



Product Support Bulletin



D-500 Transmitters Antenna Maintenance

When our Product Support Group receives calls from Radio Alarm System customers who have difficulty establishing reliable communication between the Central and a transceiver installed in the field, the solution is most often found by inspecting the antenna installation. The following test of the installed system can help identify the source of the communication problem.

Tools Required: Radio Frequency Wattmeter with 50-ohm load & Digital Volt Ohm Meter

Incorporating the following in a regular preventive maintenance or inspection program will go a long way towards preventing communication problems.

First start with a physical inspection:

- 1) Ensure that the antenna mast and lightning arrestor are properly grounded.
- 2) Inspect the antenna for proper mounting.
- 3) Ensure that no part of the Antenna is making contact with the building, trees or other foreign object.
- 4) Inspect the antenna cable for any damage, cuts or splices. If such conditions exist, replace the cable immediately.
- 5) Perform two forward and reflected power measurements: The following paragraphs will describe in detail how to perform the procedure on various Monaco Products.
 - a) First, using the 50-ohm "Dummy Load."
 - b) Second, using the installed antenna system as a load.
- 6) If your antenna system is marginal or bad, as determined by the forward and reflected power measurement, perform the following.
 - a) Ensure that all antenna cable connections are clean, tight and free of any corrosion.
 - b) Ensure that the coaxial cable connection at the base of the antenna is properly weather sealed.
 - c) Check that all antenna elements are installed and the setscrews securing the elements are tight.
 - d) Ensure that the center whip element is "cut" to the correct length for your operating frequency. Every antenna shipped from Monaco Enterprises Inc. is uncut and includes antenna-cutting instructions. Contact Monaco Enterprises Inc., if you need to cut the antenna and do not have the cutting instructions.
 - e) Perform forward and reflected power measurements.

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An open or shorted coaxial cable can also cause communication problems. The following steps describe how to measure the continuity of the antenna cable and connections.

- 1) Remove power from the transceiver that is being tested. AC power first, then battery power.
- 2) Disconnect the antenna coaxial cable from the transceiver.
- 3) Use the Digital Multi-Meter to measure the resistance from the center conductor to the shield of the coaxial connector.
- 4) This reading should be less than 10 ohms of resistance with the antenna properly connected.
- 5) Disconnect the cable from the base of the antenna and repeat.
- 6) This measurement should be an infinite resistance (open).
- 7) If any of the readings are not as indicated, then inspect the coaxial cable for a broken (open) or shorted (center conductor to shield or ground) center conductor.
- 8) When the above procedure is completed, re-connect the antenna system.
- 9) Re-apply power to the transceiver. Verify proper communication by having the BT2 interrogated by the D-500 Plus/D-700 Central Station Receiving System.

The following pages outline in detail the procedure for measuring forward and reflected power on various Monaco Products.

Warnings:

If the transmitter has been keyed up (on) for 10 sec, key it down (off) for 10 sec before making another measurement. Do not key up any transmitter for more than 60 seconds.

Measuring Forward and Reflected Power

Forward and reflected power measurements are used to test the efficiency of both the transmitter and the antenna. Reflected power should never be greater than 10% of the measured forward power. A typical forward power measurement is 3 to 5 watts; a typical reflected power measurement is less than 0.2 watts.

To measure forward and reflected power

1. Set the wattmeter switch to the forward position (center arrow pointing from left to right).
2. Disconnect the antenna coaxial cable from the BNC connector on the transceiver.
3. Connect a jumper coaxial cable to the wattmeter input and to the connector on the transceiver.



4. Connect the antenna coaxial cable to the wattmeter output connector.
5. Initiate a key up test of the transmitter. Refer below for specific instructions.
6. Observe and record the forward power indication on the wattmeter. The nominal reading is 3 to 5 watts.
7. Rotate the wattmeter switch to the reverse position (Center arrow pointing from right to left).
8. Repeat the key up test.

