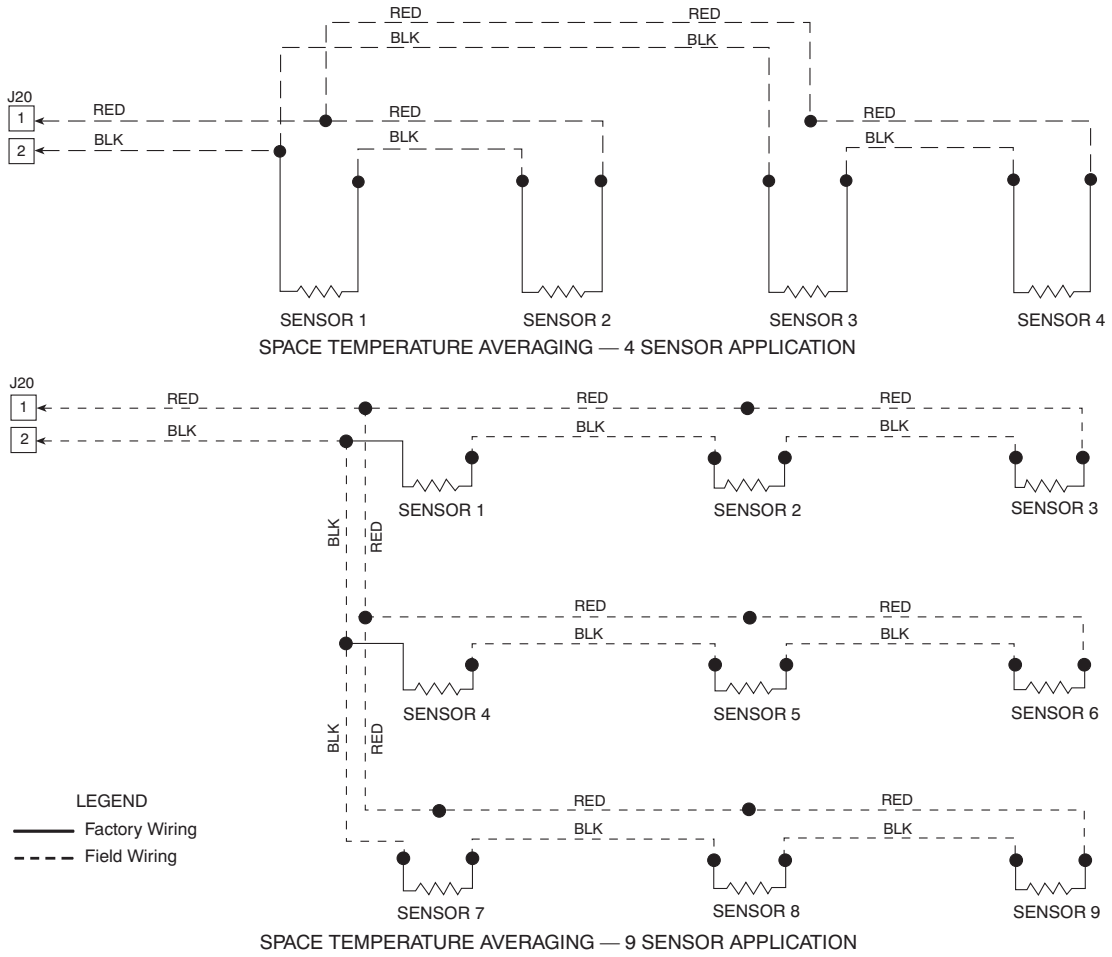
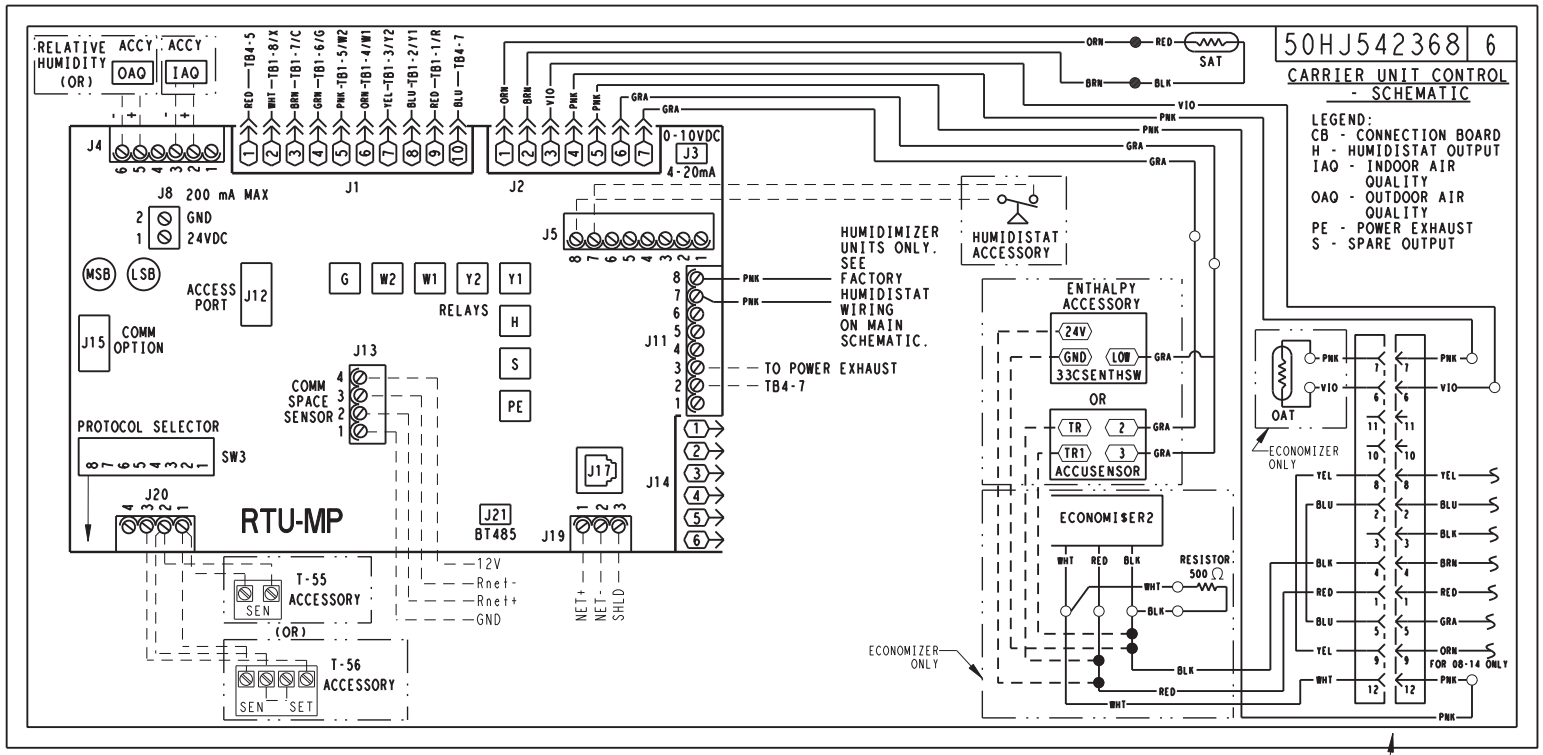


Fig. 6 - Space Temperature Averaging



Economizer Plug Connection

LEGEND

– – – – Field Supplied Wiring

_____ Factory Wiring

Field Supplied Device

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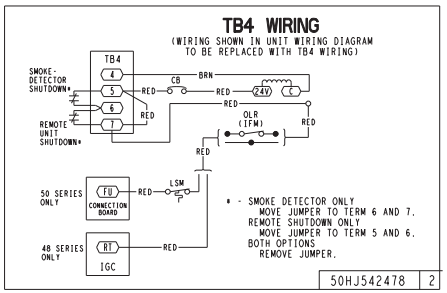

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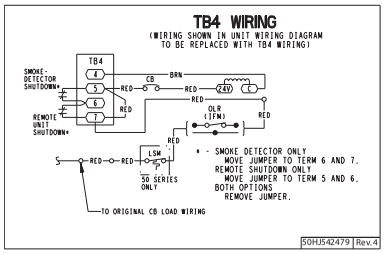
For Single Compressor Units (Non-Heat Pump Type)



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For All Other Units

Fig. 7 - RTU-MP Controller Wiring

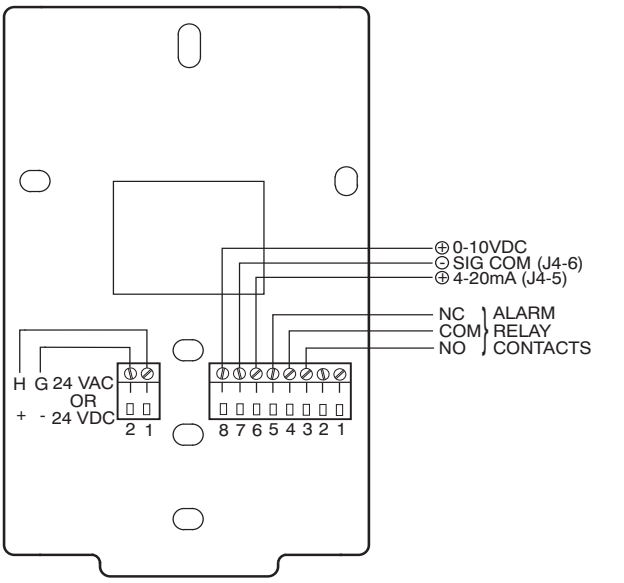

Fig. 8 - Indoor/Outdoor Air Quality (CO_2) Sensor 33ZCSENC02) - Typical Wiring Diagram

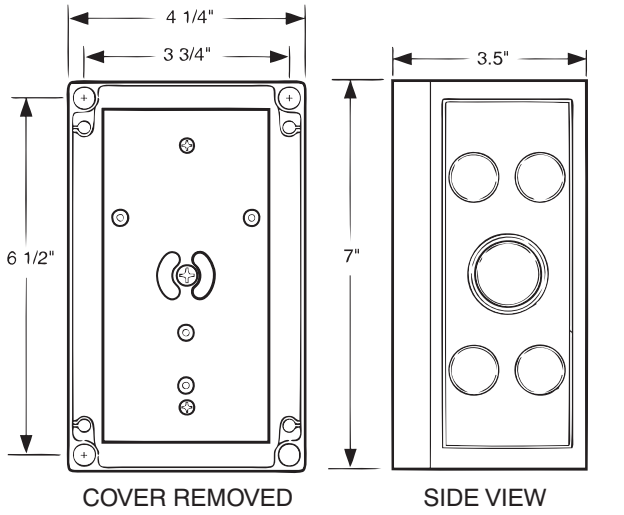

Fig. 9 - Outdoor Air Quality Sensor Cover

Wiring the Outdoor Air CO_2 Sensor

Power requirements are 18 to 36 VAC RMS 50/60 Hz; 18 to 42 vdc polarity protected/dependent; and 70 mA average, 100 mA peak at 24 vdc. All system wiring must be in compliance with all applicable local and national codes. A dedicated power supply is required for this sensor. A two-wire cable is required to wire the dedicated power supply for the sensor. The two wires should be connected to the power supply and terminals 1 and 2. To connect the sensor to the control, identify the positive (4 to 20 mA) and ground (SIG COM) terminals on the sensor. Connect the 4 to 20 mA terminal OAQ terminal J4-5. Connect the SIG COM terminal to terminal GND (BRN) terminal J4-6. (See Fig. 7.)

Outdoor Air Temperature Sensor (Fig. 10-13)

The OAT sensor is factory installed for units with an economizer.

The OAT sensor must be located properly. For outdoor locations use sensor 33ZCSENOAT. For duct mounting in the fresh air intake, use sensor 33ZCSENPAT. The sensor must be installed immediately upstream from outdoor air damper where it will accurately sense the temperature of the outdoor air entering the mixing box. (See Fig. 10 and 11.) For applications without economizer, the sensor may be located in the outdoor air-duct near the outdoor air intake (Fig. 10) or on the exterior of the building (Fig. 10). The thermistor has a range of –40° to 245°F and a resistance of 10,000 ohms at 77°F.

If the sensor is to be mounted in the outdoor air duct, use the 33ZCSENPAT sensor which has a 2 x 4-in. by $1^1/_2$-in. deep electrical box. Remove the cover and enter the knockout from the rear of the box. Install the sensor through the opening so that the sensor leads are inside the electrical box. Secure the sensor to the electrical box using a field-supplied $^1/_2$-in. conduit nut. Drill a $^1/_2$-in. hole in the outdoor air duct about a foot upstream of the outdoor air damper. Apply a $^1/_4$-in. bead of silicone type sealer around the opening and install the sensor through the hole. Secure the electrical box to the duct using 2 field-supplied, No. 10 sheet metal screws. (See Fig. 13.)

