ZETRON®

Intelligent Radio Interface Module for Motorola iDEN i365

025-9623 D3

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Products and batteries with the symbol (crossed-out wheeled bin) cannot be disposed as household waste. Old electrical and electronic equipment and batteries should be recycled at a facility capable of handling these items and their waste byproducts.

Contact your local authority for details in locating a recycle facility nearest to you.

Pb

Proper recycling and waste disposal will help conserve resources whilst preventing detrimental effects on our health and the environment.

Notice: The sign "Pb" below the symbol for batteries indicates that this battery contains lead.

FCC Class A User Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Regulatory Compliance Markings

When required these products are provided with the following Product Certification Markings:

- FCC markings
- FCC Part 68 (USA)
- CS-03(Canada)

EMC Compliance Standards

- FCC Part 15 - Radiated & Conducted Emissions (USA)
- ICES-003 - Radiated & Conducted Emissions (Canada)

Safety Summary

Warning! For your safety and the protection of the equipment, observe these precautions when installing or servicing Zetron equipment.

- Follow all warnings and instructions marked on the equipment or included in documentation.
- Only technically qualified service personnel are permitted to install or service the equipment.
- Be aware of and avoid contact with areas subject to high voltage or amperage. Because some components can store dangerous charges even after power is disconnected, always discharge components before touching.
- Never insert objects of any kind through openings in the equipment. Conductive foreign objects could produce a short circuit that could cause fire, electrical shock, or equipment damage.
- Remove rings, watches, and other metallic objects from your body before opening equipment. These could be electrical shock or burn hazards.
- Ensure that a proper electrostatic discharge device is used, to prevent damage to electronic components.
- Do not attempt internal service of equipment unless another person, capable of rendering aid and resuscitation, is present.
- Do not work near rotating fans unless absolutely necessary. Exercise caution to prevent fans from taking in foreign objects, including hair, clothing, and loose objects.
- Use care when moving equipment, especially rack-mounted modules, which could become unstable. Certain items may be heavy. Use proper care when lifting.

Change List for Rev C, January 2012

- Added RTEMS copyright information to front matter.

Change List for Rev D, June 2015

- Added a new parameter, **Use Hardware Ptt**, to the section on iDEN Handheld radio parameters, see *Use Hardware Ptt* on page *48*

Change List for Rev D1, October 2018

- Replaced a reference to Windows 2000 and Windows XP with “Windows Operating system” in *Initial Configuration Using the Digi Software Tool* on page *27*

Change List for Rev D2, March 2021

- Removed login and password references.
- Updated the Limited Warranty and Limitation of Liability statements.

Change List for Rev D3, April 2021

- Removed third-party logon and password information.

Contents

Introduction

Overview

The Intelligent Radio Interface Module (iRIM), used in conjunction with an iRIM iDEN i365 Adapter, enables you to operate a remote Motorola iDEN i365 or i365IS radio with Zetron DCS-5020 and ACOM consoles. The iRIM passes transmit and receive audio and provides access to radio functions through tone remote function tone sequences. The iRIM iDEN i365 Adapter provides the appropriate connections to the radio, enabling the radios to communicate with the iRIM, to be powered by the adapter, and to charge their batteries.

Figure 1: iRIM and iRIM Adapter

Note This manual assumes that the installer has basic proficiency with radio installation and use of radio programming software.

System Features

This iRIM has the following features:

- Remote control of Motorola i365 and i365IS radios through standard tone remote function tones
- All radio progress tones passed to the console
- Voice delay to compensate for trunked-radio system key-up delays and FSK signaling
- AGC (automatic gain control) on transmit audio
- Control of two radios per iRIM
- Modular connectors and pre-set levels for easy installation
- Configurable over Ethernet using a standard web browser
- Desk or rack mounting (optional)

Radio and Console Compatibility

- This iRIM connects to Zetron DCS-5020 and ACOM consoles.
- This iRIM is compatible with Motorola iDEN i365 and i365IS radios.

Note Throughout this manual, the notation "i365" applies equally to either the i365 or i365IS radios.

Installation

⚠ **Caution!**	This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual and commonly used radio practices, it may cause interference to radio communications. Only personnel experienced with consoles and radio systems should install the iRIM.

Overview

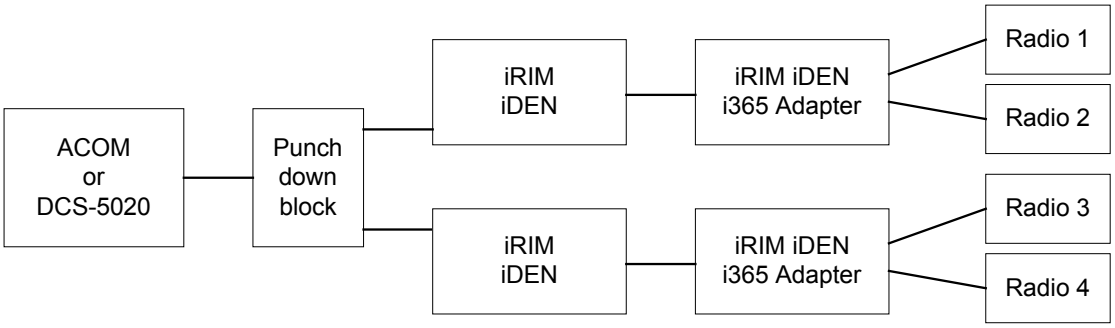
Figure 2 shows an example system installation. Each radio connects to a port on the iRIM iDEN i365 Adapter through one of the supplied radio interface cables. Ethernet cables connect the iRIM Adapters to the iRIMs. The supplied RJ-45 cable, or any standard eight-conductor RJ-45 cable, such as an Ethernet cable, connects the iRIM to a punchdown block, which is then wired to the two channels on the console system. The link between the console system and the iRIM is not limited in distance, so it may be extended by means such as a leased line. The iRIM may be installed in a standard 19-inch rack using the optional rack-mount adapter.

Installation of the iRIM is done in two phases:

- Configure system components
- Install and connect system components

Before beginning installation, read all of this section to become familiar with the system.

Figure 2: Example system with four radios



Required Tools

Common hand tools are used to install the equipment. Additional tools may be needed to wire to the punchdown block and console system.

Radio Configuration

Most of the radio's configuration parameters can be set according to your preferences. However, the following configuration parameters must be set in each iDEN radio to allow proper operation with the console:

- The baud rate must be set to 19.2kbps. From the radio main menu select: **Settings** | **Advanced** | **Baud Rate** | **19200**
- The audio output level (speaker level) should be set to mid-range. From the radio main menu select: **Settings** | **Volume** | **Speaker** | **3**

DIP Switches

For normal operation, all iRIM DIP switches should be in the default **UP** position. The DOWN position is only used in special circumstances during iRIM configuration.

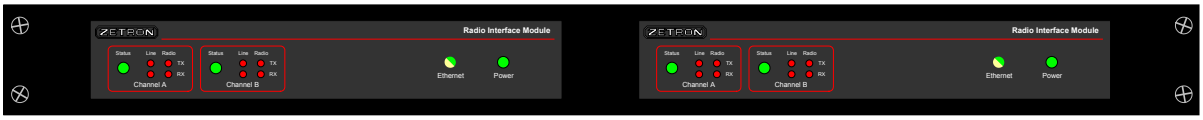
Table 1: iRIM DIP Switches

Switch	Purpose	Positions
A	Network Parameter Select — Selects whether to use the configured network parameters or the default network parameters. For more information, refer to *PC to iRIM Direct Connection* on page *40*.	UP – Use the configured IP address DOWN – Use the default IP address (see switch B)
B	IP Address Default — Selects which IP address to use for the default. For more information, refer to *PC to iRIM Direct Connection* on page *40*.	UP – 192.168.0.1 DOWN – 192.168.0.133
C	Unused	Unused
D	Fast Boot — Enables or disables the power-on RAM test.	UP – Perform RAM test on boot up DOWN – Fast boot

Mounting the iRIM and iRIM Adapter

This section is only relevant to rack-mount devices. For desktop devices, skip to the next section: *Connecting the Components* on page *12*.

The iRIMs and iRIM adapters are designed to be either free-standing devices or, with a special top cover, rack-mount devices. A free-standing iRIM or adapter has no mount points. An iRIM or adapter with a top cover meant for rack mounting has two “ears” with a total of four holes. In the rack-mount configuration, there can be up to two iRIMs per their mounting plate kit (P/N 950-0588) and up to two iRIM adapters per their mounting plate kit (P/N 950-0898). A single unit rack mount plate kit is also available for iRIMs (P/N 950-0589), but not iRIM adapters. The following figure shows two iRIMs in a dual unit rack mount plate kit.



Height	1.75 inches (1 RU)
Width	19 inches
Depth	10 inches

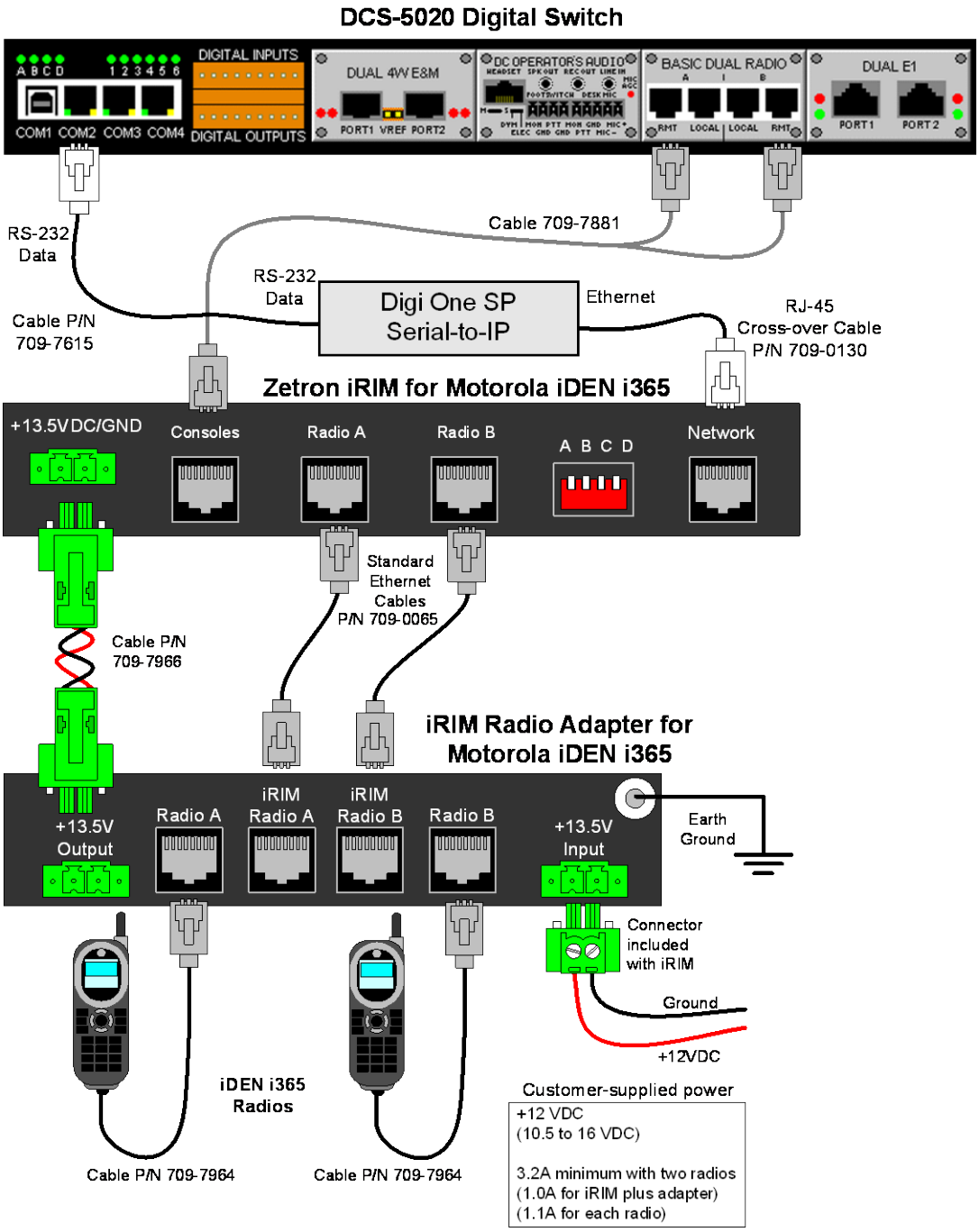
♦ **To mount the iRIM or iRIM adapter in a rack-mount configuration:**

