



# Wireless Outdoor Temperature Transmitter 418MHz

## Installation and Operating Instructions

19703\_ins\_wireless\_out\_temp\_xmtr

rev. 04/21/15

### Wireless System Overview

#### 418 MHz System:

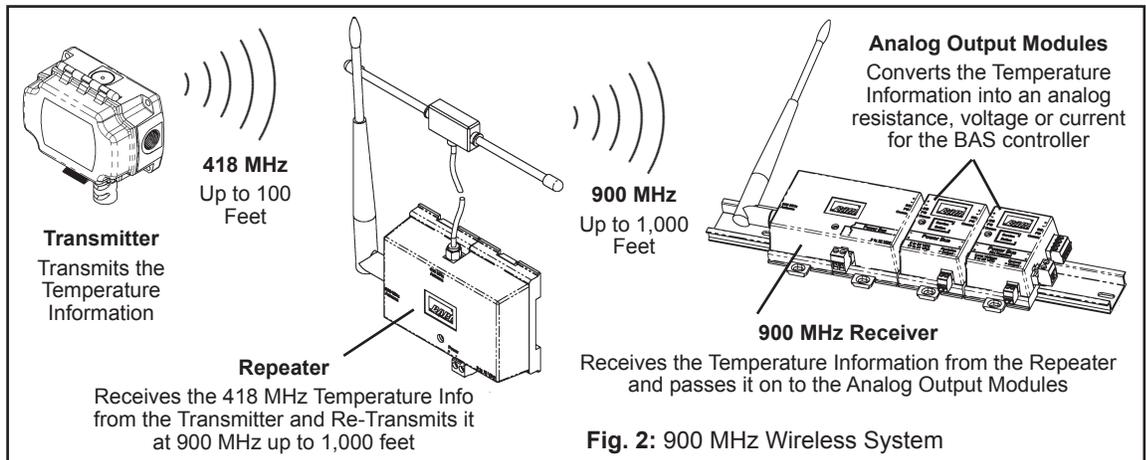
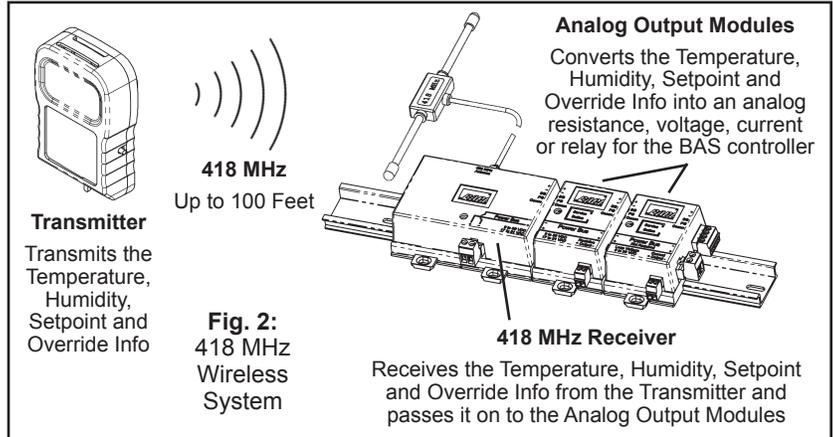
The transmitter measures the Outside Air Temperature and sends the data at 418MHz to the 418 MHz Receiver up to 100 feet away. The transmit rate is about once every 20 seconds with an estimated battery life of 5 to 8 years with two high-capacity 3.6V lithium batteries.

The transmitted info is picked up by the 418 MHz Receiver and passed along to an Analog Output Module which converts it into an analog resistance, voltage or current which is then hard wired to the analog inputs of the BAS controller.

#### 900 MHz System:

The transmitter measures the Outside Air Temperature and sends the data at 418MHz to a Repeater up to 100 feet away. The transmit rate is approximately once every 20 seconds with an estimated battery life of 5 to 8 years using two high-capacity 3.6V lithium batteries.