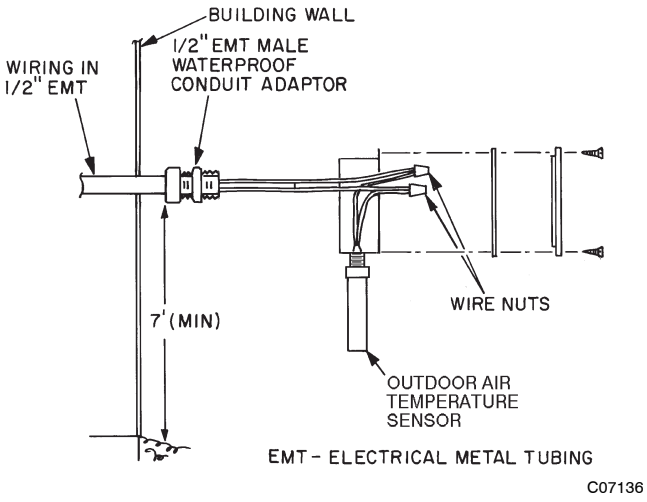

Fig. 10 - Outdoor Air Temperature Sensor Installation - Located on Building Wall (P/N 33ZCSENOAT)

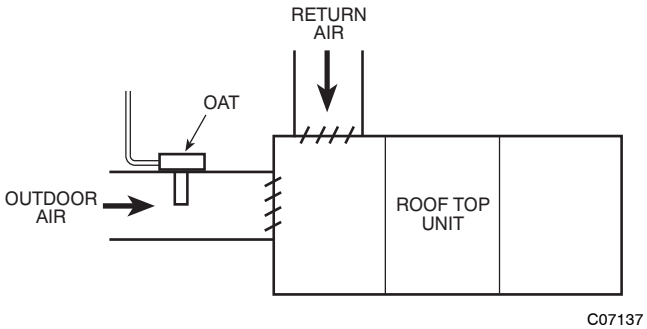

Fig. 11 - OAT Sensor Installation in Outside Air Duct (P/N 33ZCSENPAT)

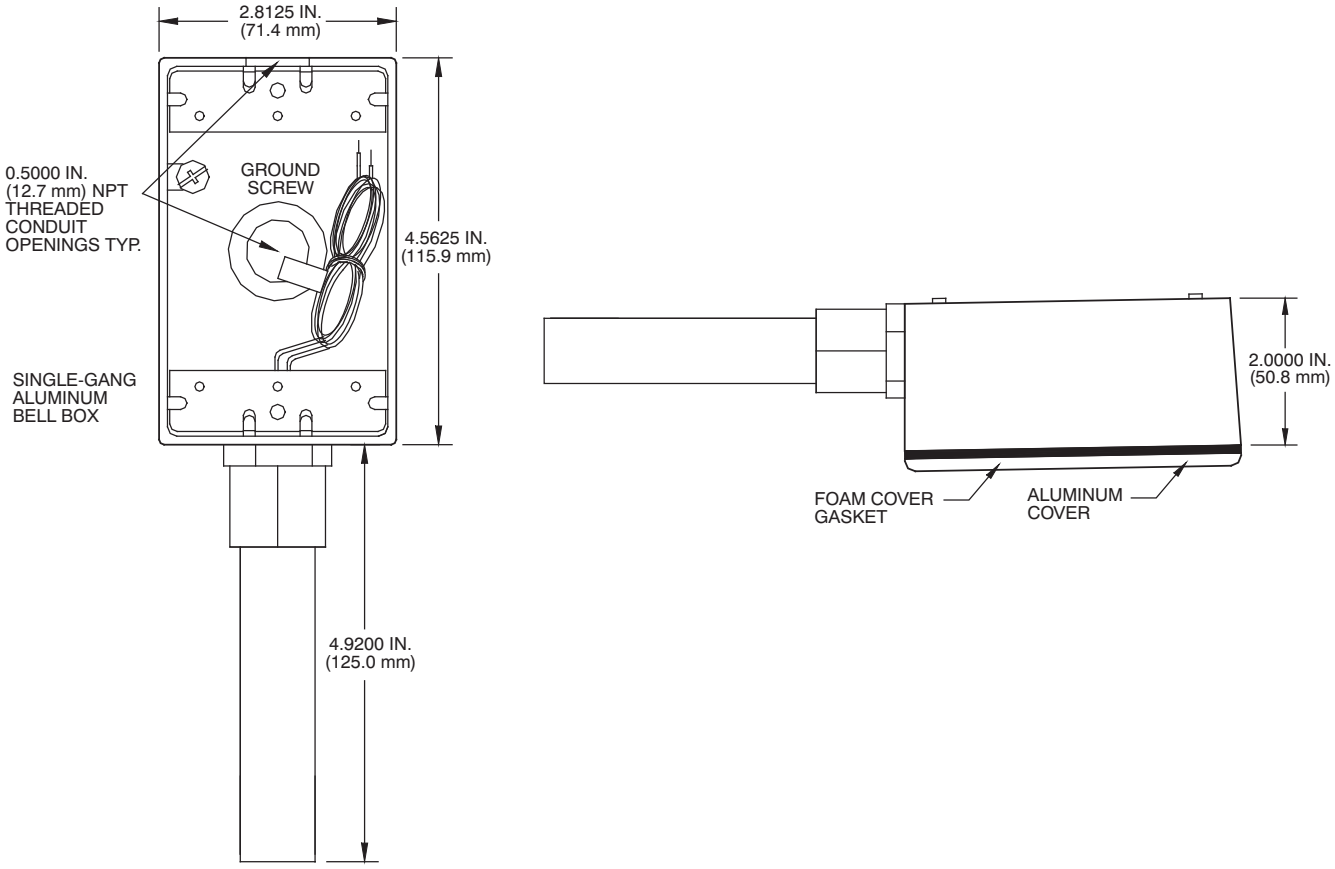

Fig. 12 - Outdoor Air Temperature Sensor (P/N 33ZCSENOAT)

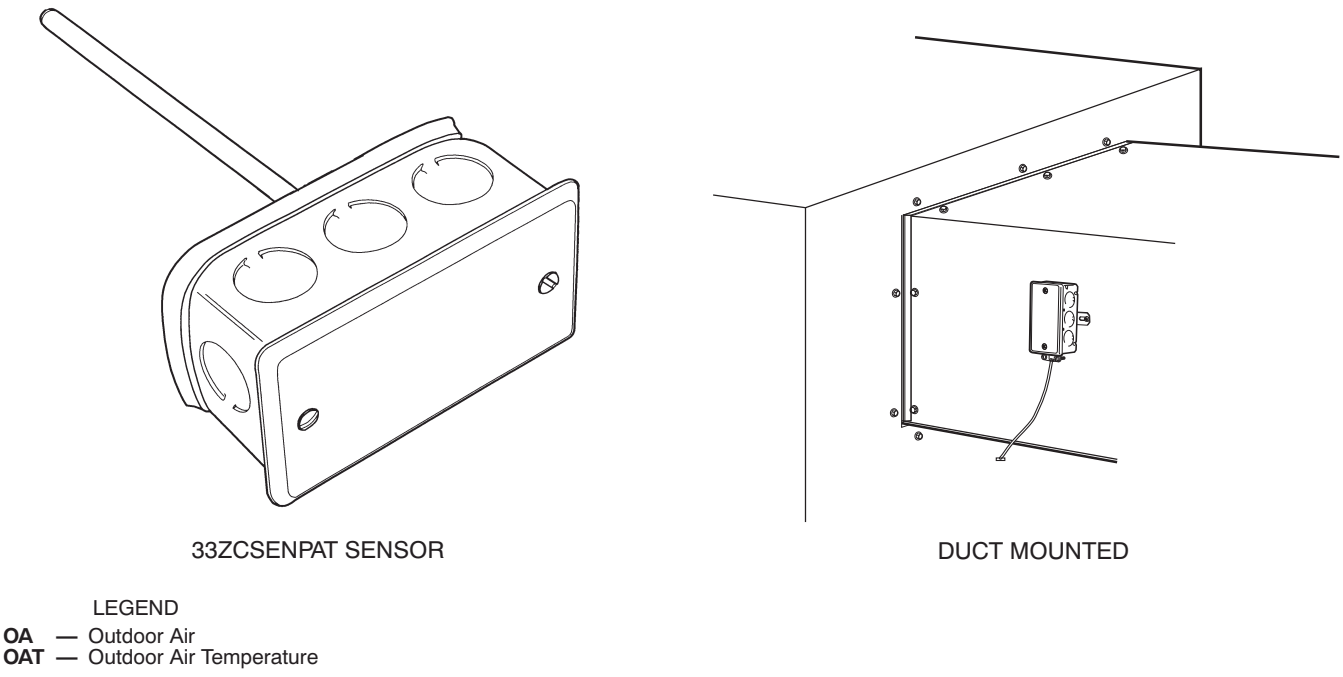

Fig. 13 - Outdoor Air Temperature Sensor Installation - Located in Outdoor Air Duct (P/N 33ZCSENPAT)

Space Relative Humidity Sensor (SPRH)

The accessory space humidity sensor is installed on an interior wall to measure the relative humidity of the air within the occupied space.

The use of a standard 2 x 4-in. electrical box to accommodate the wiring is recommended for installation. The sensor can be mounted directly on the wall, if acceptable by local codes.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Do NOT clean or touch the sensing element with chemical solvents as they can permanently damage the sensor.

DO NOT mount the sensor in drafty areas such as near heating or air-conditioning ducts, open windows, fans, or over heat sources such as baseboard heaters, radiators, or wall-mounted light dimmers. Sensors mounted in those areas will produce inaccurate readings.

If the sensor is installed directly on a wall surface, install the humidity sensor using 2 screws and 2 hollow wall anchors (field-supplied). Do not over tighten screws. (See Fig. 14.)

The sensor must be mounted vertically on the wall. The Carrier logo should be oriented correctly when the sensor is properly mounted.

Avoid corner locations. Allow at least 4 ft between the sensor and any corner. Airflow near corners tends to be reduced, resulting in erratic sensor readings. The sensor should be vertically mounted approximately 5 ft up from the floor, beside the space temperature sensor.

For wiring distances up to 500 feet, use a 3-conductor, 18 or 20 AWG cable. A shielded cable can be used, although the shield is not required. The shield must be removed from the sensor end of the cable if this cable is used.

The power for the sensor is provided by the RTU-MP control on terminal J4-4 Input 1 is used or J4-1 if Input 2 is used. To wire the sensor perform the following:

1. At the sensor, remove 4-in. of jacket from the cable. Strip 1/4-in. of insulation from each conductor. Route the cable through the wire clearance opening in the center of the sensor. (See Fig. 14.)
2. Connect a field-supplied BLACK wire to the sensor screw terminal marked Vin.
3. Connect a field-supplied RED wire into the sensor screw terminal marked Io.
4. At the RTU-MP controller, route the cable away from high voltage wiring and disconnect the power to prevent accidental shorting or grounding of wires when connecting the sensor. Remove the J4 Molex female plug.
5. Connect the field-supplied RED wire from the sensor to J4-5 if Input 1 is used or J4-2 if Input 2 is used.
6. Connect the field-supplied BLACK wire from the sensor to J4-4 if Input 1 will be used of J4-1 if Input 2 will be used.

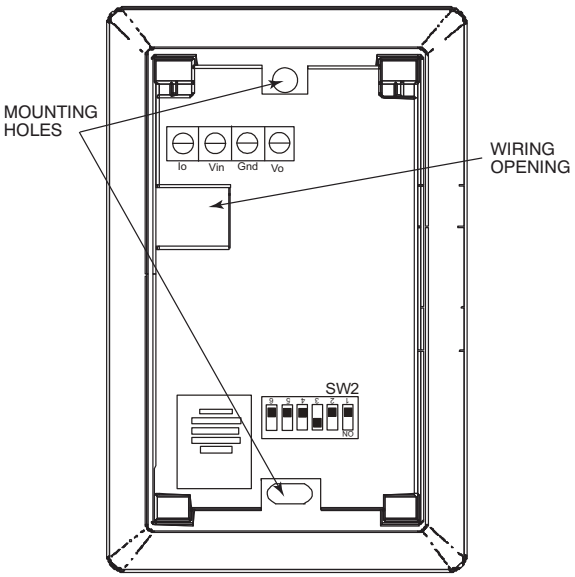

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Fig. 14 - Humidity Sensor Installation

Outdoor Air Relative Humidity Sensor (OARH)

The outdoor air relative humidity sensor accessory monitors moisture levels in the atmosphere. This information is used to determine whether the economizer (if installed) will open during the free cooling mode.

The RH transmitter should be mounted so that the unit is under an eave and protected from the elements and direct sunlight.

Install the sensor as follows:

1. Using two #8 x 3/4" self-tapping TEK mounting screws included with the sensor, secure the sensor.
2. Remove the cover and install conduit connectors, watertight fittings, and or 1/2" vent plug.
   Note that the inner ring will knockout first and then the outer ring should be tapped in (1) or (2) locations with a screwdriver before it can be peeled out. The cover will be connected to the housing by the sensor leads.
3. Use two-conductor, 16-22 AWG twisted pair or shielded cable to connect the sensor to the controller. All wiring should be done in accordance with all Local and National Electrical Code guidelines.

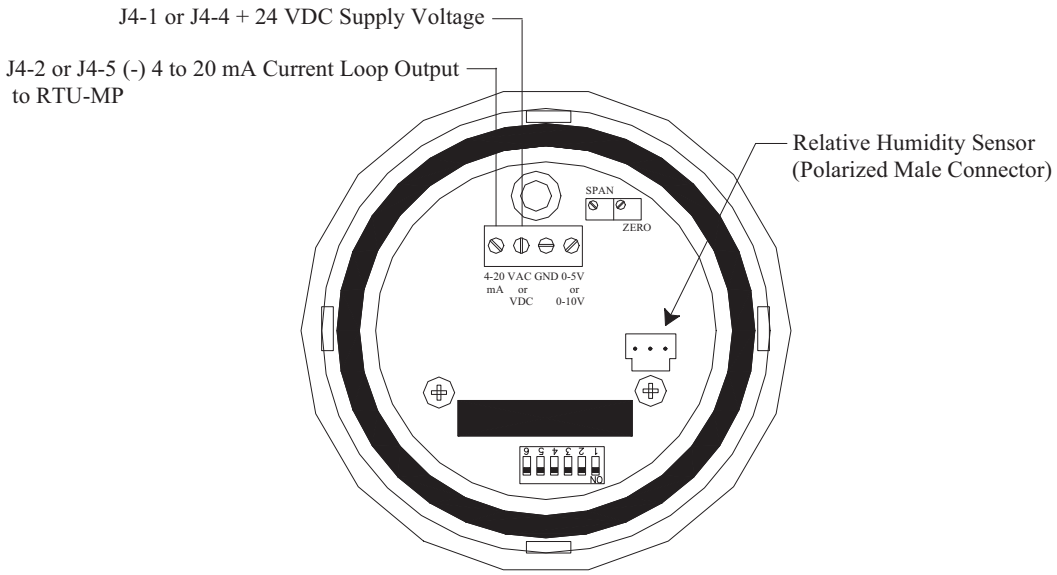
NOTE: When using a shielded cable, be sure to connect only (1) end of the shield to ground at the controller. Connecting both ends of the Shield to Ground may cause a Ground Loop.

4. Place the cover onto the unit and gently turn until it is tight. *Be careful not to apply too much pressure when tightening.*

Wiring the Outdoor Air Relative Humidity Sensor

To wire the sensor, perform the following (See Fig. 15.):

1. Identify which cable is for the sensor wiring.
2. Strip back the jacket from the cable for at least 3 inches. Strip 1/4-in. of insulation from each conductor. Cut the shield and drain wire (if located) from the sensor end of the cable.



