

The FGR-115MB contains all of the functionality of the standard FreeWave 900 MHz spread spectrum transceiver with the exception of TDMA mode. However, to be used in Mirror-Bit applications specific settings must be used as described below, the numbering follows the numbering format in the Free-Wave setup menu. Included at the back are the settings for the DGR-115RU for reference.

0) Set Operation Mode

Invoke the setup menu as you would to program the FreeWave FGR-115RC. Programming must be done through the diagnostics port using the ASC0409DC programming/diagnostics cable. The programming menu will not be displayed through the radio's RS-232 port. Enter 0 to open the Set Operation Mode menu. The menu will be displayed as shown below. A point-to-point Mirror-Bit communication link requires two radios. One radio must be set to be the Mirror-Bit Master (an entry of A in the operation mode menu, displayed as 10). The other must be the Mirror-Bit Slave (an entry of B, displayed as 11).

	SET MODEM MODE Modem Mode is 10
(0)	Point to Point Master
(1)	Point to Point Slave
(2)	Point to MultiPoint Master
(3)	Point to MultiPoint Slave
(4)	Point to Point Slave/Repeater
(5)	Point to Point Repeater
(6)	Point to Point Slave/Master Switchable
(7)	Point to Multipoint Repeater
(A)	Mirrorbit Master
(B)	Mirrorbit Slave
(Esc)	Exit to Main Menu





1) Set Baud Rate

The Baud Rate on each transceiver must be set to 38,400 (entry 4 in the Baud Rate menu), Data and Parity must be set to 0 (8, N, 1), and Modbus RTU must be set to 0.

		Μ	SEI Iodem Baud	r bau is	D RATE 038400		
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9) (A) (B)	230,400 115,200 76,800 57,600 38,400 19,200 9,600 4,800 2,400 1,200 Data, Parity MODBus RTU	0 0					
(C) (D) (E) (E) (F) (Esc)	RS232/485 Setup Port TurnOffDelay TurnOffDelay FlowControl Exit to Main	0 2 0 0 0 Menu	TurnOnDel	lay	0		





When using the FGR-115MB in a Mirror-Bit application each radio <u>must</u> have the other radio's serial number as the first entry in its Call Book with no entries in the Repeater1 and Repeater2 columns, (as shown below). In addition, the Mirror-Bit Master must be programmed to call the first entry in its Call Book.

Unlike the standard point to point operating mode, the Mirror-Bit Slave will not establish communication with the master by turning Slave Security off. The Slave must have the Mirror-Bit Master's serial number as its first entry in the Call Book as well.

			MODEM CALL BOOK Entry to Call is	00
Entry	Number	Repeater1	Repeater2	
(0)	898-0001			
(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 Ent	ry to Use (0-	9) or A(ALL)	
(Esc)	Exit to Ma	in Menu		
Enter a	all zeros (C	00-0000) as y	our last number in	n list





All values in the radio transmission characteristics section of the setup menu must be identical between the Mirrored-Bit master and the Mirrored Bit slave radios. MCU Speed (menu item B) must be set to 1. If more than one pair of FreeWave 900MHz transceivers is operating in close proximity they must be set to different Frequency Keys (menu item 0). This is also necessary if the radios are to be configured as Mirrored Bit repeaters.

	RADIO PARAMETERS
WARNII	NG: Do not change parameters without reading manual
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9) (A) (B) (C) (ESC)	FreqKey5Max Packet SizeMin Packet Size9Xmit Rate1RF Data Rate3RF Xmit Power10Slave Security0Rtry Time Out 255Lowpower Mode0High Noise0MCU Speed1RemoteLED0Exit to Main Menu
Enter Enter	Choice 0 New Frequency Key (0-E) (F for more)F
(0) (1) (2) (Esc)	Hop Table Version 0 Hop Table Size 112 Hop Freq Offset 0 Exit to Radio Menu





- 1. The FGR-115MB may be used with a number of different SEL devices, please contact SEL at www.selinc.com for a complete list of supported devices.
- 2. When the FGR-115MB is used for Mirror-Bit communication, one repeater configuration may be used in the link. Refer to Application note 5424B for repeater configuration instructions.
- 3. When the FGR-115MB is used for Mirror-Bit communication, it is not compatible with the models DGR-115RU or DGR-115RXU Mirror-Bit radios if these radios are also being used for Mirror-Bit communications. Otherwise, the FGR-115MB is compatible with any DGR or FGR-Series radios when used in standard point-to-point or point-to-multipoint modes.

Troubleshooting

The front panel LEDs are very useful in diagnosing the current condition of the FGR-115MB. The table below shows the most common conditions.

Master

Condition	CD	TR	CTS	CD	TR	CTS
Powered and connected	SG	SR	SR	SG	SR	SR
Powered, disconnected	SR	SR	0	SR	0	IF
Powered and connected but on different Freq Keys	SG/SR (alternating)	SR (on and off)	IF	SG	IF	SR

Legend:	BR	Blinking Red
	IF	Intermittent Flash Red
	0	Off
	SG	Solid Green
	SR	Solid Red, Bright



FreeWave Technologies, 1880 S. Flatiron Ct., Boulder, CO 80301 Phone: (303) 444-3862, Fax: (303) 786-9948, www.freewave.com LAN5424AF Rev A

Slave



SEL-351R Cabinet

Figure 1: Example Installation





Equipment List

The following equipment list details the required components and connections, as shown in Figure 1. A pole, a tower, and/or other means of elevating the antenna is not shown.

