Intermec

User's Manual

IF5 Fixed Reader

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Contents

Before You Begin

This section provides you with safety information, technical support information, and sources for additional product information.

Safety Summary

Your safety is extremely important. Read and follow all warnings and cautions in this document before handling and operating Intermec equipment. You can be seriously injured, and equipment and data can be damaged if you do not follow the safety warnings and cautions.

Do not repair or adjust alone

Do not repair or adjust energized equipment alone under any circumstances. Someone capable of providing first aid must always be present for your safety.

First aid

Always obtain first aid or medical attention immediately after an injury. Never neglect an injury, no matter how slight it seems.

Resuscitation

Begin resuscitation immediately if someone is injured and stops breathing. Any delay could result in death. To work on or near high voltage, you should be familiar with approved industrial first aid methods.

Energized equipment

Never work on energized equipment unless authorized by a responsible authority. Energized electrical equipment is dangerous. Electrical shock from energized equipment can cause death. If you must perform authorized emergency work on energized equipment, be sure that you comply strictly with approved safety regulations.

Safety Icons

This section explains how to identify and understand dangers, warnings, cautions, and notes that are in this document. You may also see icons that tell you when to follow ESD procedures and when to take special precautions for handling optical parts.

A warning alerts you of an operating procedure, practice, condition, or statement that must be strictly observed to avoid death or serious injury to the persons working on the equipment.

Avertissement: Un avertissement vous avertit d'une procédure de fonctionnement, d'une méthode, d'un état ou d'un rapport qui doit être strictement respecté pour éviter l'occurrence de mort ou de blessures graves aux personnes manupulant l'équipement.

A caution alerts you to an operating procedure, practice, condition, or statement that must be strictly observed to prevent equipment damage or destruction, or corruption or loss of data.

Attention: Une précaution vous avertit d'une procédure de fonctionnement, d'une méthode, d'un état ou d'un rapport qui doit être strictement respecté pour empêcher l'endommagement ou la destruction de l'équipement, ou l'altération ou la perte de données.

Note: Notes either provide extra information about a topic or contain special instructions for handling a particular condition or set of circumstances.

Global Services and Support

Warranty Information

To understand the warranty for your Intermec product, visit the Intermec web site at www.intermec.com and click **Service & Support**. The **Intermec Global Sales & Service** page appears. From the **Service & Support** menu, move your pointer over **Support**, and then click **Warranty**.

Disclaimer of warranties: The sample code included in this document is presented for reference only. The code does not necessarily represent complete, tested programs. The code is provided "as is with all faults." All warranties are expressly disclaimed, including the implied warranties of merchantability and fitness for a particular purpose.

Web Support

Visit the Intermec web site at www.intermec.com to download our current documents in PDF format. To order printed versions of the Intermec manuals, contact your local Intermec representative or distributor.

Visit the Intermec technical knowledge base (Knowledge Central) at intermec.custhelp.com to review technical information or to request technical support for your Intermec product.

Telephone Support

These services are available from Intermec Technologies Corporation.

Service	Description	In the U.S.A. and Canada call 1-800-755-5505 and choose this option
Factory Repair and On-site Repair	Request a return authorization number for authorized service center repair, or request an on-site repair technician.	1
Technical Support	Get technical support on your Intermec product.	2
Service Contract Status	Inquire about an existing contract, renew a contract, or ask invoicing questions.	3
Schedule Site Surveys or Installations	Schedule a site survey, or request a product or system installation.	4
Ordering Products	Talk to sales administration, place an order, or check the status of your order.	5

Outside the U.S.A. and Canada, contact your local Intermec representative. To search for your local representative, from the Intermec web site, click **Contact**.

Who Should Read This Document?

The manual provides you with information about the features of the IF5 Fixed Reader, and how to install, configure, operate, maintain, and troubleshoot it.

Before you install and configure the IF5, you should be familiar with your network and general networking terms, such as IP address. You should be familiar with using a Linux operating system.

You should also be familiar with the contents of the Intellitag Developer's Kit (IDK), which includes useful information for developing your RFID applications. For more information on RFID applications and application development, contact your Intermec certified RFID partner.

Related Documents

Document Title	Part Number
IF5 RFID Reader Quick Start Guide	074746
Important IF5 Information!	074934
Important IM5 Information!	075231

The Intermec web site at www.intermec.com contains our current documents that you can download in PDF format.

To order printed versions of the Intermec manuals, contact your local Intermec representative or distributor.

Patent Information

This product is covered by one or more of the following patents: 4,360,810; 4,739,328; 4,786,907; 4,864,158; 4,888,591; 4,910794; 4,999,636; 5,030,807; 5,055,659; 5,070,536; 5,280,159; 5,295,154; 5,349,678; 5,394,436; 5,425,051; 5,428,636; 5,483,676; 5,504,485; 5,504,746; 5,521,601; 5,546,397; 5,550,547; 5,574,979; 5,592,512; 5,673,037; 5,680,633; 5,682,299; 5,696,903; 5,740,366; 5,763,867; 5,777,561; 5,790,536; 5,825,045; 5,828,318; 5,828,693; 5,844,893; 5,850,181; 5,850,187; 5,862,171; 5,940,771; 5,942,987; 5,960,344; 5,995,019; 6,078,251; 6,121,878; 6,122,329; 6,172,596; 6,195,053; 6,249,227; 6,280,544; 6,286,762; 6,286,763; 6,288,629; 6,360,208; 6,384,712; 6,404,325; 6,429,775; 6,486,769; 6,501,807; 6,525,648; 6,639,509; 6,645,327; 6,677,852; 6,768,414; 6,784,789; 6,816,063.

There may be other U.S. and foreign patents pending.

1 Getting Started

This chapter introduces the IF5 Fixed Reader, explains the ports and LEDs, and explains how the reader fits into your network. It contains these topics:

- Overview of the IF5
- Unpacking the IF5
- Learning About the IF5
- How the IF5 Fits In Your Network
- Where To Go Next

Overview of the IF5

The IF5 Fixed Reader is an RFID tag reader that provides network connectivity between tag data and an enterprise system. The IF5's embedded controller can be configured to connect the IF5 to your Ethernet network or to your wireless network if you ordered the 802.11g radio option.

Unpacking the IF5

When you unpack the IF5, save the box and shipping material in case you need to ship or store the IF5. The reader comes with a documentation packet that includes a quick start guide and radio safety compliance statements.

Note: The IF5 does not ship with RFID or radio antennas. For more information on these accessories, contact your Intermec sales representative.

Learning About the IF5

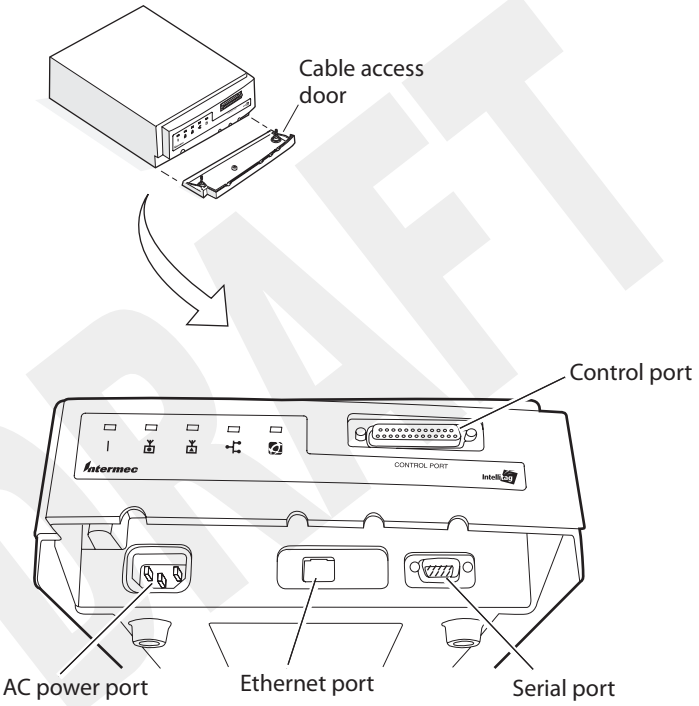
This section explains the ports and LEDs on the IF5.