C07210

Fig. 15 - Wiring Outdoor Air Relative Humidity Sensor

3. Connect the sensor cable as follows:
   a. Connect one wire from the cable for the 24DC source to J4-4 on Input 1 or J4-1 if Input 2 will be used. Connect the other end of the wire to VAC terminal on the sensor.
   b. Connect the other wire from the cable for the 4-20mA signal to J4-5 on Input 1 or J4-2 if Input 2 will be used. Connect the other end of the wire to 4-20mA terminal on the sensor.
4. In the Control box, install a no. 10 ring type crimp lug on the shield drain wire. Install this lug under the mounting screw of the RTU-MP controller.

Connect Discrete Inputs

Field installing a humidistat, smoke detector, filter and/or fan status switch, remote occupancy switch, and enthalpy to the RTU-MP controller is explained below. For other details, refer to Fig. 1 and 7 for wiring and the configuration section for configuration.

Humidistat

The humidistat input is only provided on J5-7 as input 9. (See Fig. 1.) The Humidistat Switch configuration, ***MENU→Config→Inputs→input 9***, identifies it and the normally open or normally closed status of this input at high humidity.

J5-8 = 24 VAC source for dry contact
J5-7 = Signal input

Fire Shutdown

The fire shutdown input is provided for unit shutdown in response to a fire alarm or smoke detector. The Fire Shutdown Switch configuration, ***MENU→Config→Inputs→input 5***, identifies the normally closed status of this input when there is no fire alarm. For 48/50 units without factory installed smoke detectors, a jumper is installed between TB4-5 and TB4-7. (See Fig. 7.)

When field installing smoke detectors:

TB4-5 = 24 VAC source for dry contact
TB4-6 = Signal input

NOTE: The jumper must then be reinstalled across TB4-6 and TB4-7.

Filter Status

The filter status accessory is a field-installed accessory. This accessory detects plugged filters. When installing this accessory, the unit must be configured for filter status by setting ***MENU→Config→Inputs→input 3, 5, 8, or 9*** to Filter Status and normally open (N/O) or normally closed (N/C). Input 8 or 9 is recommended for easy of installation. Refer to Fig. 1 and 7 for wire terminations at J5.

Fan Status

The fan status accessory is a field-installed accessory. This accessory detects when the indoor fan is blowing air. When installing this accessory, the unit must be configured for fan status by setting ***MENU→Config→Inputs→input 3, 5, 8, or 9*** to Fan Status and normally open (N/O) or normally closed (N/C). Input 8 or 9 is recommended for easy of installation. Refer to Fig. 1 and 7 for wire terminations at J5.

Remote Occupancy

The remote occupancy accessory is a field-installed accessory. This accessory overrides the unoccupied mode and puts the unit in occupied mode. When installing this accessory, the unit must be configured for remote occupancy by setting ***MENU→Config→Inputs→input 3, 5, 8, or 9*** to Remote Occupancy and normally open (N/O) or normally closed (N/C). Also set ***MENU→Schedules→occupancy source*** to DI on/off. Input 8 or 9 is recommended for easy of installation. Refer to Fig. 1 and 7 for wire terminations at J5.

Enthalpy Switch/Receiver

The accessory enthalpy switch/receiver (33CSENTHSW) senses temperature and humidity of the air surrounding the device and calculates the enthalpy when used without an enthalpy sensor. The relay is energized when enthalpy is high and de-energized when enthalpy is low (based on ASHRAE 90.1 criteria). If an accessory enthalpy sensor (33CSENTSEN) is attached to the return air sensor input, then differential enthalpy is calculated. The relay is energized when the enthalpy detected by the return air enthalpy sensor is less than the enthalpy at the enthalpy switch/receiver. The relay is de-energized when the enthalpy detected by the return air enthalpy sensor is greater than the enthalpy at the enthalpy switch/receiver (differential enthalpy control). (See Fig. 16 and 17.)

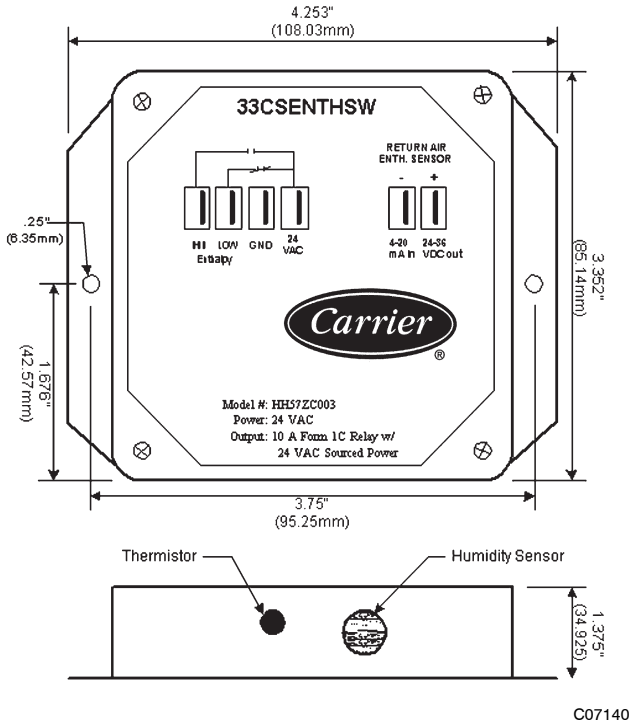


Fig. 16 – Enthalpy Switch/Receiver Dimensions (33CSENTHSW)

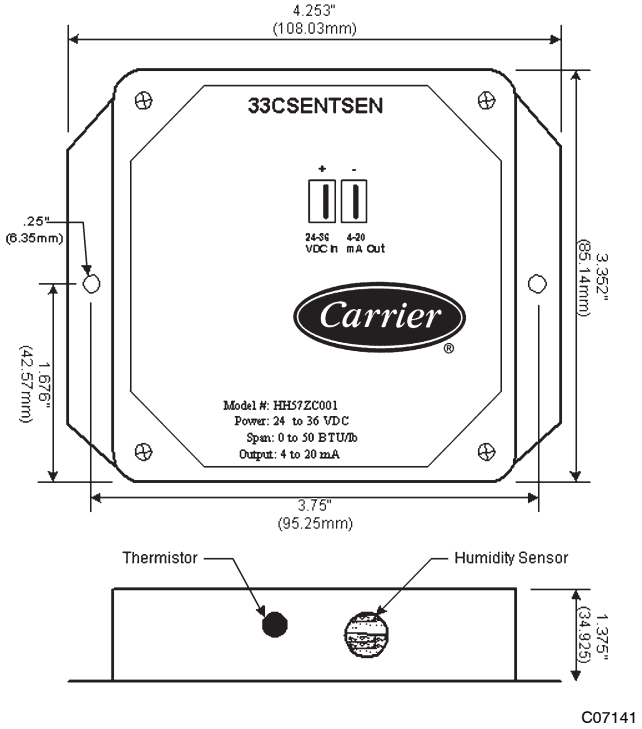


Fig. 17 – Enthalpy Sensor Dimensions (33CSENTSEN)

Outdoor Enthalpy Control

Outdoor enthalpy control requires only an enthalpy switch/receiver (33CSENTHSW). The enthalpy switch/receiver is mounted in the outdoor air inlet and calculates outdoor air enthalpy. The enthalpy switch/receiver energizes the relay output when the outdoor enthalpy is above 28 BTU/lb **OR** dry bulb temperature is above 75°F and is de-energized when the outdoor enthalpy is below 27 BTU/lb **AND** dry bulb temperature is below 74.5°F. The relay output is wired to the unit economizer which will open or close depending on the output of the switch.

NOTE: The enthalpy calculation is done using an average altitude of 1000 ft above sea level.

Mounting

Mount the enthalpy switch/receiver in a location where the outdoor air can be sampled (such as the outdoor air intake). The enthalpy switch/receiver is not a NEMA 4 (National Electrical Manufacturers Association) enclosure and should be mounted in a location that is not exposed to outdoor elements such as rain or snow. Use two field-supplied no. 8 x $^3/_4$-in. TEK screws. Insert the screws through the holes in the sides of the enthalpy switch/receiver.

Wiring

Carrier recommends the use of 18 to 22 AWG (American Wire Gauge) twisted pair or shielded cable for all wiring. All connections must be made with $^1/_4$-in. female spade connectors.

A 24-vac source is required to power the enthalpy switch/receiver; as shown in Fig. 18, the RTU-MP board provides 24 vac on one of the two grey wires. Connect the GND and 24-vac terminals on the enthalpy switch/receiver to the unit ground-brown wires on the transformer. On some applications, the power from the economizer harness can be used to power the enthalpy switch/receiver. To power the enthalpy switch/receiver from the economizer harness, connect power of the enthalpy switch/receiver to the red and brown wires (1 and 4) on the economizer harness.

For connection to rooftop units with RTU-MP control, connect the LOW Enthalpy terminal on the enthalpy switch/receiver to the grey wire connected to J2-6.

To determine that the correct grey wire was used, measure the voltage on the wire with power applied to the unit. If 24-vac is not sensed, the correct wire is connected. The grey wire with 24-vac measured with power on to the unit is used for a dry contact type switch.

Differential Enthalpy Control (Fig. 18)

Differential enthalpy control requires both an enthalpy switch/receiver (33CSENTHSW) and an enthalpy sensor (33CSENTSEN). The enthalpy switch/receiver is mounted in the outdoor air inlet and calculates outdoor air enthalpy. The enthalpy sensor is mounted in the return airstream and calculates the enthalpy of the indoor air.

The enthalpy switch/receiver energizes the HI Enthalpy relay output when the outdoor enthalpy is greater than the indoor enthalpy. The LOW Enthalpy terminal is energized when the outdoor enthalpy is lower than the indoor enthalpy. The relay output is wired to the unit economizer which will open or close depending on the output of the switch.

NOTE: The enthalpy calculation is done using an average altitude of 1000 ft above sea level.

Mounting

Mount the enthalpy switch/receiver in a location where the outdoor air can be sampled (such as the outdoor air intake). The enthalpy switch/receiver is not a NEMA 4 enclosure and should be mounted in a location that is not exposed to outdoor elements such as rain, snow, or direct sunlight. Use two field-supplied no. 8 x $^3/_4$-in. TEK screws. Insert the screws through the holes in the sides of the enthalpy switch/receiver.

Mount the enthalpy sensor in a location where the indoor air can be sampled (such as the return air duct). The enthalpy sensor is not a NEMA 4 enclosure and should be mounted in a location that is not exposed to outdoor elements such as rain or snow. Use two field-supplied no. 8 x $^3/_4$-in. TEK screws. Insert the screws through the holes in the sides of the enthalpy sensor.

Wiring

Carrier recommends the use of 18 to 22 AWG twisted pair or shielded cable for all wiring. All connections must be made with $^1/_4$-in. female spade connectors.

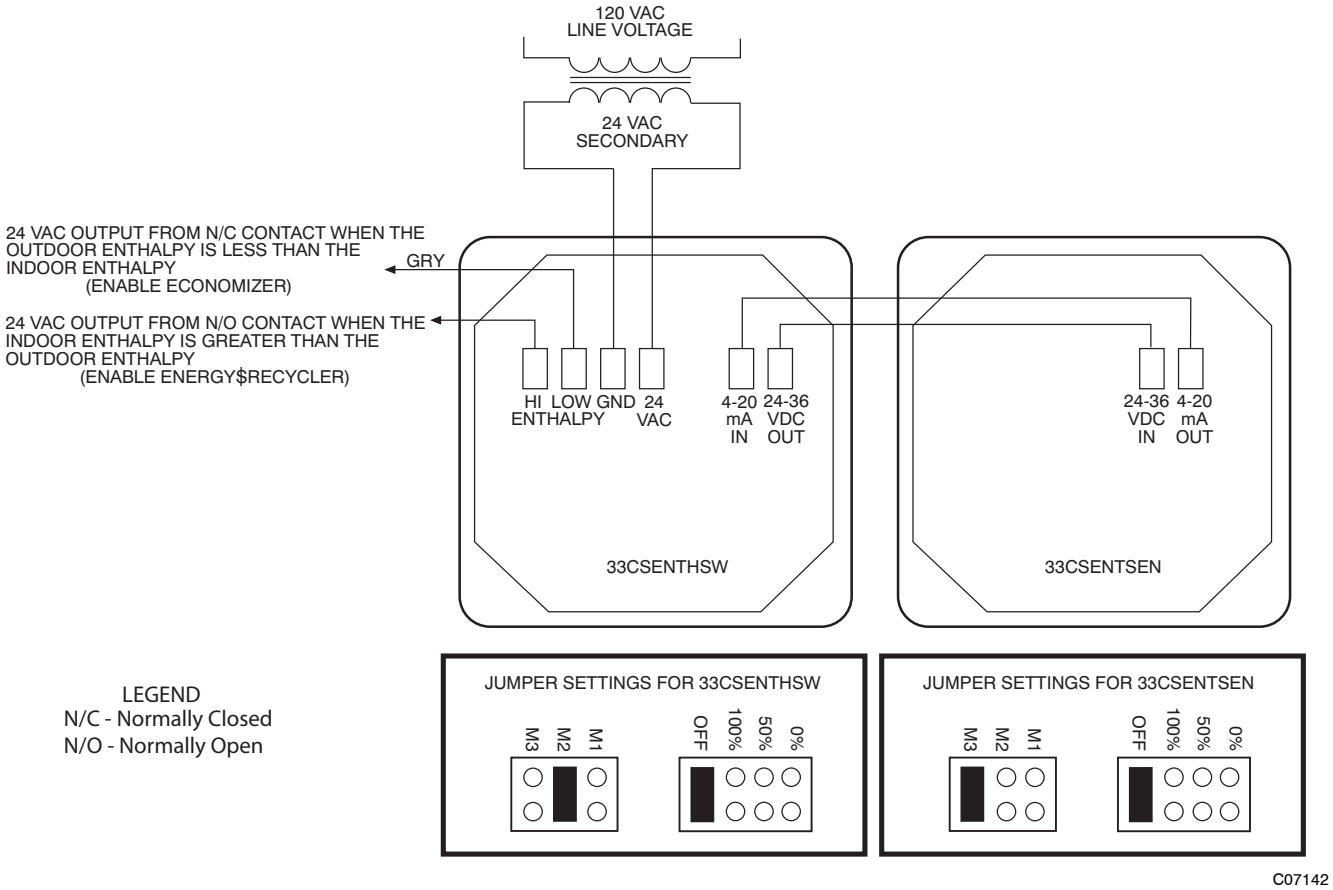


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Fig. 18 - Differential Enthalpy Control Wiring

The RTU-MP board provides 24-vac to power the enthalpy switch/receiver. Connect the GND and 24-vac terminals on the enthalpy switch/receiver to the terminals on the transformer. On some applications, the power from the economizer harness can be used to power the enthalpy switch/receiver. To power the enthalpy switch/receiver from the economizer harness, connect power of the enthalpy switch/receiver to the red and brown wires (1 and 4) on the economizer harness.

