APPLICATION NOTE 071c

TITLE: Fault Detection of Networked Radios

This application note describes several techniques to verify networked radio operation in the field with minimal test equipment.

Before proceeding with tests:

• Check that the antenna has not been damaged.
• If an antenna feed cable is used, visually check the cable for damage.
• Check that the antenna connector and other connectors are free from corrosion.
• Check that the power supply is connected to a working outlet.
• Check that the green LED lights when the power is connected to the radio.

Substitution Method.

The most effective method is by substitution, provided that a complete set of spare equipment is available.

A remote radio modem must be substituted with a remote radio modem, and a network controller must be substituted with a network controller. Remote radio part numbers begin, in general, with 601- or 603-. Network controller part numbers begin with 602- or 604-.

The presumption is that the spare radio modems' configurations have been properly set, and are not in the default configuration. If not, determine the communication port characteristics of the equipment the radios are connected to. Configure the radios to match those parameters using a PC and a terminal communications program.
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Substitute one of the suspected faulty remote radios with a radio with a similar part number; i.e., a 601- with a 601- radio, etc. If communication is restored, then the faulty radio is identified. If not, put the original radio back, and repeat the procedure with the network controller. If communication is not restored, there might be failures in both radios (which is unlikely), in which case you can swap both spares. If after swapping both spares communication is not restored, the problem could either be with:

• the power supply.
• the data cable.
• the antenna.
• some other part of the system.

Verification with no spare radio modems.

If no spares exist, then the following two (2) levels of testing may be used:

1. Basic radio link test that can be performed while the equipment is in place; and
2. Data transfer tests to confirm communication port functionality.

These tests presume the system had been working at one time and there has been a suspected failure. Further, there is a suspicion that the radios could be at fault.

Before proceeding with the tests, be sure:
• That the antenna has not been damaged.
• If an antenna feed cable is used, visually check the cable for damage.
• Check the antenna connector and other connectors are free from corrosion.
• Check that the power supply is connected to a working outlet.
• Check that the green LED lights when the power is connected to the radio.

TEST #1. Verification using LED's.

Each radio modem has a green LED. It is usually located on the surface of the box with the antenna connector. The green LED has several functions.

• During power up, it will light and stay lit for about 2-3 seconds.
• Steady blinking indicates there is a message in the send queue of that radio.
• A rapid blinking is associated with the default (configuration) plug operation.

Background:
When a remote radio is powered up with the network controller turned off, the green light will remain on for about 2-3 seconds, and then start blinking. The blinking is an indication that an initialization message is attempting to be sent from that radio to the network controller. Since the network controller is not on, the message remains in the send queue, and the LED continues to blink. When the network controller is turned on, its LED turns on for 2-3 seconds, both radios now communicate with each other, and each send their initialization message to the other. Consequently, the send queues are cleared, and the blinking should stop on the remote radio. The LED may continue to blink on the network controller if the Link Quota is greater than 1, and other radios in the network have not been turned on. The LED indicator on the network controller is not usually a good indicator of network status, only that messages are pending to be sent.

If the remote radios are still connected to terminal equipment, and that terminal equipment is sending out any data to the radio, then that radio's LED will blink while data is in the send queue.

The LED test is a basic test to insure the radio's transmitter and receiver are functioning.

Disconnect the cables from the terminal equipment. Power a remote radio by connecting the cable with the power adapter to the radio. Notice the operation of the LED (steady for 2-3 seconds, then blinking). Power the network controller. The network controller's LED will turn on steady for 2-3 seconds, and may continue to blink. The remote radio's LED should stop blinking.

When the remote LED's quit blinking, that is an indication they are communicating with each other. The test is passed. If the remote radio LED's remain blinking, there is most likely a problem with the radios.

TEST #2 Data Transfer Verification using a PC and a loopback connector.

This test concentrates on data transfer and the integrity of the communication port.

Connect each remote radio to a loop back connector. Information on the loop back connector is found in our installation manual which can be downloaded from www.monicor.com. If the radio is powered with a power adapter that is wired in to the communication cable, place the loop back connector at the terminal end of the communication cable, leaving the end of the cable connected to the radio with the power adapter.

Connect the network controller to a PC. Run a communication program on the PC. If you use our program, HOST.COM, the radios should be connected to COMM 1.

Set the baud rate of the communications program to the known settings of the radios, if different than 9600 N 8 1. If HOST.COM is used, use the ALT P command to change baud rates.

Press the F7 & F9 function keys to disable flow control checking.

Enter the escape from data transfer sequence: <1 second> +++ <1 second>.

An "*" prompt should appear. This verifies that the baud rate settings are correct.

Verify that the profile is Transparent, and that hardware flow control is selected:
Set Flow control = 3

Check the status of the radio. Type S *<CR>. Status will be returned, and there should be 0 packets in the send and receive queues of the remote radios.

Re-enable flow control checking by pressing the F8 and F10 function keys.

Put the network controller in data transfer by typing C <CR>. This connects the network controller to remote radio 01.

Type a character. The character should make the round trip from the network controller to the remote radio, and back again, due to the loop back connector on the remote radio.

Change the circuit by typing <#02#>. Type the characters rapidly, within 1 second of each other, or they will be interpreted by the network controller as simply data, and a circuit switch will not be made. The network controller will respond by returning the characters "#02#" back if the circuit switch has been successfully made.

Repeat the above test of typing a character to insure a round trip transfer of the character.

Repeat for as many radios that are on the network.

The program HOST.COM has a provision for transferring a file of data, accessible using the PgUp key. Any text file can be sent, provided that file is located in the same subdirectory as the HOST.COM program itself. Type in the file name and send with a <CR>. The file will be transferred, and again returned after making the round trip. The data will be displayed on the screen as packets of data. A timer will display the elapsed time for the file to leave the PC.

Send the file of data for each of the remote radios on the network. The timer can be used to compare that the times for each radio are approximately the same.

This test verifies that the communication ports are functioning properly.