The 418 MHz transmitted info is picked up by the Repeater and then Re-Transmitted at 900 MHz to a 900 MHz Receiver up to 1,000 feet away. The 900 MHz receiver picks up the information from the repeater and then passes it along to the Analog Output Module which converts it into an analog resistance, voltage or current which is then hard wired to the analog inputs of the BAS controller.



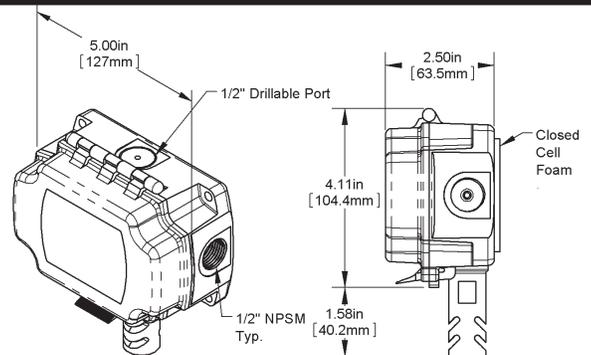
### Outside Air Temperature Transmitter Mounting

First train the transmitter and output modules as shown above on the next page.

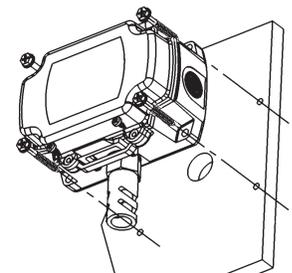
Outside Air (OSA) sensor placement is critical to good performance. The OSA sensor must be mounted in the shade away from windows, doors or vents. They should never be in direct sunlight. The ideal shaded location in the Northern hemisphere is on the North side of the building. In the Southern hemisphere, the South side of the building is ideal.

The sensor should be mounted between four feet above the ground or roof and one foot minimum below the eave with the probe pointing down. Mount the unit with four #10 screws through the mounting feet as shown in Fig 3. #10 sheet metal screws require 5/32" (4mm) pilot holes.

For concrete or cinder block, drill four 5/32" (4mm) holes, 1-3/4 inch (45mm) deep. Make sure that all screws are started in their holes before tightening. Tighten evenly. If unit has a foam gasket, only squeeze the gasket to about 1/2 of its original thickness.



**Fig. 3:** Outside Air Temperature Transmitter Dimensions (above) and Mounting (right)

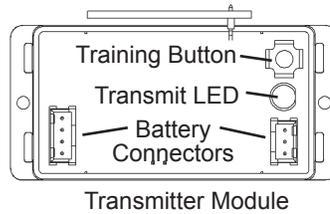


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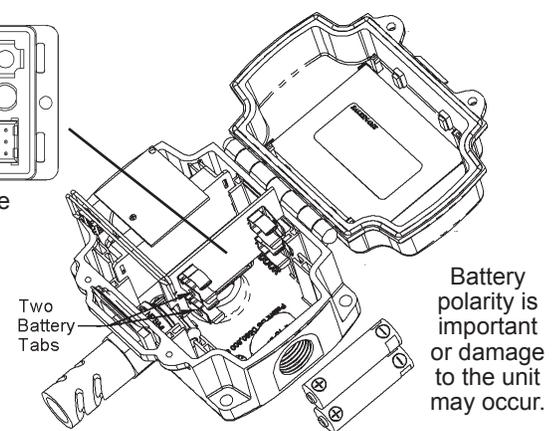
### Analog Output Module Training

The installation process requires that each transmitter is trained to its associated output modules so that they receive communications from the correct transmitter. This is done by pushing buttons in a defined sequence on the transmitter and output module. The training process is easiest on a test bench so the units are within arm's reach of each other. Training can be done in the field but requires two people and a set of walkie talkies or cell phones. Place an identification mark on the transmitter and associated output module after training so they can be matched at the job site.