Understanding the Front Panel Ports

The IF5 front panel has four ports. To access three of the ports, you need to remove the access door.

To remove the access door

- On the underside of the IF5, unscrew the two thumbscrews on the cable access door and remove the door.



IF5 Front Panel Ports: *This illustration shows how to remove the access door and where the ports are located.*

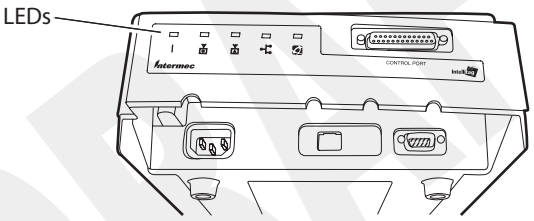
IF5 Front Panel Port Descriptions

Port	Description
AC Power	Used with an appropriate power cable, this port connects the reader to an AC power source.
Ethernet	10BaseT/100BaseTx port. Used with an appropriate cable, this port connects the reader to your Ethernet network. The reader auto-negotiates with the device it is communicating with so that the data rate is set at the highest rate at which both devices can communicate.
Serial	Used with an RS-232 null modem cable, this port connects the reader to a terminal or PC to perform configuration.
Control	General purpose input/output (GPIO) port. This port connects the reader to industrial controls such as relays or indicators. The port includes optically isolated inputs, optically isolated low voltage DC outputs, and access to 12 VDC.

For more information, see "Port Pin Assignments" on page 42.

Understanding the LEDs

The IF5 has four LEDs that show you the reader's operating status.



LED Descriptions

Panel Icon	LED Name	Description
	Power	Remains on after the IF5 boots.
	Wireless	Remains on when the radio port is active if this IF5 has an 802.11g radio.
		Not used.
	Wired LAN	Flashes when a frame is transmitted or received on the Ethernet port.
	Intermec Ready-to-Work™ Indicator	Flashes if the IF5 is searching for the RFID server. Remains on when the IF5 has found an RFID server.

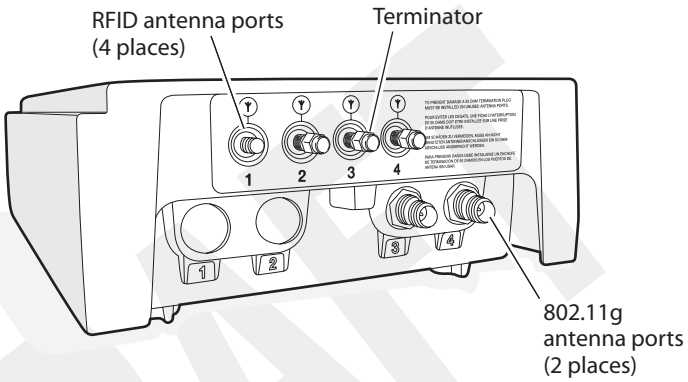
Understanding the Rear Panel Ports

Ports on the IF5 rear panel are used for connecting the IF5 to the appropriate RFID and 802.11g radio antennas.

Caution

Government regulatory agencies require that this RFID reader only use approved antennas. Therefore, this reader uses a custom antenna connector. Do not use antennas not approved for use with this reader.

Les agences de régulation gouvernementale exigent que ce lecteur d'identification par radiofréquence n'utilise que des antennes approuvées. C'est pourquoi il est muni d'un connecteur d'antenne personnalisé. Ne pas utiliser d'antenne non approuvée pour ce lecteur.



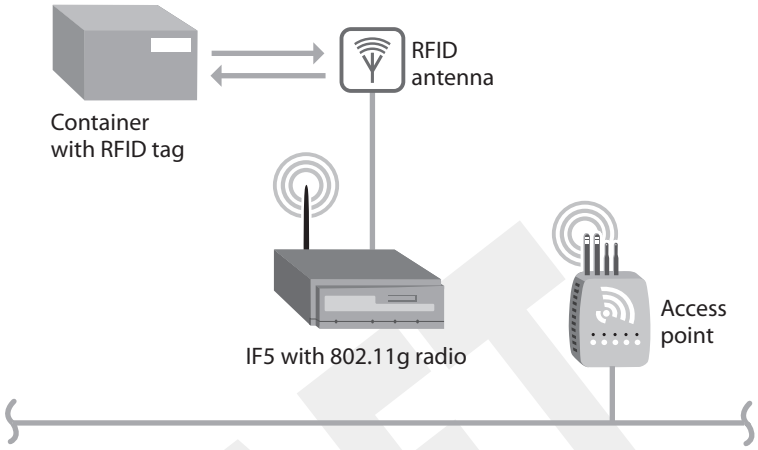
IF5 Rear Panel Ports: *This illustration shows the ports on the rear panel. The IF5 ships with antenna terminators mounted on RFID antenna ports 2, 3, and 4.*

Note: The IF5 ships with antenna terminators installed on RFID antenna ports 2, 3, and 4. Do not remove the terminator from any port unless you are installing an antenna or antenna cable on that port.

How the IF5 Fits In Your Network

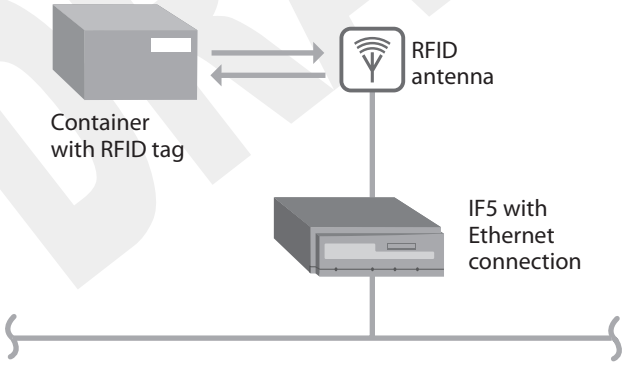
In general, the reader forwards RFID tag data to the Ethernet or 802.11g network. The next illustrations show how the IF5 fits in your network.

IF5 In an 802.11g Network



This illustration shows how the IF5 connects to your 802.11g network. The reader communicates with the access point as it sends and receives data from the RFID server.

IF5 In an Ethernet Network



This illustration shows the IF5 in a wired Ethernet network. The IF5 sends and receives RFID tag data to the RFID server through the wired network.

Where To Go Next

See the next table to learn where you can go in this manual for more information.

To learn more about	See	On page
Installing and configuring the IF5 for your network	"Connecting the IF5 To Your Network"	10
Managing and upgrading the IF5's Linux operating system	"Understanding the IF5 Operating System"	20
Solving problems with operating the IF5	"Troubleshooting"	36
Electrical and physical specifications of the IF5 and pin assignments for the ports	"Specifications"	40

2 Connecting the IF5 To Your Network

This chapter explains how to install the IF5 and configure it for your Ethernet or 802.11g network, including these topics:

- Configuring the IF5 For Your Network
- Setting the IP Address
- Configuring Security
- Setting Up the Radio
- Setting DNS Server Information
- Choosing a Mounting Location
- Installing the IF5
- 802.11g Antenna Placement Guidelines

Configuring the IF5 For Your Network

When you unpack the IF5, a wired Ethernet connection to a DHCP server is enabled by default. If you plan to connect the IF5 to your DHCP server via a wired Ethernet connection, you can proceed with "Choosing a Mounting Location" on page 16.

If your network does not use a DHCP server, you need to assign a static IP address to the IF5 before connecting the IF5 to the network. For help, see the next section, "Setting the IP Address."

If your IF5 has an 802.11g radio, you need to configure and enable the radio before connecting the IF5 to the network. For help, see "Setting Up the Radio" on page 12.

The IF5 supports the Wired Equivalent Privacy (WEP) protocol for wireless network security. For help, see "Configuring Security" on page 12.

Setting the IP Address

The IF5 will work out of the box if you are using a DHCP server to assign it an IP address. By default, the IF5 is configured to be a DHCP client and will respond to offers from any DHCP server. However, if you are not using a DHCP server, you must assign a static IP address and other TCP/IP parameters to the IF5 by editing the reader's network startup script.

