FGR-115RE
LONG RANGE ETHERNET BRIDGE

Addendum to the FreeWave Manual

v 2.05

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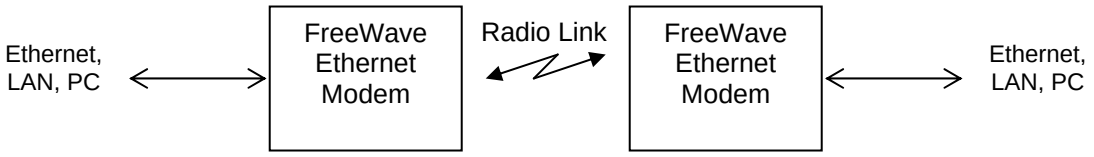
Description:

This is an addendum to the FreeWave User's Manual 900MHz Modems (the "Main Manual"). It covers details applicable specifically to operation of FreeWave Ethernet modems. Please use this addendum in conjunction with the Main Manual. The Data Port in a FreeWave Ethernet Modem is a 10Base-T RJ45 connector, to be used as part of an Ethernet LAN (Local Area Network).



In order to conserve the available bandwidth, the FreeWave Ethernet Modems have a MAC address filter. Each packet received by the Ethernet interface from the LAN is checked for the destination MAC address against the filter table. If the address is contained in the table, the packet is not forwarded across the radio link. If the address is unknown, or known to be across the radio link, then the packet is forwarded. An address is only added to the filter table after the Ethernet interface positively determines that the MAC address in question is not across the radio link. Each entry in the table has a lifetime of 4.5 minutes, to facilitate changing network conditions, and roaming across networks.

Crucial High Traffic LAN Environment Requirements:

FGR-115RE & FGRO9SE series Ethernet radios that are subject to high bandwidth conditions ***REQUIRE*** that some form of physical LAN segregation is employed to ensure functionality. FreeWave Technologies, Inc strongly recommends that a network device with filtering and routing capabilities be deployed between all radio and hard-wired LAN network segments.

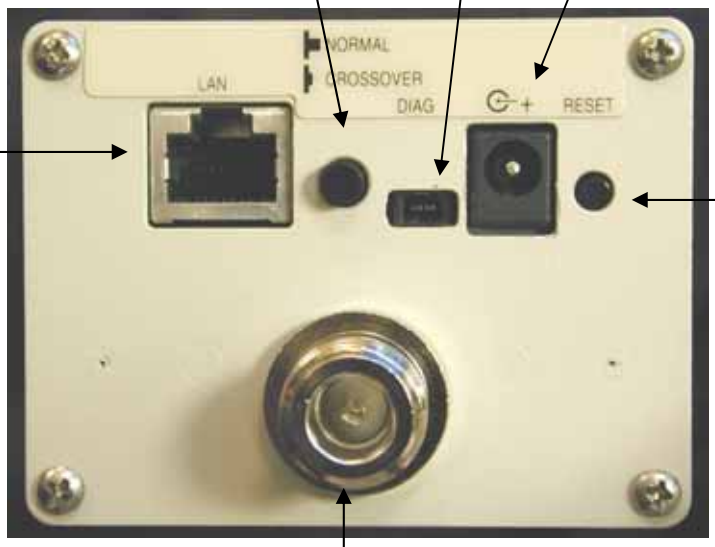
Utilizing this strategy will maximize network operation and reliability. Some solutions may include routers, managed switches, dual Ethernet cards, segregated polling environments etc. Please contact FreeWave Technologies at 1-800-548-5616 for other solutions/details.

Back Panel:

DIAG: 3-pin, RS-232-like connector for diagnostics and to program the radio. Adapter cables, part number ASC0409DC, are available from FreeWave.

NORMAL/CROSSOVER:
Switches the RJ45 connector from normal wiring to crossover wiring to avoid the need for a crossover cable.

POWER: 2.1 mm coaxial power connector. 6 – 30 VDC, center pin is positive.



LAN:
RJ45 connector, for Ethernet 10Base-T network.