Any transmitted variable can be trained to more than one output module. If a Repeater is used, be sure it is powered and within reception range of the transmitter and the 900 MHz Receiver to train the output modules.

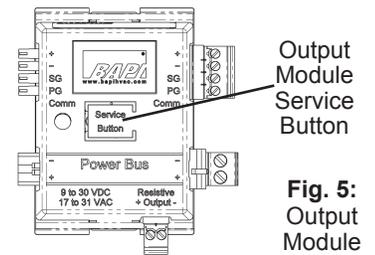


**Fig. 4:**  
Outside Air  
Temperature Sensor  
Battery Installation  
and Training Button.



### TRAINING PROCEDURE

- To train an output module to the temperature transmitter, select the Resistance, Voltage or Current Output Module you want to train and connect it to the wireless receiver. Note: Multiple output modules can be trained to the same transmitter variable if desired.
- Apply power to the receiver which will supply power to the connected output modules. The power LED on the receiver will light and remain lit. **(Current Output Modules must have loop power supplied to the module itself before they can be trained.)**
- Open the BAPI-Box cover on the transmitter and remove the battery tabs or install the batteries, observing polarity as shown in Fig 4. The small LED on the transmitter module will flash about once every 20 seconds, indicating a transmission. (The flash is very quick.)
- Press and hold down the "Service Button" on the top of the output module (Fig 5) that you wish to train. Then, press and release the "training button" (see Fig 4) on the transmitter module. When the output module receives the "training transmission" from the transmitter, the output module's red LED will light. Release the "Service Button" on the output module and the red LED will go out. The transmitter and output module are now trained to each other. During normal operation, the output module's LED will flash about once every 20 seconds indicating data reception.
- Mount the transmitter at the desired location (as shown on the previous page), removing the batteries if needed. (The units will remain trained to one another through power failures and battery replacement.)



**Fig. 5:**  
Output  
Module

### Mounting and Locating of the Antennas on the 418 MHz Receiver, 900 MHz Receiver and the Repeater

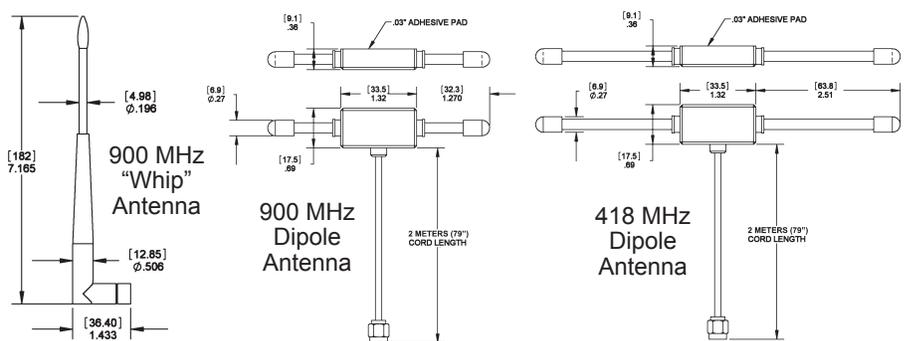
The 418 MHz Receiver, 900 MHz Receiver and Repeater may be located inside a metal enclosure but their antennas must be outside the enclosure. The 418 MHz Receiver comes with a 418 MHz Dipole Antenna. The 900 MHz Receiver comes standard with a 900 MHz "Whip" Antenna but is available with a 900 MHz Dipole Antenna. The Repeater comes standard with a 418 MHz Dipole Antenna and a 900 MHz "Whip" Antenna, but is available with a 900 MHz Dipole Antenna.

To mount the 418 MHz Dipole Antenna or 900 MHz Dipole Antenna, peel off the protective film from the adhesive pad and stick the antenna to a wall or other non-metallic support so that antenna is vertical for best reception. Antenna's should be mounted as far away from metal plates or bars as possible to avoid RF energy being reflected back or blocked on the other side of the metal. An antenna will not work inside a metal box. Mounting to drywall between studs, ceiling tiles, brick, or concrete is very common.

