HiPR-900™
Wireless Radiomodem
User Manual
Version 1.00

Preliminary

February, 2005

Part no.: 120 40515-100a (FCC-2)

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What's New in this version

History

Version 1.00, February 2005

- Preliminary version of Dataradio® HiPR-900™ wireless radiomodem.

About Dataradio

Dataradio is a leading designer and manufacturer of advanced wireless data products and systems for mission critical applications. Our products are found at the heart of mobile data and SCADA networks around the world.
With over 20 years dedicated to data technology and innovation, Dataradio is the premier source for wireless data solutions. Our products include mobile data products, telemetry devices, integrated wireless modems for fixed point-to-point and point to multi-point applications, and OEMs. Our product line is one of the broadest in the industry covering the most often-used frequency bands.

Dataradio COR Ltd.

Dataradio COR Ltd. designs and manufactures radios and integrated wireless modems to serve a wide variety of data communication needs. Dataradio produces equipment for the fixed data market including SCADA systems for utilities, petrochemical, waste and fresh water management markets and RF boards for OEM applications in the Radio Frequency Data Capture market.

Product Warranty

The manufacturer's warranty statement for this product is available in Appendix 1 .

www.dataradio.com

Dataradio provides product brochures, case studies software downloads and product information on our website. Every effort is taken to provide accurate, timely product information in this user manual. Product updates may result in differences between the information provided herein and the product shipped. The information in this document is subject to change without notice.

Definitions

Item	Definition
Access Point	**C**ommunication hub for users to connect to a wired LAN. APs are important for providing heightened wireless security and for extending the physical range of service a wireless user has access to.
ACT LED	Ethernet data activity.
Airlink	Physical radio frequency connections used for communications between units.
ARP	Address Resolution Protocol – Maps Internet address to physical address.
Asynchronous	Information that can be sent at random times, and not synchronized to a clock. Transmission characters begin with a “start” bit and end with a “stop” bit.
Backbone	The part of a network that connects most of the systems and networks together, and handles the most data.
Bandwidth	The transmission capacity of a given device or network.
Dwell Interval	Time between channel changes
Browser	An application program that provides a way to look at and interact with all the information on the World Wide Web.
CSMA/CA	(Carrier Sense Multiple Access/Collision Avoidance) - A method of data transfer that is used to prevent data collisions.
COM Port	Both RS-232 serial communications ports of the HiPR-900 wireless radiomodem are configured as DCE and are designed to connect directly to a DTE.
CTS	Clear to Send. An RS-232 output signal from the HiPR-900 signifying that it is ready to accept data (used in RTS mode).
DCE	Data Communications Equipment. This designation defines the direction (input or output) of the various RS-232 interface signals and is applied to equipment such as modems. DCE is designed to connect to DTE.
Default Gateway	A device that forwards Internet traffic from your local area network.
DHCP	(Dynamic Host Configuration Protocol) - A networking protocol that allows administrators to assign temporary IP addresses to network computers by "leasing" an IP address to a user for a limited amount of time, instead of assigning permanent IP addresses.
DNS	(Domain Name Server) - The IP address of your ISP's server, which translates the names of websites into IP addresses.
Domain	A specific name for a network of computers.
DTE	Data Terminal Equipment. This designation is applied to equipment such as terminals, PCs, RTUs, PLCs, etc. DTE is designed to connect to DCE.
Dynamic IP Addr	A temporary IP address assigned by a DHCP server.
Encryption	AES (Advanced Encryption Standard) - uses 128-bit encryption to secure data.
Ethernet	IEEE standard network protocol that specifies how data is placed on and retrieved from a common transmission medium.
Firewall	A set of related programs located at a network gateway server that protects the resources of a network from users from other networks.

Firmware	The programming code that runs a networking device.
Fragmentation	Breaking a packet into smaller units when transmitting over a network medium that cannot support the original size of the packet.
FTP	(File Transfer Protocol) - A protocol used to transfer files over a TCP/IP network.
Gateway	A device that interconnects networks with different, incompatible communications protocols.
HDX	Half Duplex. Data transmission that can occur in two directions over a single line, using separate Tx and Rx frequencies, but only one direction at a time.
HiPR-900™	Frequency hopping spread spectrum wireless modem that operates in the license free 902-928 MHz band.
HTTP	(HyperText Transport Protocol) - The communications protocol used to connect to servers on the World Wide Web.
IPCONFIG	A Windows 2000 and XP utility that displays the IP address for a particular networking device.
IPSec	(Internet Protocol Security) - A VPN protocol used to implement secure exchange of packets at the IP layer.
LNK LED	Ethernet connection established.
MAC	(Media Access Control) Address - The unique address that a manufacturer assigns to each networking device.
NAT	(Network Address Translation) - NAT technology translates IP addresses of a local area network to a different IP address for the Internet.
Network	A series of computers or devices connected for the purpose of data sharing, storage, and/or transmission between users.
Network speed	This is the *bit rate* on the RF link between units. Could be different from COM port *baud rate.*
Node	A network junction or connection point, typically a computer or work station.
OIP	Optimized IP – Compresses TCP and UDP headers, and filters unnecessary acknowledgments. This makes the most use of the available bandwidth.
OTA	Over-The-Air - Standard for the transmission and reception of application-related information in a wireless communications system
PD	PD = PARALLEL DECODE ™ technology
Ping	(Packet INternet Groper) - An Internet utility used to determine whether a particular IP address is online.
PLC	Programmable Logic Controller. An user-provided intelligent device that can make decisions, gather and report information, and control other devices.
PoE	Power Over Internet. Technology that allows the electrical current, necessary for the operation of each device, to be carried by the wired Ethernet LANs data cables rather than by power cords.
PPTP	(Point-to-Point Tunneling Protocol) - A VPN protocol that allows the Point to Point Protocol (PPP) to be tunneled through an IP network. This protocol is also used as a type of broadband connection in Europe.
PWR LED	Indicates presence of PoE or DC power input.
Router	A networking device that connects multiple networks together.
RS-232	Industry–standard interface for data transfer.

