Connections

Ensure that power and grounding are properly wired and installed before making additional connections. The included grounding hardware allows connection of a grounding lug to the M5 receptacle near the lower-left corner of the radio. Place the wave washer next to the head of the screw. Place flat washers on both sides of the grounding lug. Another grounding connection is available on the power injector.

After establishing the radio link, connect the Ethernet and T1/E1 (RJ-48C) services matching configurations made in the GUI. Use a ping test to verify connectivity across Ethernet. A T1/E1 line or test equipment can help verify T1/E1 connectivity.

Indicators

The power injector has indicators to assist in determining status. The right LED on the POWER+DATA connector is solid green when proper power is applied. For the GigE model, the left LED blinks after successful reset. For the other models, the left LED flashes when alarms are present on the radio, and is solid green under normal conditions. When this LED flashes, alarm status can be further determined by pressing the RESET button on the power injector: A solid LED indicates that there are major alarms on the radio (traffic affecting). A flashing LED indicates that all alarms are minor (not traffic affecting). Use the Exalt GUI to determine alarm status.

Register the Product

Products registered within 90 days of purchase receive 2 full years of warranty coverage for no extra charge. Unregistered products and products registered after the 90-day period, only receive a 1-year warranty. Register the product according to the instructions on the provided registration card. See the I&M manual for the full warranty statement.

For More Information

Refer to the I&M manual, which can be downloaded from the radio or from the Internet at:

http://login.exaltcom.com

Customers may be required to request permission for documentation, tools and firmware. Follow instructions from the website.

Contact Exalt Customer Care at:

Phone: (408) 871-9890
Toll-Free (USA): (877) EXALT-01 (392-5801)
Support email: support@exaltcom.com
Sales email: sales@exaltcom.com

Exalt Communications, Inc.
5809 Division St.
Campbell, CA 95008 USA
(408) 871-1804

EX-r Series

Digital Microwave Radios

Quick Start Guide

Models:

EX-4.5r GigE / EX-4.5r-c GigE
EX-4.9r v2 / EX-4.9r-c v2
EX-5r v3 / EX-5r-c v2
EX-5r Lite / EX-5r-c Lite
EX-5r GigE / EX-5r-c GigE

Part Number: 201290-002
2009-05-29

The information in this document is subject to change without notice. Exalt is not liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this document or equipment supplied with this document. Exalt makes no warranty of any kind with regard to this document. Full Warranty information is in the Installation & Management manual.

The system has been tested and found to comply with the limits of a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.
- Shielded cables and I/O cords must be used for this equipment to comply with the relevant FCC regulations.

Changes or modifications not expressly approved in writing by Exalt may void the user's authority to operate this equipment.

This Class B Digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte les exigensces du Reglement sur le material broilleur du Canada.

- this device may not cause interference, and
- this device must accept any interference, including interference that may cause undesired operation of the device.

Antennae associated with these devices must be mounted in a restricted area, at a designated minimum distance away from humans who may be subject to long-term or continuous exposure. Refer to the *Installation & Management Manual* for details.

THIS PRODUCT MUST BE PROFESSIONALLY INSTALLED

Contact Exalt or refer to the Installation & Management manual for a list of supported antennas and regional transmitter power requirements.

connection. If using the T1/E1 interfaces, additional arrestor(s) may be used. Any weatherproof T1/E1 surge protection solution may be used.

Use the included connectors with waterproof spacers on any unused connectors. Remove the spacers for any connectors that will be used.

The SYNC IN/RSL connector may be used for antenna alignment; it may therefore be desirable to delay connecting of the associated connector/spacer, or GPS unit, until alignment is complete.

Use UV-rated (outdoor) CAT5 (or higher) cable, such as Belden 1300A for all connections. **The outside radius of the cable type must be between 0.25 and 0.31 inches** to assure a proper water-tight connection. Place connector parts as shown in the photo. Note that all connector parts can be placed on a cable that is already terminated – the screw cap and beveled washer will both allow the RJ-45 connector to pass through, and the the rubber seal piece has a split slot that allows it to be placed over the cable insulation.