To assign a static IP address, you need a null modem cable (Intermec P/N 321-563-001).

Note: If your IF5 has an 802.11g radio, you assign the static IP address when you set up the radio. For help, see "Setting Up the Radio" on page 12.

To assign static TCP/IP parameters

1. Disconnect AC power from the IF5.
2. Connect a null modem cable to the serial port on the IF5 and to the serial port on your desktop PC.
3. On your desktop PC, open a HyperTerminal session with these communication parameters:

Bits per second	115200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

4 Connect AC power to the IF5. The reader boots. When the IF5 has finished booting, the $-prompt appears:

```
[root@(none)/]$
```

5 Enter the following text:

```
cd /etc/init.d
```

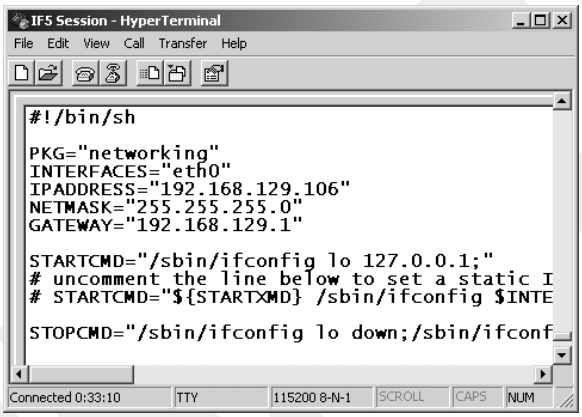
6 Press **Enter** and then enter the following text to move the DHCP startup script to the rc.sav directory:

```
mv S02dhclient /etc/rc.sav
```

7 Press **Enter** and then enter the following text to edit the network startup script:

```
vi S01network
```

8 Press **Enter**. The S01Network script appears.



9 Move the cursor to the IPADDRESS value and press **x** repeatedly to delete the current value.

10 Repeat Step 9 for the NETMASK and GATEWAY values.

11 Press **i** to enter Insert mode. In Insert mode, you move the cursor with the arrow keys.

12 Move the cursor to just after IPADDRESS= and enter the IP address you want to assign to the IF5. Be sure to include quotation marks (“) around the IP address.

13 Repeat Step 12 for the NETMASK and GATEWAY values.

14 Press **Esc**.

15 Press **:** (**Shift** + **;** for English keyboards).

16 Type `wq` and press **Enter** to save and close the file. The $-prompt appears.

Or, to leave Insert mode without saving any of your changes, type `q!` and press **Enter**. The $-prompt appears.

17 Type `reboot` and press **Enter**. The operating system boots. After the system has finished booting, the $-prompt appears.

18 Type `ifconfig` and press **Enter**. The current network settings appear with your new settings.

The IF5 is now ready to be placed in its mounting location and connected to your network.

- For help with choosing a mounting location, see "Mounting the IF5" on page 16.
- For help with connecting the IF5 to your network, see "Installing the IF5" on page 17.

Configuring Security

The IF5 supports the Wired Equivalent Privacy (WEP) protocol to add security to your wireless network based on the 802.11 standard. To use WEP security, you need to specify WEP keys when you set up the radio. For more information on setting up the radio, see the next section.

You can specify the WEP key in hexadecimal format, in two-byte groups separated by dashes:

- 40-bit: `key aabb-ccdd-ee`
- 104-bit: `key aabb-ccdd-eeff-gghh-iijj-kkll-mm`

where *aa*, *bb*,… are the key values in hex format. For example, you would enter the WEP key ABCDEFGHIJKLM as 4142-4344-4546-4748-494A-4B4C-4D.

You can also specify the WEP key as a character string by preceding the string with s: as shown in this example:

- 40-bit: `key s:ABCDE`
- 104-bit: key `s:ABCDEFGHIJKLM`

To specify multiple WEP keys, add a bracketed index number for each key after the key values:

```
key aabb-ccdd-ee [1]
key ffgg-hhii-jj [2]
key kkll-mmnn-oo [3]
```

Setting Up the Radio

If your IF5 includes an 802.11g radio, the radio is disabled by default. To use the radio, you need to enable it before you place the IF5 in its mounting location and connect it to your network.

The IF5 operating system includes a script that loads the radio drivers at boot time. To enable the radio, you need to:

1. Copy the radio startup script to the init.d directory.
2. Edit the script for your network by specifying the network name, WEP keys (if necessary), and a static IP address (if you are not using a DHCP server).
3. Restart the IF5.

These steps are explained in the next procedure.

If you need to manually set DNS server information, see "Setting DNS Server Information" on page 15.

To set up the radio

1. Connect a null modem cable to the serial port on the IF5 and to the serial port on your desktop PC.
2. On your desktop PC, open a HyperTerminal session with these communication parameters:

Bits per second	115200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

3. Connect AC power to the IF5. The reader boots. When the IF5 has finished booting, the $-prompt appears:

```
[root@(none)/]$
```

4. Type the following text:

```
cp /etc/rc.sav/S94prism54 /etc/init.d
```

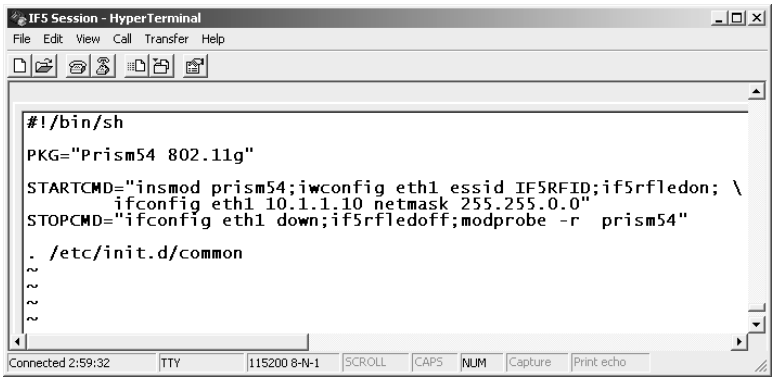
5. Press **Enter**. The radio startup script (S94prism54) is copied to the init.d directory, which includes all scripts run at boot time.
6. Type the following text:

```
cd /etc/init.d
```

7. Press **Enter** and type the following text:

```
vi S94prism54
```

8. Press **Enter**. The S94prism54 script appears.



9 Move the cursor to `IF5RFID` and press **x** repeatedly to delete it.

10 If you are going to assign a static IP address, move the cursor to the IP address placeholder value (10.1.1.10) and delete it.

If the IF5's IP address will be assigned by a DHCP server, delete all of the following text:

```
ifconfig eth1 10.1.1.10 netmask 255.255.0.0
```

11 Press **i** to enter Insert mode. In Insert mode, move the cursor with the arrow keys.

12 Move the cursor to one space past `essid` and enter your SSID or network name.

13 If you do not need to specify a WEP key or keys, continue with step 14.

To add WEP keys, add a space after the network name and specify WEP keys. For help, see "Configuring Security" on page 12.

14 Choose one of the following:

- To assign a static IP address, move the cursor to one space past `eth1` and enter the static IP address.
- To use your DHCP server, enter the following text after `networkname;`:

```
dhclient eth1
```

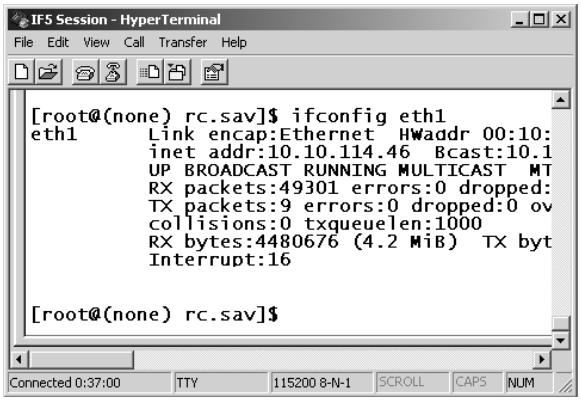
15 Press **Esc** and then press **:** (**Shift** + **;** for English keyboards).