RTU	Remote Terminal Unit. A user-provided SCADA device used to gather information or control other devices.
SCADA	Supervisory Control And Data Acquisition. A general term referring to systems that gather data and/or perform control operations.
SPI	(Stateful Packet Inspection) Firewall - A technology that inspects every incoming packet of information before allowing it to enter the network.
Spread Spectrum	Wideband radio frequency technique used for more reliable and secure data transmission.
Static IP Address	A fixed address assigned to a computer or device that is connected to a network.
Static Routing	Forwarding data in a network via a fixed path.
Subnet Mask	An address code that determines the size of the network.
Switch	A data switch that connects computing devices to host computers, allowing a large number of devices to share a limited number of ports.
Sync	Data transmitted on a wireless network that keeps the network synchronized.
TCP	(Transmission Control Protocol) - A network protocol for transmitting data that requires acknowledgement from the recipient of data sent.
TCP/IP	(Transmission Control Protocol/Internet Protocol) - A set of instructions PCs use to communicate over a network.
Telnet	A user command and TCP/IP protocol used for accessing remote PCs.
TFTP	(Trivial File Transfer Protocol) - A version of the TCP/IP FTP protocol that has no directory or password capability.
Topology	The physical layout of a network.
Transparent	A transparent unit transmits all data without regard to special characters, etc.
Tx/Rx LED	Airlink data activity
UDP	(User Datagram Protocol) - A network protocol for transmitting data that does not require acknowledgement from the recipient of the data that is sent.
Upgrade	To replace existing software or firmware with a newer version.
URL	(Uniform Resource Locator) - The address of a file located on the Internet.
VPN	(Virtual Private Network) - A security measure to protect data as it leaves one network and goes to another over the Internet.
WINIPCFG	A Windows 98 and Me utility that displays the IP address for a particular networking device.
WLAN	(Wireless Local Area Network) - A group of computers and associated devices that communicate with each other wirelessly.

1. Product Overview

This document provides information required for the operation and preventive maintenance of the DATARADIO® HiPR-900™ Spread Spectrum wireless modem.

1.1 Intended Audience

This manual is intended for system designers, professional installers, and maintenance technicians.

1.2 General Description

Dataradio's HiPR-900 with Parallel Decode™ is a Frequency-Hopping Spread-Spectrum wireless radio-modem that operates in the license free 902-928 MHz band using IP/Ethernet connectivity. HiPR-900 is designed for SCADA, telemetry, control, and industrial applications in Point-to-Point and Point-to-Multipoint configurations.

HiPR-900 supports both serial and Ethernet/IP Remote Terminal Units (RTU) and programmable logic controllers (PLC). It is standard IEEE 802.3af compliant.

Figure 1 - HiPR-900

The HiPR-900 wireless modem consists of a logic PCB (which includes modem circuitry) and a radio module. Each logic PCB and radio module is constructed in the factory to optimize performance as a wireless modem. The two boards are installed in a cast aluminum case.

The HiPR-900 wireless modem "hops" from channel to channel several times per second using a "hop" pattern applied to the Master and Remotes in a network. A distinct hopping pattern is provided for each of the available System IDs. This distinct pattern minimizes the chance of interference with other spread spectrum networks. In the United States and Canada, no license is necessary to install and operate this type of spread spectrum system.

The unit is not hermetically sealed and should be mounted in a suitable enclosure when dust and/or a corrosive atmosphere are anticipated. Physically, there are no external switches or adjustments. All operating parameters are set using web browser.

1.2.1 Characteristics

HiPR-900 has the following operational characteristics:

- High-speed user-selectable data rates of 256 and 512 Kbps and superior data compression.
- Built-in adjustable 0.1 to 1 watt transceiver.
- Used as an access point or an end point with each configurable in:
  - ♦ Bridge mode - *for fast setup between networks*
  - ♦ Router mode - *for advanced networks*
- Embedded web server with browser access (locally or remotely) to status or setup information.
- Remote access for over-the-air system firmware upgrades.
- Parallel Decode™ with SMART COMBINING dual receivers for added decode sensitivity in multi-path and fading environments.
- Wide input power range of 10 to 30 volts DC and flexibility of Power over Ethernet (PoE).
- AES 128-bit data encryption
- Native UDP and TCP/IP support
- Optimized IP (OIP) protocol reduction
- Diagnostics
- Built-in Spectrum Analyzer

1.2.2 Accessories and Options

Table 1 lists various accessory items available for the HiPR-900 Wireless Modem.

Table 1 - Accessories

Accessory	DRL Part Number
Cables, Power kit, Power cable	TBD
Adapters, RF cables, Ethernet cables, etc…	TBD
Antenna kit	Contact Sales Representative
Technical manual on CD ROM	TBD

For information on accessories and options, contact your sales representative. In the United States, call 1-800-992-7774 or 1-507-833-8819. For International inquiries, call 507-833-8819.

1.2.3 Configuration

HiPR-900 units are factory-configured to default settings. Configuration changes or upgrades are web-based.

1.3 Factory Technical Support

The Technical Support department of DATARADIO® provides customer assistance on technical problems and serves as an interface with factory repair facilities.

Dataradio COR Ltd.
299 Johnson Avenue, Suite 110
Waseca, MN 56093-0833
Technical Support hours are: Monday to Friday 7:30 AM to 4:30 PM, Central Time

Phone: 1-800-992-7774 or 1-507-833-8819 and Fax: 1-507-833-6748
Support Fax: 1-507-833-6758
Email: support@dataradio.com

1.4 Product Warranty

The HiPR-900 radiomodem is backed by Dataradio COR Ltd.'s two-year warranty excluding third party components which are covered by their respective manufacturer's warranty.

Dataradio's Data Telemetry Product Warranty statement is in Appendix 1 and included in .pdf format on CD versions of Dataradio technical manuals.

1.5 Replacement Parts

This product is not field-serviceable, except by the replacement of a complete unit. Specialized equipment and training is required to repair logic boards and radio modules.

Contact Technical Support for service information before returning equipment. A Technical Support representative may suggest a solution eliminating the need to return equipment.

1.5.1 Factory Repair

Dataradio products are designed for long life and failure-free operation. If a problem arises, factory service is available. Contact the Technical Service Department before returning equipment. A service representative may suggest a solution eliminating the need to return equipment.

A Return Material Authorization (RMA) number is required when returning equipment to Dataradio for repair. Contact the Technical Service Department at 1-800-992-7774, extension 6290 to request a RMA number. Be prepared to give the equipment model and serial number, your account number (if known), and billing and shipping addresses.

Include the RMA number, a complete description of the problem, and the name and telephone number of a contact person with the returned units. This information is important. The technician may have questions that need to be answered to identify the problem and repair the equipment. The RMA number helps locate your equipment in the repair lab if there is a need to contact Dataradio concerning the equipment. Units sent in for repair will be returned to the customer re-tuned to the current Dataradio Test and Tune Procedure and will conform to all specifications noted in this section.

Customers are responsible for shipping charges (to Dataradio) for returned units in warranty. Units in warranty are repaired free of charge unless there is evidence of abuse or damage beyond the terms of the warranty. Dataradio covers return shipping costs for equipment repaired while under warranty.

Units out of warranty are subject to repair service charges. Customers are responsible for shipping charges (to and from Dataradio) on units out of warranty. Return shipping instructions are the responsibility of the customer.