1. Ensure there is adequate rack space. Each plate requires 1RU of space.
2. The rack mount plate has a top edge and a bottom edge that must be oriented correctly. On a dual unit plate, the long edge with two rounded corners is the top. On a single unit plate, the edge closest to the stripe is the top.
3. Slip the unit's "ears" over the threaded studs on the back of the rack mount plate.
4. Secure the unit with the four provided 4-40 nuts. Repeat for additional units.
5. Install the mount plate and attached units by driving the four provided screws through the mounting plate into the rack. This is best done with two people: one to support the weight and position of the hardware and the other to drive the screws.

Connecting the Components

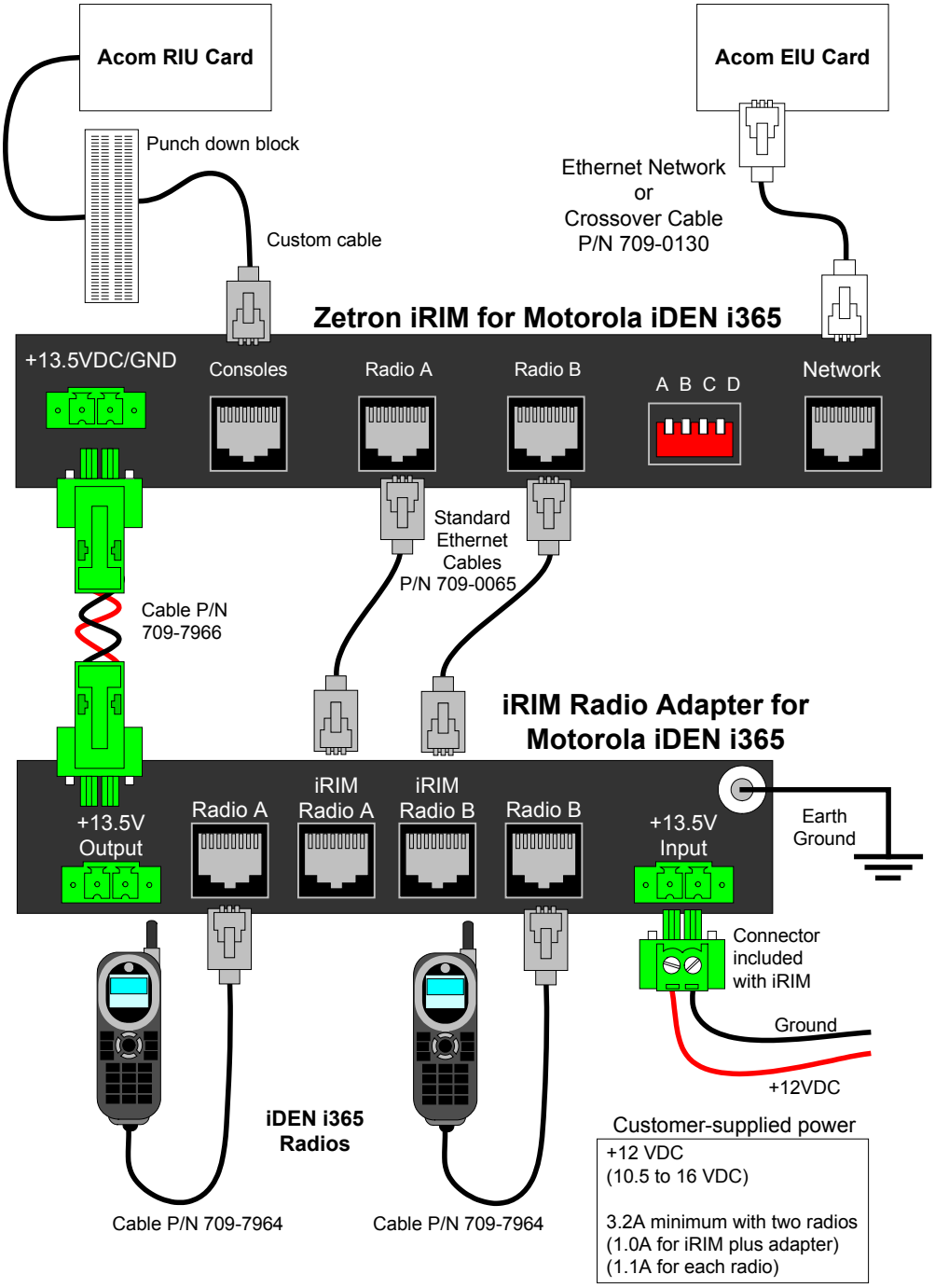
Connect the components according to the following diagrams. More detailed information is provided in the sections following the diagrams.

Figure 3: iRIM connection diagram in a DCS-5020 system



Note When looking at the back of the units as shown in *Figure 3*, pin 1 is on the left for all ports shown in the diagram.

Figure 4: iRIM connection diagram in an Acom system



Note When looking at the back of the units as shown in *Figure 3*, pin 1 is on the left for all ports shown in the diagram.

Power Ports

A single power connection to the iRIM adapter, meeting the following specifications, provides sufficient power for the iRIM, the iRIM adapter, and two i365 radios including TX/RX operation and battery charging occurring simultaneously.

Table 2: iRIM "+13.5Vdc/GND" Input Pinout

Pin	Description
1	10.5 Vdc to 16 Vdc, 3.2 amps
2	Ground

- **To connect power**

1. Connect cable 709-7966 from the iRIM adapter's output port to the power port on the iRIM as shown in *Figure 3*.
2. Using the screw terminal provided with the iRIM, connect power to the iRIM iDEN i365 Adapter as described in *Table 2* and as shown in *Figure 3*.

Radio Ports

- **To connect the iRIM to the iRIM adapter**

1. Use cable 709-0065 (or a standard CAT5 Ethernet patch cable) to connect the **Radio A** port on the iRIM to the **iRIM Radio A** port on the iRIM adapter, as shown in *Figure 3*.
2. Use cable 709-0065 (or a standard CAT5 Ethernet patch cable) to connect the **Radio B** port on the iRIM to the **iRIM Radio B** port on the iRIM adapter, as shown in *Figure 3*.

- **To connect an i365 radio to the iRIM adapter**

1. Plug the 8-pin modular connector on the supplied cable (part number 709-7964) into the appropriate RJ-45 jack on the back of the iRIM adapter (either **Radio A** or **Radio B**) as shown in *Figure 3*.
2. Connect the other end of the cable to the radio.
3. Repeat for additional radios.

Network Port

The Network Port is initially connected to a computer by way of Ethernet during initial configuration of the iRIM. A computer on the same network (or connected by a crossover cable) uses a web browser to configure the iRIM. After initial configuration, the iRIM is Network Port is connected to a COM port on the DCS-5020 Digital Switch or the Acom Console Unit, by way of an Ethernet-to-Serial convertor.

♦ **To connect the iRIM to a computer for initial configuration**

1. Use cable 709-0065 (or a standard CAT5 Ethernet patch cable) to connect the **Network** port on the iRIM to the same network as the computer.
   -or-
   Use a crossover cable to connect the **Network** port on the iRIM directly to an Ethernet jack on the computer.

♦ **To connect the iRIM to DCS-5020**

1. Using either an Ethernet network or an Ethernet crossover cable (P/N 709-0130), connect the Network Port of the iRIM to the Ethernet side of the Digi One SP Serial-to-IP convertor.
2. Connect the appropriate COM port of the DCS-5020 Digital Switch to the serial side of the Digi One SP Serial-to-IP convertor. The COM port on the Digital Switch must be properly configured. For additional information, refer to *DCS-5020 Software Installation and Configuration* (P/N 025-9540).

♦ **To connect the iRIM to Acom**

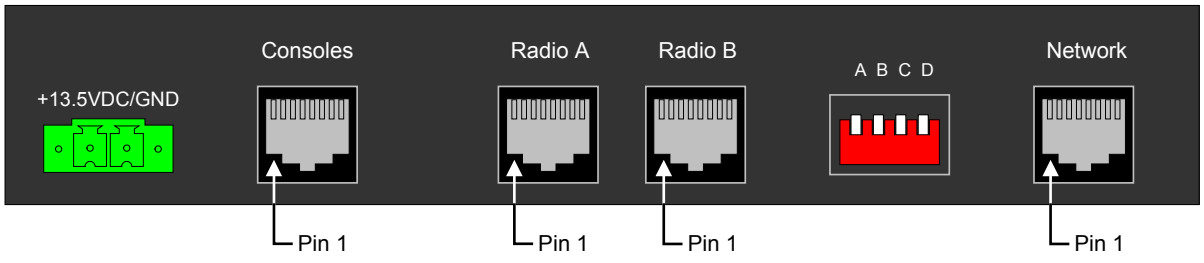
1. Using either an Ethernet network or an Ethernet crossover cable (P/N 709-0130), connect the Network Port of the iRIM to the Acom EIU. For more information, refer to *Acom Ethernet Interface Unit* (P/N 025-9620).

Consoles Port

To connect the radio audio to DCS-5020, use the supplied Y-cable (P/N 709-7881) to connect the **Consoles** jack on the back of the iRIM to the **RMT** jacks on the Basic Dual Radio Module in the DCS-5020 Digital Switch.

To connect the radio audio to Acom, use the supplied standard RJ-45 cable wired for Ethernet (P/N 209-0065) to connect the **Consoles** jack on the back of the iRIM to the Acom system's punchdown block. These wires ultimately connect to either an RIU or an EIU card. This single cable carries transmit and receive pairs for both radio channels. Since the interface uses differential audio, it is important that the twisted pairs in the cable correspond to the audio pairs on the connector. *Table 3* provides wiring information.

Figure 5: iRIM Rear Panel



Note This table assumes the cable follows the T-568B wiring scheme.