Connect the LOW Enthalpy terminal on the enthalpy switch/receiver to the grey wire connected to J2-6.

Connect the 4-20 mA In terminal on the enthalpy switch/receiver to the 4-20 mA Out terminal on the return air enthalpy sensor. Connect the 24-36 VDC Out terminal on the enthalpy switch/receiver to the 24-36 VDC In terminal on the return air enthalpy sensor. (See Fig. 18.)

Enthalpy Switch/Receiver Jumper Settings

There are two jumpers. One jumper determines the mode of the enthalpy switch/receiver. The other jumper is not used. To access the jumpers, remove the 4 screws holding the cover on the enthalpy switch/receiver and then remove the cover. The factory settings for the jumpers are M1 and OFF.

The mode jumper should be set to M2 for differential enthalpy control. The factory test jumper should remain on OFF or the enthalpy switch/receiver will not calculate enthalpy.

Enthalpy Sensor Jumper Settings

There are two jumpers. One jumper determines the mode of the enthalpy sensor. The other jumper is not used. To access the jumpers, remove the 4 screws holding the cover on the enthalpy sensor and then remove the cover. The factory settings for the jumpers are M3 and OFF.

The mode jumper should be set to M3 for 4 to 20 mA output. The factory test jumper should remain on OFF or the enthalpy sensor will not calculate enthalpy.

Communication Wiring-Protocols

General

Protocols are the communication languages spoken by control devices. The main purpose of a protocol is to communicate information in the most efficient method possible. Different protocols exist to provide different kinds of information for different applications. In the BAS application, many different protocols are used, depending on manufacturer. Protocols do not change the function of a controller; just make the front end user different.

The RTU-MP can be set to communicate on four different protocols: BACnet, Modbus, N2, and LonWorks. Switch 3 (SW3) on the board is used to set protocol and baud rate. Switches 1 and 2 (SW1 and SW2) are used to set the board's network address. See Fig 19 for the switch setting per protocol. The 3rd party connection to the RTU-MP is through plug J19. Refer to the *RTU-MP 3rd Party Integration Guide* for more detailed information on protocols, 3rd party wiring, and networking.

NOTE: Power must be cycled after changing the SW1-3 switch settings.

BACnet MS/TP

BACnet Master Slave/Token Passing (MS/TP) is used for communicating BACnet over a sub-network of BACnet-only controllers. This is the default Carrier communications protocol. Each RTU-MP module acts as an MS/TP Master. The speed of an MS/TP network can range from 9600 to 76.8K baud. Physical Addresses can be set from 01 to 99.

SW3 Protocol Selection

PROTOCOL	DS8	DS7	DS6	DS5	DS4	DS3	DS2	DS1
BACnet MS/TP (Master)	Unused	OFF	OFF	OFF	ON	OFF	Select Baud	Select Baud
Modbus (Slave)	Unused	OFF	OFF	ON	ON	OFF	Select Baud	Select Baud
N2 (Slave)	Unused	OFF	OFF	OFF	ON	ON	OFF	OFF
LonWorks	Unused	ON	ON	OFF	ON	OFF	OFF	OFF

NOTE:
DS = Dip Switch
BACnet MS/TP SW3 example shown

Baud Rate Selections

Baud Rate	DS2	DS1
9600	OFF	OFF
19,200	ON	OFF
38,400	OFF	ON
76,800	ON	ON

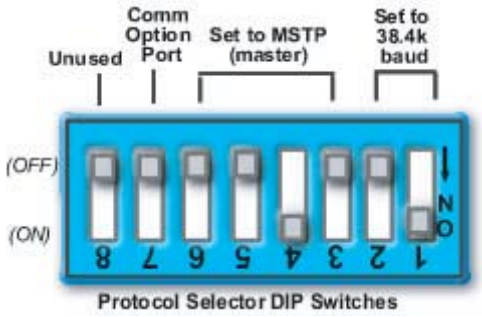

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Fig. 19 - RTU-MP SW3 Dip Switch Settings

Modbus

The RTU-MP module can speak the Modicon Modbus RTU Protocol as described in the Modicon Modbus Protocol Reference Guide, PI--MBUS--300 Rev. J. The speed of a Modbus network can range from 9600 to 76.8K baud. Physical Addresses can be set from 01 to 99.

Johnson N2

N2 is not a standard protocol, but one that was created by Johnson Controls, Inc. that has been made open and available to the public. The speed of N2 network is limited to only 9600 baud. Physical Addresses can be set from 01 to 99.

LonWorks

LonWorks is an open protocol that requires the use of Echelon's Neuron microprocessor to encode and decode the LonWorks packets. In order to reduce the cost of adding that hardware on every module, a separate LonWorks Option Card (LON-OC) was designed to connect to the RTU-MP.

This accessory card is needed for LonWorks and has to be ordered and connected using the ribbon cable to plug J15. The RTU-MP's baud rate must be set to 38.4k to communicate with the LON-OC. The address switches (SW1 & SW2) are not used with LonWorks.

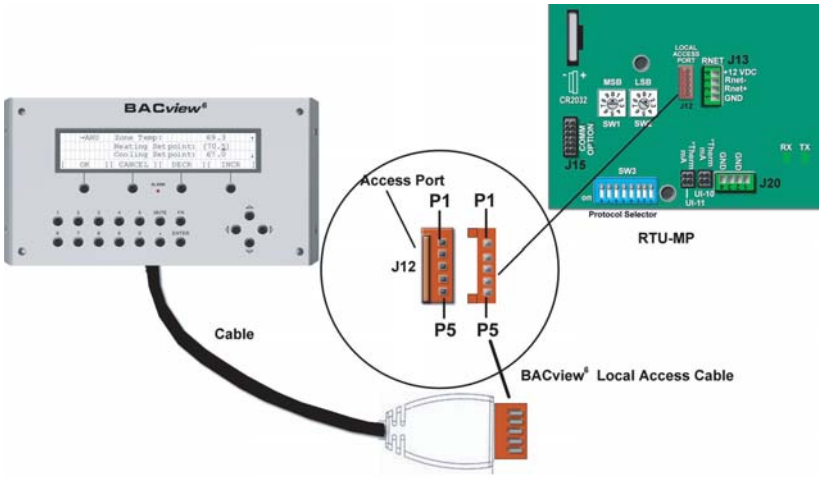
Local Access

BACview[6] Handheld

The BACview[6] is a keypad/display interface used to connect to the RTU-MP to access the control information, read sensor values, and test the RTU (See Fig. 20). This is an accessory interface that does not come with the MP controller and can only be used at the unit. You connect the BACview[6] to the RTU-MP's J12 local access port. There are 2 password protected levels in the display (User and Admin). The user password is defaulted to 0000 but can be changed. The Admin password is 1111 and cannot be changed. There is a 10 minute auto logout if a screen is left idle. See Appendix A for navigation and screen content.

Virtual BACview

Virtual BACview is a freeware computer program that functions as the BACview[6] Handheld. The USB Link interface (USB-L) is required to connect a computer to the RTU-MP board. The link cable connects a USB port to the J12 local access port. This program functions and operates identical to the handheld.



C07170

Fig. 20 - BACview[6] Handheld Connections

START-UP

Refer to the base unit installation instructions for start-up procedure and checklist. Field Service Test, explained below, will assist in proper start-up. Configuratin of unit parameters, scheduling options, and operation are also discussed in this section.

Field Service Test

The Field Service Test function can be used to verify proper operation of compressors, heating stages, indoor fan, power exhaust fans, economizer, and dehumidification. Use of Field Service Test is recommended at initial system start up and during troubleshooting. See Appendix A for Field Service Test Mode table.

Field Service Test mode has the following changes from normal operation:

- Outdoor air temperature limits for cooling circuits, economizer, and heating are ignored.
- Normal compressor time guards and other staging delays are ignored.
- The status of Alarms (except Fire and Safety chain) is ignored but all alerts and alarms are still broadcasted on the network.

Field Service Test can be turned ON/OFF at the unit display or from the network. Once turned ON, other entries may be made with the display or through the network. To turn Field Service Test on, change the value of Test Mode to ON, to turn Field Service Test off, change the value of Test Mode to OFF.

NOTE: Service Test mode is password protected when accessing from the display. Depending on the unit model, factory-installed options, and field-installed accessories, some of the Field Service Test functions may not apply.

The independent outputs (IndpOutputs) submenu is used to change output status for the supply fan, economizer, and Power Exhaust. These independent outputs can operate simultaneously with other Field Service Test modes. All outputs return to normal operation when Field Service Test is turned off.

The Cooling submenu is used to change output status for the individual compressors and the dehumidification relay. Compressor starts are not staggered. The fans and heating service test outputs are reset to OFF for the cooling service test. Indoor fans and outdoor fans are controlled normally to maintain proper unit operation. All normal cooling alarms and alerts are functional.

NOTE: Circuit A is always operated with Circuit B due to outdoor fan control on Circuit A. Always test Circuit A first, and leave it on to test other Circuits.

For units with the factory Humidi-MiZer™ option, the dehumidification relay is used to change the output status to operate the circuits in different Humidi-MiZer modes. With only the dehumidification relay on, all circuits will run in dehumidification mode. With the dehumidification relay on and the cooling test (compressor test relays) on, individual circuits will run in cooling dehumidification mode. The fans and heating service test outputs are reset to OFF for the Humdi-MiZer service test. Indoor and outdoor fans are controlled normally to maintain proper unit operation. All normal cooling/dehum alarms and alerts are functional.

The Heating submenu is used to change output status for the individual heat stages, gas or electric. The fans and cooling service test outputs are reset to OFF for the heating service test. All normal heating alarms and alerts are functional.

NOTE: Service Test Mode does not timeout. Be sure to turn off test mode or cycle power to the RTU to return to normal operation.

Configuration

The RTU-MP controller configuration points affect the unit operation and/or control. Review and understand the meaning and purpose of each configuration point before changing it from the factory default value. The submenus containing configuration points are as follows: Unit, Cooling, Heating, Inputs, Economizer, IAQ, Clock-Set, and User Password (USERPW). Each configuration point is described below under its according submenu. See the Appendix for display tables.

Unit

Start Delay

This refers to the time delay the unit will wait after power up before it pursues any specific operation.

Factory Default = 5 sec
Range = 0-600 sec

Filter Service Hours

This refers to the timer set for the Dirty Filter Alarm. After the number of runtime hours set on this point is exceeded the corresponding alarm will be generated, and must be manually cleared on the alarm reset screen after the maintenance has been completed. The timer will then begin counting its runtime again for the next maintenance interval.

Factory Default = 600 hr

NOTE: Setting this configuration timer to 0, disables the alarm.

Supply Fan Service Hours

This refers to the timer set for the Supply Fan Runtime Alarm. After the number of runtime hours set on this point is exceeded the corresponding alarm will be generated, and must be manually cleared on the alarm reset screen after the maintenance has been completed. The timer will then begin counting its runtime again for the next maintenance interval.

Factory Default = 0 hr

NOTE: Setting this configuration timer to 0, disables the alarm.

Compressor1 Service Hours

This refers to the timer set for the Compressor 1 Runtime Alarm. After the number of runtime hours set on this point is exceeded the corresponding alarm will be generated, and must be manually cleared on the alarm reset screen after the maintenance has been completed. The timer will then begin counting its runtime again for the next maintenance interval.

Factory Default = 0 hr

NOTE: Setting this configuration timer to 0, disables the alarm.

Compressor2 Service Hours

This refers to the timer set for the Compressor 2 Runtime Alarm. After the number of hours set on this point is exceeded the corresponding alarm will be generated, and must be manually cleared on the alarm rest screen after the maintenance has been completed. The timer will then begin counting its runtime again for the next maintenance interval.

Factory Default = 0 hr

NOTE: Setting this configuration timer to 0, disables the alarm.

Cooling

Number of Compressor Stages

This refers to the number of mechanical cooling stages available on a specific unit. Set this point to "One Stage" if there is one compressor in the specific unit, set to "Two Stage" if there are two compressors in the unit, and set to "None" if economizer cooling ONLY is desired.

Factory Default = One Stage for 1 compressor units
Two Stage for 2 compressor units

Cooling/Econ SAT Low Setpt

The supply air temperature must remain above this value to allow cooling with the economizer and/or compressors. There is 5°F plus and minus deadband to this point. If the SAT falls below this value during cooling, all compressors will be staged off. The economizer will start to ramp down to minimum position when the SAT = this configuration +5°F.

Factory Default = 50°F
Range = 45-75°F

Cooling Lockout Temp

This defines the minimum outdoor air temperature that cooling mode can be enabled and run. If the OAT falls below this threshold during cooling, then compressor cooling will not be allowed.

Factory Default = 45°F
Range = 0-65°F

Heating

Heat Pump RTU

This configuration is only for rooftop heat pumps. It does NOT control a reversing valve directly. Its purpose is to add additional delay between heating stages to properly control a rooftop heat pump heating operation. See the Heating Sequence of Operation for more details.

Factory Default = NO for non-heat pump units
YES for heat pump units

Heating SAT High Setpt

The supply air temperature must remain below this value to allow heating. There is 5°F plus and minus deadband to this point. If the SAT rises above this value during heating the heat stages will begin to decrease until the SAT has dropped below this value.

Factory Default = 120°F
Range = 95-150°F

Heating Lockout Temp

This defines the maximum outdoor air temperature that heating mode can be enabled and run. If the OAT rises above this threshold during heating, then heating will not be allowed.

Factory Default = 65°F
Range = 49-95°F

Inputs

NOTE: For installation of inputs and field installed accessories, refer to the appropriate sections.