Insert the RJ-45 connector until it clicks into place. Then adjust the position of the rubber seal into the connector recepticle. Align the beveled washer on top of the rubber seal, and strongly hand-tighten the rear section of the connector. Inspect the rubber seal to assure that there is no deformation, and that the seal appears tight.

The total length of the PoE cable, including the cable from the power injector to the connected network equipment must not exceed 100 meters.

Aligning Antennas

The received signal level (RSL) test point is on the SYNC IN/RSL connector. Use the included RSL cable to connect a volt meter during antenna alignment. DC voltage at the RSL port is related to the RSL level in dBm. For example, a value of 0.6VDC is roughly equivalent to an RSL of -60dBm and a value of 0.75VDC is roughly equivalent to an RSL of -75dBm. In this manner, voltage is inversely proportional. Align antennas to the *minimum* possible voltage (0.6VDC is less than 0.7VDC, but represents a higher RSL level of -60dBm compared to -70dBm). RSL should be roughly equal to the value planned in the link design (within 1 to 2 dB). Account for all transmission system gains and losses to confirm the designed value. For the GigE radio, the management interfaces allow the selection of each polarization (Vertical or Horizontal) for RSL measurement when in cross-polarization configuration. Generally, it is good practice to verify RSL for both polarizations.

After the designed RSL is achieved, mechanically secure the antenna for both azimuth and elevation alignment. Carefully monitor the RSL voltage while tightening the mechanics and ensure that the antenna remains in alignment.

Use the integrated alignment buzzer as an alternate or in addition to the RSL test point. On the GUI, set the Buzzer Timeout parameter on the System Configuration page to 10, 120, or ON for the buzzer to be active for 10 minutes, 120 minutes, or continuously. Set the Buzzer Timeout parameter to Off to disable the buzzer. Buzzer pitch relates to RSL: a higher pitch represents better RSL. A continuous tone indicates a successful link to the far end. A chirping (beeping) buzzer indicates that the radio is not locked to the far end. Note also that RSL in dBm is provided on the Monitor>Performance section of the management interfaces.

It is good practice to initially mount the Radio A antenna by bearing and sight, and attempt initial alignment from the Radio B side first. Align the Radio B antenna until maximum RSL is achieved, secure the Radio B antenna, then align the Radio A antenna until maximum RSL is achieved. Two or three rounds of alignment at each end are typically required to achieve the designed target RSL. For initial alignment, a slow steady sweep in horizontal, then vertical alignment will help identify the antenna center beam by watching for the highest signal in both planes. RSL reporting is delayed by approximately 1 second. With this in mind, for fine alignment, it is a good practice to make small adjustments, wait, then make a measurement, and continue adjusting in small steps.

Configure all parameters on both radio terminals to match the requirements of the system design and verify that the radio link communicates properly during the back-to-back bench test. It can be extremely challenging, time consuming, and costly to troubleshoot a system that is not properly preconfigured and tested.

Extracting the I&M Manual

Click the **Manual** navigation link. The browser displays the PDF file. Click the **Save** button in the PDF toolbar to save the manual on the local system.

Reset to Critical Factory Settings

If required, the radio may be reset to the critical factory settings:

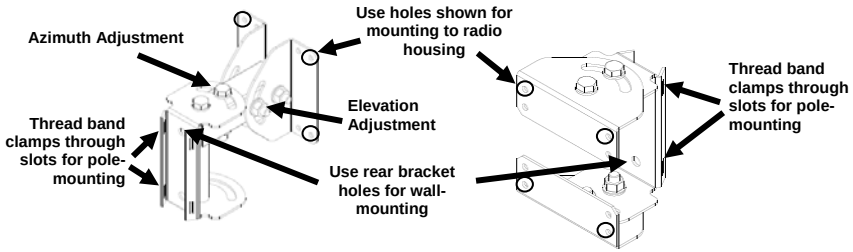
1. Remove power from the power injector (the DATA+POWER cable remain connected).
2. Hold the **RESET** button on the power injector while applying power.

   Hold the **RESET** button down through the whole power cycle and monitor the DATA+POWER left LED on the power injector.
3. Release the **RESET** button only after the left LED blinks (for the GigE models) or is in a steady state (for all other models). The button is held for approximately 45-60 seconds.