Table 3: iRIM "Consoles" Jack Signal Pinout

Pin	Wire Color	Description
1	Orange/White	RXB+ (RIM to Console Audio +, Channel B)
2	Orange	RXB– (RIM to Console Audio –, Channel B)
3	Green/White	RXA+ (RIM to Console Audio +, Channel A)
4	Blue	TXA+ (Console to RIM Audio +, Channel A)
5	Blue/White	TXA– (Console to RIM Audio –, Channel A)
6	Green	RXA– (RIM to Console Audio –, Channel A)
7	Brown/White	TXB+ (Console to RIM Audio +, Channel B)
8	Brown	TXB– (Console to RIM Audio –, Channel B)

Pin 1 is to the left when looking at the rear of the iRIM, as shown in *Figure 5*.

Quick Setup for Zetron Consoles

Overview

This chapter describes how to configure the iRIM for use with an Acom or DCS-5020 console using step-by-step procedures. Additional detail and reference information is provided in the following chapter, *iRIM* on page *39*.

In this chapter:

Requirements

- The Zetron console is already configured
- The radios are already configured for the iRIM (see *Radio Configuration* on page *10*)
- A computer with the following:
  - Ethernet network capability
  - Web browser
- Connection between the PC and the iRIM such as a crossover Ethernet cable

  -or-
- Ethernet cable and 10-BASE-T connection to the network

Connecting to the iRIM

All iRIMs come from the factory with the same configuration. The default network settings are fine if the iRIMs are not actually going to be used on a network, but need to be changed if they are. (The main issue is that on networks, all devices must have different IP addresses and the iRIMs all have the same address initially.)

1. Apply power to the iRIM.
2. Connect the Ethernet port on the configuration PC to the Network port on the back of the iRIM with a cross-over Ethernet cable. The Ethernet LED on the front of the iRIM should be green. If you do not have a cross-over cable, connect both the configuration PC and the iRIM to a common Ethernet switch.
3. Set the IP address of the configuration PC to **192.168.0.5**, the network mask to **255.255.255.0**, and gateway address to **192.168.0.2**.
4. Open a web browser, such as Internet Explorer, on the configuration PC. Open a connection to this URL:
5. **http://192.168.0.133/**

   The page to the right should appear in the browser.

Warning! Good cybersecurity practice requires changing the default password immediately after logging in for the first time. Continued use of default passwords is a significant security vulnerability.

6. Enter the default password and click the **Login** button. If you don't know the password, contact Zetron Technical Support.

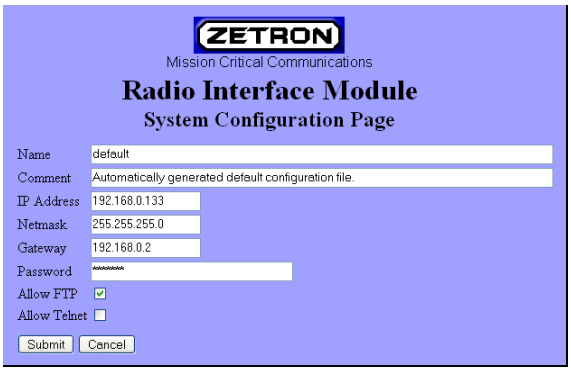
At this point, the configuration can be modified or product version information about the iRIM may be viewed. Use the buttons on screen to navigate through the menus. Do not use the browser's "back" button as the iRIM has to keep state between screens and the "back" button does not notify the iRIM that the user is viewing a different screen. The login session shall time out after 10 minutes of inactivity.

Configuring System Parameters

The system parameters consist of the unit's name, a comment describing the configuration and the network settings. The name and comment are descriptive and do not affect the operation of the iRIM. The network settings only need to be modified if the iRIM is to be placed on a network, especially with any other iRIM. Changing the network settings requires a reboot of the iRIM for them to take effect, but other configuration changes may be made before rebooting.

- **To modify the system parameters, from the main menu:**

1. Click the **View or Modify Configuration** button. This will bring up the **View/Modify Configuration** page, seen below.
2. Click the **System Parameters** button. This will bring up the **System Configuration** page.
3. The **Name** and **Comment** fields may be changed as desired.
4. The fields **IP Address**, **Netmask**, and **Gateway** depend on the network configuration. If the iRIM will not be connected to a network, these settings may be left alone. If the iRIM will be connected to a network, contact your IT department to get settings compatible with your particular network.
5. The **Password** field changes the password used to log into the iRIM menus. It is not strong by any means, and just interferes with casual or accidental access to the unit.
6. The checkboxes **Allow FTP** and **Allow Telnet** provide for FTP and telnet access to the iRIM via the network. The **Allow FTP** checkbox needs to be checked to allow text file configuration and firmware uploads. Debugging information for Zetron technical support may be viewed via a telnet session, but the **Allow Telnet** checkbox should normally remain unchecked.
7. Click **Submit**. This will return to the **View/Modify Configuration** page. Note, if any changes were made to the system parameters they have not been saved yet.
8. Click **Save Changes**. This saves the new configuration to the iRIM's non-volatile memory. The previous configuration is also preserved. If any changes were made to the network settings, they will not take effect until the iRIM is rebooted. This will bring up the main menu page.
9. Click the **Reboot Radio Interface Module** button. This will bring up the reboot screen. Clicking the **Reconnect** button will bring up the iRIM banner page.



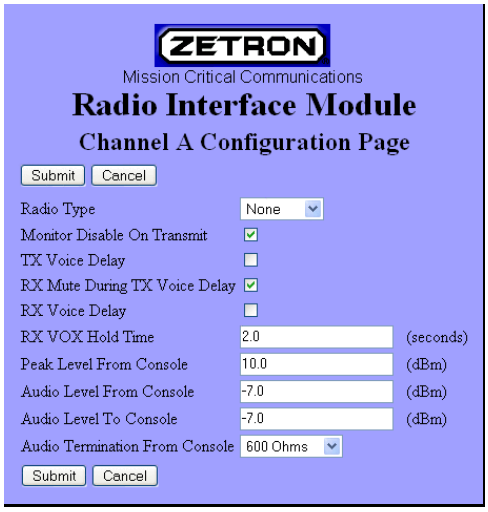
Configuring Channel Parameters

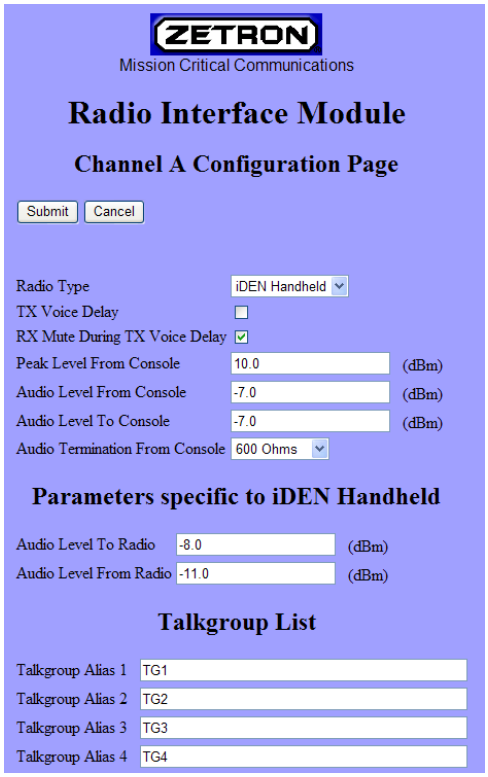
The Channel A and B parameters are identical, but correspond to the two radio ports on the back of the iRIM. Channel A and Channel B are configured independently from each other and can have different settings.

Channel A or Channel B Parameters

Changes to the radio channel parameters take effect when the configuration is saved; a reboot is not necessary. The following instructions apply to both channel A and channel B. To modify the parameters for channel A, from the main menu:

1. Click the **View or Modify Configuration** button. This will bring up the **View/Modify Configuration** page.
2. Click the **Channel A Parameters** button. This will bring up the **Channel A Configuration** page.
3. First select **iDEN Handheld** from the **Radio Type** drop-down menu. Once you've selected a radio, the page will reload itself with more radio specific configuration items.
4. Check the **RX Voice Delay** checkbox. This will delay incoming voice audio playback until after the iRIM sends the PTT ID to the console ensuring the dispatcher will hear the entire call.
5. The fields **Peak Level From Console**, **Audio Level From Console**, and **Audio Level To Console** are described in more detail in the following section, *Configuring Console Audio Levels* on page *23*. The default values should work, but may need adjustment depending on installation specific details.
6. The fields **Audio Level From Radio** and **Audio Level To Radio** should not need to be modified as they are radio-specific.





7. The **Talkgroup List** is used to configure aliases for the Talkgroups. Talkgroup aliases configured here are displayed at the console.
8. Click the **Submit** button. This will return to the **View/Modify Configuration** page.

> ⚠ **Caution!** If any changes were made to the channel parameters they have not been saved yet.

9. The previous steps may be repeated for Channel B. Click the **Channel B Parameters** button. This will bring up the **Channel B Configuration Page**.
10. Click the **Save Changes** button. This saves the new configuration to the iRIM's non-volatile memory. The previous configuration is also preserved.

Configuring Console Audio Levels

This section provides additional detail for step *5* from the preceding procedure. The three settings of interest are **Peak Level From Console**, **Audio Level From Console**, and **Audio Level To Console**. The settings are in units of dBm, where 0 dBm is equivalent to 0.775 VRMS.

Peak Level From Console defines the maximum audio level, and where clipping occurs. The iRIM assumes the loudest tone from the console is the high-level guard tone. It bases its AGC calculations on this being the loudest tone. The level for the HLGT should be less than the **Peak Level From Console**.

Audio Level From Console defines the level of the average voice audio from the console. Audio received by the iRIM from the console at this level is transmitted over the air at 60% deviation on an analog broadcast. If the voice audio over the air sounds too quiet, this setting should be decreased; if the audio is too loud, it should be increased.

Audio Level To Console defines the level of the average voice audio received by the radio. Audio received by the iRIM from the radio is transmitted to the console at this level on average.

The following example assumes that the console system is properly calibrated. Between the iRIM and the console is a bearer with an unknown amount of loss, which needs to be compensated for:

1. Connect a true RMS AC voltmeter to the transmit audio input pair from the console to the iRIM. (For the pinout, see *Table 3* on page *17*.)
2. Transmit a test tone from the console that is intended to produce 60% deviation over the air; it may be a 1 kHz alert tone. Measure the level of the signal at the iRIM. (An example: the console's 1 kHz alert tone with the HLGT set to 0 dBm, with no line loss between the console and the iRIM, should be about -6 dBm.) This measurement will be used in Step *7*.

3. Connect a true RMS AC voltmeter to the receive audio output pair from the iRIM to the console. (For the pinout, see *Table 3* on page *17*.)
4. Measure the loss between the iRIM and the console by transmitting a tone on a field radio or using a service monitor, and measure the level at the iRIM's receive audio output pair, and again at the UDCC receive audio input. This measurement will be used in Step *8*.
5. Following the directions in the previous sections, return to the **Channel A Configuration** or **Channel B Configuration** page.
6. Leave the **Peak Level From Console** setting at its default.
7. Set the **Audio Level From Console** to measured value in Step *2*, which corresponds to a 60% channel deviation. The iRIM default for the **Audio Level From Console** is -7 dBm.
8. Set the **Audio Level To Console** to the sum of the line loss measured in Step *4*, in dB, and the Audio Level From Console setting. This assumes the console is expecting to receive the same audio level as it transmits. (Otherwise add the line loss to the console's expected receive level.)
9. Click the **Submit** button. This will return to the **View/Modify Configuration** page.