RESET:
Push button to reset the Ethernet interface. (This button does not invoke Setup mode)

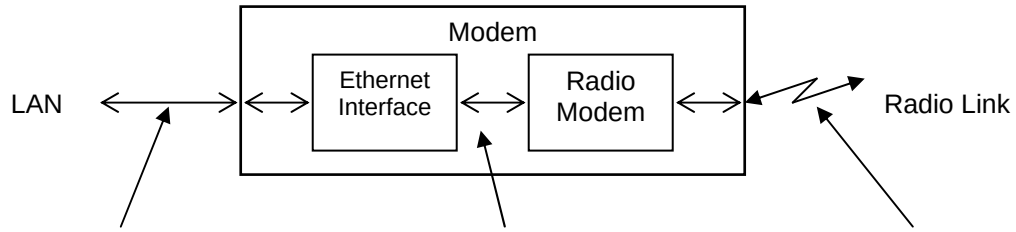
ANTENNA: see Main Manual.

Also available as a board level Class 1, Div 2 product with the following changes:

- Crossover switch is removed and hardwired in the “Normal” position.
- Power connector is replaced by a two foot long twisted wire supply line.
- ‘N’ type antenna connector is replaced by a standard SMA connector.

Front Panel:

The modem has 2 rows of LEDs. The bottom row of 3 LEDs is described in the Main Manual. The top row has 7 LEDs that indicate the state of the Ethernet Interface.
The Modem has 2 ports: the Ethernet, or Data, Port and the Radio Link; and it includes 2 devices: an Ethernet Interface and a Radio Modem.



All other LEDs on the top row show the activity of the Ethernet port.

The TX and RX LEDs in the top row show the activity between the Ethernet Interface and the Radio Modem.

The LEDs on the bottom row show the status and activity of the Radio Link.

LINK: green = the modem is connected to its LAN.

TX: green = the modem is transmitting to another modem over the radio link.

RX: green = the modem is receiving from another modem over the radio link.

LTX: green = the modem is sending data to its LAN.

LRX: green = the modem is receiving data from its LAN.

COL: red flash = the modem saw a collision on the LAN.

ERR: red flash = the modem saw an error on the LAN

See Main Manual

Setup:

To program the modem, proceed as described in the Main Manual, with the following exceptions:

- **Capital U on the diagnostics port brings up the Setup menu.**
- The diagnostic port must be used, as there is no RS232 Data Port in this modem.
- The following settings must be selected.

Menu 1

The Modem Baud rate shown here is neither the data rate of the Radio Link, nor the data rate of the Ethernet 10Base-T connection to the LAN. This sets the protocol internal to the Modem, between the Ethernet Interface and the RF modem.

SET BAUD RATE
Modem Baud is 230400

(0) 230,400		**Must be selected** (for best throughput)
(1) 115,200		
…		
(9) 1,200		
(A) Data, Parity	0	**Must be "0"** (Default)
(B) MODBus RTU	0	**Must be "0"** (Disabled)
(C) RS232/485	0	**Must be "0"** (TTL)
(D) Setup Port	2	**Must be "2"*** (Diagnostics port used for Setup)
(E) TurnoffDelay	0	**No effect**
(F) FlowControl	1	**Must be "1"** (CTS flow control)

Menu 0, Submenu F

Ethernet/IP Radio Setup

(0) Ethernet Mode	1	**Must be set to "1"***
(1) Half/Full Duplex	0	**Select full or half as required.**
(2) Slave IP Stack	0	**Set to "1" if not connected to a hub or switch**
(3) Slave UDP Mode	0	**Set to "1" for UDP Connect Mode**
(4) IP Address 255.255.255.255		**Used for Slave modem for I.D. in UDP**
(5) Port Address	4131	**Default Port Address**
------ new in v2.44 firmware		
(6) IP Address 2 255.255.255.255		**Default IP Address that the modem calls in UDP Mode upon initial power up**
(7) Port Address 2	6535	**Port Address associated with IP 2**
(8) MAC Filter	0	**0 disables internal MAC filter. 1 enables.**

***NOTE**: Once the "Ethernet Mode" is set to 1 (Menu 0, Submenu F, Item 0), the "Setup Port" (Menu1, Item D) can not be changed. Therefore, first change the "Setup Port" to "2", then change the "Ethernet Mode" to "1".