Some previous configuration information may be lost and replaced with the factory default settings, including the IP address (**10.0.0.1**), password (**password**), Endpoint Identifier (to Radio B) and VLAN enable (to disable). The GigE model also resets the PoE interface to auto-negotiate.

Mounting Kit

Use the enclosed mounting bracket kit. The mounting bracket is designed to support pole-mounting to a pole from 2–5"/5–13cm in diameter. The bracket can also be mounted to a wall.



Placing the washers:

1. Place flat washer next to bolt head.
2. Thread bolt through the assemblies.
3. Place another flat washer.
4. Place a wave washer and the fastening nut.

Flat washers provide a smooth sliding surface for assemblies that pivot. The wave washer provides a securing surface for the nut. The bolts connecting the bracket to the radio require a 5mm hex wrench (not included).

Cabling

Lightning arrestors are recommended near the radio for surge protection on all cabled interfaces. These protect the radio against surges. Additional lightning arrestors are generally necessary for all cable egress points for cables entering shelters or buildings. These protect surges from entering connected equipment and/or harming humans or equipment collocated in the shelter or building.

For the PoE connection, the **PolyPhaser IXG-05** is approved for all models. The **Transtector ALPU-EXLT**, or **ALPU-90V** are approved for all models except GigE versions. For the GigE versions, if the ETH2 connector is being used, additional IXG-05 devices should be used for this

Introduction

Note: Read this entire document before attempting to install Exalt Digital Microwave Radios.

The reader is strongly encouraged to obtain a copy of the *Installation and Management Manual* (I&M) for this product. The I&M is embedded in the radio's graphical user interface (GUI) and can be saved locally (as described in this document). In addition, customers may request access to documentation (and software) by creating an account and logging in at:

http://login.exaltcom.com

This quick start guide (QSG) is intended to provide only a brief overview of the r-Series radios. The reader must have experience with networking and RF. Refer to the I&M manual for full descriptions, **regulatory requirements**, **safety requirements** and troubleshooting information.

Preparation

Complete a path analysis and link design prior to installation. Gather the following information in the design phase:

- Length(s) and type(s) of transmission system cabling and connectors (if any)
- Make and model of antennas
- Antenna structure requirements, antenna and radio mounting locations
- Cable routes and egress location
- Grounding plan, surge protection, grounding mechanics, power and wiring
- Critical radio settings: RF center frequency, transmitter output power, occupied channel bandwidth, mode selection, TDD frame length, and link distance setting
- Anticipated RSL
- Number of T1/E1 circuits enabled (if any)

Perform the following tasks before installing the radio terminals:

- Build antenna/radio structures and egress mechanics
- Mount antennas and transmission line (if any), lightning arrestor(s) and grounding
- Prepare and test interface and power cables

Shipping Contents

Review the labeling and contents of all boxes and the physical condition of the shipping container and contents. Ensure that items are not damaged, and that part numbers and serial numbers match the original equipment order and shipping information. Each radio terminal box should contain the following:

- Radio terminal
- Power injector
- AC adapter with power cord
- Mounting kit
- Accessory kit
- Quick start guide (this document)
- Product registration card

The accessory kit contains the following items:

- Connectors (4ea or 6ea for GigE models) with waterproof spacers (3ea or 5ea)
- Weather-seal tape (required for RF connectors on the -c models)
- RF connector cover (for the -c models, covering the unused RF connector, where applicable. This may be pre-installed on the RF connector labeled 'ANT 2')

- RSL adapter cable
- Grounding hardware (M5 screw, M5 wave washer, 2 x M5 flat washers)
- Lifting hook (may be temporarily attached to the grounding or mounting screws, and used for transporting the radio terminal up and down a tower or building)

Getting Started

It is strongly advised to configure the radio system prior to physical installation. This step minimizes total installation time and aids troubleshooting that may be required during commissioning.

CAUTION: For the -c models, ANT 1 is activated when power is applied. Before power is applied, terminate ANT 1 of the radio to a 50-Ohm load. Place a 50-Ohm termination or ≥20dB fixed attenuator on the port. Alternatively, cable ANT 1 to the antenna system or back-to-back with the other terminal with at least 40dB of total attenuation between the terminals.