1.6 Unpacking

When ready for installation, carefully unpack your HiPR-900 shipping carton and identify each item as listed below:

- One HiPR-900 radiomodem
- Power cable (3 ft)
- Ethernet cable (3 ft)
- Quick Start Guide

If damage has occurred to the equipment during shipment, file a claim with the carrier immediately.

2. Installation

2.1 Parallel Decode

Dataradio's proprietary patent-pending Parallel Decode(tm) technology combines Spatial Diversity and Smart Combining to provide increased sensitivity plus immunity to multipath fading. Even in the absence of motion, the changing wavelengths inherent in frequency-hopping systems makes it possible for stationary sites to experience frequency-selective interference. Parallel Decode technology receives and continuously combines signals from two antennas a short distance apart, ensuring a more reliable link.

The dual antenna connections also permit the use of a higher-gain antenna for the receiver. Full 1W transmit power can be used with up to 6 dBi antenna gain.

Dual antenna ports also permit listening to a far distant site with a high- gain antenna while using an omni to serve local stations. The Parallel Decode receiver algorithm automatically and continually decodes signals from both antennas.

In special applications such as rotating machinery, dual antenna ports allow the use of cross-polarized antennas, automatically selecting the best signal regardless of the orientation of the machine.

2.2 Antennae Installation

2.2.1 Professional Installation & RF Exposure Compliance Requirements

The HiPR-900 radiomodem is intended for use in the SCADA market. The HiPR-900 must be professionally installed and must ensure a minimum separation distance of more than 9.06 in. (23 cm) between the radiating structure and any person. An antenna mounted on a pole or tower is the typical installation and in rare instances, a 1/2-wave whip antenna is used.

The HiPR-900 radiomodem uses low power radio frequency transmitter. The concentrated energy from an antenna may pose a health hazard. People should not be in front of the antenna when the transmitter is operating.

The installer of this equipment must ensure the antenna is located or pointed such that it does not emit an RF field in excess of Health Canada limits for the general population. Recommended safety guidelines for the human exposure to radio frequency electromagnetic energy are contained in the Canadian Safety Code 6 (available from Health Canada) and the Federal Communications Commission (FCC) Bulletin 65. Proper installation of the transceiver antenna of HiPR-900 products, as summarized in section 2.2.2 below, will result in user exposure substantially below the recommended limits for the general public.

The HiPR-900 complies with Part 15 of the FCC rules and must be professionally installed. Operation must conform to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received including interference that may cause undesired operation of the device.

Notes:

Any changes or modifications not expressly approved by the party responsible for compliance (in the country where used) could void the user's authority to operate the equipment.

2.2.2 Antenna Connection

This equipment has been tested and approved with antennae having a maximum gain of 8.5 dB. Antenna with a higher gain are strictly prohibited (regulations of Industry Canada). The required antenna impedance is 50 ohms. To reduce potential radio interference, the antenna type and its gain should be chosen to ensure the effective isotropic radiated power (EIRP) is not more than required for successful communication.

FCC/IC Rule: The output power is not to exceed 1.0 watt (30 dBm) and the EIRP not to exceed 6 dBi gain (36dBm). A sample calculation is provided below.

Referring to Figure 2:

Sample Calculation: Yagi Antenna: 8.5 dBi, which exceeds 6 dBi gain by 2.5 dB
Cable Loss: 1.5 dB
HiPR-900 output initially set to 30 dBm (1 watt).

(Initial output level) dBm - (excess antenna gain) dB + (cable loss) dB = (new power setting) dBm

Therefore, the sample calculation becomes: 30dBm – 2.5 dB + 1.5dB = 29 dBm

The HiPR-900 output must be reduced by 1 dB to 29 dBm.

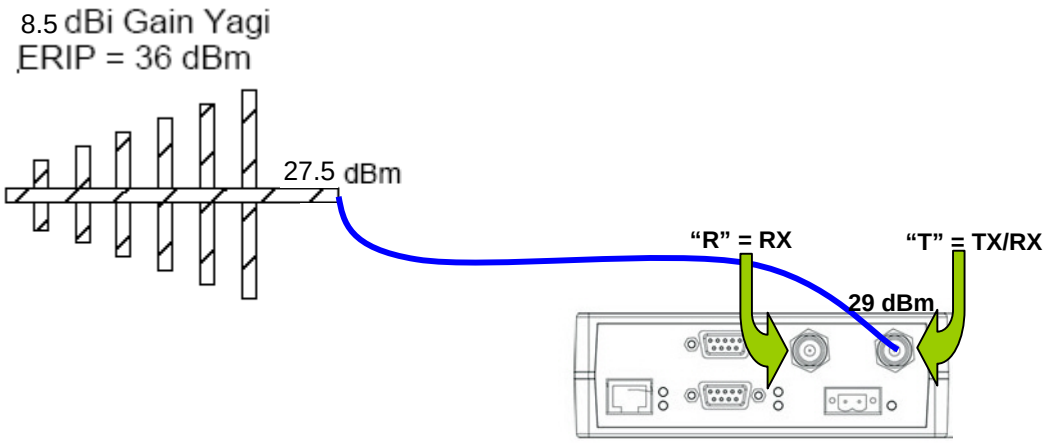


Figure 2 - Sample equation

2.2.3 Spacing and Constraints

Referring to Figure 3, HiPR-900 radiomodems commonly use two separate antennae:

- "T" - Main transceiver -

  Constraints are the limit of 9.06 in/23 cm (see 2.2.1 above) and omni-directional factors

- "R" - Auxiliary receiver –

  Constraints are the receiver spacing of at least 5/8 λ (wavelength) from transceiver antenna and omni-directional requirements *(8in. / 21cm)*

For the optimum antenna spacing at the frequency you are using, consult Dataradio System Engineering.

For installation of ground-plane dependent antennas, the center of the surface used for mounting is preferable for best omni-directional pattern. For ground-plane independent antennas, installation may be close to the edges of the mounting surface.

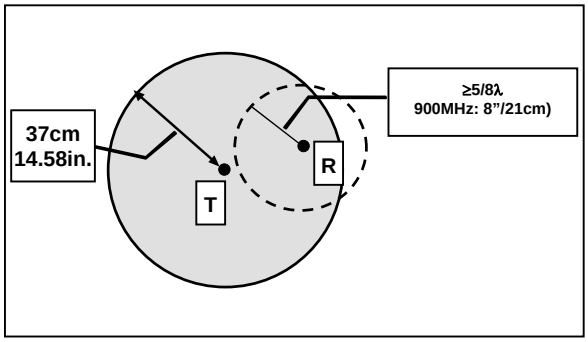


Figure 3 - Antenna spacing

2.2.4 Acceptable Antennae

The antennae listed in Table 2 were tested and typed for maximum gain. These antennae are FCC approved for use with the HiPR-900. Similar antenna types from other manufacturers are also acceptable.