> ⚠ **Caution!** If any changes were made to the channel parameters they have not been saved yet.

10. The previous steps may be repeated for Channel B. Click the **Channel B Parameters** button. This opens the **Channel B Configuration** page.
11. Click the **Save Changes** button. This saves the new configuration to the iRIM's non-volatile memory. The previous configuration is also preserved.

Configuring the Digi One SP Device

Overview

Note The Digi One is used for DCS-5020 consoles and is not required for Acom consoles.

The configuration of the Digi One™ SP serial/IP conversion module is accomplished through the Ethernet port on the device. The configuration takes place in two phases.

The first phase is only required if the Digi One is not preconfigured, or if it was reset to a blank configuration. This first phase is carried out using a software tool provided by Digi International on CD-ROM. It will require that the unit is connected to the network while being configured.

Tip If a preconfigured Digi One module is provided (it has preconfigured IP address labels attached) then skip to the second phase, *Configuration Using a Browser* on page *34*.

The second phase is carried out with the browser installed on your PC (such as Internet Explorer). You simply enter the IP address of the module you want to work on into the browser address bar manually.

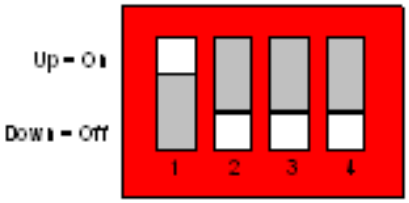
Confirming the Serial Port Pinout

Warning! The switch must be set correctly since the functions of the port pins change depending on the settings. Actual damage to equipment can occur if the serial cable is plugged in while the switch is set to the wrong serial port type.

The Digi One SP module is capable of supporting three different serial port standards. They are EIA-232 (same as RS-232), EIA-422/485 Full-Duplex, and EIA-485 Half Duplex. Which type of serial port is being supported is set using a small, red, 4-position

DIP switch on the bottom of the module near the end with the serial port D-connector. In this application, the switch will always be set to support an EIA-232 serial port.

Figure 6 - Digi One™ SP Serial Port Switch set to EIA-232



When the switch is configured as shown in *Figure 6* (that is switch 1 up and switches 2, 3, and 4 down), the module is set for EIA-232 and the D-connector will have the pinout shown in *Table 4*.

Table 4: Pinout of Digi One SP Configured for EIA-232

DB-9 Pin	EIA-232 Signal
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI
Shell	GND

Initial Configuration Using the Digi Software Tool

The first phase of software configuration for the Digi One SP module is carried out using a configuration software tool provided with the units on CD-ROM by Digi International. Before starting this procedure you will need to obtain a permanent IP address from the IT department responsible for the network that the link will be installed on. (If multiple radio interface module links are being installed, then you need a fixed address for each Digi One SP module used.) In addition, you will also need to obtain the IP address assigned to the iRIM interface module with which this Digi One module will be communicating.

Note In any actual installation, the fixed IP address used for the serial/IP module must be assigned by the IT department with responsibility for the network on which the link is being installed.

The configuration of the Digi One SP module can be programmed on a different network than the one it will eventually be installed in (like the network in your shop) as long as the IP address assigned is also available on that network. If this is not the case, then you will have to perform this work "on-site". Fortunately, the steps do not take very long and almost any PC connected to the network will have adequate resources to carry out the task. (Runs Windows Operating system and has a CD-ROM drive)

Note If you try to assign an IP address to the Digi unit which is not valid on the network that the configuration PC is part of, the Digi will refuse to accept the configuration. Make sure that the IP address of your PC and the IP address assigned to the Digi are compatible.

Note For the purposes of the following example, the IP address was chosen assuming a network numbered 192.168.25 and a subnet mask of 255.255.255.0.

Table *5* gives the rest of the settings that will be used for the serial/IP module.

Note These IP settings may very well not work on your network.

Table 5: Initial Programming for the Digi One SP Module

Parameter	Digi One Module Setting
IP	192.168.25.135
subnet	255.255.255.0

gateway	192.168.25.2
DNS serv	[none]
Domain	[none]
Host name	[none]
Scenario	Outgoing Network Connection/ Outgoing TCP Connection

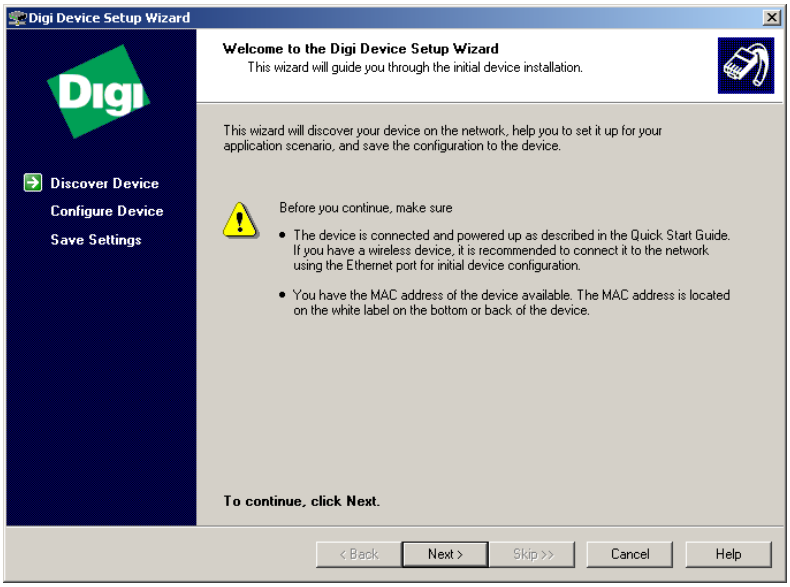
♦ Connecting the Digi One SP to the network

1. Remove the modules from their packing and confirm that their DIP switches are set to EIA-232 (see *Figure 6*).
2. Locate the MAC address printed on the bottom line of the factory label on Digi One SP module. Write this number down because you will need it during the initial setup. (It is labeled "MA: xxxx:xxxx".)
3. Install the loopback device supplied with the unit on the serial port D-connector of the Digi One SP.
4. Plug the power supply into the module and then into a wall socket. Do not expect the power LED to come on right away.
5. Plug the Ethernet cable into the RJ-45 jack on the module and plug the other end of the cable into any available port on the network. This must be the same network that serves the PC you intend to use for configuring the module and in which the module will be used. The port used does not need to be the port to which the module will finally end up connected.

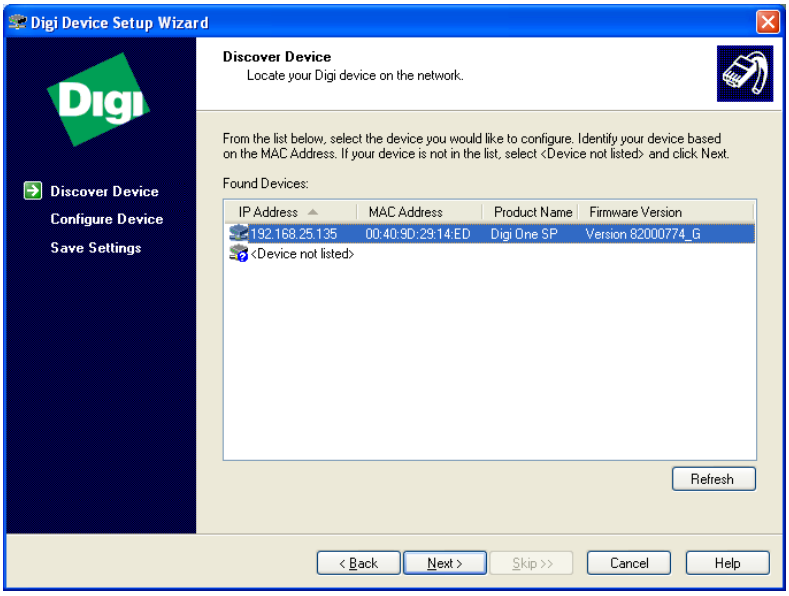
The Power and Link LEDs should both be on at this point.

♦ Performing the initial configuration using the Digi software tool

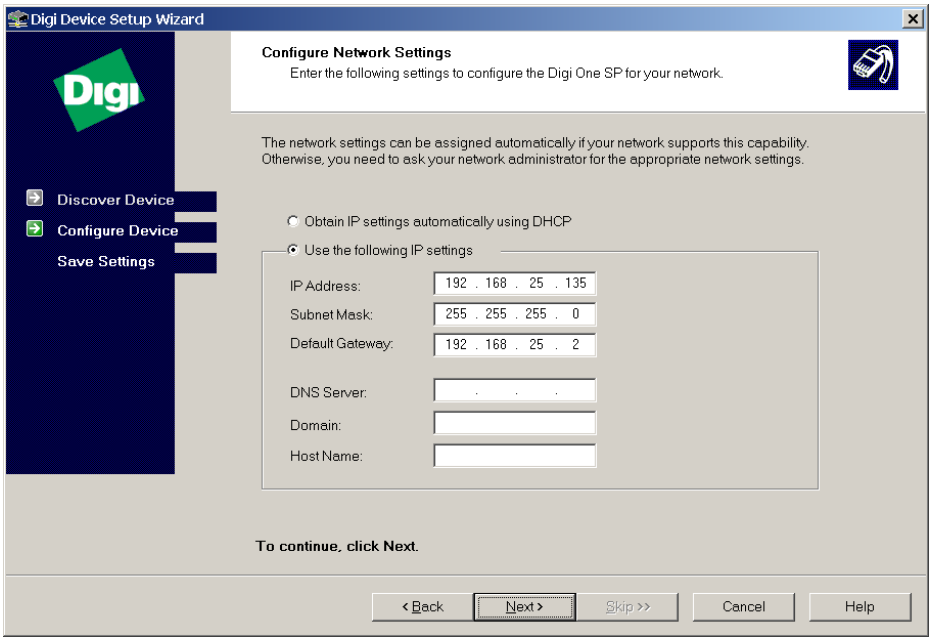
1. Insert the CD-ROM into the disk drive and close the drive. If the top screen for the utilities does not start automatically, use the **RUN** option on the **START** menu.
2. From the opening screen, select the Digi Device Setup Wizard. The opening screen of the wizard will look like the following. Click **Next**.