Transmission distance performance will vary based on environment. 100 feet is the maximum that can be expected if there are no obstructions. In general, each obstruction will half the expected transmission distance. Obstructions include but are not limited to;

walls, partitions, floors, ceilings, doors, tinted glass, ground, many people, vehicles, foliage, rain, snow and fog. Metal (solid or screen) blocks the RF signal preventing propagation but also can bounce the signal around the potential obstacle. Wood, drywall, plaster, brick, and concrete attenuates the signal but will let it pass (if it's not too thick) at a reduced signal strength. Anything that holds water absorbs the signal to the point of blockage like rain, fog, people, ground, dense foliage etc. Elevator shafts and stairwells usually block RF signals.

The 900 MHz "Whip" Antenna simply screws onto the 900 MHz Receiver or the Repeater. Mounting the antenna on a metal surface may limit reception from behind the surface.



**Note:** The Dipole antennas above are displayed horizontally to show dimensions but they should be mounted vertically for best reception.



### Mounting of the 418 MHz Receiver, 900 MHz Receiver and Analog Output Modules

The 418 MHz Receiver, 900 MHz Receiver and Analog Output Modules can be mounted in snap track, DIN Rail or surface mounted. The text and figures refer to the 418 MHz Receiver, but the mounting process is the same for both receivers.

#### **SNAPTRACK MOUNTING**

Push in the blue mounting tabs on the bottom of the receiver and output modules. These units will now fit into the board slots of 2.75" snap track. Insert the receiver at the far left of the snap track, then insert each analog output module and slide it to the left until its connectors are fully mated into the receiver or the next analog output module. You may attach up to 127 analog output modules to a receiver.

If your output modules cannot fit in one piece of snap track, then mount another piece of snap track nearby and insert the additional modules. Connect wires from the right side of the first string of modules to the left side of the second string of modules on the second snap track. (See "Extending the RS485 Network" on pg. 5.) This configuration requires one or more Pluggable Terminal Block Connector Kits (BA/AOM-CONN).

#### **DIN RAIL MOUNTING**

Push out the blue mounting tabs on the bottom of the receiver and output modules. These units will now snap onto DIN Rail. Catch the EZ mount hook on the edge of the DIN rail as shown in Fig 8. Then rotate into place.

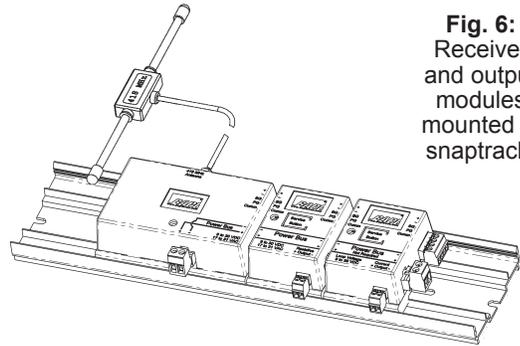
Attach the receiver at the far left of the DIN Rail, then attach each analog output module and slide it to the left until its connectors are fully mated into the receiver or the next analog output module. You may attach up to 127 analog output modules to a receiver.

If your output modules cannot fit onto one piece of DIN Rail, then mount another piece nearby and attach your additional modules. Connect wires from the right side of the first string of modules to the left side of the second string of modules on the second DIN Rail. (See "Extending the RS485 Network..." on pg. 5.) This configuration requires one or more Pluggable Terminal Block Connector Kits (BA/AOM-CONN).

