

Application Note #5426

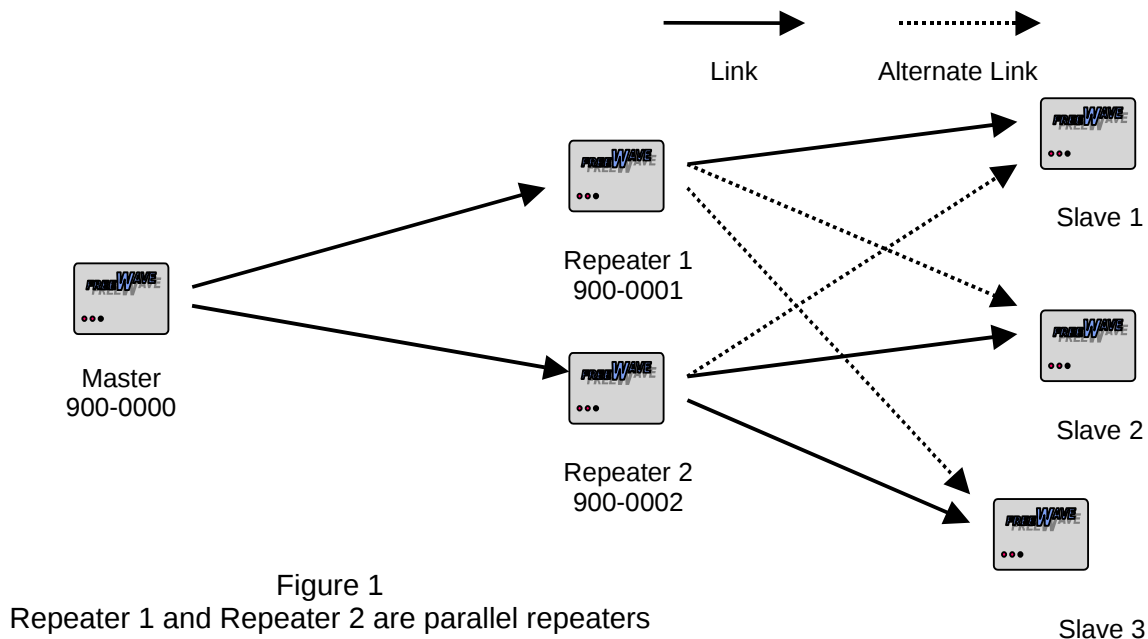
Creating Redundant Repeater Paths in Multipoint Networks

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Losses of communications in FreeWave radio networks, although rare, can be caused by lightning damage, power interruptions or other equipment failures. If such a failure should occur at a repeater site, communications would be lost not only with the effected site, but also with every site that is linked into the network through the lost repeater. However, if one or more alternate repeater paths exist, any radios that were linked into the network through a failed repeater will automatically reconnect to the network through one of the alternate repeater paths. This application note describes how to create alternate repeater paths in a multipoint network using the radios' call books.

Avoiding Parallel Repeaters

When defining alternate repeater paths, it is important to avoid creating parallel repeater paths. Parallel repeaters are one or more repeaters that are linked directly to the master or to a common repeater and that are on the same frequency key. See Figure 1. Parallel repeaters can be a source of interference, which may reduce the reliability of communications to any sites in a position to hear more than one of the repeaters. The multipoint repeater frequency function is used to eliminate parallel repeaters. When this function is enabled, a repeater receives on one frequency key and transmits on different frequency key. In the example network shown in Figure 1, the repeater frequency function is enabled in either Repeater 1 or Repeater 2 to prevent parallel repeater interference.





Procedure

1. Set network ID to 255 in every radio in the network.

MULTIPOINT PARAMETERS

(0)	Number Repeaters	1
(1)	Master Packet Repeat	2
(2)	Max Slave Retry	9
(3)	Retry Odds	1
(4)	DTR Connect	0
(5)	Repeater Frequency	0
(6)	NetWork ID	0255
(7)	Reserved	
(8)		
(9)	MultiMasterSync	0
(9)	1 PPS Enable/Delay	255
(A)	Slave/Repeater	0
(B)	Diagnostics	0
(C)	SubNet ID	Disabled
(D)	Radio ID	Not Set
(Esc)	Exit to Main Menu	
Enter Choice		

2. Program the call book of each slave and repeater

Refer to the example network shown in Figure 1. Each slave and repeater will only link with radios that are listed in its call book. The serial number of the master is placed in the call books of both Repeater 1 and Repeater 2. The serial numbers of both Repeater 1 and Repeater 2 are placed in each slave's call book. It is not necessary to put the slave's serial numbers in the repeater's call books nor is it necessary to put the repeater's serial numbers in the master's call book.