Input 3

This input is a discrete input and can be configured to be one of five different inputs: No Function, Compressor Safety, Fan Status, Filter Status, or Remote Occupancy. This input can also be configured to be either Normally Open (N/O) or Normally Closed (N/C). Input 3 is factory wired to pin J1-2. Field accessories get wired to its parallel pin J5-5. Do not connect inputs to both locations, one function per input.

Factory Default = Compressor Safety and N/O

NOTE: Compressor Safety input comes from the CLO board. J1-2 is always factory wired to TB1-8 (X) terminal on the unit. If the unit has a CLO board, do not configure input 3 for anything but Compressor Safety.

Input 5

This input is a discrete input and can be configured to be one of five different inputs: No Function, Fire Shutdown, Fan Status, Filter Status, or Remote Occupancy. This input can also be configured to be either Normally Open (N/O) or Normally Closed (N/C). Input 5 is factory wired to pin J1-10. Field accessories get wired to its parallel pin J5-3. Do not connect inputs to both locations, one function per input.

Factory Default = Fire Shutdown and N/C

NOTE: Fire Shutdown input comes from TB4-7. J1-10 is always factory wired to TB4-7. Only change input 5s function if absolutely needed.

Input 8

This input is a discrete input and can be configured to be one of five different inputs: No Function, Enthalpy Switch, Fan Status, Filter Status, or Remote Occupancy. This input can also be configured to be either Normally Open (N/O) or Normally Closed (N/C). Input 8 is factory wired to pin J2-6. Field accessories get wired to its parallel pin J5-1. Do not connect inputs to both locations, one function per input.

Factory Default = No Function and N/O

Input 9

This input is a discrete input and can be configured to be one of five different inputs: No Function, Humidistat, Fan Status, Filter Status, or Remote Occupancy. This input can also be configured to be either Normally Open (N/O) or Normally Closed (N/C). Input 9 is factory and field wired to pin J5-7. Do not connect inputs to both locations, one function per input.

Factory Default = Humidistat and N/O

Space Sensor Type

This tells the controller what type of space sensor is installed to run the unit. The three types that can be used are the T55 space sensor, the T56 space sensor, or the RS space sensor.

Factory Default = T55 Type

Input 1 Function

This input is an analog input and can be configured to be one of five different inputs: No Sensor, IAQ Sensor, OAQ Sensor, Space RH Sensor, or Outdoor RH Sensor. Input 1 is wired to pin J4-5.

Factory Default = No Sensor

Input 2 Function

This input is an analog input and can be configured to be one of five different inputs: No Sensor, IAQ Sensor, OAQ Sensor, Space RH Sensor, or Outdoor RH Sensor. Input 2 is wired to pin J4-2.

Factory Default = No Sensor

Setpoint Slider Range

This sets the slider range of the space sensor (with this built in function). The slider is used to offset the current control setpoint.

Factory Default = 5 Δ°F
Range = 0-15 Δ°F

T55/56 Override Duration

This sets the occupancy override duration when the override button is pushed on the space sensor.

Factory Default = 1 hr
Range = 0-24 hr

IAQ Low Reference @ 4mA

This is used when an IAQ sensor is installed on Input 1 or 2. This value is displayed and used when 4mA is seen at the input.

Factory Default = 0 PPM
Range = 0-400 PPM

IAQ High Reference @ 20mA

This is used when an IAQ sensor is installed on Input 1 or 2. This value is displayed and used when 20mA is seen at the input.

Factory Default = 2000 PPM
Range = 0-5000 PPM

NOTE: IAQ low Reference @ 4mA and IAQ High Reference @ 20mA are used to set the linear curve of mA vs. PPM.

OAQ Low Reference @ 4mA

This is used when an OAQ sensor is installed on Input 1 or 2. This value is displayed and used when 4mA is seen at the input.

Factory Default = 0 PPM
Range = 0-400 PPM

OAQ High Reference @ 20mA

This is used when an OAQ sensor is installed on Input 1 or 2. This value is displayed and used when 20mA is seen at the input.

Factory Default = 2000 PPM
Range = 0-5000 PPM

NOTE: OAQ low Reference @ 4mA and OAQ High Reference @ 20mA are used to set the linear curve of mA vs. PPM.

Economizer

Economizer Exists

This point tells the controller if there is an economizer installed on the unit.

Factory Default = NO if no economizer
YES if there is an economizer installed

Economizer Minimum Position

This defines the lowest economizer position when the indoor fan is running and the building is occupied.

Factory Default = 20%
Range = 0-100 %

Economizer High OAT Lockout

If the outdoor air temperature rises above this value, economizer cooling will be disabled and dampers will return and stay at minimum position.

Factory Default = 75°F
Range = 55-80°F

Power Exhaust Setpt

When the economizer damper position opens above this point the power exhaust operation will begin. When the damper position falls 10% below the setpoint, the power exhaust will shutdown.

Factory Default = 50%
Range = 20-90 %

NOTE: This point is only used when Continuous Occ Exhaust = NO

Continuous Occ Exhaust

This point tells the controller when to run the power exhaust if equipped on the unit. If set to YES, the power exhaust will be on all the time when in occupied mode and will be off when in unoccupied mode. If set to NO the power exhaust will be controlled by the Power Exhaust Setpoint.

Factory Default = NO

IAQ

Max Differential CO_2 Setpt

If the difference between indoor an outdoor air quality becomes greater then this value the damper position will stay at the IAQ Greatest Min Dmpr Pos. configuration point.

Factory Default = 650 PPM
Range = 300-950 PPM

IAQ Greatest Min Dmpr Pos.

This is the greatest minimum position the economizer will open to while trying to control the indoor air quality, CO_2 differential.

Factory Default = 50% open
Range = 10-60% open

Clockset

This submenu screen allows you to set the date and time manually. The Daylight Savings Time (DST) can also be changed here. The date and time is automatically set whenever software is downloaded. The clock is a 24 hour clock and not am/pm. The time should be verified (and maybe changed) according to unit location and time zone.

Factory Default = Eastern Standard Time

USERPW

This submenu screen allows you to change the user password to a four number password of choice. The User password change screen is only accessible with the Administrator Password (1111). The ADMIN password will always override the user password.

Factory Default = 0000
Range = 0000-9999

Sequence of Operation

The RTU-MP will control the compressor, economizer and heating outputs based on its own space temperature input and setpoints. An optional CO_2 IAQ sensor mounted in the space can influence the economizer minimum position. The RTU-MP has its own hardware clock that is set automatically when the software is installed on the board. The RTU-MP's default is to control to occupied setpoints all the time, until a type of occupancy control is set. Occupancy types are described in the scheduling section. The following sections describe the operation for the functions of the RTU-MP. All point objects that are referred to in this sequence will be in reference to the objects as viewed in BACview[6] Handheld.

Scheduling

Scheduling is used to start heating or cooling (become occupied) based upon a day of week and a time period and control to the occupied heating or cooling setpoints. Scheduling functions are located under occupancy determination and the schedule menu accessed by the Menu softkey (see Appendix - for menu structure). Your local time and date should be set for these functions to operate properly. Five scheduling functions are available by changing the Occupancy Source to one of the following selections:

Always Occupied (Default Occupancy)

The unit will run continuously. RTU-MP ships from the factory with this setting.

Local Schedule

The unit will operate according to the schedule configured and stored in the unit. The local schedule is made up of three hierarchy levels that consist of two Override schedules, twelve Holiday and four Daily schedules, and are only accessible by the BACview screen (handheld or virtual).

The Daily schedule is the lowest schedule in the hierarchy and is overridden by both the Holiday and Override schedule. It consists of a start time, a stop time (both in 24 hour mode) and the seven days of the week, starting with Monday and ending in Sunday. To select a daily schedule scroll to the Schedules menu off of the Menu selection. Enter the User password and change the Occupancy Source to Local Schedule. Scroll down and over to the Daily menu and press enter. Choose one of the four Daily schedules by pressing the Next softkey and change the Use? point from NO to YES by selecting the point and pressing the INCR or DECR softkey. Press the OK softkey and scroll to the start and stop times. Edit these times following the same steps as the Use? point. Finally scroll down to the Days: section and highlight the days required for the Daily schedule by INCR or DECR softkeys and press OK softkey.

The Holiday schedule is created to override the Daily schedule and identify a specific day and month of the year to start and stop the unit and change control to the unoccupied heating and cooling setpoints. Follow the same steps to turn on one of the twelve Holiday schedules and start and stop times. Next, select one out of the twelve months and one out of the thirty-one days of that month. The RTU-MP will now ignore the Daily schedule for the specific day and time you selected and follow the Holiday Schedule for this period.

The Override schedules primary purpose is to provide a temporary change in the occupied heating and cooling setpoints and force the unit to control to the unoccupied heating and cooling setpoints. This would occur on a set day in a particular month and last during the start and stop time configured. The Override schedule is enabled by following the same steps to create the Holiday schedule.

NOTE: Push button override is only available when running a local or BACnet Schedule.

BACnet Schedule

For use with a Building Automation System that supports native BACnet scheduling is scheduling the unit. With the Occupancy Source set to BACnet schedule the BAS will control the unit through network communication and it's own scheduling function.

BAS On/Off

The Building Automation System is scheduling the unit via an On/Off command to the BAS ON/OFF software point. The Building Automation System can be speaking BACnet, Modbus, or N2 and is writing to the BAS On/Off point in the open protocol point map.

NOTE: If the BAS supports NATIVE BACnet scheduling, then set the Occupancy Source to BACnet schedule. If the BAS is BACnet but does NOT support NATIVE BACnet scheduling, then set the Occupancy Source to BAS On/Off.

DI On/Off

A hard-wired input on the RTU-MP will command the unit to start/stop. Inputs 3, 5, 8, and 9 on plug J5 can be hard-wired to command the unit to start/stop.

NOTE: Scheduling can either be controlled via the unit or the BAS, but NOT both.

Indoor Fan

The indoor fan will be turned on whenever any one of the following conditions is true:

- It is in the occupied mode. This will be determined by its own internal occupancy schedule.
- Whenever there is a demand for cooling or heating in the unoccupied mode.
- Whenever the remote occupancy switch is closed during DI On/Off schedule type or if occupancy is forced occupied by the BAS during BAS On/Off schedule type.

When transitioning from unoccupied to occupied, there will be a configured time delay of 5 to 600 seconds before starting the fan. The fan will continue to run as long as compressors, heating stages, or the dehumidification relays are on when transitioning from occupied to unoccupied with the exception of Shutdown mode. If Fire Shutdown, safety chain, SAT alarm or SPT alarm are active; the fan will be shutdown immediately regardless of the occupancy state or demand.

The RTU-MP has an optional Supply Fan Status input to provide proof of airflow. If this is enabled, the point will look for a contact closure whenever the Supply Fan Relay is on. If it is not enabled then it will always be the same state as the Supply Fan Relay. The cooling, economizer, heating, dehumidification, CO_2 and power exhaust routines will use this input point for fan status.

Cooling

The compressor outputs are controlled by the Cooling Control PID Loop and Cooling Stages Capacity algorithm. They will be used to calculate the desired number of stages needed to satisfy the space by comparing the Space Temperature (SPT) to the Occupied Cool Setpoint plus the T56 slider offset when occupied and the Unoccupied Cool Setpoint (UCSP) plus the T56 slider offset, if unoccupied. The economizer, if available, will be used for cooling in addition to the compressors. The following conditions must be true in order for this algorithm to run:

- Indoor Fan has been ON for at least 30 seconds.
- Heat mode is not active and the time guard between modes equals zero.
- If occupied and the SPT > (occupied cool setpoint plus the T56 slider offset).
- Space Temperature reading is available.
- If it is unoccupied and the SPT > (unoccupied cool setpoint plus the T56 slider offset). The indoor fan will be turned on by the staging algorithm.
- If economizer is available and active and economizer open > 85% and SAT > (SAT low limit + 5°F) and SPT > effective set point + 0.5°F.

OR
Economizer is available, but not active
OR
Economizer is not available

- OAT > DX Lockout temperature.

If all of the above conditions are met, the compressors will be energized as required, otherwise they will be de-energized.

There is a fixed 3-minute minimum on time and a 5-minute off time for each compressor output and a 3-minute minimum time delay between staging up or down.

Any time the compressors are running the RTU-MP will stage down the compressors if the SAT becomes less than the cooling low supply air setpoint.

After a compressor is staged off, it may be started again after a normal time-guard period and the supply air temperature has increased above the low supply air setpoint.

Economizer

The Economizer dampers are used to provide free cooling and Indoor Air Quality, if optional CO_2 sensor is installed, when the outside conditions are suitable.

The following conditions must be true for economizer operation:

- Indoor Fan has been on for at least 30 seconds.
- Enthalpy is Low if the Enthalpy input is enabled.
- SAT reading is available.
- OAT reading is available.
- SPT reading is available.
- OAT <= High OAT economizer lockout configuration (default = 75).
- OAT <= SPT

If any of the mentioned conditions are not true, the economizer will be set to its configured minimum position. The minimum damper position can be overridden by the IAQ routine described later in this section.

If the above conditions are true, the Economizer Control Master Loop will calculate a damper position value based on the following calculation:
Damper Position = minimum position + PID (SPT - econ setpoint). Econ setpoint is half way between the effective cool and heat setpoints. If the SAT drops below the cooling low supply air setpoint (+ 5°F), the economizer will ramp down to minimum position.

Power Exhaust

If RTU-MP is also controlling an exhaust fan, it can be enabled based on damper position or by occupancy. If configured for continuous occupied operation, it will be energized whenever the controller is in the occupied mode and disabled when in the unoccupied mode. If configured for damper position control, it will be energized whenever the economizer exceeds the power exhaust setpoint and disabled when the economizer drops below the setpoint by a fixed hysteresis of 10%.

Heating

The compressor outputs are controlled by the Heating Control PID Loop and Heating Stages Capacity algorithm. They will be used to calculate the desired number of stages needed to satisfy the space by comparing the SPT to the Occupied Heat Setpoint the T56 slider offset when occupied and the Unoccupied Heat Setpoint plus the T56 slider offset if unoccupied. The following conditions must be true in order for this algorithm to run:

- Indoor Fan has been ON for at least 30 seconds.
- Cool mode is not active and the time guard between modes equals zero.
- If occupied and SPT < (occupied heat setpoint plus T56 slider offset)
- SPT reading is available
- If it is unoccupied and the SPT < (unoccupied heat setpoint plus T56 slider offset). The indoor fan will be turned on by the staging algorithm.
- OAT < High OAT lockout temperature.