16 Type `wq` and press **Enter**. The changes are saved and the $-prompt appears.

Or, to leave Insert mode without saving any of your changes, type `q!` and press **Enter**. The $-prompt appears.

17 Type `reboot` and press **Enter**. The reader boots. When the IF5 is finished booting, the $-prompt appears.

18 Type `ifconfig eth1` and press **Enter**. The new radio settings appear.



If you need to manually set DNS addresses, continue with the next section, "Setting DNS Server Information."

The IF5 is now ready to be placed in its mounting location and connected to your network.

- For help with choosing a mounting location, see "Choosing a Mounting Location" on page 16.
- For help with connecting the IF5 to your network, see "Installing the IF5" on page 17.

Setting DNS Server Information

Your DHCP server passes DNS server information to the IF5. If you are not using a DHCP server, you can set DNS addresses manually by editing the /etc/resolv.conf file.

To set DNS addresses manually

1. Connect a null modem cable to the serial port on the IF5 and to the serial port on your desktop PC.
2. On your desktop PC, open a HyperTerminal session with these communication parameters:

Bits per second	115200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

3. Connect AC power to the IF5. The reader boots. When the IF5 has finished booting, the $-prompt appears:

   `[root@(none)/]$`

4. At the $-prompt, type `cd /etc` and press **Enter**. A list of files in the /etc directory appears.

5 Type `vi resolv.conf` and press **Enter**. The resolv.conf file appears.

6 Move the cursor to the nameserver information and press **x** repeatedly to delete it.

7 Press **i** to enter Insert mode. In Insert mode, move the cursor with the arrow keys.

8 Move the cursor to one space past `nameserver` and enter your DNS server address.

9 Press **Esc** and then press **:** (**Shift** + **;** for English keyboards).

10 Type `wq` and press **Enter**. The changes are saved and the $-prompt appears.

Or, to leave Insert mode without saving any of your changes, type `q!` and press **Enter**. The $-prompt appears.

11 Type `reboot` and press **Enter**. The reader boots. When the IF5 is finished booting, the $-prompt appears.

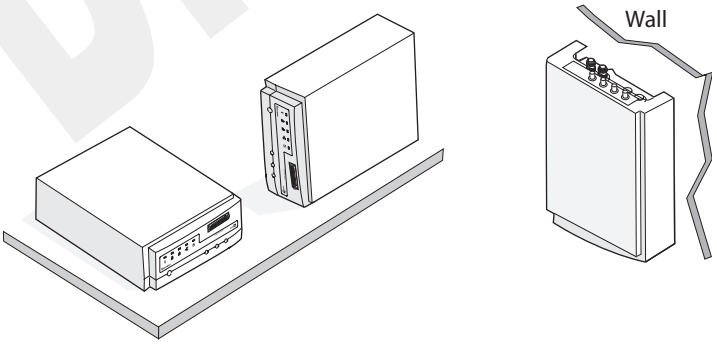
12 Type `ifconfig eth1` and press **Enter**. The new network settings appear.

Choosing a Mounting Location

You can place the IF5 horizontally or vertically on a stable surface. You can also mount the IF5 to a wall or a beam using one of these mounting bracket kits:

- Mounting bracket kit (P/N 068918)
- Rotating mounting bracket kit (P/N 068751)

For more information, contact your local Intermec representative.



Mounting the IF5: *This illustration shows the ways you can install the IF5 on a horizontal or vertical surface.*

The next table includes environmental requirements for the IF5. Choose a location that meets these requirements.

IF5 Environmental Requirements

Type	Minimum	Maximum
Operating temperature	-25ºC (-13ºF)	70ºC (158ºF)
Storage temperature	-40ºC (-22ºF)	70ºC (158ºF)
Humidity (non-condensing)	10%	90%

Installing the IF5

After you configure the IF5 for your network and choose a mounting method, you can place the IF5 in its mounting location and connect it to your network.

Note: If you are using a DHCP server, make sure the server is running before you connect power to the IF5. If there is no DHCP server available at boot time, the IF5 may seem to be locked up while searching for DHCP lease offers.

To connect the IF5 to your network

1. Remove the access door from the lower front panel of the IF5. For help, see "Understanding the Front Panel Ports" on page 3.
2. Attach one to four RFID antennas to the RFID antenna ports, starting with port 1. Do not remove the terminators from unused antenna ports.

Warning

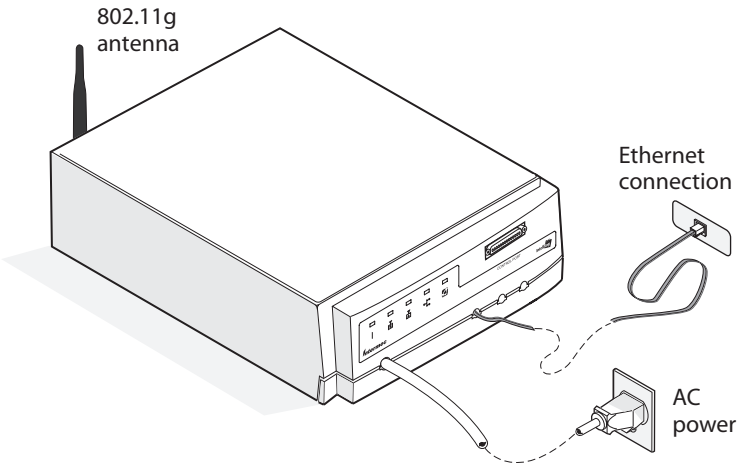
Each port must have either an antenna or a terminator connected. Do not apply power to the reader unless an antenna or terminator is installed on each antenna port.

Avertissement: Chaque port doit contenir soit une antenne ou un terminateur. Ne pas alimenter le lecteur tant qu'une antenne ou un terminateur ne sont pas raccordés à chaque port de l'antenne.

3. For a wired network, connect an Ethernet cable to the IF5 Ethernet port.

   For an 802.11g network, install an antenna on antenna port 4.
4. Connect the AC power cord to the AC power port on the IF5.
5. Install the cable access door and route the cables through the openings in the door seam. Make sure the cables are not caught in the seam.
6. Place the IF5 in its mounting location. For more information, see "Choosing a Mounting Location" on page 16.
7. For an Ethernet network, connect the Ethernet cable to your network.

   For an 802.11g network, continue with the next step.
8. Connect the AC power cord to an AC outlet. As soon as you apply power, the IF5 boots and the green Power LED turns on.



The IF5 is now ready to communicate in your network.

802.11g Antenna Placement Guidelines

Antennas and their placement play a vital role when installing a wireless network. The exact range that you will achieve is difficult to determine. Intermec recommends that you allow an Intermec-certified RF specialist to perform a site survey before you install a wireless network. For more information, contact your local Intermec representative.

Radio signals may reflect off some obstacles and be absorbed by others. For example, two radios may achieve up to 305 m (1,000 ft) of range if positioned outdoors within line of sight, with no obstacles between them. However, the same two radios may only achieve 152 m (500 ft) of range when the RF signal has to travel through items such as cubicles. If the signal must penetrate office walls, the signal range may decrease to 91 m (300 ft).

Using the proper antennas for your environment and placing them in the proper areas can help improve range. Here are some general guidelines for positioning antennas:

- Place the antenna as high as possible. In an office environment, try to place it above cubicle walls.
- Keep the line-of-sight between the antennas and wireless end devices clear of metal surfaces (like beams or girders) and large quantities of paper products.
- Do not place a sheet of metal (such as a filing cabinet) between two antennas.

3 Using the IF5 Operating System

This chapter explains the IF5's Linux operating system and includes these topics:

- About the Linux Operating System
- Sending Commands Through the Command Line Interface
- Copying Files to the IF5
- Launching Applications at Boot Time
- Understanding Startup Scripts
- Using the IF5 NFS Server and NFS Client
- Upgrading the Linux Kernel and File System
- Upgrading the RFID Reader Firmware

About the Linux Operating System

The IF5 uses an open source Linux operating system (version 2.4.24).