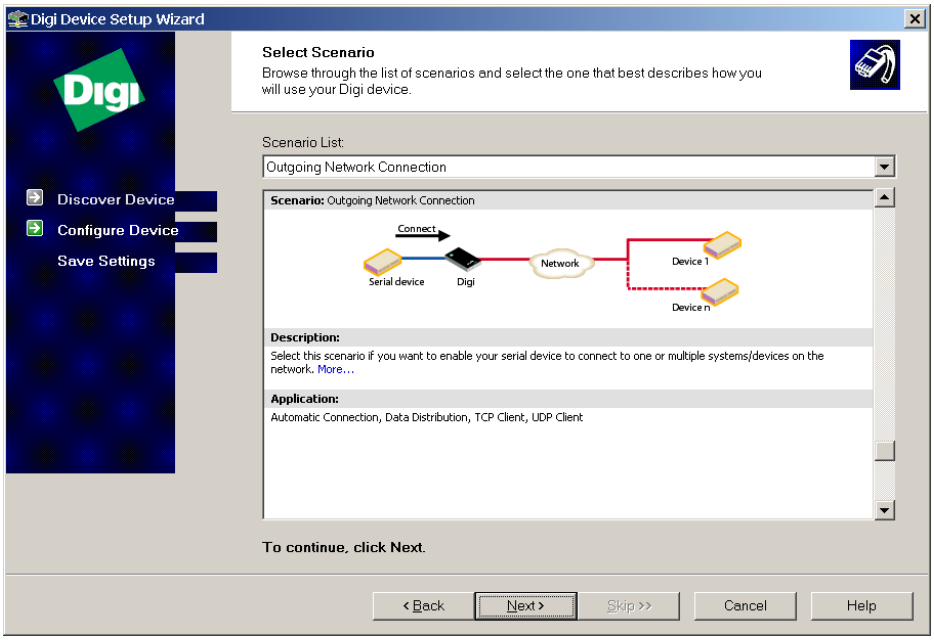
3. Once the software has scanned the network available to it, it will display the IP and MAC addresses of any Digi One units it finds. Select the MAC address for the unit you are configuring and then click on **Next**.



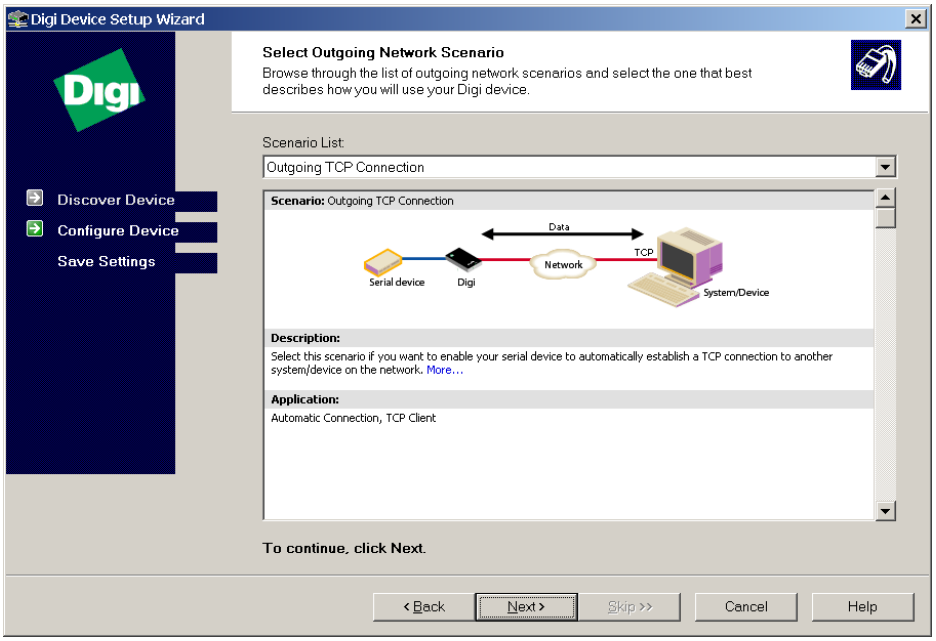
4. When the following screen appears, select the manual IP radio button and fill in the boxes for **IP Address**, **Subnet Mask**, and **Default Gateway**. In the following example, these have been filled in with the settings from *Table 5*. Please note that the boxes for **DNS Server**, **Domain**, and **Host Name** should still be blank. When you are finished, click on **Next**.



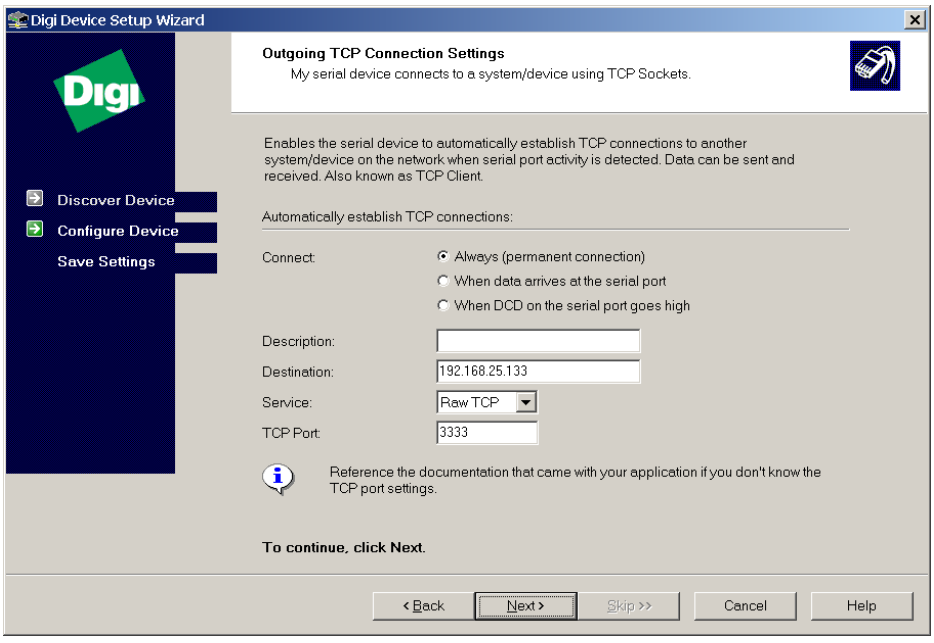
5. When the Select Scenario screen is displayed, use the **Scenario List** box or the scroll bar on the right of the window to move through the list and select **Outgoing Network Connection** as the scenario type. Click on **Next**.



6. After selecting Outgoing Network Connection as a scenario, you be prompting in the following screen to pick a more specific scenario. Open the **Scenario List** box and select **Outgoing TCP Connection** as the scenario type. Click on **Next**.



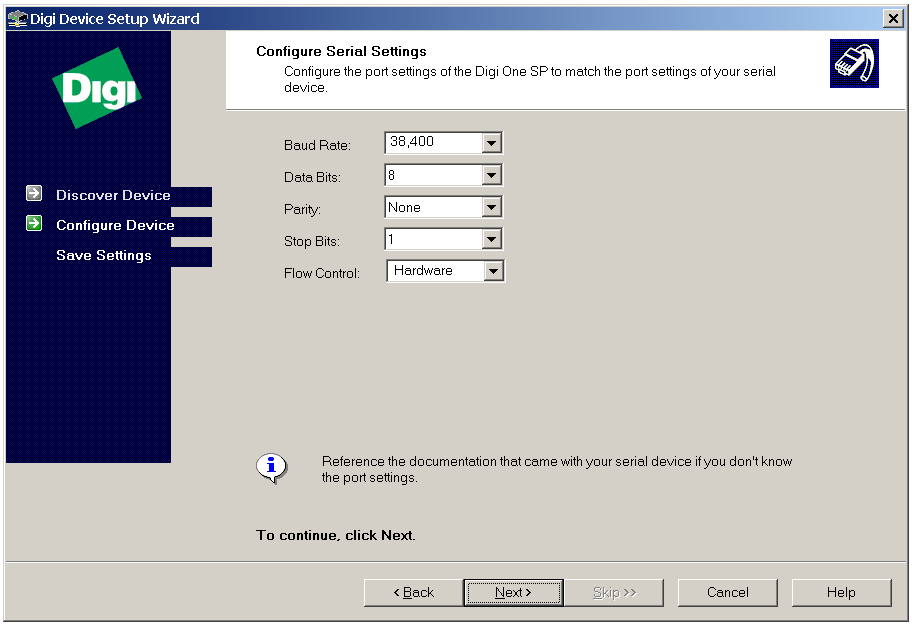
7. When the following screen opens, enter the TCP Connection settings. When you are finished, click on **Next**.



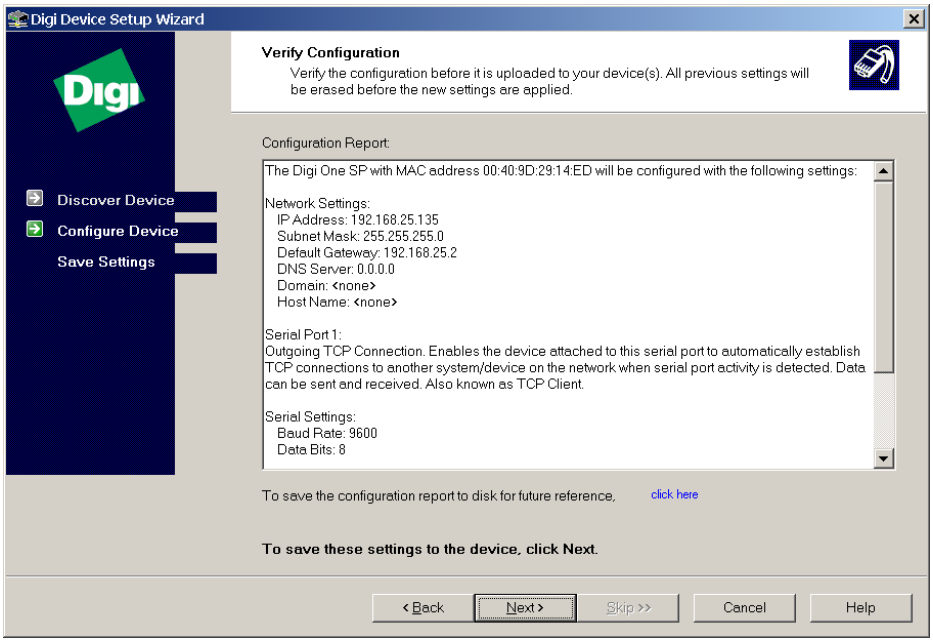
Connect = Always
Description = (blank)
Destination = (IP address of the iRIM module)
Service = Raw TCP
TCP Port = 3333

8. When the following screen is displayed, configure the serial port parameters as follows then click on **Next**.

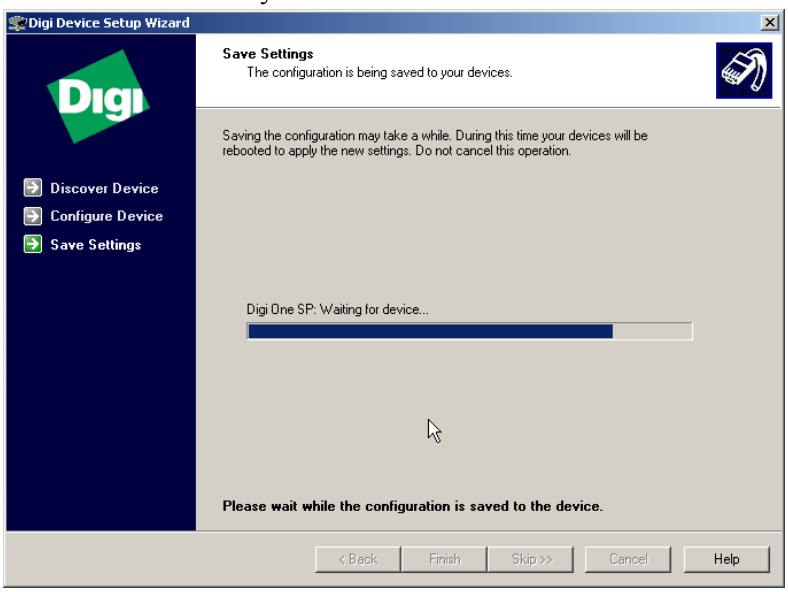
   Data Rate = 38,400 Data Bits = 8
   Parity = None Stop Bits = 1
   Flow Control = Hardware