If all of the above conditions are met, the heating outputs will be energized as required, otherwise they will be de-energized. If the SAT begins to exceed the high supply air setpoint, a ramping function will cause the Heat Stages Capacity algorithm to decrease the number of stages until the SAT has dropped below the setpoint.

There is a fixed one minute minimum on time and a one minute off time for each heat output. Heat staging has a 2 minute stage up and 30 second stage down delay.

Heat pump operation (if the Heat Pump RTU configuration is set to YES) is the same as above except for what is explained below. There is a fixed 3 minute on and 5 minute off time for the first heat stage output, and a one minute on and one minute off time for the second heat stage output. There is a 10 minute minimum stage up delay if the heat demand is <= 3°F, and a 2 minute minimum stage up delay if heat demand is > 3°F. The stage down delay is still 30 seconds. If the Compressor Safety Alarm is active, the second heat stage will come on with the first stage with no delay.

Indoor Air Quality

If the optional indoor air quality sensor is installed, the RTU-MP will maintain indoor air quality within the space at the user configured differential set point. The set point is the difference between the indoor air quality and an optional outdoor air quality sensor. If the outdoor air quality is not present then a fixed value of 400ppm is used. The following conditions must be true in order for this algorithm to run:

- The mode is occupied.
- Indoor Fan has been ON for at least 30 seconds.
- Indoor Air Quality sensor has a valid reading

As air quality within the space changes, the minimum position of the economizer damper will be changed thus allowing more or less outdoor air into the space depending on the relationship of the indoor air quality to the differential setpoint. If all the above conditions are true, the IAQ algorithm will run and calculates an IAQ minimum position value using a PID loop. The IAQ minimum damper position is then compared against the user configured economizer minimum position and the greatest value becomes the final minimum damper position of the economizer output.

If the calculated IAQ minimum position is greater than the IAQ maximum damper position configuration then it will be clamped to the configured value.

Dehumidification

The RTU-MP will provide occupied and unoccupied dehumidification only on units that are equipped with the Humidi-MiZer™ option from the factory. This function requires a space relative humidity sensor or a humidistat for control. The space relative humidity senor can be installed and configured as one of the two analog input channels (inputs 1 or 2 on J4), or a humidistat can be installed and configured as switch input 9 on J5. When using a relative humidity sensor to control dehumidification, occupied or unoccupied dehumidification setpoints are use accordingly. When using a humidistat, setpoints are not used and the dehumidification call comes when the humidistat indicates high humidity.

When the indoor relative humidity becomes greater then the dehumidification setpoint (or switches from low to high), a dehumidification demand will acknowledged. Compressor state is monitored and time guards are honored. If a compressor was just turned off prior to the dehum call the dehumidification output will be delayed the 5 minute minimum off time of the compressor. When ok to dehumidify, the dehumidification output (J11-7, 8) will be energized. This will bring on the supply fan, all compressors, and the dehumidification relay placing the unit in reheat dehumidification mode. If dehumidification is called for during cooling or cooling is called for during dehumidification, the unit will run in cooling dehumidification mode. Individual unit circuits can be in different dehumidification modes based on the demand. Refer to the base units operation for additional information.

NOTE: There is a fixed 5% hysteresis that the indoor relative humidity must drop below the active setpoint to end the dehumidification mode and de-energize the dehumidification output. The output will also de-energize if the fan relay is de-energized.

Demand Limit

If the RTU-MP receives a level 1 (one degree offset), 2 (two degree offset), or a 3 (4 degree offset) to the BACnet demand limit variable, the controller will expand the heating and cooling setpoints by the configured demand limit setpoint value and remain in effect until the BACnet demand limit variable receives a 0 value.

TROUBLESHOOTING

General

The RTU-MP controller acts as an intelligent imbedded thermostat to the rooftop unit, but can be monitored and controlled from a 3rd party network. This causes the system as a whole to be troubleshot from three points of view. The three parts to the system are the rooftop unit, the MP controller, and the 3rd party network connected. Determining which part needs to be troubleshot is the first step.

The MP controller can be used to troubleshoot the rooftop unit and/or itself with service test, communicating LED's, and built in alarms; which is discussed in this literature. Disconnecting the RTU-MP from the 3rd party network may also help troubleshooting the controller and rooftop unit. Third Party Network troubleshooting may also be required.

There is an on-board battery that is used for RAM and clock back-up. It is a 3-volt lithium battery (CR2032). The average life is 7 years with a minimum of 10,000 hours of back-up. When the RTU-MP board is powered up, the battery is not being used. If power is lost, the battery backs up the application code, settings and configurations, and time clock. Battery replacement should be done with the board powered up.

Communication LED's

The LED's indicate if the controller is speaking to the devices on the network. The LED's should reflect communication traffic based on the baud rate set. The higher the baud rate the more solid the LED's will appear.

Table 3 – LED's

The LED's on the RTU-MP show the status of certain functions

If this LED is on...	Status is...
Power	The RTU MP has power
Rx	The RTU MP is receiving data from the network segment
Tx	The RTU MP is transmitting data over the network segment
DO#	The digital output is active

The **Run** and **Error** LED's indicate control module and network status

If Run LED shows...	And Error LED shows...	Status is...
2 flashes per second	Off	Normal
2 flashes per second	2 flashes, alternating with **Run** LED	Five minute auto–restart delay after system error
2 flashes per second	3 flashes, then off	Control module has just been formatted
2 flashes per second	4 flashes, then pause	Two or more devices on this network have the same ARC156 network address
2 flashes per second	On	Exec halted after frequent system errors or control programs halted
5 flashes per second	On	Exec start–up aborted, Boot is running
5 flashes per second	Off	Firmware transfer in progress, Boot is running
7 flashes per second	7 flashes per second, alternating with **Run** LED	Ten second recovery period after brownout
14 flashes per second	14 flashes per second, alternating with **Run** LED	Brownout
On	On	Failure. Try the following solutions: • Turn the RTU–MP off, then on. • Format the RTU–MP. • Download memory to the RTU–MP. • Replace the RTU–MP.

Table 4 – Troubleshooting Alarms

POINT NAME	BACnet OBJECT NAME	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
Safety Chain Alarm	safety_chain	Alarm Generated Immediate Shutdown	Automatic	Over load Indoor Fan or Electric Heater overheat.
Fire Shutdown Alarm	fire_alarm	Alarm Generated Immediate Shutdown	Automatic	Smoke detected by smoke detector or configuration incorrect
Space Temp Sensor Failure	spt_alarm	Alarm Generated Immediate Shutdown	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
SAT Sensor Alarm	sat_alarm	Alarm Generated Immediate Shutdown	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
High Space Temp Alarm	spt_hi	Alarm Generated	Automatic	The space temperature has risen above the cool setpoint by more than the desired amount.
Low Space Temp Alarm	spt_lo	Alarm Generated	Automatic	The space temperature has dropped below the heat setpoint by more than the desired amount.
High Supply Air Temp	sat_hi	Alarm Generated	Automatic	SAT is greater then 160 degrees for more than 5 minutes.
Low Supply Air Temp	sat_lo	Alarm Generated	Automatic	The supply air temperature is below 35°F for more than 5 minutes.
Supply Fan Failed to Start	sf_fail	Alarm Generated Immediately disable Operation	Automatic	Tripped Circuit Breaker, Broken belt, Bad indoor fan motor, Configuration incorrect, Bad fan status switch.
Supply Fan in Hand	sf_hand	Alarm Generated Ramp down Operations	Automatic	Bad Fan Status Switch, Configuration incorrect.
Compressor Safety Alarm	dx_compstat	Alarm Generated	Automatic	Compressor would not start.
Setpoint Slider Alarm	slide_alarm	Alarm Generated Offset set to zero	Automatic	STO sensor is open or shorted for more then 5 seconds.
Dirty Filter Alarm	filter	Alarm Generated	Automatic/re-set timer when configured with or without switch	Dirty Filter, supply fan run time exceeded, filter switch configuration wrong.
Switch Configuration Alarm	sw_cfg_alarm	Alarm Generated Disable misconfigured switch functions	Configure correctly	More than one binary input is configured for the same purpose. More then one discrete input is configured to provide the same function.
Misconfigured Analog Input	an_cfg_alarm	Alarm Generated Disable 4 selectable analog inputs	Configure correctly	More then one analog input is configured to provide the same function.
OAT Sensor Alarm	oat_alarm	Alarm Generated Economizer and Low ambient DX cooling lockout disabled.	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
Space RH Sensor Alarm	sprh_alarm	Alarm Generated Dehumidification disabled	Automatic	Sensor reading is out of range. Bad sensor, bad wiring, or sensor configured incorrectly.
Outdoor RH Sensor Alarm	oarh_alarm	Alarm Generated	Automatic	Sensor reading is out of range. Bad sensor, bad wiring, or sensor configured incorrectly.
High Space Humidity	sprh_hi	Alarm Generated	Automatic	IRH is greater then 70% for more then 10 minutes.
Low Space Humidity	sprh_lo	Alarm Generated	Automatic	IRH is less then 35% for more then 10 minutes.
IAQ Sensor Alarm	iaq_alarm	Alarm Generated Disables IAQ Operation Economizer moves to minimum position	Automatic	Sensor reading is out of range. Bad sensor, bad wiring, or sensor configured incorrectly.
OAQ Sensor Alarm	oaq_alarm	Alarm Generated Set OAQ to 400	Automatic	Sensor reading is out of range. Bad sensor, bad wiring, or sensor configured incorrectly.
High Carbon Dioxide Level	co2_hi	Alarm Generated	Automatic	CO2 reading is above 1200ppm.
Supply Fan Runtime Alarm	sf_rntm	Alarm Generated	clear the timer	Supply fan run time exceeded user defined limit.
Compressor 1 Runtime Alarm	dx1_rntm	Alarm Generated	clear the timer	Compressor run time limit is exceeded.
Compressor 2 Runtime Alarm	dx2_rntm	Alarm Generated	clear the timer	Compressor run time limit is exceeded.

Alarms

Alarms can be checked through the network and/or the local access. All the alarms are listed in Table 4 with name, object name, action taken by control, reset method, and probable cause. There are help screens for each alarm on the local access display and listed in Appendix A: Help Screens. Some alarms are explained in detail below.

Safety Chain Alarm

This alarm occurs immediately if the supply-fan internal overload trips or if an electric-heat limit switch trips. The Unit Status will be Shutdown and the System Mode will be Disable. When this happens TB-1 (R terminal) will not have 24 VAC, but the RTU-MP board will still be powered. (See Fig. 21.) All unit operations stop immediately and will not restart until the alarm automatically clears. There are no configurations for this alarm; it is all based on internal wiring. This alarm will never occur if Fire Shutdown Alarm is active.

Fire Shutdown Alarm

This alarm occurs immediately when the smoke detector senses smoke. The Unit Status will be Shutdown and the System Mode will be Disable. When this happens TB4-7 will not have 24 VAC, but the RTU-MP board will still be powered. (See Fig. 21.) All unit operations stop immediately and will not restart until the alarm automatically clears. If there is not a smoke detector installed or the smoke detector did not trip, check input configurations.

NOTE: The default function for input 5 is normally closed Fire Shutdown, if no detector is installed the jumper must be in place.

Space Temp Sensor Failure

This alarm occurs if the space sensor wired to the RTU-MP is disconnected or shorted for more then 10 seconds. When this occurs the Unit Status will be Shutdown and the System Mode will be Run. Sensor, sensor connections, wiring, board connection, and configurations should be checked for faults or errors. Alarm will reset automatically when cause is fixed.

SAT Sensor Alarm

This alarm occurs immediately when the supply air temperature sensor wired to the RTU-MP is disconnected or shorted. When this occurs the Unit Status will be Shutdown and the System Mode will be Run. Sensor, sensor connections, wiring, board connection, and configurations should be checked for faults or errors. Alarm will reset automatically when cause is fixed.

Switch Configuration Alarm

This occurs if more than one binary input (inputs 3, 5, 8, and 9) is configured for the same function. When this happens the two inputs (or more) configured wrong will be disabled as an inputs. This alarm will automatically be cleared when configuration is corrected.

An example of this would be: Input 3 = Compressor Safety, input 5 = Fan Status, input 8 = Fan Status, and input 9 = Humidistat; the alarm would be active, unit would run, compressor safety and humidistat would function normally, and Fan Status (inputs 5 & 8) will be interpreted as "No Function."

Misconfigured Analog Input

This occurs if more than one analog input (inputs 1 & 2) is configured for the same sensor. When this happens the two inputs will be disabled as inputs. This alarm will automatically be cleared when configuration is corrected.

An example of this would be: Input 1 = IAQ Sensor, input 2 = IAQ Sensor; the alarm would be active, unit would run, but the IAQ Sensor (inputs 1 & 2) will be interpreted as "No Function."

Third Party Networking

Third party communication and networking troubleshooting should be done by or with assistance from the front end 3rd party technician. A Module Status Report (Modstat) can be run from the BACview[6] or Virtual BACview (see Table 5 to perform). This lists information about the board status and networking state. For basic troubleshooting, see Table 6. Refer to the *RTU-MP 3rd Party Integration Guide* for additional information.