A complete explanation of Linux procedures and commands is beyond the scope of this manual. For more information on general Linux operation, see a Linux reference.

Sending Commands Through the Command Line Interface

You can configure settings by sending commands through the Linux Bash command line interface (CLI). To send commands this way, you need to run a HyperTerminal session to connect the IF5 to your desktop PC. You can connect via Ethernet or a serial connection. To connect via Ethernet, you need to know the IF5's IP address.

To send commands through the CLI

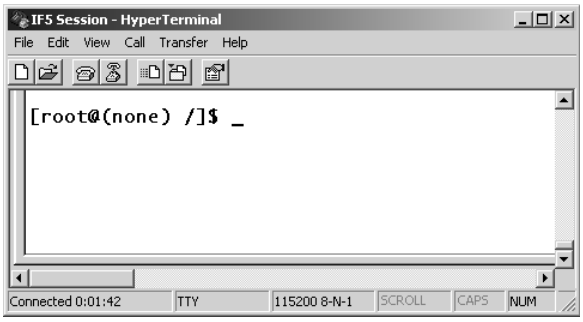
1. Connect a null-modem cable from the IF5 serial port to the serial port on your desktop PC. Or, connect an Ethernet cable from the IF5 to your network.
2. On your desktop PC, open a HyperTerminal session.

   For a serial connection, choose these settings:

Bits per second	115200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

   For an Ethernet connection, enter the IF5's IP address in the **Host address** field, enter 23 in the **Port number** entry field, and choose TCP/IP (Winsock) from the **Connect using** drop-down list.
3. Connect AC power to the IF5.
4. Press **Enter**. HyperTerminal connects to the IF5. When the boot process is complete, the $-prompt appears.

Note: For an Ethernet connection, you will be prompted to enter a userid and password. The default is "root" for both.



At the $-prompt, you can send commands to the operating system.

Configuring the Linux Operating System

You can configure the operating system to meet the needs of your application. This section includes information on a variety of commands you can send at the $-prompt to change Linux settings as needed.

Setting the Time Zone

By default, the IF5 displays the date and time in Universal Time (UTC) format. To set your own time zone, you need to know the difference between your local time and UTC time. At the $-prompt, send this command:

```
echo "[MyStandardTime][n][MyDaylightTime][d]" > /etc/TZ
```

where:

MyStandardTime	is the abbreviation for your local standard time (for example, PST for Pacific Standard Time).
n	is the number of hours your local time is earlier than UTC. If your local time is later than UTC, specify n as a negative value.
MyDaylightTime (optional)	is the abbreviation for your daylight savings time (or other local variation). This variable is always interpreted as one hour ahead of local standard time. By default, Linux interprets daylight time as beginning on the first Sunday of April at 2:00 A.M. and ending on the last Sunday of October at 2:00 A.M. Do not specify this variable if daylight savings time does not apply in your area.
d (optional)	is the number of hours your daylight savings time is ahead of local standard time. Specify d only if your daylight savings time is more than one hour ahead of local standard time.

For example:

- To set the IF5 time zone to United States Pacific Standard Time (PST), send this command:

  ```
  echo "PST8PDT" > /etc/TZ
  ```

- To set the IF5 time zone to Western Europe Time (WET), send this command:

  ```
  echo "WET-1WEST" > /etc/TZ
  ```

- To set the IF5 time zone to Japan Standard Time (JST), send this command:

  ```
  echo "JST-9" > /etc/TZ
  ```

For more information on setting the date and time, see a Linux reference.

Changing File Access Privileges

Linux files have associated access privileges (read, write, execute). To change the privileges for a file, send the chmod command at the $-prompt:

`chmod [+/-p] /path/filename/`

where:

+	adds a privilege and – removes a privilege.
p	is the type of privilege to change (r – read, w – write, x – execute).
path	is the path to the file.
filename	is the name of the file to be changed.

For more information on access privileges, see a Linux reference.

Copying Files to the IF5

You can copy files to the IF5 in several ways:

- Via Trivial File Transfer Protocol (TFTP). To use this method, you must have a TFTP server application running on the host PC.
- By using a Network File System (NFS) server. To use this method, you must have an NFS server application running on the host PC.
- Via the Linux SCP command. The IF5 supports encrypted copying of files from the host PC using the Secure Shell (SSH) protocol. The IF5 has an SSH server that auto-starts at boot time and is ready to accept a host-initiated copy operation.

These methods are described in the next sections.

Note: Before you proceed, make sure all files you wish to copy to the IF5 have been moved into your TFTP server directory.

Copying Files Via TFTP

1. Make sure your TFTP server application is configured and running on the host PC.
2. Connect the IF5 to your computer and start a HyperTerminal session as described in "To send commands through the CLI" on page 20.
3. In HyperTerminal, enter the following text at the $-prompt:

   ```
   cd /tmp
   ```

4. Press **Enter** and enter the following text:

   ```
   tftp -gr MyFileName xxx.xxx.xxx.xxx
   ```

   where:

   MyFileName is the name of the file you want copied to the IF5.

   xxx.xxx.xxx.xxx is the IP address of the TFTP server.

5. Press **Enter**. The file is copied. When the copy is complete, the $-prompt appears.

Note: To verify that the file has been copied, at the $-prompt type `ls -l` and press **Enter**. The name of the file that was copied, the date of the copy, and size of the file appear.

Copying Files By Using an NFS Server

A Network File System (NFS) server allows you to copy a directory system and files from a Windows PC to the IF5.

To copy files to the Linux file system using an NFS server

1. Make sure your NFS server is configured and running on the host PC.
2. Connect the IF5 to your computer and start a HyperTerminal session as described in "To send commands through the CLI" on page 20.
3. In HyperTerminal, enter the following text at the $-prompt:

   `mount -t nfs xxx.xxx.xxx.xxx:/c/MyDirectory /tmp`

   where:

   xxx.xxx.xxx.xxx is your desktop PC's IP address.

   MyDirectory is the name of the directory on your C drive where the files to be copied are located.

Note: If you cannot mount the nfs drive, check to see if you have firewall software running. If so, turn off the firewall software.

4. Press **Enter**. The directory and file system are mounted to the /tmp directory on the IF5. When the mount is complete, the $-prompt appears.
5. Enter the following text:

   `cp /tmp/MyFileName /IF5Directory`

   where:

   MyFileName is the name of the file to be copied.

   IF5Directory is the name of the directory on the IF5 to which the file should be copied.
6. Press **Enter**. The file is copied from the /tmp directory to the new location. When the file is copied, the $-prompt appears.

Copying Files Via SCP

The IF5 supports the Secure Shell (SSH) protocol for secure transfer of data to its file system. If your host PC also supports SSH, you can use the Linux SCP command to copy files to the IF5.

To copy files to the Linux file system via the SCP command

1. Connect the IF5 to the computer where the SSH client is located.
2. Send this command to the IF5:

   `scp MyFileName root@xxx.xxx.xxx.xxx:IF5Directory`

where:

MyFileName	is the name of the file you want copied to the IF5.
xxx.xxx.xxx.xxx	is the IP address of the IF5.
IF5Directory	is the name of the directory on the IF5 to which the file should be copied.

3 Press **Enter**. The file is copied. During the process, you may be prompted to enter the password (default is "root").

Note: The actual syntax for the SCP command may vary depending on your host PC.

Launching Applications at Boot Time

After you copy your applications to the IF5, you can launch them automatically at startup. To do this, browse to /etc/profile and add your startup commands at the end of the file. In this example, /etc/profile runs the testbri application at boot time.

Example

```
#!/bin/sh
if [ -n "$BASH" ]; then
  export PS1="[\u@\h \W]$ "
fi
for i in /usr/local/conf/*
do
  if [ -f $i ]; then
   source $i
  fi
done
if [ $(tty)== /dev/ttyS0 ]; then
$BRIAPI_HOME/bin/testbri
fi
```

Understanding Startup Scripts

The startup scripts of the IF5 are located in /etc/init.d. All the script file names beginning with "S" in this directory will be executed by the init process via the rcS script file.

The S01...S*nn* prefixes of the script files determine the order in which the files are processed, so S01network will be the first script run at startup.