Table 2 - Acceptable Antennae

Type	Manufacturer	Part Number	Gain (dBi)
Yagi	Maxrad	BMOY8903	8.5
Omni Directional	Maxrad	MFB9153	5.1
Directional Panel	Maxrad	MP8066	8.1
Portable	Maxrad	MEXR-902-BN	2.5

2.3 Network application

HiPR-900 is suited to a variety of network applications. Its primary design goal was to satisfy the needs of SCADA systems using RTUs or PLCs in either point-to-point or point-to-multipoint service. This section gives an overview of some common configurations.

2.3.1 Modes

2.3.1.1 Bridge mode

Bridge mode provides for fast set-up. IP bridging for quick deployment of basic point-to-point and point-multipoint networks with minimal configuration. Bridge mode carries ARP and is transparent to any IP-based or IP-encapsulated protocols.

2.3.1.2 Router mode

Used in advanced networks, router mode enables OIP optimization for reduced overhead and improved throughput, and supports more complex network topologies such as store-and- forward and multihop links. There is only one model to buy or stock because any HiPR900 unit can be configured for bridge or router mode, router gateway (access point), remote station, or even as a combined store-and-forward remote with a local drop.

Selection of “master” or “remote” as well as data delivery conditions is done using the web browser.

2.3.2 RF Path and communications range

The reliable communication range of the HiPR-900 is dependent on terrain, RF (radio frequency) path obstacles, and antenna system. To assure reliable communications, a competent professional who can determine what antennae are required and whether or not a repeater is needed should study the RF path between stations.

2.3.3 COMMON CHARACTERISTICS

The networks described in this section share common characteristics:

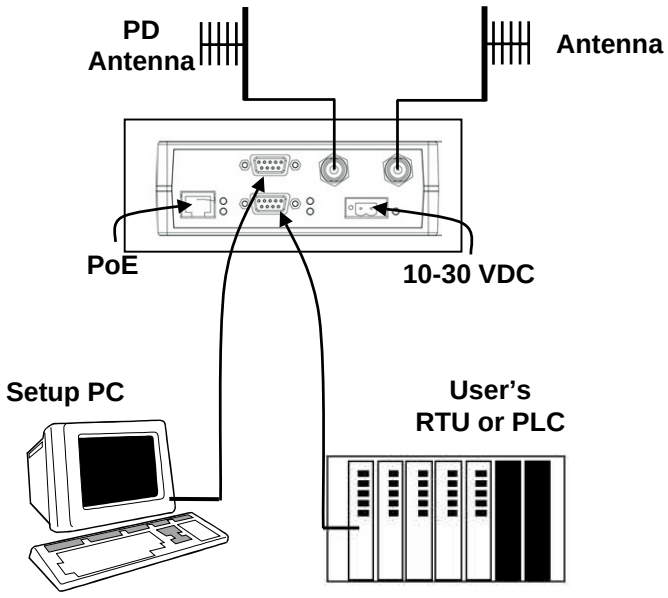
1. The network speed (256 and 512 Kbps) varies in a network as the Master announces the speed to use to the remote stations.
2. Transmission of online diagnostics may be enabled or disabled at any station or stations without affecting their ability to communicate with other stations.

2.3.4 Basic connections

The connections required are shown in Figure 4.

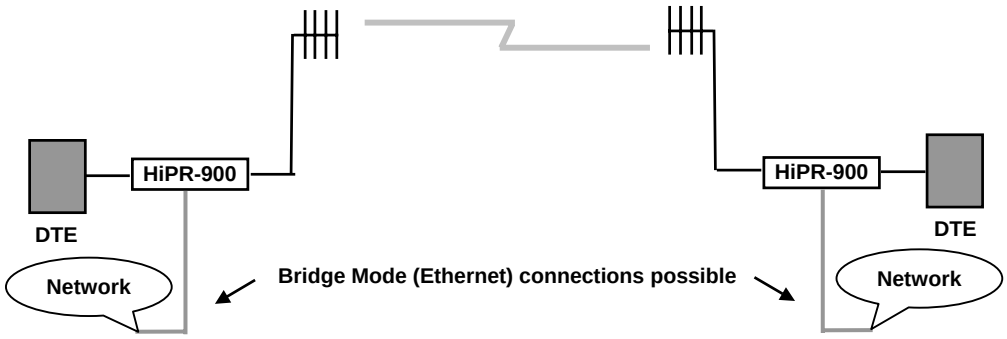
While an RTU or PLC is shown in the diagram, master stations often use a PC running an application designed to communicate with remote RTUs or PLCs. The Setup PC is used for both configuration and local and remote diagnostics. It may be left connected at all times but is not required for normal operation once the unit has been configured.

Figure 4 - Basic Setup



2.3.5 POINT-TO-POINT SYSTEM

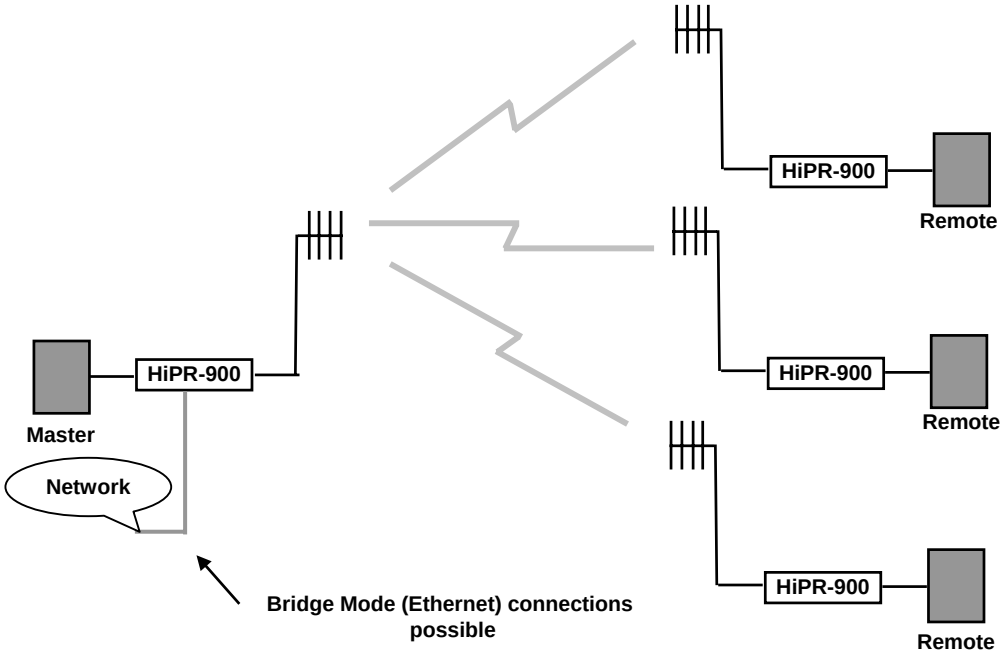
Figure 5 - Point-to-Point IP Network System



A simple point-to-point connection is shown above. In this system, the user's equipment (DTE) is set up in a master-remote configuration. Ethernet network connection is also possible using bridge mode.