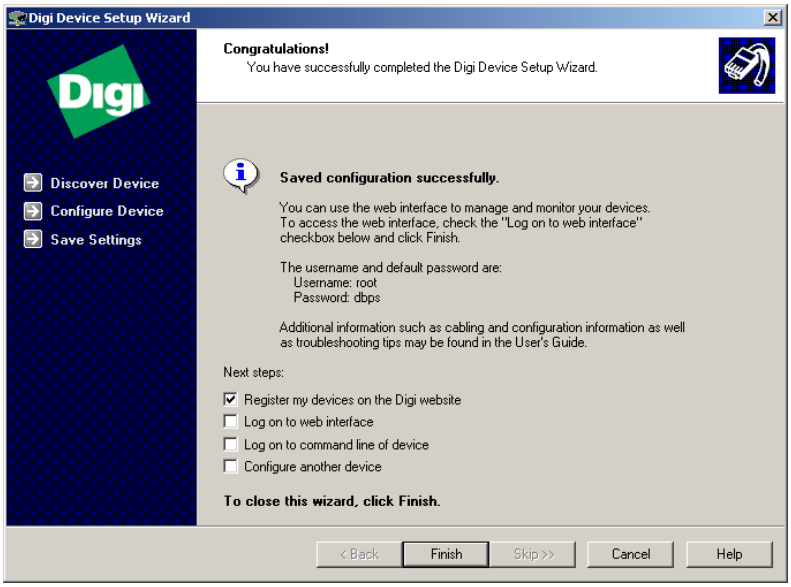
9. After you finish selecting and setting up the scenario, the wizard will display a screen that allows you to scroll through the settings you have entered for the module to confirm that they were correctly entered. If you wish, you can save a copy of this report to your hard drive. When you finish your review, click on **Next**.



10. The following screen is displayed while the program saves the new settings to the Digi One SP module. This process will take several minutes and the status bar will reach the right side long before it is over. Be patient. You do not need to do anything until the process is finished. The program will advance to the next screen automatically.



11. This screen confirms that you have successfully configured the Digi One SP module to perform as an Outgoing TCP Connection. Review the check boxes at the bottom of the screen, select the ones you want or clear them all, and click on **FINISH**.



12. The remaining programming to configure the modules will be accomplished by connecting to each module directly by means of an ordinary browser.

Configuration Using a Browser

The final configuration of the Digi One module used to communicate with the iRIM module is accomplished by logging onto the unit with a common Internet browser and making the necessary changes. The easiest time to do this is right after you finish the first phase of the module configuration using the tool provided by Digi International on CD-ROM, while the module is still connected to the network.

For the purposes of this example, we will still be using the IP address information initially presented in *Table 5*. The serial port settings for the unit is listed in *Table 6*. Unlike the IP addresses (*which must be provided by the IT department controlling the network on which the units will be installed*) this information will always be the same for any Kenwood Radio Interface Module installation.

Warning! Good cybersecurity practice requires changing the default password immediately after logging in for the first time. Continued use of default passwords is a significant security vulnerability.

You will need to enter the default user name and the unique default password for the Digi One module. A label on the device should have a unique default password for that device. If there is no password information, or you don't know the user name, contact Digi International.

Table 6: Final Configuration of the Digit One™ SP Module

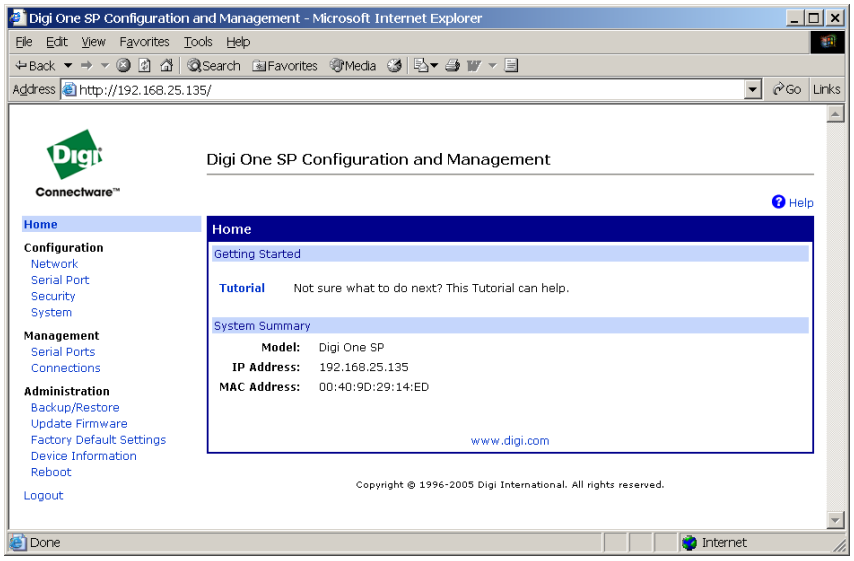
Parameter	Digi One Setting
NETWORK	no change
SERIAL PORT Basic Serial Settings: Advanced Serial Settings: require user to login Verbose connection (click "APPLY")	 No Change No No
SECURITY	No changes
SYSTEM Optimization (click "APPLY")	 latency

A re-boot of each DIGI device is required after these configuration changes.

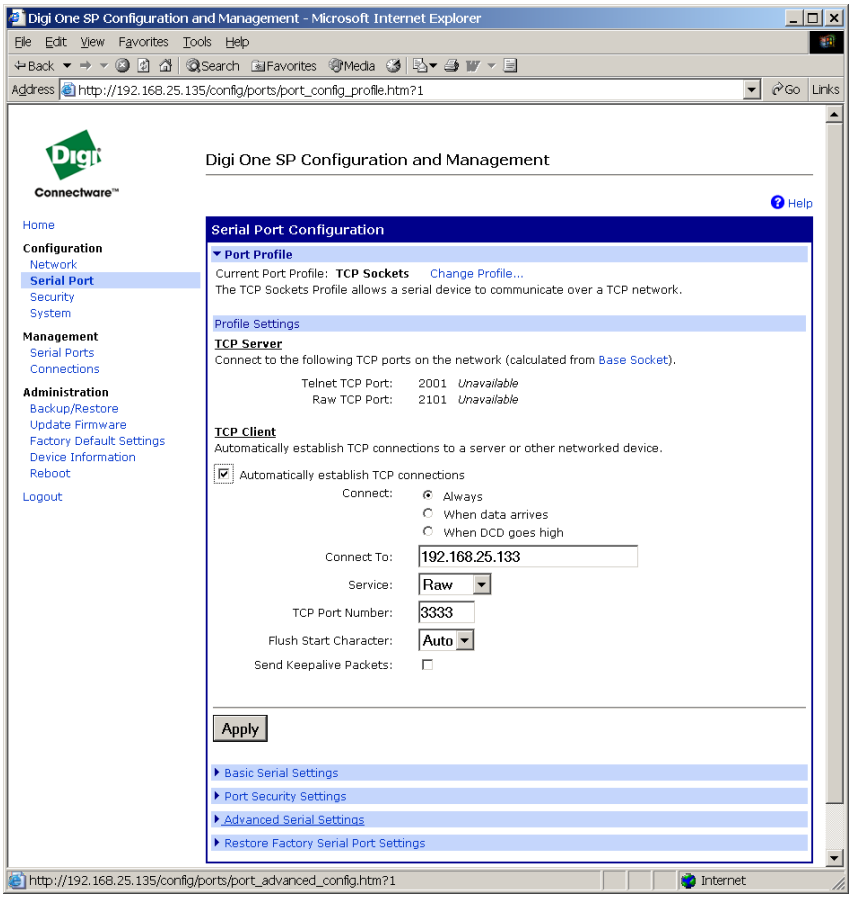
- **Programming the Digi One SP module with your Internet browser.**

1. After opening your browser, manually enter the address of the Digi One SP module into the address bar. In our example this would be “192.168.25.135”. Press ENTER and the log on dialog box that follows should appear.

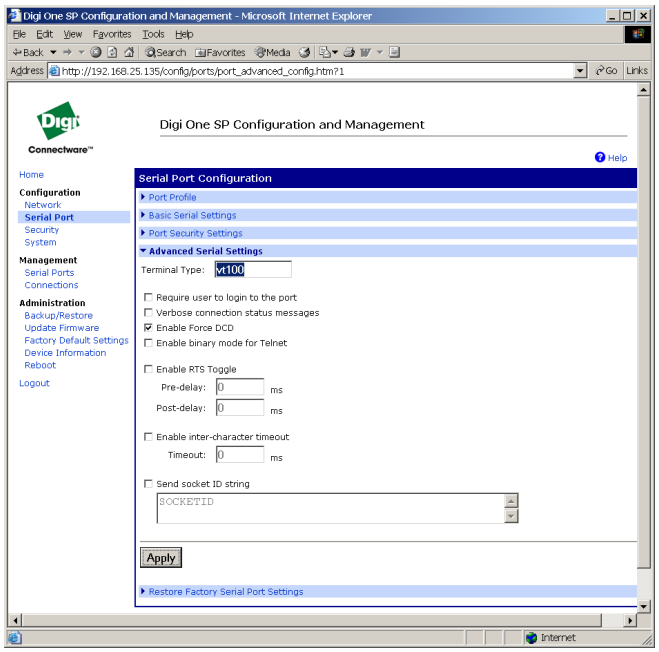
2. Enter the default user name and password into the appropriate boxes in the dialog and click on the **OK** button. The Home screen for the module should appear. The screens we need to open can be accessed by clicking on the options **Serial Port** and **System** found in the column on the left of the screen, under the heading **Configuration**.



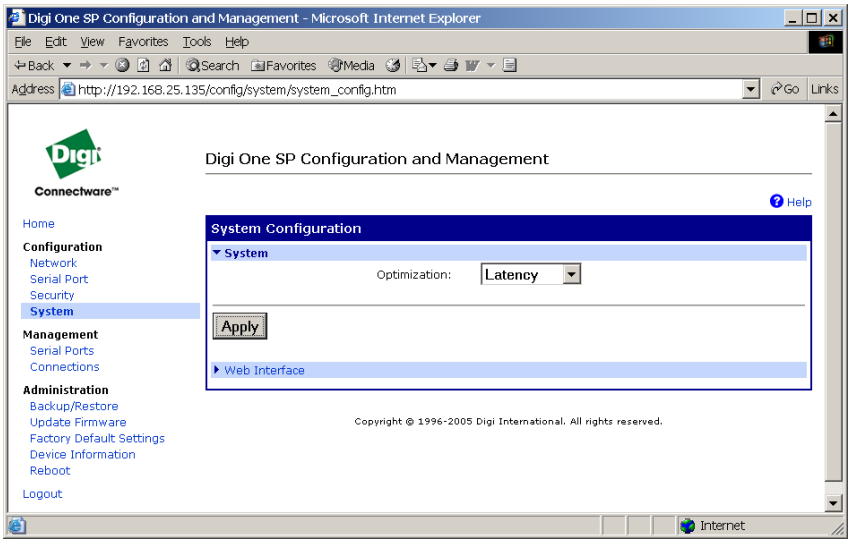
3. Click on the option **Serial Port**. This opens the **Serial Port Configuration** window. We will not be changing any settings in this opening screen. Notice the **Basic** and **Advanced** options that appear in the bottom of the window.