Each script file must have a start and stop command incorporated.

The next table lists the files in the order they are run at startup.

IF5 Startup Files

Filename	Purpose
S01network	Networking
S02dhclient	DHCP auto-start
S05thttpd	thttpd
S09telnetd	Telnet server
S10openssh	Open SSH server
S11portmap	Portmap
S12mountd	Mountd
S13nfsd	NFS Server
S20snmpd	SNMP Agent
S90ntpclient	NTP Client
S91syslog	Syslog
S92BRIdge	BRIdge
S94Prism54	802.11g radio

You can edit or remove the startup scripts to change default boot settings. For example, to disable the auto-start of the DHCP client, you remove the S02dhclient script file from the /etc/init.d/ directory.

Then you edit the S01network script to assign a static IP address to the IF5. In this example, to assign the IP address 150.50.5.33 to the IF5, change this line:

```
IPADDRESS="192.168.100.55"
```

to:

```
IPADDRESS="150.50.5.33"
```

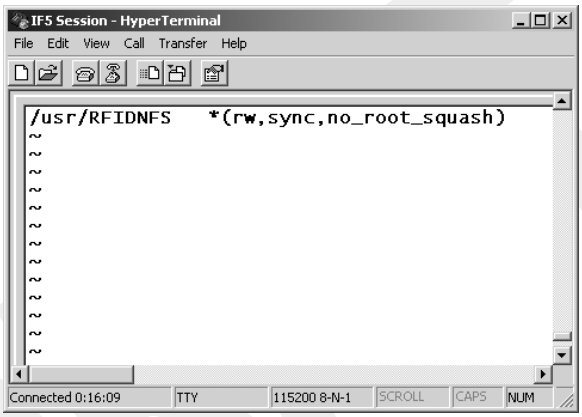
In this example, you also need to delete the "#" character from the beginning of the line (if present) to uncomment the STARTCMD line.

Using the IF5 NFS Server and NFS Client

At startup, the NFS server in the IF5 is started by the init process using the script S13nfsd. To allow an NFS client on your desktop PC to mount the IF5 file system, you need to create a file called "exports" in the IF5's /etc directory. The exports file defines the exported remote file system that the NFS client can mount to its local directory.

To create the exports file

1. Connect to the IF5 and start a HyperTerminal session as described in "To send commands through the CLI" on page 20.
2. At the $-prompt, enter `cd /etc` and press **Enter**.
3. Type `vi exports` and press **Enter**. The exports file appears.



4. Press **i** to enter Insert mode. In Insert mode, move the cursor with the arrow keys.
5. Enter the name of the directory that the IF5 is exporting and any additional parameters for the NFS client.

   For example, to allow any client to mount the /usr/local directory, you would enter this text:

   ```
   /usr/local  *(rw,no_root_squash)
   ```

   where:

*	means the directory can be mounted by anyone.
no_root_squash	means the client should maintain the root id.

6. Press **Esc** to leave Insert mode and then press **:** (**Shift** + **;** for English keyboards).
7. Type `wq` and press **Enter** to save your editing and quit. The $-prompt appears.
8. Type `exportfs -ua` and press **Enter**.
9. Type `exportfs -a` and press **Enter** to refresh the export table.

Viewing the Mounted File System

From the client side, to start mounting the file, type:

```
mount -t nfs xxx.xxx.xxx.xxx:/usr/local /MyMountPointLocation
```

where:

xxx.xxx.xxx.xxx	is the IP address of the IF5.
MyMountPointLocation	is the path to the mount point location on your desktop PC.

Note: You might need to specify "no firewall" in your Linux security setting in order to mount the IF5 file system. The command syntax may be different depending on the NFS client you are using.

The local mount point location should be empty when you issue the mount command. Once mounted, you will be able to see all the files in the mounted IF5 directory from your PC at the mount point location you specified.

Conversely, if your PC has an NFS server, you can define the file system to be exported and mount it on the IF5's /tmp directory on it by typing

```
mount -t nfs xxx.xxx.xxx.xxx:/MyPCDirectory /tmp
```

at the CLI, and exchange files that way. Make sure /tmp is empty before mounting it.

Creating Backup Images

If your PC has an NFS server, you can create backup images of your root file system and the /usr/local/ partitions. These are useful if you are customizing the root file system with your own startup scripts, profiles, and applications.

Backing Up the Root File System

The Linux root file system is duplicated in two separate partitions on the IF5. When you create a backup image of the root file system, you need to activate the alternate root file system, reboot the IF5, and then make a copy of the primary root file system.

Note: If you have not previously upgraded the root file system and plan to do so, you should perform the upgrade before you back up the root file system. After the upgrade is complete, begin with step 4 of the next procedure.

For more information on upgrading the root file system, see "Upgrading the Linux Kernel and File System" on page 31.

To create a backup image of the root file system partition

1. Make sure your NFS server is running on your desktop PC.
2. Connect to the IF5 and start a HyperTerminal session as described in "To send commands through the CLI" on page 20.
3. At the $-prompt, type `if5setenv` and press Enter. Wait for the $-prompt to appear before continuing.
4. Type `reboot` and press Enter. The IF5 operating system reboots.
5. At the $-prompt, type this command:

   `mount -t nfs` *`xxx.xxx.xxx.xxx`*`:/`*`MyPCDirectory/tmp`*

   where:

xxx.xxx.xxx.xxx	is the IP address of the IF5.
MyPCDirectory	is the path to the directory on your host PC where you want the backup image to be stored.

6. Press **Enter**. At the $-prompt, type:

   `cat /proc/cmdline`

7. Press **Enter**. A list of startup settings and the $-prompt appears.
8. In the list of startup settings, note whether `root=1f00` or `1f01`.
9. If `root=1f00`, type this command:

   `dd if=/dev/mtdblock1 of=/tmp/target.img bs=512 count=8192`

   If `root=1f01`, type this command:

   `dd if=/dev/mtdblock0 of=/tmp/target.img bs=512 count=8192`

10. Press **Enter**. The root file system is copied to the /tmp/target.img.
11. At the $-prompt, type:

    `umount /tmp`

12. Press **Enter**. The /tmp directory is unmounted. On the host PC, verify that target.img has been copied to the directory you specified.

Restoring the Root File System

To restore the root file system, you need to copy the original vmlinux.img and target.img files to the IF5 and perform the upgrade procedure. For help, see "Upgrading the Linux Kernel and File System" on page 31.

Backing Up the /usr/local/ Partition

If you have copied your applications and files to the /usr/local/ directory, you can create a backup image on your desktop PC using your NFS server.

To create a backup image of the /usr/local/ partition

1. Make sure your NFS server is running on your desktop PC.
2. Connect to the IF5 and start a HyperTerminal session as described in "To send commands through the CLI" on page 20.
3. At the $-prompt, type this command:

   `mount -t nfs` *`xxx.xxx.xxx.xxx`*`:/`*`MyPCDirectory`* `/tmp`

   where:

xxx.xxx.xxx.xxx	is the IP address of the IF5.
MyPCDirectory	is the path to the directory on your desktop PC where you want the partition to be stored.

4. Press **Enter**. At the $-prompt, type:

   `umount /usr/local/`

5. Press **Enter**. The /usr/local/ partition is unmounted and the $-prompt appears.
6. Type this command:

   `dd if=/dev/mtdblock2 of=/tmp/`*`MyFileImage`* `bs=512 count=14336`

   where *MyFileImage* is the name of the backup image to be created.
7. Press **Enter**. The backup image of /usr/local is copied to /tmp/MyFileImage.
8. At the $-prompt, type:

   `umount /tmp`

9. Press **Enter**. The /tmp directory is unmounted. On the host PC, verify that /usr/local has been copied to the directory you specified.

Restoring the /usr/local Partition

If you need to restore the original /usr/local partition, follow the next procedure.

To restore the /usr/local partition

1. Make sure your NFS server is running on your desktop PC.
2. Connect to the IF5 and start a HyperTerminal session as described in "To send commands through the CLI" on page 20.
3. At the $-prompt, type `umount /usr/local/` and press **Enter**. The /usr/local/ partition is unmounted and the $-prompt appears.