2.3.6 POINT-MULTIPOINT SYSTEM

Figure 6 - Point-to-Multipoint System



A basic Point-Multipoint system for polling application is shown above. Using a web browser, one HiPR-900 unit must be set to “Master”. The remaining units in the network must be set to “Remote”. All units are set to “selective” data delivery to prevent remote stations from hearing each other's responses. Ethernet network connection is also possible using bridge mode.

2.4 Selectable Data Rates

Switchable data rates of 256 and 512 Kbps allow optimizing installations for highest throughput or maximum range. The sophisticated DSP modem gives optimal performance in either mode, whether a short-range LAN extension or long-range point-to-point link.

2.5 Combined Access Point and Remote

Any unit can be configured as a Master station, and as an Access Point or Remote. This flexibility allows the backbone network to be connected wherever it is most convenient, and completely independently of where the Master station is located. Deployment and keeping spares is simplified with only a single model required.

2.6 Online & Offline Diagnostics

HiPR-900 units continually monitor and report on their environmental and operating conditions. Each transmission carries online diagnostic information that can be monitored remotely or even sent to a designated host for logging and later analysis.

Additional information, statistics, and offline test facilities are available via the browser. RF paths can be monitored and checked from either end of a link, without travelling to the other station.

2.7 Built-in Spectrum Analyzer

Dataradio's innovative built-in Spectrum Analyzer continually monitors signal strength at each unit during normal operation. The spectrum analyzer can also scan the band on command to establish the noise floor and check for foreign signals or other sources of interference. Noisy or occupied sub-bands can be locked-out.

3. Physical Description

3.1 Front Panel

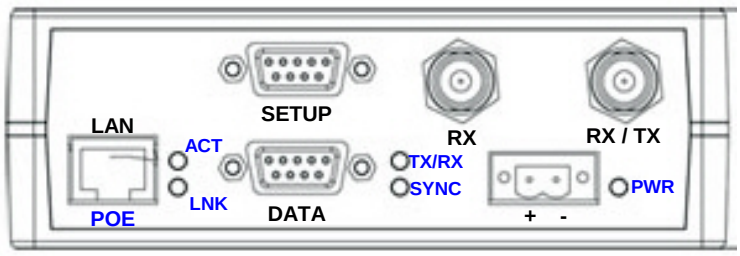


Figure 7 - HiPR-900 Front Panel

The front panel includes:

- One standard RJ-45 autosensing 10/100 UTP Ethernet connection with Auto-MDIX. Supports direct connection to both Terminal Devices and Ethernet hubs or switches without resorting to crossover cables. LED indicators make it simple to verify that Ethernet cables and connections are good.
- Two DE-9F RS232 ports. Serial baud rates from 1200 to 115,200 are supported. The HiPR-900 radiomodem is factory set (default) for 19200 b/s, 8 bits, no parity, and 1 stop bit.
- The antenna connector for the transceiver is a female 50-ohm TNC type. The HiPR-900 is designed to operate with an antenna having a maximum gain of 10 dBi. Antennae with higher gain are strictly prohibited (FCC and Industry Canada). Required antenna impedance is 50 ohms.
- One TNC-type female antenna connector for the auxiliary receiver
- One right-angle power connector. The 10 to 30 VDC wide-range switching power supply permits powering from 12 volt as well as 24 volt systems, and the high-efficiency switching design runs cooler with less loss. The HiPR-900 automatically senses and switches between its DC input and PoE, using the DC input if both are present. This minimizes the load on PoE Ethernet switches while allowing them to act as a backup to the local power supply.
- HiPR-900 has five dual-color LED indicators. Their functions are shown in Table 3.

Table 3 - HiPR-900 LEDs indications

LED	Color	Definition
ACT	Green	Data transmission or reception activity
LINK	Green	Connection OK
	Amber	Collision
Tx / Rx	Green	Data reception activity
	Amber	Data transmission activity
	Red	Receive CRC error
SYNC	Green	Remote: In sync with Master
		Master: Normal
	Red	Remote: Loss of Master sync
		Master: Failure
PWR	Green	Normal
	Amber (at boot-up)	Normal *(approx 5 secs)*
	Amber	Application failure
	Red	Hardware failure

4. Operation & Configuration

4.1 Local and Remote (OTA) Configuration

Configuration and status displays are accessible from anywhere on the network, wired, or wireless. Monitoring, problem diagnosis, and even configuration changes can be done from anywhere on the corporate network. Setup is password-protected to avoid tampering or unauthorized changes.

4.2 Over-the-Air Firmware Upgrade

Both the configuration parameters and operating firmware can be updated remotely, even over the network itself, using the standard FTP protocol.

4.3 Browser-Based Setup and Status

A built-in web server makes configuration and status monitoring possible from any browser-equipped computer, both locally or remotely. Status, configuration, and even online help are available without requiring special client software. Connect to any unit from any other, or over corporate LAN.

4.3.1 LAN Setup

On a laptop or a desktop PC running MS-Windows and equipped with an existing LAN connection, connect to the RJ-45 input of the HiPR-900.

1. Click Start ➔ Settings ➔ Control Panel ➔ Network and Dial-up Connection
2. Click on the relevant Local Area Connection
3. On the Local Area Connection Status screen, click the Properties button
4. On the Local Area Connection Properties screen, scroll the List Box until “Internet Protocol (TCP/IP)” is highlighted, click the Properties button
5. On the Internet Protocol (TCP/IP) Properties screen, select the “Obtain an IP address automatically” radio button

   Note:
   If selecting instead the “Use the following IP address” radio button, enter 192.168.204.nnn (where nnn is a number between 2 and 254) in the IP address field. The Subnet mask is 255.255.255.0 while the Default gateway is left blank.
6. Click the OK button
7. Reboot to complete the connection process

4.3.2 Login Screen

On the Address line of the Internet browser of your choice, type the factory-default IP address given to all HiPR-900 radiomodem units: 192.168.204.1. Press Enter. The Enter Network Password screen opens.

Figure 8 - Enter Network Password screen

4.3.2.1 Initial Installation Login

For an initial installation, type in the User Name dialog box a string of any letters or numbers of at least 1 and not exceeding 15 characters. Type in the Password dialog box a string of any letters or numbers of at least 8 and not exceeding 15 characters. Do not place a check mark in the "Save this password in your password list" box. Click OK to access to the Web Interface (Figure 9).

