Using FreeWave Spread Spectrum Radio Modems to Tail-End an MAS Radio Network

November 8, 2000

As radio licenses become more difficult to obtain, it may be advantageous to consider using FreeWave license-free spread spectrum radio modems to extend an existing licensed MAS radio network. This application note describes one technique that has been used successfully in field applications to connect a network of FreeWave spread spectrum modems to an MAS network.

A FreeWave radio modem is ready to accept and transmit data the moment that data is applied to its RS-232 port. Depending on the manufacturer and model, however, MAS radios may require a delay between the time that the transmitter is keyed and the time that the radio is ready to accept data. Keying of the MAS radio is normally accomplished by raising the RTS line on its RS-232 port. The MAS radio signals its readiness to accept data by raising the CTS line. For proper operation, a connection between the MAS radios RTS and CTS lines must be made from the FreeWave master radio to the devices connected to each FreeWave slave radio. This requires the activation of two functions in the FreeWave radios and rewiring of the RS-232 connections to the master and slave radios.

Equipment Required
9-Wire shielded RS-232 cable (2)
RS-232 9-pin male connector blocks (2)
RS-232 9-pin to 25-pin adapter (optional if connection is to 25 pin RS-232 port)

Programming the FreeWave Radios

Activate the RTS to CTS mode on the FreeWave master radio by setting menu item 7 in the Radio Parameters menu to 1.

Activate the DTR Connect function on the FreeWave slave radio(s) by setting menu item 4 in the Multipoint Parameters menu to 1.

RS-232 Wiring Diagram

If the FreeWave slave radio is connected to a DTE device with a 9-pin RS-232 connector, configure the RS-232 cable as follows:

DTE Device				FreeWave
Pin Number	Function	Connect To	Pin Number	Function
2	Tx Data		2	Tx Data
3	Rx Data		3	Rx Data
7	RTS		4	DTR
5	Signal Ground		5	Signal Ground
8	CTS		8	CTS

If the FreeWave slave radio is connected to a DTE device with a 25-pin RS-232 connector, configure the RS-232 cable as follows:

DTE Device				FreeWave
Pin Number	Function	Connect To	Pin Number	Function
2	Tx Data		2	Tx Data
3	Rx Data		3	Rx Data
4	RTS		4	DTR
7	Signal Ground		5	Signal Ground
5	CTS		8	CTS

FreeWave Technologies, 1880 S. Flatiron Ct., Boulder, CO 80301
Phone: (303) 444-3862, Fax: (303) 786-9948, www.freewave.com
LAN5410AA   Rev B

Page 2 of 4

Using FreeWave Spread Spectrum Radio Modems to Tail-End an MAS Radio Network

November 8, 2000

If the FreeWave master radio is connected to an MAS radio (DCE device) with a 9-pin RS-232 connector, configure the RS-232 cable as follows:

FreeWave				MAS Radio
Pin Number	Function	Connect To	Pin Number	Function
1	Carrier Detect		7	RTS
2	Tx Data		3	Tx Data
3	Rx Data		2	Rx Data
5	Signal Ground		5	Signal Ground
7	RTS		8	CTS

If the FreeWave master radio is connected to an MAS (DCE device) with a 25-pin RS-232 connector, configure the RS-232 cable as follows:

FreeWave				MAS Radio
Pin Number	Function	Connect To	Pin Number	Function
1	Carrier Detect		4	RTS
2	Tx Data		3	Tx Data
3	Rx Data		2	Rx Data
5	Signal Ground		7	Signal Ground
7	RTS		5	CTS

FreeWave Technologies, 1880 S. Flatiron Ct., Boulder, CO 80301
Phone: (303) 444-3862, Fax: (303) 786-9948, www.freewave.com
LAN5410AA Rev B

Page 3 of 4

Using FreeWave Spread Spectrum Radio Modems to Tail-End an MAS Radio Network

November 8, 2000

How it works

The remote device connected to a FreeWave slave radio raises the RTS line. This causes the DTR line on the slave radio to go high. As soon as the FreeWave master radio is available, it will connect to the slave radio. When a connection is established between the slave radio and the master radio, the master radio's carrier detect line will go high. This causes the RTS line on the MAS radio to go high. When the master radio is ready to accept data, its CTS line will go high which raises the RTS line on the FreeWave master radio. This causes the CTS line to go high on the FreeWave slave radio, which raises the CTS line on the remote device allowing data to be transmitted. When the data transmission is complete, the remote device lowers its RTS line, which causes the FreeWave radios to disconnect and the MAS radio to stop transmitting.

Notes:

The DTR connect function does not pass through a FreeWave repeater. This application will only work on FreeWave networks that do not have one or more repeaters between the master and slave radios.