Menu 3 (for Point-to-Point)

RADIO PARAMETERS		
(0) FreqKey	5	
(1) Max Packet Size	9	Recommended: "9" (for best throughput)
(2) Min Packet Size	1	Recommended: "1" (for best throughput)
(3) Xmit Rate	1	
…		
(A) High Noise	0	
(B) MCU Speed	1	**Must be "1"** (to accommodate 230K Baud Rate)

Menu 3 (for Point-to-MultiPoint)

RADIO PARAMETERS		
(0) FreqKey	5	
(1) Max Packet Size	6	Recommended: "6" (for best throughput)
(2) Min Packet Size	6	Recommended: “3” (for best throughput)
(3) Xmit Rate	1	
…		
(A) High Noise	0	
(B) MCU Speed	1	**Must be "1"** (to accommodate 230K Baud Rate)

Menu 5 (for Point-to-MultiPoint)

MULTIPOINT PARAMETERS		
(0) Number Repeaters	1	**Must be set to "0"** (no repeaters) **or "1"** (1 repeater)
(1) Master Packet Repeat	2	**Must be set to "2"**
(2) Max Slave Retry	9	
…		
(A) Slave/Repeater	0	**This function is not supported and therefore should not be used with Ethernet radios**

Installation:

To install the modem, proceed as described in the standard FGR user manual, with the following exceptions:

- Connect the modem to the LAN with a CAT5 RJ45 Ethernet cable.
- Use the "Normal/Crossover" switch to select the polarity of the Ethernet connection. If connecting to a switch, router or hub, select "Normal". If connecting to a NIC or a modem, select "Crossover". However, if using a crossover cable, the opposite settings of the switch apply.
- If required, use the top row of LED's for troubleshooting the Ethernet Interface.

Troubleshooting:

To troubleshoot the modem, proceed as described in the Main Manual. Additionally, use the top row of LED's in this Ethernet modem as troubleshooting tools.

- No data is being passed between the LAN's.
  Upon power up, the Ethernet interface's MAC filtering table can become corrupted, and must be reset, or allowed to timeout. After power up, press the Reset Button on the back of the FreeWave Ethernet, or allow 4.5 minutes to pass and the table to reset.

- The LINK LED is off:
  The Modem has not successfully connected to the LAN.
  Make sure that the Modem is powered On.
  Make sure that the Ethernet device connected to the Modem is On.
  Make sure the Modem and the Ethernet device are connected with a good Ethernet cable.
  Try switching the "Normal/Crossover" switch to the opposite position.
  Ensure the Ethernet device is set for auto-detect, or 10BaseT.

- The TX LED stays on:
  Data is not transferring successfully from this modem's LAN to the other modem's LAN.
  Make sure the radio link is working (see Main Manual).
  Make sure both modems are linked to their respective LANs (modems' LINK LED's are on).

- The RX LED stays on:
  Data isn't going between this modem and its LAN.
  The Ethernet device to which this modem is connected isn't receiving data.

- The COL LED flashes:
  There are collisions on this modem's LAN.
  Collisions are normal when the modem is connected to the LAN through a hub (it simply means that two Ethernet devices tried to send data through the hub at the same time). The Ethernet network is designed handle such collisions.
  Collisions do not happen when the modem is connected directly through a switch, a NIC, or a router.

- The ERR LED flashes:
  A data buffer is getting full.
  This typically occurs if the radio settings are incorrect. This also occurs when the radio link, or the LAN link are not present. Check the radio settings, the Radio Link, and the LAN link.
  Try pressing the Reset Button on the back panel to reset the Ethernet Interface.

Glossary of Terms:

Ethernet Modem:	The entire FreeWave modem, which includes a Radio Modem and an Ethernet Interface.
Ethernet Bridge:	A connection between two Ethernet LANs, using an Ethernet modem at each end.
Radio Modem:	The radio portion of the Ethernet Modem. It communicates with other radio modems.
Ethernet Interface:	The Ethernet portion of the Ethernet Modem. It translates and filters data between the LAN and the Radio Modem.
Radio Link:	The radio frequency link between FreeWave radios.
LAN:	(Local Area Network): A computer network, such as Ethernet.
Collision:	The condition when one LAN device tries to transmit while another device is already transmitting.
NIC:	(Network Interface Card): A device that translates between a LAN and a computer, typically found inside a personal computer.
Switch:	A smart device for connecting many Ethernet devices together.
Router:	A smart device for directing the Ethernet packets from one network to another.
Hub:	A dumb device for connecting many Ethernet devices together.
Ethernet Device:	Any device that attaches to an Ethernet LAN, typically using an RJ45 connector.