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9. Observe and record the reflected power indication on the wattmeter. An acceptable reading is 10% or less of the forward power reading with 0 watts reflected being perfect.
10. Repeat the above steps only with the 50 ohm dummy load connected to the antenna side of the wattmeter. The readings should be 3 to 5 watts forward, and 0 watts reflected.

BT2-3 Building Transmitter

To manually control how long the transmitter is keyed up:

1. Remove the antenna and connect the wattmeter, select forward power setting.
 - a. Press and hold the white “TEST” button on the CPU that is located on the inside of the front door of the enclosure.
 - b. Release the white TEST button after about three seconds and watch the “SEND” LED which is right above the white button.
 - c. When the “SEND” LED turns ON press and HOLD the red “RESET” button which is directly below the white test button.
 - d. Make the forward power measurement and release the red button.
 - e. Select the reflected power setting on the wattmeter.
 - f. Press and hold the white “TEST” button, on the CPU, for three seconds.
 - g. When the “SEND” LED turns on, press and hold the red “RESET” button.
 - h. Make the reflected power measurement and release the button.

NOTE: if the transmitter remains keyed up for longer than 20 or 30 seconds, a radio disconnect will occur indicated by the transmitter disconnect LED lighting which is located near the antenna connection on the power supply. To reconnect the radio power, press S2, the “POWER RESET” button, located directly below the transmitter disconnect LED.

2. Remove the wattmeter from the circuit and reconnect coax to the antenna.
3. Final Testing: Poll the BT2-3 and verify it answers the interrogation.

BT2-4 Building Transmitter

To manually control how long the transmitter is keyed up:

1. Remove the antenna and connect the wattmeter, select forward power setting.
 - a. Dial the rotary switches to “0004”.
 - b. Put the unit in diagnostics: Move the “BT2 SETUP OPTIONS” dipswitch labeled “NORMAL” to the UP/off position.
 - c. Display reads “ddd4”.
 - d. Press and release the blue “ENTER SELECT” button to key up the transmitter.
 - e. Make the forward power measurement. Press and release the blue button to key down the transmitter.
 - f. Select the reflected power setting on the wattmeter.
 - g. Press and release the blue “ENTER SELECT” button to key up the transmitter.
 - h. Make the reflected power measurement. Press and release the blue button to key down the transmitter.

NOTE: if the transmitter remains keyed up longer than 30 seconds, a radio disconnect will occur. To reconnect the radio power, press S2 below the AC fuse after keying down the transmitter by pressing the blue Enter Select button.

- i. Dial the rotary switches back to “0000”, display reads “ddd0”

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- j. Move the “BT2 SETUP OPTIONS” dipswitch labeled “NORMAL” to the down/on position.
2. Remove the wattmeter from the circuit and reconnect coax to the antenna.
3. Final Testing: Poll the BT2-4 and verify it answers the interrogation.

M-1 Conventional FACP with Building Transmitter

To manually control how long the transmitter is keyed up

1. Remove the antenna and connect the wattmeter, select forward power setting.
 - a. Put the M-1 in diagnostics. From the Main Menu, go to #9 “ONLINE/OFFLINE” by pressing “9” “ENT”
 - b. Select #3 “DIAGNOSTICS (OFFLINE)”. Enter password and press “ENT”.
 - c. Once in Diagnostics, select #11 “RADIO TESTS” by pressing “1” “1” “ENT”
 - d. To key up the radio, select #1 “RADIO KEYUP W/TONE” by pressing “1” “ENT”
 - e. Make the forward power measurement.
 - f. Press any key, EXCEPT “ENT”, to key down the transmitter.
 - g. Select the reflected power setting on the wattmeter.
 - h. To key up the radio, select #1 “RADIO KEYUP W/TONE” by pressing “1” “ENT”
 - i. Make the reflected power measurement.
 - j. Press any key, EXCEPT “ENT”, to key down the transmitter.

NOTE: If the transmitter remains keyed up for longer than 30 seconds the radio disconnect will occur. To reconnect the radio, key down the radio by pressing any key, EXCEPT “ENT”, then press “XMTR RESET” on the keypad.