Dataradio recommends immediately changing the HiPR-900 unit's IP address as well as set your own login password as part of the initial configuration *(See 4.3.3.4 and 4.3.3.13)*.

For subsequent access to the HiPR-900 unit, use the User Name and Password you configured.

Note:

The User Name entry is currently not an access-limiting factor. It only serves to identify the person gaining access. User Name may be required by future versions.

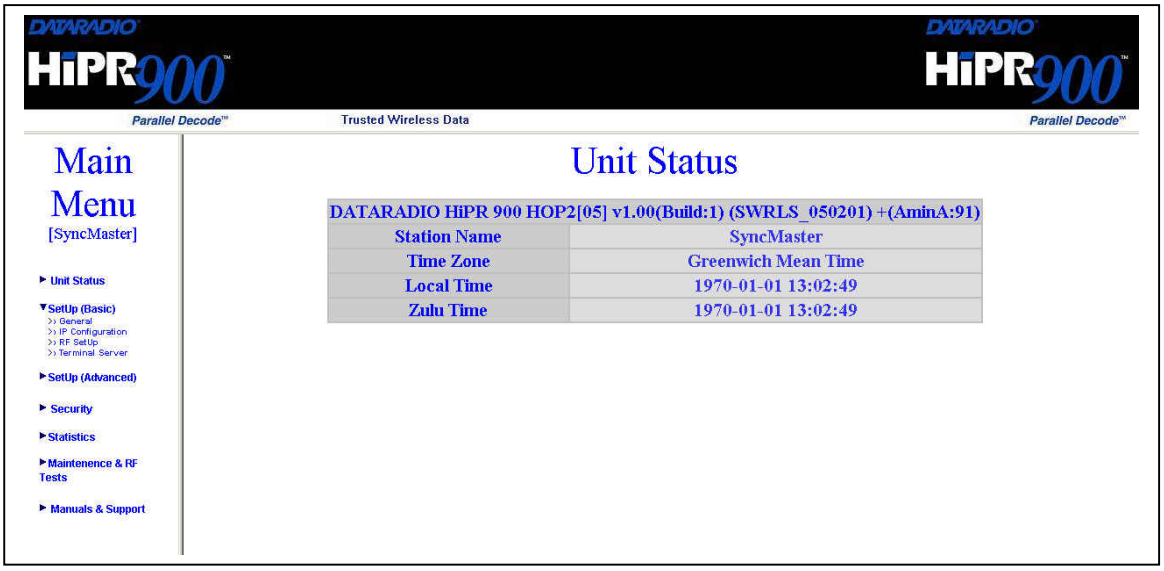


Figure 9 - Web User Interface (Preliminary)

4.3.3 Interface

The HiPR-900 user interface (Figure 9) provides easy access to the various menus used to configure and view your network settings.

The Navigation Area lists seven top-level menus, four of which expand to offer submenu. The tables starting at section 4.3.3.2 below list action of each function.

4.3.3.1 Test & Save Parameters Buttons Behavior

Submenus which have Dialog boxes also have Command Buttons to Test, Reset, and Save Parameters in addition to Station Reset.

Referring to the example in Figure 10 below, make entries into the Dialog boxes. When satisfied, click on Test Parameter to temporarily make the parameters active in the unit's memory. If not satisfied, click on Reset values button to return to the status prevalent before changes were made.

Notes:

Reset values commands affect all Dialog boxes or radio buttons in the opened window.

When finished, permanently save the parameter entries into the unit's memory *(along with any other entries made in other submenus);* click on Save Parameters.

Some parameters require a Station Reset and the Station Reset command button only appears if needed. Use the Save Parameters command button before Station Reset otherwise temporarily entered parameters are lost. Pressing the Station Reset button opens the Confirm Station Reset (Figure 11) as a reminder to first save.

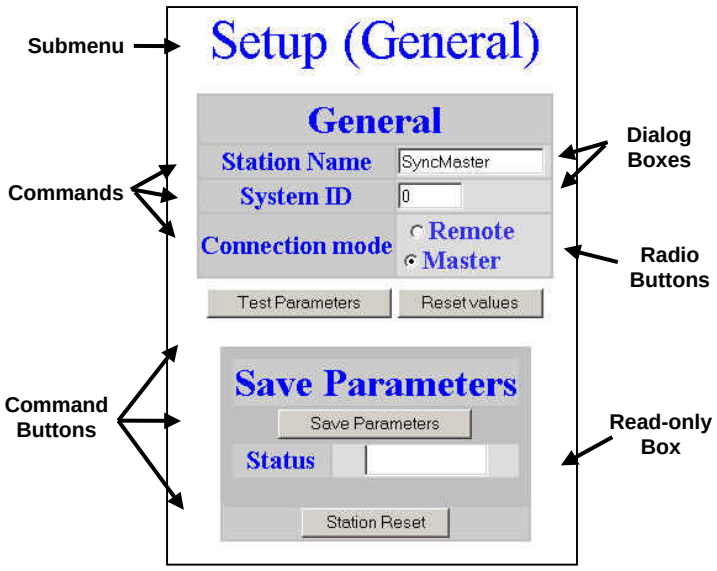


Figure 10 - Parameter Command Buttons behavior

Figure 11 - Station Reset Confirmation

4.3.3.2 Unit Status

Table 4 - Unit Status

Command	Description
Banner	**Displays HiPR-900 information retrieved from the connected unit. Have this information handy if contacting Dataradio support.**
Station Name	**Displays name of connected unit.** **Configured under Setup Basic ➔ General ➔ StationID**
Time Zone	**Displays local time zone.** **Configured under Setup Advanced ➔ SNTP➔ TimeZone**
Local Time	**Displays local time computed using UTC time and Time Zone**
Zulu Time	**Displays UTC time.** **Configured under Setup Advanced ➔ SNTP➔ SNTP UTC Time**

4.3.3.3 Setup (General)

Table 5 - Setup (General)

Command	Description
Station Name	**Station name identifier – Enter string up to forty characters in length**
System ID	**Factory default ID is zero. Dataradio recommends changing it to some other value unique to each HiPR-900 network to prevent collision and security reason.**
Connection mode	**Remote/Master** **Within a HiPR network, one unit has to be configured as a master that the remotes synchronize to. It can be any unit in a system but is normally the one considered the base unit for coverage and support reasons.**
IP Forwarding mode	**Bridge / Router modes – Defaults to Bridge mode. Use Router for more advanced IP configurations.**

4.3.3.4 Basic IP Configuration

Table 6 - Basic IP Configuration

Command	Description
IP Address	**Set to valid unique IP address for each individual unit**
Network Mask	**Set to valid IP netmask for each individual unit *(may be same or different depending on customer's IP network topology)*.**
IP Default Gateway	**Set to valid Default Gateway.** **May change for different groups or locations**