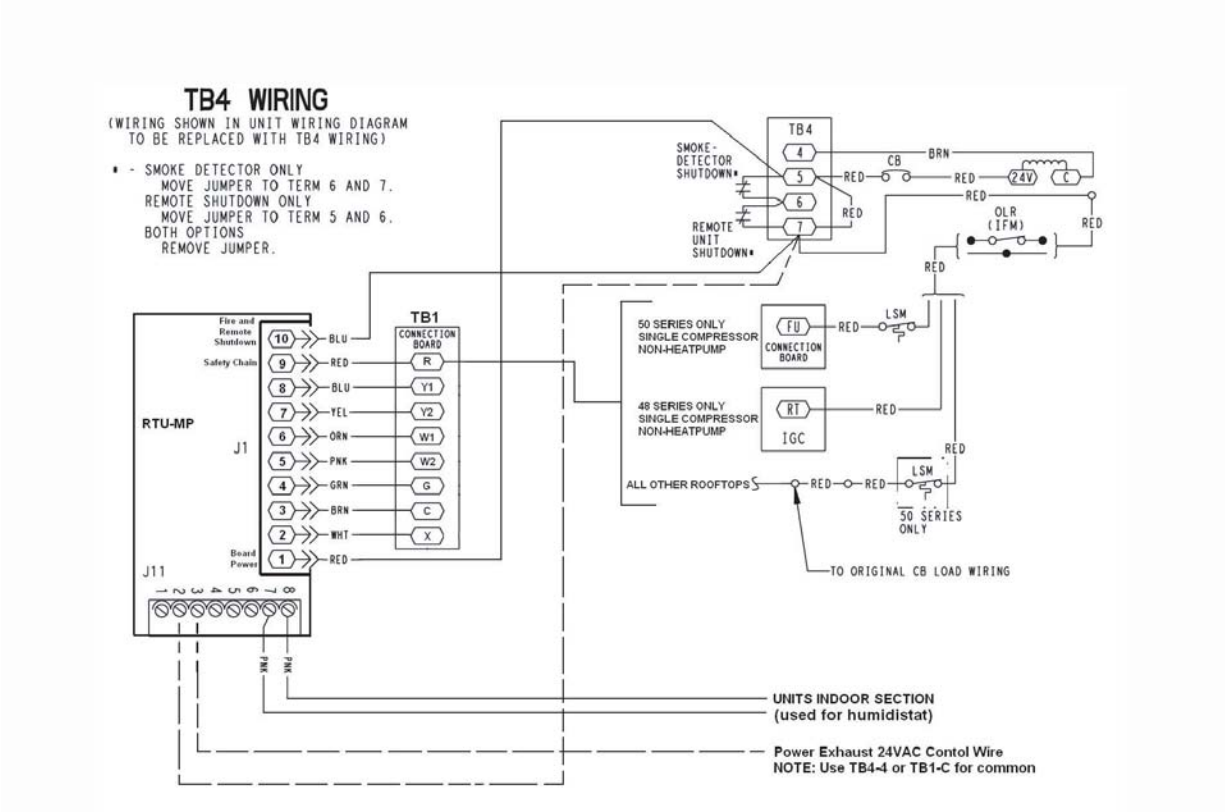


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Fig. 21 - TB4 Troubleshooting and Wiring

Table 5 – Manufacture Date

When troubleshooting, you may need to know a control module's manufacture date

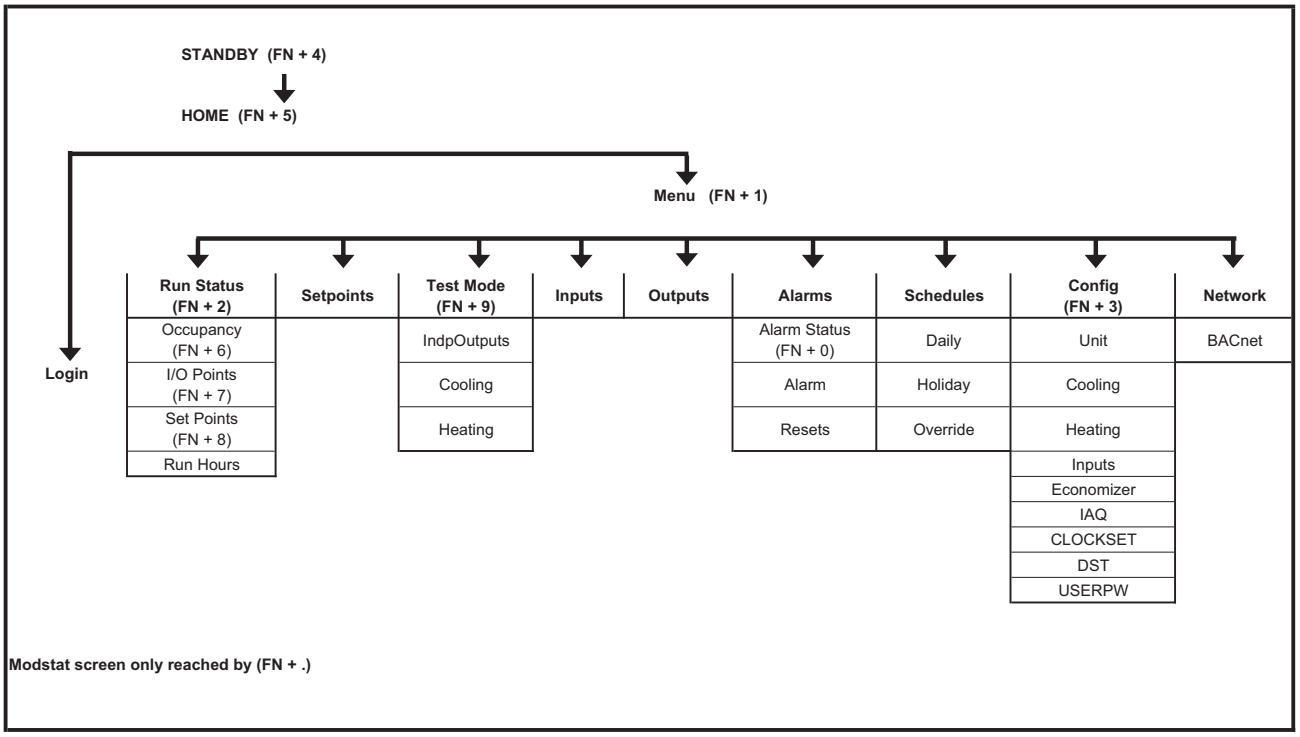
Obtain the manufacture date from a...	Notes
Module status report (modstat)	To obtain a modstat with BACview[6]: 1. Press Function (FN) key and hold. 2. Then press period (.) 3. Release both buttons. 4. Scroll down to find "Base Board hardware." Underneath it will be the manufacture date.
Sticker on the back of the main control module board "Serial No: RMPYMxxxxN" (Bar Coded & Typed Number)	The serial numbers are unique and contain embedded information: **"RMP"** – These first three digits are unique to RTU–MP and are used as an identifier. **"YM"** – These two digits identify the last digit of the year and month (in hex, A=10/Oct) of manufacture. "74" would represent a date of manufacture of "April 2007". **" xxxx"** – These four digits represent the sequential number of units produced for a given product for the mentioned manufacturing time period. **"N"** – This final digit represents the decade and toggles between "N" and "M" every ten years.

Table 6 – Basic Protocol Troubleshooting

Problem	Possible cause	Corrective action
No communication with 3rd party vendor	Incorrect settings on SW1, SW2 and SW3	Verify and correct switch settings. Cycle power to RTU–MP after changing switch settings.
	RS485 Port has no voltage output	Verify RTU–MP has correct power supply
	(check with RTU–MP disconnected from RS485 communication bus)	Possible bad driver on board.
	Bacnet @ 9600/19.2K – .01 to .045vdc	Check RS485 bus for external before reconnecting to the bus
	Bacnet @ 38.4K – .06 to .09vdc	Voltage, shorts or grounding
	Bacnet @ 76.8K – .1vdc	Before reconnecting to the bus
	Modbus @ 9600 – 76.8K – .124vdc	
	N2 @ 9600 – .124vdc	
	Verify devices are daisy chained and repeaters and bias terminators are correctly installed	Check 3rd party vendor RS485 communication wiring guidelines and troubleshooting procedures

APPENDIX A — LOCAL ACCESS DISPLAY TABLES

Screen Navigation



Main Screens

Screen	Point Name	BACnet Object	Values
STANDBY	Unit Status	unit_stat_1	OFF Fan Only Free Cooling Cooling Heating Dehumidification Service Test Shutdown
	Occupancy Status	occ_status	Unoccupied / Occupied
	Date & Time		
	ver	version	00.00
HOME	Unit Status	unit_stat_1	OFF Fan Only Free Cooling Cooling Heating Dehumidification Service Test Shutdown
	Occupancy Status	occ_status	Unoccupied / Occupied
	Date & Time		
	ver	version	00.00
Login	Admin or User		
	Password	****	user: 0000 Admin:1111

APPENDIX A — LOCAL ACCESS DISPLAY TABLES (CONT)

Menu - Run Status

Screen	Point Name	BACnet Object	Range	Units
Run Status	Unit Run Status	unit_stat	OFF Fan Only Free Cooling Cooling Heating Dehumidification Service Test Shutdown	
	System Mode	sysmode	Disable Test RUN	
		occ_status	Unoccupied / Occupied	
	Cooling Stages Active	coolstgs	0–2	
	Heating Stages Active	heatstgs	0–2	
	RTU–MP Software Version	version	xx.xx	
Occupancy	Occupancy Determination			
	Occupancy Source:	occ_source	Always Occupied Local Schedule BACnet Schedule BAS On/Off DI On/Off	
	Occupancy Status	occ_status	Unoccupied / Occupied	
	Local Schedule Status	kp_sched_stat	Unoccupied / Occupied	
	BACnet Schedule Status	bacnet_schedule	Unoccupied / Occupied	
	Sensor Override Time	overtime	0–1440	min
	BAS ON/OFF Status:	bas_on_off	Unoccupied / Occupied	
	DI ON/Off Status:	remocc	Unoccupied / Occupied	
I/O Points	I/O Points			
	Analog Inputs			
	Space Temperature Sensor	sptsens	xxx.x	dF
	Supply Air Temperature	sat	xxx.x	dF
	Local Outside Air Temp Sensor	oatsens	xxx.x	dF
	Outdoor Air Relative Humidity	oarh	xxx	%RH
	Outdoor Air Quality	oaq	xxx	PPM
	Space Relative Humidity	sprh	xxx	%RH
	Indoor Air Quality	iaq	xxx	PPM
	Binary Inputs			
	Safety Chain Feedback	safety	Off / Run Enabled	
	Compressor Safety Status	compstat	Normal / Trouble	
	Fire Shutdown	firedown	Run Enabled / Shutdown	
	Enthalpy Switch	enthalpy	High / Low	
	Humidistat Input Status	humstat	Low / High	
	Filter Status	filtstat	Clean / Dirty	
	Supply Fan Status	fanstat	Off / Running	
	Remote Occupancy Input	remocc	Off / On	
	Network Inputs			
	Outside Air Temp (BACnet)	oat	xxx.x	dF
	Enthalpy (BACnet)	enthalpy_net	High / Low	
	Binary Outputs			
	Supply Fan Relay State	sf	Off / On	
	Compressor 1 Relay State	comp_1	Off / On	
	Compressor 2 Relay State	comp_2	Off / On	
	Heat 1 Relay State	heat_1	Off / On	
	Heat 2 Relay State	heat_2	Off / On	
	Dehumidification Relay State	humizer	Off / On	
	Power Exhaust Relay State	aux_2	Off / On	
	Analog Output			
	Economizer Commanded Pos.	econocmd	xxx	%open
Set Points	Unit Setpoints			
	Effective Cool Setpoint	effective_cool_sp	xxx	dF
	Effective Heat Setpoint	effective_heat_sp	xx	dF
	Slider Setpoint Adjustment	sp_adj	xx	dF
	Setpoint Slider Range	spo_range	xx	^dF
	Occupied Cooling Setpoint	occ_cool_sp	xx	dF
	Occupied Heating Setpoint	occ_heat_sp	xx	dF
	Occupied Dehum Setpoint	occ_dehum_setpt	xx	%RH
	Unoccupied Cooling Setpoint	unocc_cool_sp	xxx	dF
	Unoccupied Heating Setpoint	unocc_heat_sp	xx	dF
	Unoccupied Dehum Setpoint	unocc_dehum_setpt	xx	%RH
	Max Differential CO2 Setpt	co2_stpt	xxx	PPM
	Power Exhaust Setpt	pesetpt	xxx	%
Run Hours	Run Hours			
	Supply Fan Runtime	sf_runtime	xxxxxx	hr
	Compressor 1 Runtime	c1_runtime	xxxxxx	hr
	Compressor 2 Runtime	c2_runtime	xxxxxx	hr
	Filter Runtime	flts_runtime	xxxxxx	hr

APPENDIX A — LOCAL ACCESS DISPLAY TABLES (CONT)

Menu - Set Points

Screen	Contents	BACnet Object	Default Value	Units	Range	Editable
Setpoints	User/BAS Setpoints					
	Occupied Cooling Setpoint	occ_cool_sp	74	dF	55–80	Y
	Occupied Heating Setpoint	occ_heat_sp	68	dF	55–80	Y
	Setpoint Slider Range	spo_range	5	^dF	0–15	Y
	Occupied Dehum Setpoint	occ_dehum_setpt	60	%RH	30–90	Y
	Unoccupied Cooling Setpoint	unocc_cool_sp	85	dF	75–130	Y
	Unoccupied Heating Setpoint	unocc_heat_sp	60	dF	40–80	Y
	Unoccupied Dehum Setpoint	unocc_dehum_setpt	95	%RH	0–100	Y
	Max Differential CO_2 Setpt	co2_stpt	650	PPM	300–950	Y
	Power Exhaust Setpt	pesetpt	50	%	10–100	Y

Menu - Test Mode

Screen	Contents	BACnet Object	Range	Units	Editable
Test Mode	Field Service Test				
	Current State	svc_test	Off / On		Y
IndpOutputs	Independent Outputs				
	Test Mode	svc_test	Off / On		Y
	Supply Fan	test_sf	Off / On		Y
	Economizer Damper Position	test_eco	0–100	%	Y
	Power Exhaust	test_x2	Off / On		Y
Cooling	Test Cooling				
	Test Mode	svc_test	Off / On		Y
	Compressor 1	test_c1	Off / On		Y
	Compressor 2	test_c2	Off / On		Y
	Dehumidification Mode	test_hmz	Off / On		Y
Heating	Test Heating				
	Test Mode	svc_test	Off / On		Y
	Heat 1	test_h1	Off / On		Y
	Heat 2	test_h2	Off / On		Y