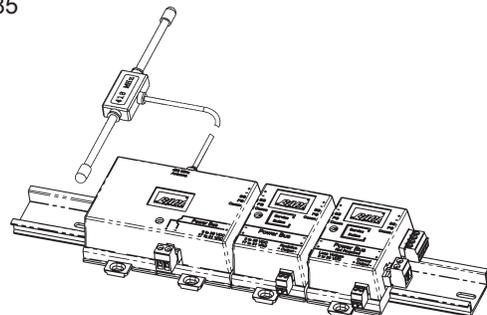
#### **SURFACE MOUNTING**

Push out the blue mounting tabs on the bottom of the receiver and output modules. Attach the receiver to the surface by inserting a screw in each blue tab. Attach Analog Output Modules by placing each one against the surface and sliding it to the left until its connectors are fully mated into the receiver or the next analog output module. Attach each module to the surface with two screws, one in each blue tab. You may attach up to 127 analog output modules to a receiver.

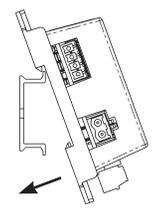
If your output modules cannot fit in one straight line on the surface, then mount a second string of modules nearby. Connect wires from the right side of the first string of modules to the left side of the second string of modules. (See "Extending the RS485 Network..." on pg. 5.) This configuration requires one or more Pluggable Terminal Block Connector Kits (BA/AOM-CONN).



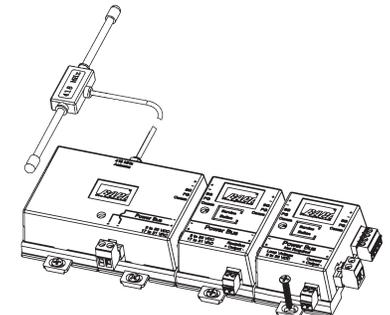
**Fig. 6:** Receiver and output modules mounted in snaptrack.



**Fig. 7:** Receiver & output modules mounted on DIN Rail.



**Fig. 8:** Catch the EZ Mount hook on the edge of the DIN Rail, then rotate into place.



**Fig. 9:** Receiver and output modules surface mounted.

### Wireless Temperature Transmitter Specifications

**Supply Power:** Two AA 3.6V Lith. batteries, 2.25 AH  
5 to 8 year battery life at 20 second transmit rate

**Temperature Input:** Thermistor

**Accuracy:** ±0.54°F (±0.3°C)

**Transmitted Range:** -40 to 185°F (-40 to 85°C)

**Antenna:** Built inside the enclosure

**Dimensions:** Shown at the bottom of page 1

**Environmental Operation Range:**

Temp: 32° to 140°F (0° to 60°C)

Humidity: 5% to 95% RH non-condensing

**Enclosure Material & Rating:** ABS Plastic, UL94 V-0

**Radio Frequency:** 418 MHz North America

**Transmitter Interval:** ~20 seconds

#### **FCC Approval #:**

- T4F061213RSO (418MHz Room Transmitter Only)
- T4F060811TEMP (418MHz Temperature Probe Only)
- T4F060811RH (418MHz Temp & Humidity Probe Only)
- OUR9XSTREAM (Repeater Unit Only)