4. Click on the option **Advanced Serial Settings**. As shown in the following window, configure the serial port parameters to match the settings listed in *Table 6*. When you have finished, be sure to click on the **Apply** button before you leave this window, otherwise none of the changes will be stored in the module.

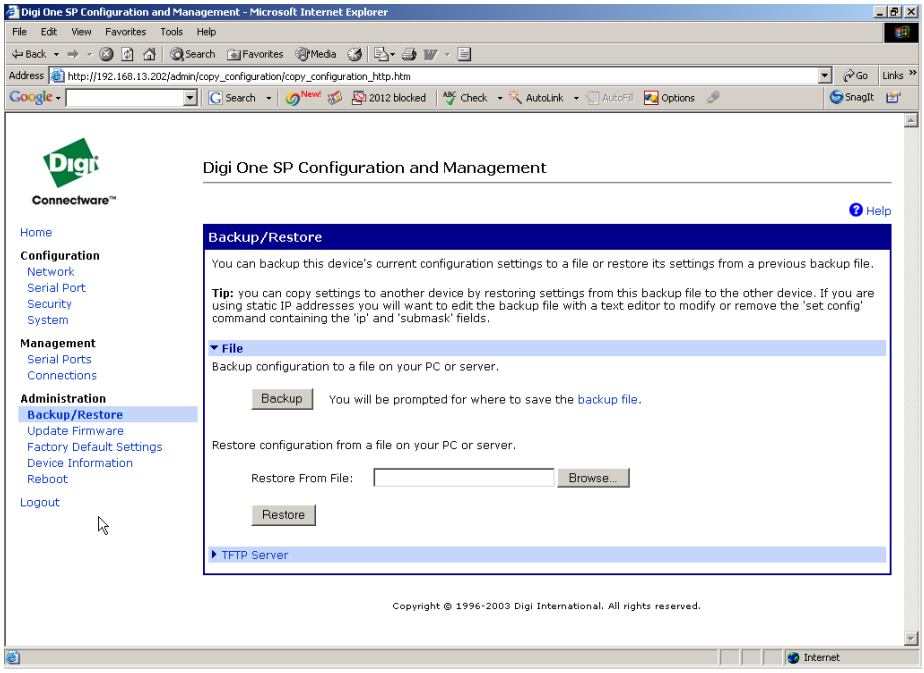


5. Click on the option **System** in the left column. This opens the **System Configuration** window. Use the down arrow to open the list and set the parameter **Optimization:** to read **Latency**. When you have finished, be sure to click on the **Apply** button before you leave this window, otherwise none of the changes will be stored in the module.



6. This concludes the programming of the module. It must be rebooted before being placed in service. You can do this by clicking on **Reboot** in the left column, or by disconnecting the unit from the network and removing power from it.

   If you wish to save a "snapshot" of the modules programming, either for backup purposes or to facilitate the cloning of similar units, please notice that under the heading **Administration** in the left hand column there is an option for **Backup/Restore**. This opens a screen from which you may save a copy of the current unit configuration to your PC hard drive.



iRIM Configuration Reference

Overview

The iRIM is programmed through its network interface using a standard web browser or FTP client. Once initial programming is complete, the iRIM will continue to function normally during further programming, so its configuration may be modified "live". This chapter describes how to connect to the product, modify the configuration with a web browser, save and restore the configuration with an FTP client, and view the configuration and firmware versions.

In this chapter:

Requirements

To program the system, you will need the following:

- PC, with the following:
  - Ethernet network capability
  - Internet Explorer version 6.0 or later
  - FTP client (optional)
- Connection between the PC and the iRIM such as a crossover Ethernet cable

  -or-
- Ethernet cable and 10-BASE-T connection to the network

Setup

This section describes how to prepare the system for programming. In order to program an iRIM, it must be physically connected to the computer or to the network to which the computer is connected, and the PC and iRIM must be properly configured to "talk" to one another. There are two different methods to accomplish this. Which way is best depends on whether the iRIM has been previously configured and the level of security required.

PC to iRIM Direct Connection

The typical method for configuring an iRIM that is fresh from the factory or whose configuration is unknown is to connect it directly to a PC with a cross-over cable. The primary reason is that the default or current iRIM network settings can be incompatible or conflicting with your existing network. The direct connection method also provides the highest level of security, since the iRIM is only accessible by that PC and not over a general network.

1. The first step is to connect the iRIM's **Network** jack to the PC's network card with a standard Ethernet cross-over cable.
2. The second step is to make sure that the iRIM's network parameters and password are known. If they are not known, then they must be defaulted by moving DIP switch **A** on the back of the unit to the down position. This will default the network parameters as follows:

Parameter	iRIM Default Value
IP Address	192.168.0.1 (DIP SW B up) -or- 192.168.0.133 (DIP SW B down)
Netmask	255.255.255.0
Gateway	192.168.0.2

3. The final step is to modify the PC's network settings to talk to the iRIM. Specifically, set the netmask to the same value as in the iRIM, and set the IP address to a valid value for the netmask, but not the same as the iRIM. If the iRIM is set to its defaults, for example, the following settings are appropriate for the PC:

Parameter	Suggested Value
IP Address	192.168.0.3
Netmask	255.255.255.0
Gateway	192.168.0.2

PC to iRIM Connection over a Network

If the iRIM has previously been configured for use on a particular network, then it may be accessed over that network by connecting its **Network** port to a hub or router on the network using a standard Ethernet cable. This method may be more convenient than a direct connection, but is less secure, since anyone on the network can gain access to the iRIM and modify its configuration. And, even though the iRIM has a password, it is sent over the network in the clear, meaning that anyone with the appropriate software can monitor the network and learn the password. The password is only designed to protect against accidental access, not determined attacks. As a result, the iRIM should only be left connected to a network if access to that network is limited to trusted individuals.

HTTP Access

Once the iRIM has been connected to the PC over a network (even if that network is just a cross-over cable), a web browser may be used to view and edit the configuration, save a copy of the configuration to disk, view the firmware and configuration versions, and undo firmware updates and configuration changes.

Connecting

The iRIM may be accessed by typing its IP address into the Address bar in Internet Explorer 6.0 or later. The opening page will ask for the password. After entering the password, click on the Login button. The main screen appears with the following options: View or Modify Configuration, Versions, Logout, and Reboot iRIM. From this point on, it is very important not to use the BACK button on the web browser. Doing so may cause unexpected results.

Viewing and Modifying the Configuration

To view and/or modify the configuration, click on the **View or Modify Configuration** button on the main page. This will bring up the **View/Modify Configuration** page with the options: **System Parameters**, **Channel A Parameters**, **Channel B Parameters**, and **Return to Main Page**. Click on the appropriate button to modify the system parameters, (channel A parameters or channel B parameters). To leave without making any changes, click **Return to Main Page**.

Once in the **System Configuration Page**, the **Channel A Configuration Page**, or the **Channel B Configuration Page**, the available parameters are listed along with their current value. Any parameter may be changed either by checking or unchecking the box, selecting an item from the pull-down list, or typing an entry into the edit field, depending on the parameter.

When the parameters have been set to the desired states, click **Submit** to remember those changes, although they will not take effect yet. At any time, click **Cancel** to discard the changes.

Upon selecting **Submit** if any parameters were set to invalid values, the page will redisplay with the invalid parameters shown in red. These parameters must be set to valid values or the changes discarded in order to continue.

Once all the parameters have been set to valid values, the **View/Modify Configuration** page will again display, this time with a notice that changes have been made to the configuration. Two buttons reading **Save Changes** and **Discard Changes** will also replace the **Return to Main Page** button. Further changes may be made on any of the pages without affecting the operation of the unit.

When the entire configuration has been modified as desired, click **Save Changes** to save the configuration to flash; the iRIM will begin using the new settings. Or, click **Discard Changes** to leave the existing configuration unchanged. In either case, you will be returned to the main page.

Saving the Configuration to Disk

Saving a copy of the configuration to disk is useful for cloning multiple units or for backing up the configuration. To save a copy of the configuration to disk, follow the instructions on the main page by right-clicking the **this link** option and selecting the **Save Target As** entry on the context menu. Use the **Save As** dialog box to select the file name and location for the file.

Saving the Event Log to Disk

During operation, the iRIM logs any errors and unexpected conditions into an event log. If there is a problem with the unit, this event log may be saved to disk and returned to Zetron Technical Support for further diagnostics. To save the event log to disk, follow the instructions on the main page by right-clicking **the this** link option and selecting the **Save Target As** entry on the context menu. Use the **Save As** dialog box to select the file name and location for the file.

Viewing the Firmware and Configuration Versions

To view the firmware and configuration versions loaded into the iRIM, click **Versions** on the main page. This brings up a page displaying the version, size, CRC, and status of the bootloader, failsafe, and both executable images. It will also display the name and status of both copies of the configuration.

The firmware and configuration labeled **Current** is the one that is currently being used and will continue to be used. A firmware or configuration labeled **Previous** is a backup that can be changed to **Current** by reverting to the previous executable or configuration.

Reverting to a Previous Firmware or Configuration Version

If it becomes necessary to revert to a previous version of firmware or configuration, this can be done from the versions page. If a previous version of firmware is available, there will be a button labeled **Revert** to previous executable version. Clicking the button causes the unit to copy the previous version of firmware over the current version of firmware (which will take several seconds), and then brings up a page announcing that the unit is rebooting and providing a button labeled **Reconnect** that brings up the login screen once the product has finished rebooting.

If a previous version of the configuration is available, there will be a button labeled **Revert** to previous configuration on the versions page. Clicking the button causes the unit to copy the previous configuration over the current configuration and begin using that configuration immediately. Note that changes to the **IP Address**, **Netmask**, and **Gateway** will not take effect until the iRIM is rebooted. This may be accomplished by pressing the **Reboot Radio Interface Module** button on the main page.

Rebooting the iRIM

There are times when it is desirable to reboot the iRIM remotely, most notably after changing its **IP Address**, **Netmask** or **Gateway**. Instead of these parameters taking effect immediately and ending your configuration session, they do not take effect until the unit is rebooted. This can be accomplished by clicking on the **Reboot Radio Interface Module** button on the main page. Doing so brings up a page announcing that the unit is rebooting and providing a button labeled **Reconnect** that brings up the login screen once the product has finished rebooting.

Logging Out

When you are done accessing the iRIM with a web browser, click **Logout** on the main page to end the session.

FTP Access

Uploading a saved configuration file to a Radio Interface Module or upgrading its executable requires the use of an FTP client. Any FTP client may be used, including the one that comes with Windows.

- **To access the FTP Client in Windows**

  1. Type **ftp** ***IP_address*** at the command line from the directory containing the configuration or firmware files, where ***IP_address*** is the IP address of the unit.

Note If you don't know the factory password, contact Zetron Technical Support.

Warning! Good cybersecurity practice requires changing the default password immediately after logging in for the first time. Continued use of default passwords is a significant security vulnerability.

2. Enter a user name and the password for the unit being worked on. (You will be prompted for a username and password. The username can be anything, but the password must match the password in the unit's configuration.)
3. Once the password has been validated, entering ***put filename*** uploads a file from the PC's hard drive to the Radio Interface Module. (Entering **get filename** downloads a file from the Radio Interface module to the PC's hard drive. Entering **dir** lists the files available for download.
4. Enter **bye** to end the session.

