

## **APPLICATION NOTE 067**

**TITLE: Site surveys when using demonstration equipment.**

It is simple to determine if the radios will provide the coverage you desire. There are several simple tests that you can make to determine the system margin, i.e. the reserve signal strength of the radio network.

1. Loop-back test.
2. Audio SINAD test.
3. Point-to-point test.

1. The first is probably the simplest and most accurate. The theory is to send data into one radio, transmit it to a second radio, loop-back the data so it returns to the first radio. If the radios are working properly, the messages are transferred in both directions. By separating the radios, there will be a point where noise will start to corrupt the signal transmission, and the looping back of data will slow down. If the radios are separated further, the data transmission stops.

Configure the radios first. You will be using the HOST.COM program, QMODEM, or some other suitable communications program on the PC. Set the radios to the transparent profile (which enables hardware flow control). Use the Write command if you will be turning the radios on and off.

Create a text file that you can use to send through the radios during a test. It is helpful to create a file that has some pattern recognition, like the following line:

```
Line 1 00000000001111111112222222223333333333444444444555555555566666666666  
Line 2 00000000001111111112222222223333333333444444444555555555566666666666  
Line 3 00000000001111111112222222223333333333444444444555555555566666666666  
etc.
```

Store this file in the same subdirectory as the HOST.COM program.

Create a loop-back connector (connect pins 2-3 and 4-8 on a DB-9 connector) and install it on the stationary radio. Locate the stationary radio where one of the radios will be located.

Connect the second radio to a laptop PC. Run the HOST program. Type a character or two to test the radios. After a short delay, the character typed will appear on the screen.

Then, using the PgUp key, you can send a file of data. When files of data are sent, the radios will break the files up into packets of data. A packet of data will be more difficult to transmit over distance than a single character, since the length of the radio packet will be longer for 32 characters

(or whatever the packet length is set to) than a single character. As the file is being sent, it will be looped-back at the other radio, and will start being displayed on the PC screen.

Take the radio and laptop to the various locations you wish coverage and perform the file transfer. Data should transfer as steadily as if the radios were near each other.

Then, continue to take the radio and laptop away from the other radio, until the data transfer starts to slow down. This distance should be about 1.5 times the distance of the point you want coverage. If it is not, then an external antenna is recommended.

2. The second test is an audio test, and requires an external audio amplifier. Radio Shack sells a small portable audio amplifier which works well. Connect the audio output of the radio (Pin 9) to the audio input of the amplifier. Connect ground (Pin 5 on the radio) to the audio amplifier ground.

Turn on the audio amplifier and connect it to the remote radio (the "B" radio if a point-to-point radio). There should be only static or noise.

Turn on the network controller (or the "A" radio in a point to point system), and you will hear "polling", a repetitive type sound. Connect the network controller to a PC, start the Host program (or equivalent), and put the radio into a transmit test mode, where it transmits a tone. Use the sequence:

faerbtst ^x (all lower case, where ^x means CONTROL x).

You will hear beeps as you enter the command, but continue. You can then enter 3 options: N, H, F (No modulation, Half modulation, Full modulation).  
Type F.

The transmitter will come on, indicated by a solid green led light, and an audio signal on the audio amplifier. Take the remote radio with the audio amplifier to locations around the site. When the signal is weak, the tone will be combined with noise. When out of range, only noise will be heard. When the mixture of noise and signal is approximately half and half, that will be the coverage area.

3. The third method is to actually connect the equipment that will be eventually used. This is the final test to insure proper coverage, but is the most bulky.

Please call if you experience any difficulty with any of the above tests.