Power can be applied after terminating ANT 1. To apply power:

1. Connect a CAT5 cable to connector A (Power/Ethernet).
2. Connect the opposite end of the CAT5 cable to the DATA+POWER connector on the power injector.
3. Connect the DC connector on the AC adapter to the power injector.
4. Connect the AC connector on the AC adapter to AC power.

Configuration Overview

For proper communication, one radio terminal must be configured as Radio A (radios are configured as Radio B at manufacture). In addition, for some models, **a proper Regulatory Domain Key (RDK) is required before any system configurations are allowed**. Other configurations may also be necessary before completing installation. Use the Exalt browser-based GUI for configuration.

Connect an Ethernet port to the DATA connector on the power injector using either a straight or crossover cable. Connect the opposite end to a computer with an Ethernet port and browser software.

The computer accessing the Exalt GUI must match the IP subnet of the radio. The radio's default IP address is **10.0.0.1.** Since all radios are configured with the same IP address at manufacture, change at least one radio's IP address to avoid an IP address conflict. Use the following procedure:

- Change the IP address of the accessing computer to match the radio's subnet, select the Ethernet network adapter, and then select TCP/IP properties. Select the static IP address option and change the IP address to 10.0.0.*x* (where, *x* does not equal 1 or any other address planned for either radio).

Using the GUI

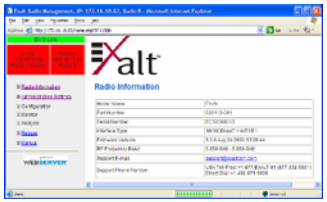
A browser is required to access the GUI. Microsoft Internet Explorer 5.0 or greater is recommended. Netscape, Mozilla, and Firefox are supported. Use the following procedure to access the Exalt GUI.

1. Open a browser window and type the IP address of the radio (such as 10.0.0.1) in the address field, and press **ENTER**.

   A password dialog box displays.

2. Type **admin** into the User name field.
3. Type **password** into the Password field.
4. Press **OK**.

The GUI displays the Radio Information page. Use the navigation panel to access the configuration and management tools.



To establish a working link:

1. For models with the Regulatory Domain Key (RDK) feature, enter the RDK on the **Administration>Settings** GUI page. Each RDK is unique and is tied to the unit's serial number. The RDK may be found at **www.exaltcom.com/activate.htm**
2. Press the **UPDATE** button on this page to accept the RDK.

Note: For models with the RDK feature, system configuration is **impossible** without proper RDK installation.

3. On the Configuration>System page, change the **Endpoint Identifier** (Radio A or Radio B) of one terminal to Radio A. Press the **UPDATE** button.

Note: Changing the Endpoint Identifier displays a confirmation page and reboots the unit.

4. Enter any feature License Key purchased. The License Key is unique and tied to the unit's serial number. Press the **UPDATE** button to accept the entry.
5. Change the radio's IP address, as desired, on the **Administration Settings** page and press the **UPDATE** button.

Note: If the IP address is changed, open a new browser window and navigate the GUI to the new IP address.

At this stage, all other configurations can remain at the factory default settings, and the link operates for back-to-back bench testing. However, for most installations, the following parameters must match the link design (at both ends of the radio link):

Administration Settings:	Link Security Key AES (option) enable/disable, & key
Configuration>System:	DFS enable/disable (where applicable) Radio Transmit Power Bandwidth Mode RF Frequency Link Distance TDD Frame Size TX/RX Throughput Ratio (opposite)
Configuration>Interface>Ethernet:	All settings
Configuration>Interface>T1/E1:	All settings

Note: Disable any T1/E1 interface not intended for use. Available throughput is allocated to the Ethernet interface.

Note: The Radio Transmit Power is usually set to the minimum level as a default. Based on path calculations and regulatory requirements, this value should be set to the proper level at installation.

This product must be professionally installed. The Radio Transmit Power must be configured, prior to connection to the antenna system, in accordance to all government regulations that apply. The professional installer is responsible to ensure that the implementation is within legal limits.