4.3.3.5 RF Setup

Table 7 - RF Setup

Command	Description
Power Level	**Sets power level between 0.1 and 1.0 watt (Default 1.0)**
Airlink speed	**256000, 512000 *(Default)* - Sets the maximum speed the HiPR900 will use for data packet transmissions. *Slower speed preferred for longer range.***
SubBand Mask	**Indicates which channels are to be used in the shared band.**

4.3.3.6 Terminal Server Configuration

Table 8 - Terminal Server Configuration

Command	Description
Baud Rate	**Port 1 - 2400, 4800, 9600, 19200, 38400, 57600, 115200**
	Port 2 - 2400, 4800, 9600, 19200, 38400, 57600, 115200
Connection Mode	**Port 1 - Inactive, TCP Passive, TCP Active, UDP**
	Port 2 - Inactive, TCP Passive, TCP Active, UDP
Local IP Address	
Local Port	
Remote IP Address	
Remote Port	

4.3.3.7 Advanced IP Configuration

Table 9 - Advanced IP Configuration

Command	Description
MTU	**Default 1500. *Range 576 to 1500 bytes***
Factory MAC address	**Factory Ethernet MAC address**
DHCP Server	**Disabled, Enabled (Default).**
DHCP Client	**Disabled(Default), Enabled**
NAT	**Disabled(Default), Enabled**
RIPV2	**Disabled(Default), Enabled**

4.3.3.8 RF Network Setup

Table 10 - RF Network Setup

Command	Description
RF MAC	**Unit's RF MAC address**
RF IP Address	**Displays factory-assigned address: nnn.nnn.nnn.nnn "Factory"**
	Entering 0.0.0.0 sets the RF IP Address to the factory default and high-lights the "Factory" name (active address) **Entering nnn.nnn.nnn.nnn (RF IP Address of your choice) overrides the factory default and highlights the "Override" name (active address)**
RF Net Mask	**Set to valid common IP netmask for all units within a HiPR network**
RF MTU	**Default 1500. *Range 576 to 1500 bytes***

4.3.3.9 Broadcast / Multicast

Table 11 - Broadcast / Multicast

Command	Description
Broadcast Outbound mobile address	
Broadcast Directed Enable	**Disabled, Enabled**
Broadcast Limited Enable	**Disabled, Enabled**
Multicast Addresses	
Multicast Add / Delete Address	**Add, Delete and Relevant address**
Multicast Enable	**Disabled, Enabled**

4.3.3.10 IP Optimization & Tuning

Table 12 - IP Optimization & Tuning

Command	Description
Optimization TCP Proxy	**Disabled (Default), Enabled. Actives the TCP Proxy module**
Optimization Data Compression	**Disabled, Enabled (Default). Applies data compression over the IP payload**
OIP RF ACK enable	**Disabled (Default), Enabled.**
OIP Retries	**Enter number of retries. Default is 3, range 0-255**

4.3.3.11 Simple Network Time Protocol

Table 13 - Simple Network Time Protocol

Command	Description
SNTP – Server addr	
SNTP – Enable	**Disabled, Enabled**
SNTP – Period	
SNTP – UTC Time	
SNTP – TimeZone	
SNTP – Daylight Savings	**Off, On**
Time Control – Time Sources	**AirLink, SNTP**
Time Control Refresh Period	
Time Control Refresh TimeOut	

4.3.3.12 Hopper Network

Table 14 - Hopper Network

Command	Description
Dwell	**Displays value between 10 and 400ms**
Sync Loss	**Displays value between 50 and 10000ms. Indicates time a remote unit will stop transmitting after the master is 'lost'.** ***Value usually at least several times the current dwell cycle time***
Max Net Speed	**256000, 512000(Default)**
TDD Mode	**Off, On(Default) –** **Normally used in a point- to- point network carrying Ethernet traffic. Maximizes RF link efficiency for bridges carrying two-way traffic**
ACK Mode	**Off, On**
SubBand Mask	

4.3.3.13 Security

Table 15 - Security

Command	Description
User ID	**Enter a string of any letters or numbers of at least 1 and not exceeding 15 characters**
Old Password	**For initial installation, enter a string of any letters or numbers of at least 8 and not exceeding 15 characters. For subsequent access, enter the old password.**

New Password	**Enter a string of any letters or numbers of at least 8 and not exceeding 15 characters**
New Password	**Re-enter the new password string**
Encryption	**Disabled, Enabled**
Encryption Key	**All units in a network must have the same key. Enter a string of 32 *(16bytes = 128 bits)* hexadecimal characters *(0 to F).*** ***Displayed in pairs separated with spaces***

4.3.3.14 Network Statistics

Table 16 - Network

Command	Description
Data bytes presented	
Control Acks Rx'd	
Data packets sent	
Data bytes delivered	
Control Nacks Rx'd	
Data packets Rx'd	

4.3.3.15 Packet Statistics

Table 17 - Packet Statistics

Command		Description
IP Stats	**RX: Total packets received**	
	RX: Total bytes received	
	RX: Packets	
	RX: Packets delivered	
	RX: Packets forwarded	
	RX: Packets miss	
	RX: Packets discard	
	RX: Packets Error	
	TX: Packets	
	TX: Packets miss	
	TX: Packets discard	
	TX: Packets Error	
	RX: Packets missed	
	RX: Erroneous packets	
	RX: Discarded packets	
	TX: Total packets sent	
	TX: Total bytes	
	TX: Packets missed	
	TX: Erroneous packets	
	TX: Discarded packets	
UDP Stats	**RX: Total packets received**	
	RX: Packets missed	
	RX: Erroneous packets	
	RX: Discarded packets	

	TX: Total packets sent	
	TX: Packets missed	
	TX: Erroneous packets	
	TX: Discarded packets	
TCP Stats	RX: Total packets received	
	RX: Packets missed	
	RX: Erroneous packets	
	RX: Discarded packets	
	TX: Total packets	
	RX: Packets missed	
	RX: Erroneous packets	
	RX: Discarded packets	
	TCP Socket Active Connection	
	TCP Socket Passive Connection	
	TCP Socket Open Connection	
	TCP Socket Close Connection	
	TCP Socket Reset Connection	
	TCP Socket Failed Connection	
	TCP Socket Abort Connection	
ICMP Stats	RX: Total packets received	
	RX: Packets missed	
	RX: Erroneous packets	
	RX: Discarded packets	
	TX: Packets	
	RX: Packets missed	
	RX: Erroneous packets	
	RX: Discarded packets	

4.3.3.16 Event Log

Table 18 - Event Log

Command	Description
Event Log	

4.3.3.17 RF Test

Table 19 - RF Test

Command	Description
Ping	
Test Tones	

4.3.3.18 FTP Transfer

Table 20 - FTP Transfer

Command	Description
Server Address	
User Name	

Password	
File Name	
Operation	**Send (Put), Receive (Get)**
Mode	**ASCII, Binary**
Request Transfer	
Reset values	
Status	

4.3.3.19 RSSI Table

Table 21 - RSSI Table

Command	Description
RSSI meters (dBm)	**See Figure *nn***
Range	
Thresholds	

4.3.3.20 Manuals & Support

Table 22 - Manuals & Support

Command	Description
Manuals	

5. Troubleshooting & Testing

5.1 Hardware Requirements

- In-line watt meter (5W range)
- Radio service monitor (IFR or equivalent).
- Cable with TNC male connector to connect HiPR-900 to the service monitor.