No.	ltem	Description	Approx. Cost
1	900 MHz Spread Spectrum Transceiver	FreeWave Technologies, Inc. Model FGR-115MB, 12 VDC power, 1 W output, 20 mile line of sight, 120 VAC to 12 VDC adapter, and 6' DB-9M-to-DB-9F straight through cable included. (An SEL C285 cable can be used directly without adaptors if desired). www.freewave.com (303) 444-3862	\$1350
2	DB-9 Gender Changer	FreeWave Technologies, Inc. Model ECD0009MM, DB-9M-to-DB- 9M converter or equivalent (each end of connector is male)	\$6
3	Yagi Antenna	FreeWave Technologies, Inc ¹ Model EAN0900YC. 10 dB directional, 26" long	\$194
4	Low-Loss RF Cable	FreeWave Technologies, Inc ² Model ASC0504NN. 50' length (other lengths available)	\$140
5	Fiber-Optic Transceiver	SEL ³ Model SEL 2800M. EIA-232 DB-9M-to Fiber-Optic Transceiver	\$102
6	Fiber-Optic Cable	SEL ³ Model C800FZ. Terminated Cable, 25' or less (other lengths available)	\$60
7	DB-9 Null Modem Adapter	FreeWave Technologies, Inc Model ECD0009NM 9 pin male to 9 pin female Null Modem Adapter, or equivalent (one end is male, one end is female)	\$7
8	Surge Protection	Northern Technologies Model QWS-920N ⁴ . N type M-to-F 1/4 shorting stub coaxial protector tuned for 870-970 MHz. www.northern-tech.com (800) 727-9119	\$135

Table 1: Equipment List





Notes:

- 1. Other antennas may also be used.
- 2. Other low-loss RF cable may be used.
- 3. Other fiber-optic transceivers and cable may be used. Note, the fiber-optic transceivers are not required, but provide complete isolation between the radio and antenna and the relay.
- 4. Other surge protection may be used (PolyPhaser, etc.). This unit is recommended by FreeWave for use with their radios.





SET MODEM MODE Modem Mode is 10

(0)	Point to Point Master
(1)	Point to Point Slave
(2)	Point to MultiPoint Master
(3)	Point to MultiPoint Slave
(4)	Point to Point Slave/Repeater
(5)	Point to Point Repeater
(6)	Point to Point Slave/Master Switchable
(7)	Point to Multipoint Repeater
(A)	SEL Master(10)
(B)	SEL Slave(11)
(Esc)	Exit to Main Menu

SET BAUD RATE Modem Baud is 038400 (1) 115,200 76,800 (2) 57,600 (3) (4) 38,400 (5) 19,200 (6) 9,600 4,800 (7) (8) 2,400 (9) 1,200 (A) Data, Parity 0 (B) MODBus RTU 0 (Esc) Exit to Main Menu

Note:

DGR-115RU & DGR-115RXU transceivers are not compatible with FGR-115MB transceivers.





			MODEM CALL BOOK	
			Entry to Call is 00	
Entry	Number	Repeater1	Repeater2	
(0)	898-0001			
(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 Ent	ry to Use (0-	-9) or A(ALL)	
(Esc)	Exit to Ma	in Menu		
Enter a	ll zeros (O	00-0000) as y	your last number in list	

```
RADIO PARAMETERS
WARNING: Do not change parameters without reading manual
(0) FreqKey
                      5
(1)
     Max Packet Size 8
(2) Min Packet Size 9
(3) Xmit Rate 1
(4) RF Data Rate
                     3
(5) RF Xmit Power 10
(6) Slave Security 0
(7)
   RTS to CTS
                      0
     Retry Time Out 255
(8)
     Lowpower Mode
(9)
                      0
(Esc) Exit to Main Menu
Enter Choice 0
Enter New Frequency Key (0-E) (F for more)F
(0)
     Hop Table Version 0
     Hop Table Size 109
Hop Freq Offset 0
(1)
(2)
(Esc) Exit to Radio Menu
```







Page 11 of 12

LAN5424AF Rev A



To use the FGR-115MB transceivers as repeaters in a Mirror-Bit link, the settings of the radios should be modified as shown below. A block diagram on the previous page shows the generic setup, while lacking the details as shown on page 5.

	Master 1	Slave 1	Master 2	Slave 2
Modem Mode	10 (A)	11 (B)	10 (A)	11 (B)
Baud Rate	38400	230400	230400	38400
Call Book Location 0	(slave 1)	(master 1)	(slave 2)	(master 2)

FOR MORE DETAILED INFORMATION, REFER TO THE FGR-115MB USER MANUAL ADDENDUM WHICH MAY BE FOUND ON THE USER CD OR CALL OUR TECH SUPPORT AT (303) 444-3862