MODEM CALL BOOK			
Entry to Call is 00			
Entry	Number	Repeater1	Repeater2
(0)	900-0000		
(1)	000-0000		
(2)	000-0000		
(3)	000-0000		
(4)	000-0000		
(5)	000-0000		
(6)	000-0000		
(7)	000-0000		
(8)	000-0000		
(9)	000-0000		
(C)	Change Entry to Use (0-9) or A(ALL)		
(Esc)	Exit to Main Menu		
Enter all zeros (000-0000) as your last number in list			

Figure 2.

Call book for Repeater 1 and Repeater 2. In example, master's serial number is 900-0000.



```

                                MODEM CALL BOOK
                                Entry to Call is 00
                                Repeater1 Repeater2
Entry  Number
(0) 900-0001
(1) 900-0002
(2) 000-0000
(3) 000-0000
(4) 000-0000
(5) 000-0000
(6) 000-0000
(7) 000-0000
(8) 000-0000
(9) 000-0000
(C) Change Entry to Use (0-9) or A(ALL)
(Esc) Exit to Main Menu
Enter all zeros (000-0000) as your last number in list
```

Figure 3.

Call book for Slaves 1, 2 and 3. Do not use the repeater entry columns. These are for point-to-point repeaters only. Do not enter the slave's serial numbers.

Placing the serial number of both repeaters in each slave's call book gives the slaves the option of linking into the network through either repeater. Each slave will connect through one of the repeaters. There is no way to determine which repeater each slave will use. They will link to whichever repeater that they hear first. This will tend to be the closest repeater with the strongest signal. Once a slave has linked to one of the repeaters, it will remain linked to that repeater unless the link is interrupted. If the link is interrupted, the slave will disconnect from the network and attempt to connect through the other repeater listed in its call book.

3. Reduce each slave's Retry Time Out setting

RADIO PARAMETERS

WARNING: Do not change parameters without reading manual

```

(0) FreqKey                2
(1) Max Packet Size        8
(2) Min Packet Size        9
(3) Xmit Rate              1
(4) RF Data Rate           3
(5) RF Xmit Power          9
(6) Slave Security         1
(7) RTS to CTS             0
(8) Retry Time Out      10
(9) Lowpower Mode          0
(Esc) Exit to Main Menu
Enter Choice
```

Retry Time Out determines how quickly a radio will disconnect from an established link and attempt to connect to the network through a new link. The factory default setting of 255 will cause the radios to take about 5 seconds to disconnect. Reducing this setting to 10 decreases the disconnect time to about 200 ms. This parameter can be set as low as 8.



4. Enable the Repeater Frequency function in one of the repeaters.

MULTIPOINT PARAMETERS

(0) Number Repeaters	1
(1) Master Packet Repeat	2
(2) Max Slave Retry	9
(3) Retry Odds	1
(4) DTR Connect	0
(5) Repeater Frequency	1
(6) NetWork ID	0255
(7) Reserved	
(8) MultiMasterSync	0
(9) 1 PPS Enable/Delay	255
(A) Slave/Repeater	0
(B) Diagnostics	0
(C) SubNet ID	Disabled
(D) Radio ID	Not Set
(Esc) Exit to Main Menu	

Enter Choice

With Repeater Frequency enabled, the repeater will link to the Master radio on the master's frequency key and transmit on a different frequency key, which is set in step 5. Using a different frequency key eliminates the possibility of parallel repeater interference. A slave radio that links to this repeater will automatically follow the repeater's frequency key even if the slave is set to a different frequency key.

5. Set the frequency key of this repeater to a different value than the Master radio.

RADIO PARAMETERS

WARNING: Do not change parameters without reading manual

(0) FreqKey	2
(1) Max Packet Size	8
(2) Min Packet Size	9
(3) Xmit Rate	1
(4) RF Data Rate	3
(5) RF Xmit Power	9
(6) Slave Security	1
(7) RTS to CTS	0
(8) Retry Time Out	255
(9) Lowpower Mode	0
(Esc) Exit to Main Menu	

Enter Choice