**Compliance:** This device complies with Part 15 of the FCC rules  
Operation is subject to the following conditions.

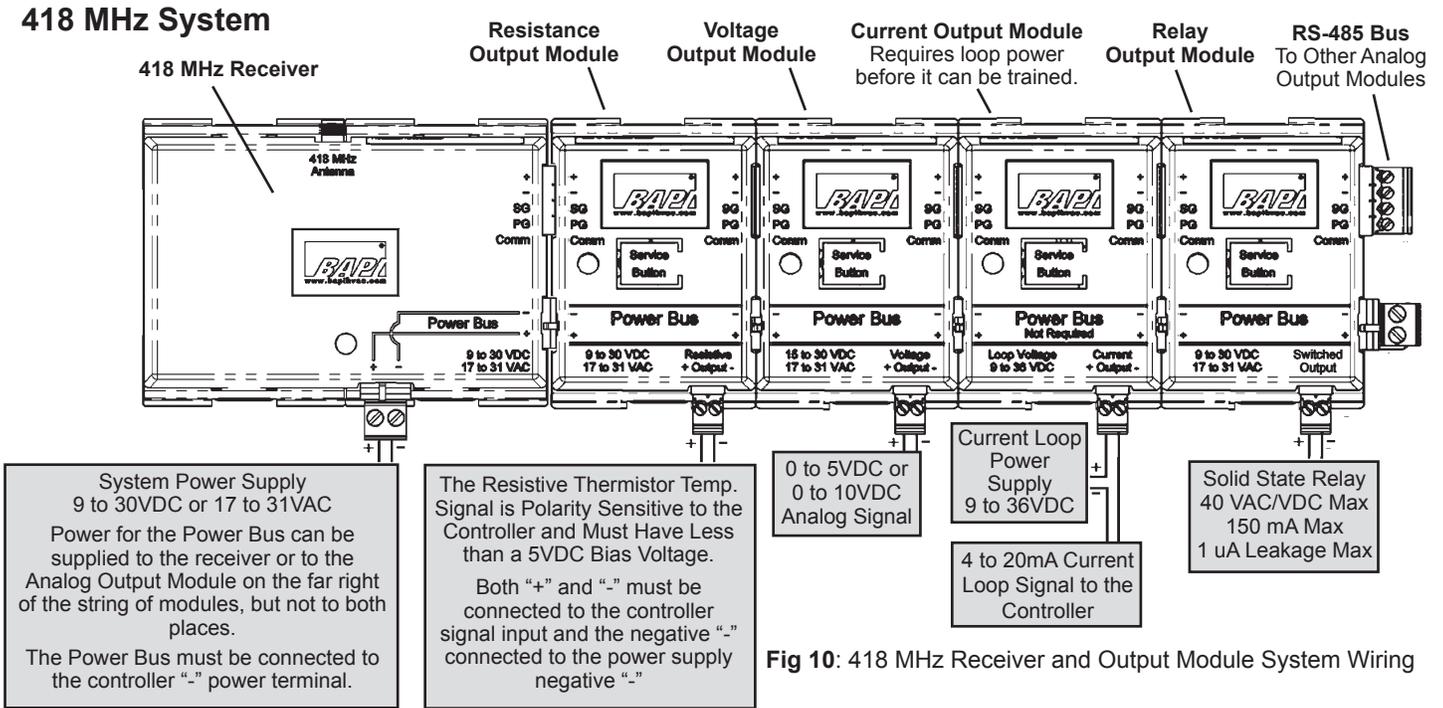
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

#### **FCC Radio Frequency Interference Statement:**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15, Subpart B, of the FCC Rules. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause interference to radio communications.