- k. Exit #1 RADIO TESTS, press “0” (zero) “ENT”.
- l. Exit the DIAGNOSTIC Menu and return to the Main Menu, press “0” (zero) “ENT”.

NOTE: Inactivity on the keypad will allow the M-1 to time out, exit the diagnostic mode, and return to the Main Menu.

2. Remove the wattmeter from the circuit and reconnect coax to the antenna.
3. Final Testing: Poll the M-1 and verify it answers the interrogation.

MAAP-1 Addressable FACP with Building Transmitter

To key up the transmitter for ten seconds:

1. Remove the antenna and connect the wattmeter, select forward power setting.
 - a. From the Main menu, go to #2 “MAINTENANCE” by pressing “2” “ENT”. Enter the password and press “ENT”.
 - b. All troubles must be silenced to enter the main menu.
 - c. Select #5 “RADIO KEYUP TEST” by pressing “5” “ENT”.
 - d. Select #1 “ACCEPT” by pressing “1” “ENT”. The transmitter keys up for 10 seconds.
 - e. Make the forward power measurement.
 - f. Select the reflected power setting on the wattmeter.
 - g. Select #5 “RADIO KEYUP TEST” by pressing “5” “ENT”.
 - h. Select # “ACCEPT” by pressing “1” “ENT”. The transmitter keys up for 10 seconds.
 - i. Make the reflected power measurement.
 - j. Press “0” (zero) “ENT” to exit the Maintenance Menu
 - k. Press “0” (zero) “ENT” to return to the Main Menu

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NOTE: Inactivity on the keypad will allow the MAAP-1 to time out, exit the maintenance mode, and return to the Main Menu.

2. Remove the wattmeter from the circuit and reconnect coax to the antenna.
3. Final Testing: Poll the MAAP-1 and verify it answers the interrogation.

Typical readings and trouble shooting hints:

Forward Power	Reflected Power	Notes
4 to 6 watts	0.3 watts or less	NORMAL. For all VHF band radios (170 MHZ and less) and most UHF band radios (400 MHZ and above).
2 watts	0.1 watts or less	For some UHF band radios operating in the 420 to 425 MHZ range, this is a normal reading. If you are unsure of your typical UHF transmit values contact Monaco Enterprises
Less than 4 watts	Less than 0.3 watts	*See Below.
4 watts or more	0.5 watts or more	Reflected power is to high: There is a problem with the antenna: <ol style="list-style-type: none"> 1. Check all antenna connections 2. Check the lightning arrestor (if one is installed) 3. Verify Antenna is trimmed to the correct freq. The installation instructions that come with the antenna have information on trimming the antenna. 4. Verify that the antenna coaxial cable is not damaged. 5. Verify the Antenna is not installed close to power lines or making contact with the building.
4 watts nominal	4 watts nominal	<u>Stop transmitting immediately!</u> There is either a direct short or direct open to the antenna line.

*Normal RF power readings can be 3 to 4 watts nominally, depending on the accuracy of your wattmeter. Radio Wattmeter's will have the highest degree of accuracy when the display shows a full-scale deflection. To ensure that your meter is as accurate as possible:

1. Make sure the meter is calibrated at least annually.
2. Take several measurements of like transmitters. This will give you a "baseline" value of how accurate your meter measures RF. This means that readings as little as 3 watts could be normal for your wattmeter.
3. Use and store the meter with care. The display is referred to as a "jewel meter movement" and is sensitive to shock and severe vibrations

High-reflected power is always a result of the antenna system. The "Antenna System" is everything that leaves the transmitter out to the antenna I.E. Coaxial cable, connectors, lightning arrestor and the antenna itself. A Monaco Transceiver that is permitted to continue operating on a faulty antenna will cause the transmitter to degrade to the point of complete failure. Any failure to a transmitter that is a result of an improperly installed or damaged antenna is not covered by warranty.

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