Note The FTP connection will time out in two minutes if no action is taken.

5. To upload a saved configuration files:
    - Make sure that it is named **config.txt**
    - Use the FTP client to upload the file to the Radio Interface Module.
    - Be sure to list the files available for download and make sure that there is no **errors.txt** file. If there is, it means that the configuration file contained errors.

Downloading and viewing the **errors.txt** file should provide enough information to correct the problem, since **config.txt** is a simple text file that can be edited with any text editor such as Notepad.

Upgrading the unit's firmware involves uploading the ".binary" file received as part of the upgrade and ensuring that no **errors.txt** file is generated. (The file's extension is the full word ".binary", not ".bin".)

Configuration Reference

System Parameters

The system parameters are found on the **System Configuration Page**, and they apply to the iRIM as a whole.

Name

The name can be any text string up to 80 characters long. It is used to identify the configuration in the versions page. The default is **default**.

Comment

The comment can be any text string up to 80 characters long and is used to further describe the configuration. The default is **Automatically generated default configuration file**.

IP Address

The IP address can be any valid IP address in the format of `xxx.xxx.xxx.xxx`; each `xxx` grouping can be any number from 0 to 255. The IP address chosen must be a valid IP address for the network that the iRIM resides on and must not already be in use by any device on that network. The default is **192.168.0.133**.

> **Note** Changes to the IP address do not take effect until the unit is rebooted.

Netmask

Netmask can be any valid netmask in the format of `xxx.xxx.xxx.xxx`, where each `xxx` grouping can be any number from 0 to 255. The netmask chosen must be the correct netmask for the network that the iRIM resides on. The default is **255.255.255.0**.

> **Note** Changes to **Netmask** do not take effect until the unit is rebooted.

Gateway

Gateway can be any valid IP address in the format of `xxx.xxx.xxx.xxx`, where each `xxx` grouping can be any number from 0 to 255. The gateway chosen should be a valid gateway address for the network that the iRIM resides on. If there is no gateway on the network, it may be set to any valid, unused IP address. The default is 192.168.0.2.

> **Note** Changes to **Gateway** do not take effect until the unit is rebooted.

Password

Password can be any valid text string including letters, numbers, and punctuation up to 32 characters long. This is the password that must be entered in order to gain access to the unit with a web browser or an FTP client. The password is case sensitive.

Note If you don't know the password, contact Zetron Technical Support.

Warning! Good cybersecurity practice requires changing the default password immediately after logging in for the first time. Continued use of default passwords is a significant security vulnerability.

Allow FTP

If **Allow FTP** is enabled, then access by an FTP client is allowed in order to upload and download configuration files and upgrade the unit's firmware. If **Allow FTP** is disabled, no access is allowed by FTP clients. The default is enabled (checked).

Allow Telnet

If **Allow Telnet** is enabled, then access by a Telnet client is allowed. This access should not be necessary, as it is limited to certain trouble-shooting features. If **Allow Telnet** is disabled, then no access is allowed by Telnet clients. The default is disabled (unchecked).

Channel Parameters

The channel parameters are duplicated on both the **Channel A Configuration Page** and the **Channel B Configuration Page**. They may be set independently for each channel.

Radio Type

The radio type is selected from a drop-down list:

- If no radio is to be connected to the channel, select **None**.
- If an i365 radio is to be connected to the channel, select **iDEN Handheld**.

  Selecting **iDEN Handheld** refreshes the page, adding several more parameters at the bottom. These are described in *Parameters Specific to iDEN Handheld* on page *48*.

TX Voice Delay

If **TX Voice Delay** is enabled, then voice delay is used on transmit audio to offset the radio's key-up delay. This can be especially useful on trunked radio channels. As soon as the console sends a keying tone, the audio will be buffered. When the radio acquires a channel, the audio will begin playing back. The length of the delay is equal to the channel acquisition time. On a conventional channel, the radio keys-up immediately, and the voice delay is unnoticeable. If the checkbox is not checked, then console audio sent while the radio is acquiring a channel will be lost. The default is unchecked.

RX Mute During TX Voice Delay

If **TX Voice Delay** and **RX Mute During TX Voice Delay** are enabled, then no receive audio is heard by the console while it is transmitting. This is meant to mute the radio's progress tones including the go-ahead-to-talk beep emitted when a channel is acquired. This beep is meaningless to a console operator, since they are able to start talking immediately upon pressing the TX key. Call failed tones are still received by the console. If the check box is not checked, all radio progress tones are heard by the console operator, assuming the console is configured for full duplex operation. The default is checked.

Peak Level From Console (dBm)

Note The parameter listed here as "Peak" Level is also referred to as High Level Guard Tone or HLGT in other places.

Peak Level From Console specifies the level at which high level guard tone, from the console system, reaches the iRIM. It must account for any line losses between the console and the iRIM and is expressed in dBm. A value of 0 dBm is equivalent to 0.775 VRMS. The default is **10** dBm.

Audio Level From Console (dBm)

Audio Level From Console specifies the level at which average voice audio, from the console system, reaches the iRIM. A 1 kHz tone at this level is sent over the air at 60% channel deviation. This level must account for any losses on the line between the console and the iRIM and is expressed in dBm. A value of 0 dBm is equivalent to 0.775 VRMS. The default is **-7** dBm.

Audio Level To Console (dBm)

Audio Level To Console specifies the level at which average voice audio, sent to the console system, leaves the iRIM. A 1 kHz tone at 60% channel deviation received from the radio is sent down the line at this level. This level is not affected by losses on the line between the console and the iRIM and is expressed in dBm. A value of 0 dBm is equivalent to 0.775 VRMS. The default is **-7** dBm.

Audio Termination From Console

Audio Termination From Console determines the termination applied to the transmit audio sent from the console system to the iRIM. It may either be set to 600W or 200 kW. Typically, only one device on the line would be terminated at 600W, while all others would be set to 200 kW or some other high impedance. The default is **600W**.

Guard Tone To Console On COR

This parameter is not used.

Parameters Specific to iDEN Handheld

The iDEN-specific parameters are available on both the **Channel A Configuration Page** and the **Channel B Configuration Page**, and may be set independently for each channel. iDEN-specific parameters are only available if the radio type for that channel is set to **iDEN Handheld**.

Use Hardware Ptt

This parameter determines whether the iRIM will use serial protocol commands (when this parameter is disabled) to key the iDEN handheld radio or if it will generate a hardware PTT signal (when this parameter is enabled) to make group calls. Use of this function requires that the radio be interfaced to the iRIM by means of the 709-8061 cable provided by Zetron. The default setting for this parameter is **Disabled**.

Note Changing the state of this parameter from Disabled to Enabled will also cause a change in the default level setting for the audio levels **To** and **From** the radio.

Audio Level To Radio (dBm)

Audio Level To Radio specifies the level at which average voice audio from the iRIM is sent to the radio. A 1 kHz tone at this level will be sent over the air at 60% channel deviation. This level is expressed in dBm. A value of 0 dBm is equivalent to 0.775 VRMS. The default level setting should not need to be changed; however, it is dependent on the state of the **Use Hardware Ptt** parameter.

Disabled = **-8 dBm** Enabled = -20 dBm

Audio Level From Radio (dBm)

Audio Level From Radio specifies the level at which average voice audio from the radio reaches the iRIM. A 1 kHz tone at 60% channel deviation received from the radio will reach the iRIM at this level, which is expressed in dBm. A value of 0 dBm is equivalent to 0.775 VRMS. The default level setting should not need to be changed; however, it is dependent on the state of the **Use Hardware Ptt** parameter.

Disabled = **-11 dBm** Enabled = -20 dBm

Talkgroup List

The Talkgroup list is available on both the **Channel A Configuration Page** and the **Channel B Configuration Page**, and may be set independently for each channel. **Talkgroup List** is only available if the radio type for that channel is set to **iDEN Handheld**.

Talkgroup Alias (1-20)

A **Talkgroup Alias** is used to replace generic Talkgroup numbers with names that are easier to understand during console operation. The aliases configured in the iRIM are passed to the console when it requests the static channel list.

LED Indicators

iRIM Adapter LEDs

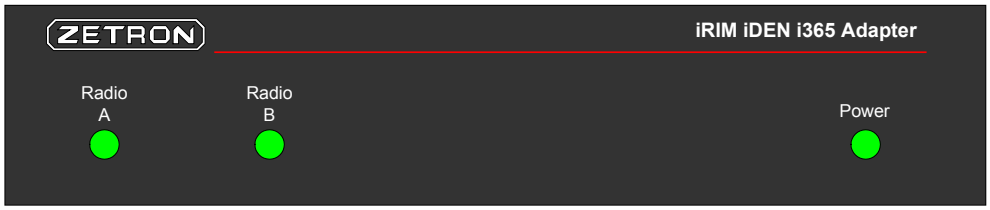


Table 7: iRIM adapter LED indications

LED	Indication	Description
Radio A	Green	Battery charging voltage present for Radio A. When off, there is insufficient voltage for charging the battery.
Radio B	Green	Battery charging voltage present for Radio B. When off, there is insufficient voltage for charging the battery.
Power	Green	The iRIM adapter has power. It is off otherwise.

iRIM LEDs

Table 8: iRIM LED indications

LED	Indication	Description
Status	Off	Channel is idle.
	Red	Channel is transmitting.
	Green	Channel is receiving (and for the duration of the VOX hold time).
	Amber	Channel is both transmitting and receiving.
Line TX	Red	The LED blinks red while the iRIM is sending an FSK packet to the console system. It is off otherwise.
Line RX	Red	The LED blinks red when a valid remote function tone sequence is received from the console system and remains red as long as valid low level guard tone is present. It is off otherwise.
Radio TX	Red	The Radio TX indicator for each channel blinks red when the iRIM sends a data packet to the radio. It is normal for this indicator to blink even in an idle state because the iRIM continuously polls the radio on the serial interface.
Radio RX	Red	The Radio RX indicator for each channel blinks red when the iRIM receives a data packet from the radio. It is normal for this indicator to blink even in an idle state because the iRIM continuously polls the radio on the serial interface.
Ethernet	Off	The iRIM is not connected to a network.
	Green	The iRIM is connected to a network (it does not indicate a valid IP configuration, only a working Ethernet connection).
	Amber	There is transmit or receive activity on the network.
Power	Off	iRIM does not have power or is not functioning properly.
	Green	iRIM has power and is functioning properly.
	Amber	iRIM is in reset.

Specifications

General System Specifications

Progress tones	Passes all radio progress tones (see the radio user guide for details)
Power	10.5 Vdc to 16 Vdc Up to 3.2 amps (1.0 amp for iRIM, 1.1 amp per radio)
Mounting	Co-located with the radio Desk or rack mount (optional)
Operating temperature	0-60° C, 32-140° F
Size	1.5 x 7.75 x 10.25 inches (HxWxD)

Tone Remote Interface

Interface Type	Industry standard tone remote interface
Audio	4-wire, 600W
Tone Timings	High Level Guard Tone: 120 ms Function Tone: 40 ms Low Level Guard Tone: duration of transmit Guard Tone Frequency: 2175 Hz

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