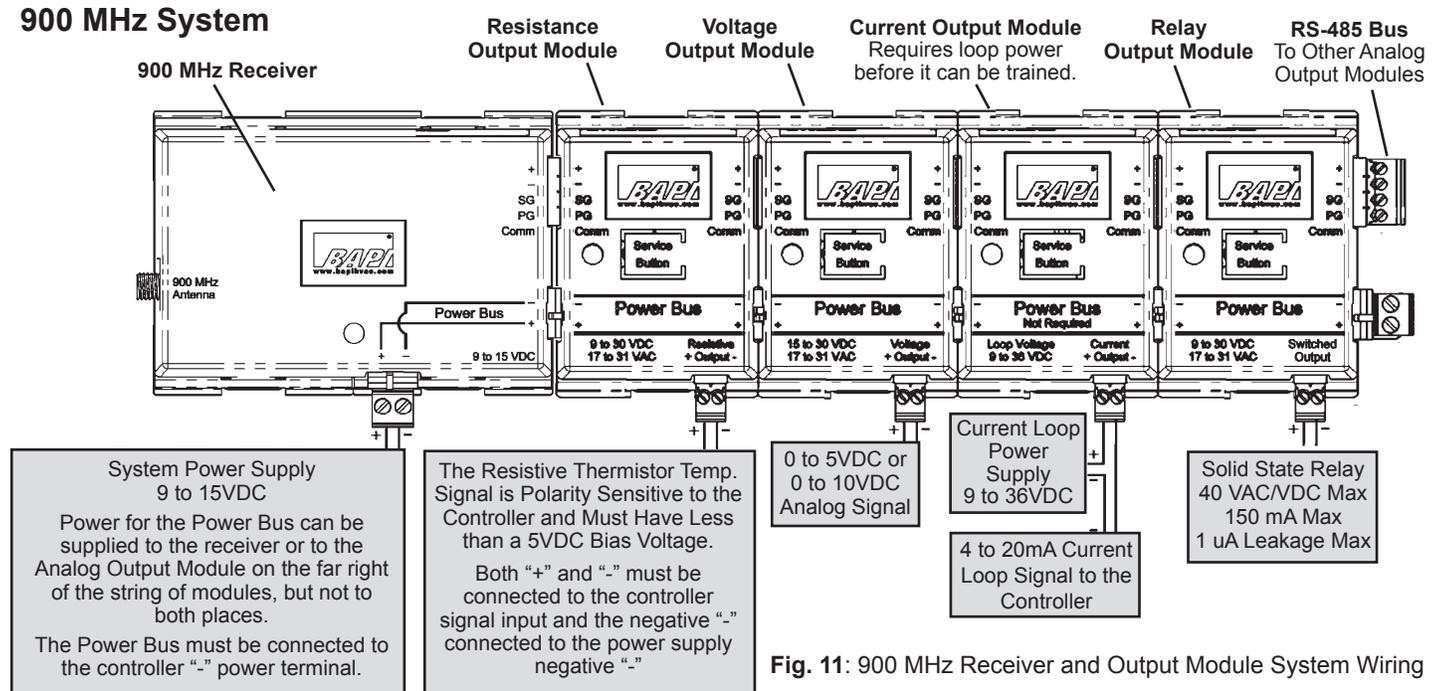
Specifications subject to change without notice.

### 418 MHz Receiver and 900 MHz Receiver with Analog Output Modules Termination



#### Termination Notes for 418 MHz and 900 MHz Systems:

1. The wireless receiver and Analog Output Modules are interconnected and require module power along the "Power Bus" terminals. The bus can be powered from either the receiver end on the left or the last output module on the right side. Be sure you have enough DC current or AC VA for all the devices on the bus.
2. The **Current Output Module (BA/COM)** signal is **LOOP POWERED** and must be externally powered with 9 to 36 VDC separate from the Power Bus. The Loop Power must be connected to the Current Output Module before it can be trained.
3. Be sure to follow the polarity (+ or -) symbols listed on each receiver and the output modules to maintain communication and Power Bus integrity.

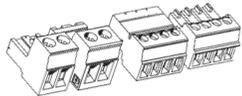


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### Extending the RS485 Network between the Receiver and the Analog Output Modules

The Analog Output Modules may be mounted up to 4,000 feet away from the receiver. The total length of all the shielded, twisted pair (TSP) cables shown in Fig 12 is 4,000 feet (1,220 meters). Connect the terminals together as shown in Fig 12. If the distance from the receiver to the group of Analog Output Modules is greater than 100 feet (30 meters), provide a separate power supply for that group of Output Modules. BAPI's VC350A-EZ Voltage Conv. and a small transformer are a perfect solution.

**Note:** This configuration requires one or more Pluggable Terminal Block Kits for the extra wire terminations on the left and right side of the Output Modules. Each kit includes 4 connectors.