4 Type the following text:

```
cp /tmp/MyFilename /dev/mtdblock2
```

where *MyFilename* is the name of the partition to be restored.

5 Press **Enter**. The /usr/local partition is copied to the /dev/mtdblock2 directory.

Upgrading the Linux Kernel and File System

You can upgrade the Linux kernel and file system in several ways:

- Via TFTP
- By using the IF5 SSH server
- By using the NFS mounts

These methods are described in the next sections.

Note: To upgrade the IF5 kernel and file system, use only files provided by Intermec. Other image files are not supported.

Upgrading Linux Via TFTP

Make sure the TFTP server on the host PC is running before you begin this procedure.

To upgrade the Linux kernel and file system via TFTP

1 Connect the IF5 to your computer and start a HyperTerminal session as described in "To send commands through the CLI" on page 20.

2 Connect the IF5 to your network with an Ethernet cable.

3 In HyperTerminal, enter the following text at the $-prompt:

```
cd /tmp
```

4 Press **Enter** and type the following text:

```
tftp -gr vmlinux.img xxx.xxx.xxx.xxx
```

where *xxx.xxx.xxx.xxx* is the IP address of your TFTP host.

5 Press **Enter**. The file is copied to the IF5's /tmp directory. When the copy is complete, the $-prompt appears.

6 Type the following text:

```
tftp -gr target.img xxx.xxx.xxx.xxx
```

where *xxx.xxx.xxx.xxx* is the IP address of your TFTP host.

7 Press **Enter**. The file is copied to the IF5's /tmp directory. When the copy is complete, the $-prompt appears.

8 Type the following text:

```
upgrade.sh
```

9 Press **Enter**. The upgrade process begins and takes a few minutes. When the upgrade is complete, the IF5 operating system reboots. When the boot process is complete, the $-prompt appears.

Upgrading Linux With the SSH Server

If your host PC supports the SSH protocol, you can use the Linux SCP command to upgrade the operating system.

1 Connect the IF5 to the computer where the SSH client is located.

2 Send this command to the IF5:

```
scp MyDirectory/vmlinux.img root@xxx.xxx.xxx.xxx:/tmp
```

where:

MyDirectory is the name of the directory on your host PC where the upgrade image is located.

xxx.xxx.xxx.xxx is the IF5's IP address.

3 Press **Enter** and type the IF5 password (default is "root") when prompted.

4 Press **Enter** and enter the following text:

```
scp MyDirectory/target.img root@xxx.xxx.xxx.xxx:/tmp
```

where:

MyDirectory is the name of the directory on your host PC where the upgrade image is located.

xxx.xxx.xxx.xxx is the IF5's IP address.

5 Press **Enter** and type the IF5 password when prompted.

6 Press **Enter** and enter the following text:

```
ssh root@xxx.xxx.xxx.xxx upgrade.sh
```

where *xxx.xxx.xxx.xxx* is the IF5's IP address.

7 Press **Enter** and type the IF5 password when prompted. The upgrade process begins and takes a few minutes. When the upgrade is complete, the IF5 reboots. When the boot process is done, the $-prompt appears.

Note: The actual syntax for the SCP and SSH commands may vary depending on your host PC.

Upgrading Linux Using NFS Mounts

1. Connect the IF5 to your computer and start a HyperTerminal session as described in "To send commands through the CLI" on page 20.
2. Start your NFS server.

Note: If you cannot mount the NFS drive, check to see if you have firewall software running. If so, turn off the firewall software.

3. In HyperTerminal, enter the following text:

   `mount -t nfs` *`xxx.xxx.xxx.xxx`*`:/c/`*`MyDirectory`* `/tmp`

   where:

xxx.xxx.xxx.xxx	is your desktop PC's IP address.
MyDirectory	is the name of the directory on your C drive where the new Linux image files (vmlinux.img and target.img) are located.

4. Press **Enter**. The directory is mounted on the IF5. When the process is complete, the $-prompt appears.
5. Enter the following text:

   `upgrade.sh`

6. Press **Enter**. The upgrade process begins and takes a few minutes. When the upgrade is complete, the IF5 reboots. When the boot process is complete, the $-prompt appears. By default, your original network configurations and profile are preserved.

Upgrading the RFID Reader Firmware

Before upgrading the RFID reader firmware, the upgrade file must be available to the application. There are two ways to make the file available:

- Download the upgrade file to the /tmp directory on the IF5 via TFTP. For help, see "Copying Files Via TFTP" on page 23.
- Connect the IF5 to your NFS server and mount the drive where the upgrade is located. For help with NFS servers, see "Copying Files By Using an NFS Server" on page 24.

Note: To upgrade the RFID firmware, use only files provided by Intermec. For RFID software development, contact your Intermec RFID certified partner.

Caution

Make sure the IF5 is connected to a reliable AC power source before you upgrade the firmware. Do not cycle power to the IF5 during the upgrade. If AC power is lost during the upgrade, the IF5 may require factory repair.

Attention: Assurez-vous que l'IF5 est branché sur une alimentation secteur (~) fiable avant d'effectuer la mise à niveau du micrologiciel. Durant la mise à niveau, ne mettez pas l'appareil hors tension. Si une coupure de courant survient durant la mise à niveau, il est possible que l'IF5 nécessite une réparation en usine.

To upgrade the RFID reader firmware

1. Connect the IF5 to your computer and start a HyperTerminal session as described in "To send commands through the CLI" on page 20.
2. At the $-prompt, enter the following text:

   ```
   killall BRIdge
   ```

3. Press **Enter** and enter the following text:

   ```
   ploadcl -ff Path/Firmware -b -nbri 1
   ```

   where:

   Path is the path to the location of the new firmware file.

   Firmware is the name of the new firmware file.

4. Press **Enter**. The new file is uploaded to the IF5. When the upload is complete, the $-prompt appears.
5. Type `reboot` and press **Enter** to reboot the IF5. When the boot process is complete, the $-prompt appears.

4 Troubleshooting

This chapter includes information for solving problems you may encounter when working with the IF5, including:

- Problems at Boot Time
- Problems While Reading RFID Tags
- Problems With Connectivity
- Problems With Copying Files

Problems and Solutions

If you have problems while operating the IF5, check these lists of problems and possible solutions.

Problems at Boot Time

Problem	Solution
While booting, the IF5 seems to be locked up.	By default, the IF5 is configured for DHCP. If the IF5 cannot find a DHCP server at boot time, it may appear to be locked up. If the IF5 is connected to your host PC, open a HyperTerminal session and press **Ctrl-C** to stop the DHCP search. Make sure your DHCP server is available and reboot the IF5. If the IF5 is not connected to your host PC, or if your network does not use a DHCP server, disconnect power to the IF5. You need to set static TCP/IP parameters on the IF5. For help, see "Setting the IP Address" on page 10.
While booting, the IF5 seems to be locked up when running the first startup script (S01network).	If the IF5 is connected to your host PC, open a HyperTerminal session and press **Ctrl-C** to stop the script from running. Open the S01network script file and check your syntax. Typographic errors in the S01network file will cause the IF5 to lock up at boot time.
The IF5 is connected to AC power but the Power LED on the IF5's front panel is not lit and the IF5 does not respond to commands.	Check the AC power connection and power cord.

Problems While Reading RFID Tags

Problem	Solution
You are unable to read RFID tags.	Check these conditions: • Your RFID antennas must be connected correctly to the IF5 and mounted in optimum locations. For help, contact your Intermec RFID engineer. • Terminators must be installed on all unused RFID antenna ports. If you have operated the IF5 without terminators on all unused RFID antenna ports, the RFID module may be damaged. • The tags you are trying to read may be out of range. Reposition the RFID antennas. For help, contact your Intermec RFID engineer or certified partner.
You send the nbri l command and the command fails.	The BRI application is not running. BRI is turned off before and during firmware installations or upgrades. To restart the BRI, send this command: `ploadcl -nbri l` Reboot the IF5.