5.2 Software Requirements

5.2.1 Ping

The PING command determines whether a specific IP address is accessible. It works by sending a packet to the specified address and waiting for a reply. It is useful for troubleshooting "end-to-end" reachability, network connectivity, and network latency.

5.2.2 HiPR-900 Web interface

5.2.2.1 RF and IP Information

See web interface Setup pages, which includes RF and IP information

5.2.2.2 Status and Statistics

See web interface Statistics page, which includes Network and Packet statistics

5.2.2.3 RF Tests

See web interface Maintenance & RF Tests page, which includes RF Tests

5.2.3 Windows/Unix Tools

5.2.3.1 Network Connectivity

- PING
- ROUTETRACE (UNIX) / TRACERT (WINDOWS)

5.2.3.2 Configuration Information

- WINIPCFG (WIN95/98), IPCONFIG (WIN2K) or IFCONFIG (UNIX) - To view system TCP/IP setting.
- DHCPMGR (UNIX) - Graphical user interface which enables user to manage the DHCP service on the local system
- ARP (WINS & UNIX) View and update the system ARP table
- ROUTE (WINS & UNIX) View and update the system routing table

5.2.3.3 Statistics Information

- NETSTAT (WINS & UNIX) The netstat command symbolically displays the contents of various network-related data structures, i.e. IP, TCP UDP …

5.2.3.4 DNS

To Troubleshoot DNS specific problem.

- NSLOOKUP - Program to query Internet domain name servers.
- WHOIS - Utility that returns information about a domain name or IP address.

  For example, if you enter a domain name such as www.dataradio.com, whois will return the name and address of the domain's owner.
- Finger - Utility that takes an email address as input and returns information about the user who owns that email address . On some systems, finger only reports whether the user is currently logged on.

6. Specifications

These specifications are subject to change without notice.

GENERAL	
	HiPR-900
Frequency	902- 928 MHz ISM band
Configurations	IP Bridge, IP Gateway, IP Remote
Management	HTTP embedded web server for setup and help
Supported Protocols	Ethernet IEEE 802.3 (Any protocol running over IP such as ICMP, IGMP, TCP, UDP,IPSec, SNTP etc.) IP Fragmentation Address Resolution Protocol (ARP) IP directed broadcast IP limited broadcast IP multicast relay DHCP Client and Server Network Address Translation (NAT) Dynamic Routing (RIPv2)
Channels	51
Channel Spacing	500 kHz
Operating Temperature	-30° to + 60° C
Humidity	95% at 40° C non-condensing
Supply voltage	10 - 30 VDC maximum or IEEE 802.3af Power-Over-Ethernet (PoE)
Rx Current Drain at 12 VDC	<400 mA (to be determined)
Tx Current Drain at 12 VDC	<1.5 A (to be determined)
Cold start 1	8 seconds (typical)
Nominal Dimensions	5.50" W x 1.81" H x 4.25" D (13.97 x 4.6 x 10.8 cm)
Shipping Weight	2.26 lbs. (1.028 Kg)
Mounting Options	Flat surface, DIN-rail option

TRANSMITTER	
TX Frequencies	902- 928 MHz
Mode	Frequency-hopping spread-spectrum (FHSS)
TX Power Out	0.1 to 1.0 Watts, user adjustable
Frequency Tolerance	1.0 PPM

RECEIVER	
RX Frequencies	902- 928 MHz
Bit Error Rate (BER)	TBD

Modem / Logic	
Data Rate	256/512 Kbps (user selectable)
Modulation Type	RCFSK
Addressing	IP

SETUP and COM Port	
Interface	EIA RS-232F DE9F
Data Rate	1200 – 115,200 b/s (Defaults: Setup & COM = 19.2 Kbps)

Display	
5 Bi-color status LEDs	LAN link, LAN activity, Tx/Rx, Sync, Power

Connectors	
Antenna Connector	Dual TNC female
Serial Setup Port	DE-9F
Serial Terminal Server	DE-9F
Ethernet RJ-45	10/100 BaseT auto-MDIX
Power -I/O	Phoenix

Diagnostics	
Online	temperature, Supply voltage and source, RSSI, Spectrum, fwd and rev power, back-ground interference,

FCC / IC / UL Certifications			
	FCC	IC (DOC)	UL
900 MHz	Part 15.247 pending		

Pending

Dataradio COR Ltd. ("DRL") warrants to the original purchaser for use ("Buyer") that data telemetry products manufactured by DRL ("Products") are free from defects in material and workmanship and will conform to DRL's published technical specifications for a period of, except as noted below, two (2) years from the date of shipment to Buyer. DRL makes no warranty with respect to any equipment not manufactured by DRL, and any such equipment shall carry the original equipment manufacturer's warranty only. DRL further makes no warranty as to and specifically disclaims liability for, availability, range, coverage, grade of service or operation of the repeater system provided by the carrier or repeater operator. Any return shipping charges for third party equipment to their respective repair facilities are chargeable and will be passed on to the Buyer.

If any Product fails to meet the warranty set forth above during the applicable warranty period and is returned to a location designated by DRL. DRL, at its option, shall either repair or replace such defective Product, directly or through an authorized service agent, within thirty (30) days of receipt of same. No Products may be returned without prior authorization from DRL. Any repaired or replaced Products shall be warranted for the remainder of the original warranty period. Buyer shall pay all shipping charges, handling charges, fees and duties for returning defective Products to DRL or DRL's authorized service agent. DRL will pay the return shipping charges if the Product is repaired or replaced under warranty, exclusive of fees and duties. Repair or replacement of defective Products as set forth in this paragraph fulfills any and all warranty obligations on the part of DRL.

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EXCEPTIONS

ONE YEAR:	Labor to replace defective parts in repeaters or base stations
THIRTY DAY:	Tuning and adjustment of telemetry radios
NO WARRANTY:	Fuses, lamps and other expendable parts

Effective 01/2004

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