Pluggable Terminal Block Kit (BA/AOM-CONN)

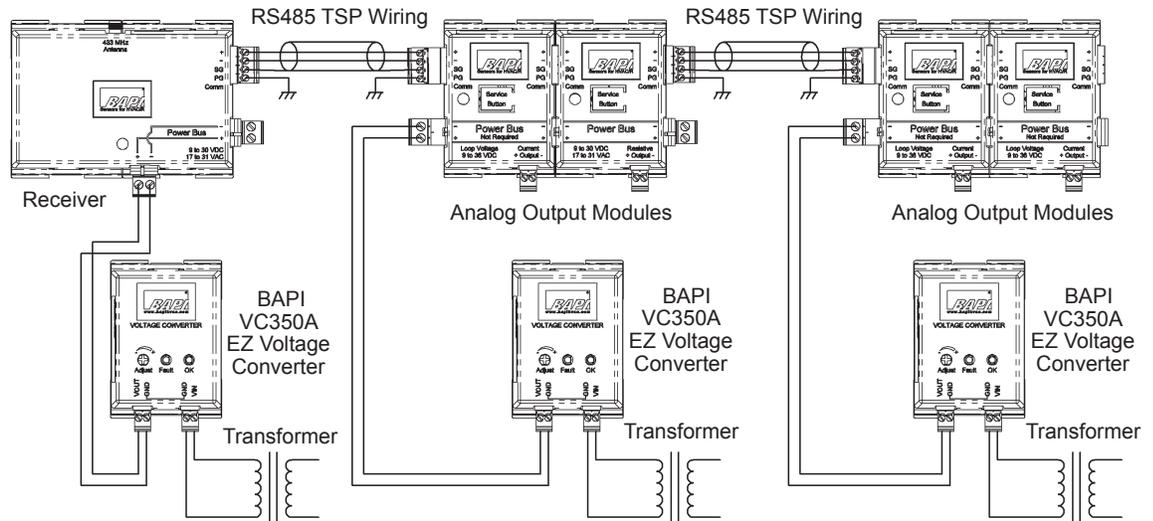


Fig. 12: Extended RS485 Network between the Receiver and the Analog Output Modules

### Wireless System Diagnostics

#### Possible Problems:

Temperature or Humidity is reading its low limit or high limit, or the LED at the top of the Analog Output Module is blinking rapidly:

Temperature or Humidity reading is coming out the wrong output module

Temperature or Humidity reading is incorrect

#### Possible Solutions:

- Check for proper wiring and connections from the output modules to the controller.
  - Check to see if the controller's software is configured properly.
  - Check for proper power to the receiver, repeater (if used) and output modules.
  - Retrain the Analog Output Module.
  - Check that the associated transmitter is transmitting (the LED will flash about once every 20 seconds when it transmits). If not, replace the batteries. Check that the associated receiver is receiving the transmissions (its LED will blink right after the transmitter LED if it receives that transmission.) If it is not receiving the transmissions, move it closer to the transmitter or reposition the antenna for maximum reception.
- Note:** The receiver will receive transmissions from all transmitters that are within range, not just the one you are testing.

- Retrain the Analog Output Module.

- Check for proper wiring and connections from the output modules to the controller.
- Check to see if the controller's software is configured properly.
- Check to see if the correct output module is connected to the correct controller.

#### Analog Output Module Default Status when Wireless Transmission is Interrupted:

If an output module does not receive data from its assigned transmitter for 15 minutes, the red LED on the top of the module will blink rapidly. If this happens, the individual Analog Output Modules will react as follows:

- Resistance Output Modules (BA/ROM) calibrated for temperature will output the highest resistance in their output range.
- Voltage Output Modules (BA/VOM) calibrated for temperature will set their output to 0 volts.
- Current Output Modules (BA/COM) calibrated for temperature will set their output to 4 mA.
- Voltage Output Modules (BA/VOM) calibrated for humidity will set their output to their highest voltage (5 or 10 volts).
- Current Output Modules (BA/COM) calibrated for humidity will set their output to 20 mA.
- Setpoint Output Modules (BA/SOM) will hold their last value indefinitely.
- Relay Output Modules (BA/RYOM Units Only) will go to their default state (example: open for a normally open unit).

When a transmission is received, the output modules will revert to normal operation in 60 seconds or less.

Specifications subject to change without notice.