Problems With Connectivity

Problem	Solution
You can ping the IF5 from your host PC but cannot ping the host PC from the IF5.	Your host PC firewall is active. Disable your firewall setup.
You have trouble connecting to the IF5 via Ethernet and its 802.11g radio.	The Ethernet and radio connections may be on the same subnet. Make sure they are on different subnets and try again.
You have assigned a static IP address to the IF5 but cannot connect to it over your network.	When you assign a static IP address to the IF5, you also need to disable DHCP. To disable DHCP, delete or move the S02dhclient startup script out of the /etc/init.d directory and then reboot the IF5. To enable DHCP, move S02dhclient into the /etc/init.d directory and reboot. For more information, see "Setting the IP Address" on page 10. Connect to the IF5 via HyperTerminal and send the ifconfig (for Ethernet) or iwconfig (for 802.11g) command to view the active network parameters. Make sure that your IP address and other parameters were assigned correctly. If not, check your command syntax and try again.
You cannot consistently maintain your 802.11g radio connection to the IF5.	You may need to move the IF5 so its 802.11g radio antenna is in a better position for its mounting location and your network. Make sure the 802.11g radio antenna is connected to antenna port 4.

Problems With Copying Files

Problem	Solution
While copying files to the IF5, the IF5 seems to be locked up.	The root directory on the IF5 may be full. Press **Ctrl-C** to stop the copy operation and then check the available disk space by sending the df command at the $-prompt. A report on available disk space appears. Delete files if necessary and try copying the files again.
You are unable to mount a PC drive to the IF5.	Make sure the NFS client on your host PC is configured correctly. The NFS client on your host PC must be running before you can mount a drive.
You are unable to mount an IF5 drive on your host PC.	Check these conditions: • Make sure the NFS server on your host PC is configured correctly. The NFS server on your host PC must be running before you can mount a drive. • Your host PC firewall is active. Disable your firewall setup.

A Specifications

This appendix includes physical and electrical specifications for the IF5 and information about the port pin assignments.

IF5 Specifications

Height	9.5 cm (3.8 in)
Length	35.5 cm (14.0 in)
Width	23.6 cm (9.3 in)
Weight	2.63 kg (5.8 lb)
AC electrical rating	~ 100 to 240V, 1.0 to 0.5A, 50 to 60 Hz
Operating temperature	-25ºC to +70ºC (-13ºF to +158ºF)
Storage temperature	-40ºC to +70ºC (-22ºF to +158ºF)
Humidity (non-condensing)	10 to 90%
Ethernet interfaces	10BaseT/100BaseTx (twisted-pair)
Ethernet compatibility	Ethernet frame types and Ethernet addressing
Ethernet data rate	10 Mbps/100 Mbps
Radios supported	802.11g
Serial port maximum data rate	115,200 bps
SNMP agent	RFC 1213 (MIB-2), RFC 1398 (dot3), RFC 1493 (Bridge), 802.11, 802.1x
Linux version	2.4

802.11g Radio Specifications

Frequency band	2.4 to 2.5 GHz worldwide
Type	Direct sequence, spread spectrum
Modulation	Direct sequence, spread spectrum (CCK, DQPSK, DBPSK)
Power output	63 mW (18 dBm)
Basic data rate	11, 5.5, 2, and 1 Mbps
Extended data rate	54, 48, 36, 24, 18, 12, 9, and 6 Mbps
Channels	11 (North America), 13 (Europe), 4 (France), 14 (Japan), 1 (Israel)
Range (Maximum power output, 11 Mbps)	160 m (525 ft) open environment 50 m (165 ft) semi-open environment 24 m (80 ft) in closed environment Unlimited range with roaming (Lowering the power output level reduces the range)
Receiver sensitivity (11 Mbps)	-82 dBm
Security	WEP 64, WEP 128

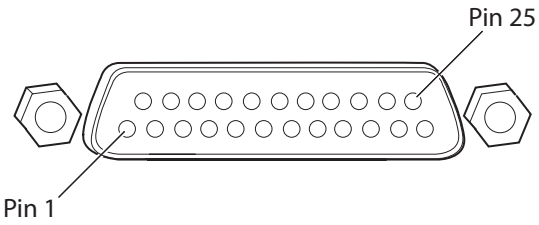
RFID Specifications

Protocol	Intellitag
Frequency range	865-868 MHz, 869 MHz, or 915 MHz
Usable channels	1
Output power	
865-867 MHz, 915 MHz	Minimum: 28.5 dBm Typical: 29.5 dBm Maximum: 30.0 dBm
869 MHz	Minimum: 25.5 dBm Typical: 26.5 dBm Maximum: 27.0 dBm
Occupied frequency bandwidth	<250 KHz
Tag data rates	32 kbps/160 kbps
Dispatch rates	
Tag ID rate	70 tags per second
Tag data exchange rate	Reads a tag containing 8 bytes of data within 12 mS. Performs a verified write to a tag at an average rate of 31 mS per byte per tag.
Write range	Up to 70% of the read distance under similar conditions
Transmitter type	90% amplitude modulation index
Frequency stability	<±100 ppm from -25°C to +55°C
Number of antennas	Up to 4, electronically switched
Antenna port isolation	≥22 dB
Antenna connectors	865-867 MHz: SMA 915 MHz: Reverse SMA

Port Pin Assignments

Control Port

The control port provides access to the IF5's GPIO board.



Control Port Pin Assignments

Pin	Description	Active Polarity
1	Input-1M	Low-RTN
2	Input-2M	Low-RTN
3	Input-3M	Low-RTN
4	Input-4M	Low-RTN
5	Ground	
6	Ground	
7	Output-1P	High (10-48V)
8	Ground	
9	Output-2P	High (10-48V)
10	Ground	
11	Output-3P	High (10-48V)
12	Ground	
13	Output-4P	High (10-48V)
14	Input-1P	High (10-48V)
15	Input-2P	High (10-48V)
16	Input-3P	High (10-48V)
17	Input-4P	High (10-48V)
18	12VDC	
19	Output-1M	Low-RTN
20	12VDC	
21	Output-2M	Low-RTN
22	12VDC	
23	Output-3M	Low-RTN
24	12VDC	
25	Output-4M	Low-RTN

Inputs

The GPIO inputs are rated for input signals of 10-48V. Both the high and low signal contacts are exposed and isolated to 1500V. Input impedance is 1.8KΩ minimum.

Control Port Input Specifications

Signal	Description	Min.	Typical	Max.
V_{in} (High)	High input voltage	10V	24V	48V
V_{in} (Low)	Low input voltage	-1V	0V	1V

Outputs

The GPIO outputs are controlled by a power MOSFET relay rated to switch a 0-48V load at up to .25A. The high and low contacts are exposed and isolated from ground. Transient suppression limits output voltage spikes to 65VDC.

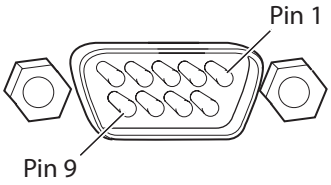
Control Port Output Specifications

Signal	Description	Min.	Typical	Max.
Leakage Current (High)	Switch output, high leakage current	0 mA	1 mA	10 mA
V_{sat} (Low)	Switch output on, saturation voltage with .25A load	0V	1V	1.5V

Power

The GPIO interface supplies access to 12VDC@0.5A. The supply return is common to the IF5 chassis. The supply is intended to power local loads such as relays or indicators, and can eliminate the need for an external power supply for these loads.

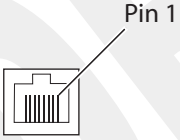
Serial Port



Serial Port Pin Assignments

Pin	Description	Active Polarity
1	NC	
2	Receive data (RXD)	High
3	Transmit data (TXD)	High
4	NC	
5	Signal ground	
6	NC	
7	NC	
8	NC	
9	NC	

Ethernet Port



Ethernet Port Pin Assignments

Pin	Description
1	LAN_RX+
2	LAN_RX-
3	LAN_TX+
4	VDC_A
5	VDC_A
6	LAN_TX-
7	VDC_B
8	VDC_B

Note: The IF5 does not support power over Ethernet.