Menu - Inputs

Screen	Contents	BACnet Object	Range	Units	Editable
Inputs	Input Points				
	Analog Inputs				
	Space Temperature Sensor	sptsens	xxx.x	dF	N
	Supply Air Temperature	sat	xxx.x	dF	N
	Local Outside Air Temp Sensor	oatsens	xxx.x	dF	N
	Outdoor Air Relative Humidity	oarh	xxx	%RH	N
	Outdoor Air Quality	oaq	xxx	PPM	N
	Space Relative Humidity	sprh	xxx	%RH	N
	Indoor Air Quality	iaq	xxx	PPM	N
	Binary Inputs				
	Safety Chain Feedback	safety	Off / Run Enabled		N
	Compressor Safety Status	compstat	Normal / Trouble		N
	Fire Shutdown	firedown	Run Enabled / Shutdown		N
	Enthalpy Switch	enthalpy	High / Low		N
	Humidistat Input Status	humstat	Low / High		N
	Filter Status	filtstat	Clean / Dirty		N
	Supply Fan Status	fanstat	Off / Running		N
	Remote Occupancy Input	remocc	Off / On		N
	Network Inputs				
	Outside Air Temp (BACnet)	oat	xxx.x	dF	N
	Enthalpy (BACnet)	enthalpy_net	High / Low		N

Menu - Outputs

Screen	Contents	BACnet Object	Range	Units	Editable
Outputs	Output Points				
	Binary Outputs				
	Supply Fan Relay State	sf	Off / On		N
	Compressor 1 Relay State	comp_1	Off / On		N
	Compressor 2 Relay State	comp_2	Off / On		N
	Heat 1 Relay State	heat_1	Off / On		N
	Heat 2 Relay State	heat_2	Off / On		N
	Dehumidification Relay State	humizer	Off / On		N
	Power Exhaust Relay State	aux_2	Off / On		N
	Analog Output				
	Economizer Commanded Pos.	econocmd		%open	N

APPENDIX A — LOCAL ACCESS DISPLAY TABLES (CONT)

Menu - Alarms

Screen	Contents	BACnet Object	Range	Editable
Alarms				
Alarm Status	Active Alarms			
	Safety Chain Alarm	safety_chain	OFF / ACTIVE	N
	Fire Shutdown Alarm	fire_alarm	OFF / ACTIVE	N
	Space Temp Sensor Failure	spt_alarm	OFF / ACTIVE	N
	SAT Sensor Alarm	sat_alarm	OFF / ACTIVE	N
	High Space Temp Alarm	spt_hi	OFF / ACTIVE	N
	Low Space Temp Alarm	spt_lo	OFF / ACTIVE	N
	High Supply Air Temp	sat_hi	OFF / ACTIVE	N
	Low Supply Air Temp	sat_lo	OFF / ACTIVE	N
	Supply Fan Failed to Start	sf_fail	OFF / ACTIVE	N
	Supply Fan in Hand	sf_hand	OFF / ACTIVE	N
	Compressor Safety Alarm	dx_compstat	OFF / ACTIVE	N
	Setpoint Slider Alarm	slide_alarm	OFF / ACTIVE	N
	Dirty Filter Alarm	filter	CLEAN / DIRTY	N
	Switch Configuration Alarm	sw_cfg_alarm	OFF / ACTIVE	N
	Misconfigured Analog Input	an_cfg_alarm	OFF / ACTIVE	N
	OAT Sensor Alarm	oat_alarm	OFF / ACTIVE	N
	Space RH Sensor Alarm	sprh_alarm	OFF / ACTIVE	N
	Outside RH Sensor Alarm	oarh_alarm	OFF / ACTIVE	N
	High Space Humidity	sprh_hi	OFF / ACTIVE	N
	Low Space Humidity	sprh_lo	OFF / ACTIVE	N
	IAQ Sensor Alarm	iaq_alarm	OFF / ACTIVE	N
	OAQ Sensor Alarm	oaq_alarm	OFF / ACTIVE	N
	High Carbon Dioxide Level	co2_hi	OFF / ACTIVE	N
	Supply Fan Runtime Expired	sf_rntm	OFF / ACTIVE	N
	Compressor 1 Runtime Alarm	dx1_rntm	OFF / ACTIVE	N
	Compressor 2 Runtime Alarm	dx2_rntm	OFF / ACTIVE	N
Alarm History	Module Event History (100 most recent)			
	Active Alarms	Buffer		
	Active Faults	Buffer		
	Returned–To–Normal (RTN)	Buffer		
	Manually Cleared (CLR)	Buffer		
Timed–Alarms Manual Resets	Timed–Alarm Resets			
	Dirty Filter Alarm	flts_rt_clear	RUN / CLEAR	Y
	Supply Fan Runtime Expired	sf_rt_clear	RUN / CLEAR	Y
	Compressor 1 Runtime Alarm	c1_rt_clear	RUN / CLEAR	Y
	Compressor 2 Runtime Alarm	c2_rt_clear	RUN / CLEAR	Y

APPENDIX A — LOCAL ACCESS DISPLAY TABLES (CONT)

Menu - Schedules

Screen	Contents	BACnet Object	Units	Range	Editable
Schedules	Occupancy Config.				
	Status	occ_status		Unoccupied / Occupied	
	Day and Time				
	Occupancy Source:	occ_source		Always Occupied Local Schedule BACnet Schedule BAS On/Off DI On/Off	Y
	T55/56 Override Duration	ovr_dur	hr	0–24	Y
Daily	Daily Sch X		(24hr)		
	Use?	use_norX		No / Yes	Y
	Stat:	schX_stat		Off / On	Y
	Start Time	norm_bhX		0–23	Y
		norm_bmX		0–59	Y
	Stop Time	norm_ehX		0–23	Y
		norm_emX		0–59	Y
	Days	mon_normX		MON or –	Y
		tue_normX		TUE or –	Y
		wed_normX		WED or –	Y
		thurs_normX		THU or –	Y
		fri_normX		FRI or –	Y
		sat_normX		SAT or –	Y
		sun_normX		SUN or –	Y
Holiday	Holiday Sch X		(24hr)		
	Use?	use_holX		No / Yes	Y
	Stat:	holX_stat		Off / On	Y
	Start Time	hol_bhX		0–23	Y
		hol_bmX		0–59	Y
	Stop Time	hol_ehX		0–23	Y
		hol_emX		0–59	Y
	Month	hol_monX		0–12	Y
	Day	hol_dayX		0–31	Y
Override	Override Sch X		(24hr)		
	Use?	use_ovrX		No / Yes	Y
	Stat:	ovrX_stat		Off / On	Y
	Start Time	ovr_bhX		0–23	Y
		ovr_bmX		0–59	Y
	Stop Time	ovr_ehX		0–23	Y
		ovr_emX		0–59	Y
	Month	ovr_monX		0–12	Y
	Day	ovr_dayX		0–31	Y

NOTE: The “X” above represents the number of a specific schedule. There are 4 Daily Schedules, 12 Holiday Schedules and 2 Override Schedules

APPENDIX A — LOCAL ACCESS DISPLAY TABLES (CONT)

Menu - Configuration

Screen	Contents	BACnet Object	Default Value	Units	Range	Editable
Config						
Unit			Unit Configuration			
	Start Delay	startdelay	5	sec	0–600	Y
	Filter Service Hours	flts_service	600	hr	xxxx; 0 = Disable Alarm	Y
	Supply Fan Service Hours	sf_service	0	hr	xxxx; 0 = Disable Alarm	Y
	Compressor1 Service Hours	c1_service	0	hr	xxxxx; 0 = Disable Alarm	Y
	Compressor2 Service Hours	c2_service	0	hr	xxxxx; 0 = Disable Alarm	Y
Cooling			Cooling Configuration			
	Number of Compressor stages	nu_cl_stgs	One Stage*		One Stage Two Stage None	Y
	Cooling/Econ SAT Low Setpt	sat_low	50	dF	45–75	Y
	Cooling Lockout Temp	oatlcool	45	dF	0–65	Y
Heating			Heating Configuration			
	HeatPump RTU?	heatpump	No*		No / Yes	Y
	Heating SAT High Setpt	sat_high	120	dF	95–150	Y
	Heating Lockout Temp	oatlheat	65	dF	45–95	Y
Inputs			Input Configuration			
	Binary Inputs					
	Input 3	inp_03_func	Compressor Safety		No Function Compressor Safety Fan Status Filter Status Remote Occupancy	Y
		inp_03_sw	N/O		N/O / N/C	Y
	Input 5	inp_05_func	Fire Shut-down		No Function Fire Shutdown Fan Status Filter Status Remote Occupancy	Y
		inp_05_sw	N/C		N/O / N/C	Y
	Input 8	inp_08_func	No Function		No Function Enthalpy Switch Fan Status Filter Status Remote Occupancy	Y
		inp_08_sw	N/O		N/O / N/C	Y
	Input 9	inp_09_func	Humidistat		No Function Humidistat Fan Status Filter Status Remote Occupancy	Y
		inp_09_sw	N/O		N/O / N/C	Y
	Analog Inputs					
	Space Sensor Type	spt_type	T55 Type		T55 Type T56 Type RS Type	Y
	Input 1 Function	inp_01_func	No Sensor		No Sensor IAQ Sensor OAQ Sensor Space RH Sensor Outdoor RH Sensor	Y
	Input 2 Function	inp_02_func	No Sensor		No Sensor IAQ Sensor OAQ Sensor Space RH Sensor Outdoor RH Sensor	Y
	Setpoint Slider Range	spo_range	5	^dF	0–15	
	T55/56 Override Duration	ovr_dur	1	hr	0–24	Y
	IAQ Low Reference @ 4mA	iaq_4ma	0	PPM	0–400	Y
	IAQ High Reference @ 20mA	iaq_20ma	2000	PPM	0–5000	Y
	OAQ Low Reference @ 4mA	oaq_4ma	0	PPM	0–400	Y
	OAQ High Reference @ 20mA	oaq_20ma	2000	PPM	0–5000	Y
Economizer			Economizer Configuration			
	Economizer Exists	econ_exist	No*		No / Yes	Y
	Economizer Minimum Position	economin	20	%	0–100	Y
	Economizer High OAT Lockout	oatlecon	75	dF	55–80	Y
	Power Exhaust Setpt	pesetpt	50	%	20–90	Y
	Continuous Occ Exhaust	occ_exh	No		No / Yes	Y
IAQ			Indoor Air Quality Configuration			
	Max Differential CO2 Setpt	co2_stpt	650	PPM	300–950	Y
	IAQ Greatest Min Dmpr Pos	iaq_max_dpr	50	%open	10–60	Y
CLOCKSET			Set Current Time/Date (24 hr clock)			
	Time (hh:mm:ss):					Y
	Date (dd–mmm–yy):					Y
			DST			
DST	Start Time:					Y
	Amount:					Y
	Entry #					Y
	Beg (mm–dd–yy)					Y
	End (mm–dd–yy)					Y
USERPW	View/Set User					
	Password:		0000		0000–9999	Y

* These defaults change based on unit and FIOPs. The shown defaults are single compressor non–heat pump units without economizers.

Menu - Network

Screen	Contents	BACnet Object	Range	Editable
Network		Network Info		
	Max Masters	this_device/64	1–127	Y
	Max Info Frames	this_device/63	1–999	Y
BACnet	BACnet Device Instance: Base BACnet Device ID: Autogenerate Device ID?			

Menu - Help Screens

TYPE	Screen	Contents
Configuration	Start Delay	Defines number of seconds after power up the unit must wait before normal operation.
	Cooling/Econ SAT Low Setpt	Defines the minimum SAT allowed during cooling and economizer mode.
	Cooling Lockout Temp	Defines the minimum OA temp allowed during cooling mode.
	Heating SAT High Setpt	Defines the maximum SAT allowed during heating mode.
	Heating Lockout Temp.	Defines the maximum OA temp allowed during heating mode.
	Economizer Minimum Position	Defines the minimum damper position of the economizer during occupied periods.
	Economizer High OAT Lockout	Defines the maximum OA temp which will allow the unit to run in economizer mode.
	Power Exhaust Setpt	Defines the economizer damper position that enables power exhaust operation.
	Continuous Occ Exhaust	Defines continuous power exhaust operation during occupied periods.
	Max Differential CO2 Level	Defines the maximum difference between the indoor and outdoor air quality to maintain healthy indoor air.
	IAQ Greatest Min Dmpr Pos.	Defines the minimum OA damper position for maintaining indoor air quality.
Alarms	Safety Chain Alarm	When a supply fan overload or electric heat limit opens, the 24 VAC at TB–1(R) will be lost.
	Fire Shutdown Alarm	The smoke detector has opened and the 24VAC at TB4–7 is lost.
	Space Temp Sensor Failure	The sensor is missing or shorted.
	SAT Sensor Alarm	The sensor is missing or shorted.
	High Space Temp Alarm	The space temperature has risen above the cooling setpoint by more than the desired amount.
	Low Space Temp Alarm	The space temperature has dropped below the heating setpoint by more than the desired amount.
	High Supply Air Temp	The supply air temperature sensor is reading above 160F.
	Low Supply Air Temp	The supply air temperature sensor is reading below 35F.
	Supply Fan Failed to Start	The control logic is commanding the supply fan ON, but senses the fan is OFF.
	Supply Fan in Hand	The control logic is commanding the supply fan to be OFF, but senses the fan ON.
	Compressor Safety Alarm	A compressor lockout board has locked out it's compressor.
	Setpoint Slider Alarm	The setpoint slider voltage is out of range.
	Dirty Filter Alarm	The Filter runtime has exceeded the configurable alarm timer limit, or the filter status switch has tripped or configuration is wrong.
	Switch Configuration Alarm	More than one binary input is configured for the same function.
	Misconfigured Analog Input	More than one analog input is configured for the same function.
	OAT Sensor Alarm	The outdoor air temperature sensor is missing or shorted. The OAT sensor is required if Economizer Exists configuration point is set to Yes.
	Space RH Sensor Alarm	The sensor is missing or shorted.
	Outdoor RH Sensor Alarm	The sensor is missing or shorted.
	High Space Humidity	The space relative humidity sensor is reading above 70%RH.
	Low Space Humidity	The space relative humidity sensor is reading below 30%RH.
	IAQ Sensor Alarm	The sensor is missing or shorted.
	OAQ Sensor Alarm	The sensor is missing or shorted.
	High Carbon Dioxide Level	The Carbon dioxide level in the space has exceeded the configured limit. CO2 reading is above 1200ppm
	Supply Fan Runtime Alarm	The Supply fan runtime has exceeded the configurable alarm timer limit.
	Compressor 1 Runtime Alarm	A compressor runtime has exceeded the configurable alarm timer limit.
	Compressor 2 Runtime Alarm	A compressor runtime has exceeded the configurable alarm timer limit.
Network	Info	To access the module status report press the "FN" and "." buttons simultaneously.

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