1. Introduction

Congratulations on your purchase of the RangeLAN2 7250, the industry's leading PC Card Wireless LAN Adapter. As with all members of the RangeLAN2 family, RangeLAN2 7250 is a long range, high performance, wireless LAN adapter card with minimal power requirements.

RangeLAN2 7250 was designed to be a "plug-and-play" product. It includes antennas designed and manufactured by Proxim for long range and ease of use. Plug the adapter into your portable computer's PCMCIA Type II slot, attach the antenna, and load the driver. Then you're connected without wires to your network's existing electronic mail, printers, software applications, and other network resources. That's how simple it is!

The RangeLAN2 7250 may be placed in NetWare clients, Windows for Workgroups nodes, Windows 95 or NT machines, or any network operating system that supports ODI or NDIS drivers. Your RangeLAN2 7250 wireless clients "look" like standard network nodes to the operating system.

Today, Proxim is the leading supplier of spread spectrum radio networking technology for local area environments. Proxim's unmatched spread spectrum networking expertise, combined with the company's extensive experience serving the communications needs of the mobile computing user, have kept Proxim at the forefront of the emerging wireless LAN market.

Proxim also manufactures RangeLINK, a family of low-cost, high speed wireless inter-building bridges, and ProxLink, a wireless RS-232 cable replacement product. If you would like more information on RangeLINK or ProxLink, please contact Proxim's Sales Department at 800/229-1630.

The RangeLAN2 Family

RangeLAN2 7250 is part of a family of high-performance products that provides a complete wireless networking solution.

- **RangeLAN2 7500** is a wireless access point which allows for easy expandability of your wireless network increasing range and facilitating mobility applications. It operates at the Data Link level (layer 2) of the OSI model, providing protocol-independent access for RangeLAN2 computer users into an existing wired Ethernet LANs.

- **RangeLAN2 7100** is a high performance wireless LAN adapter that fits into a standard PC/AT ISA bus slot.

- **RangeLAN2 7200** is a high performance two-piece wireless LAN adapter which fits into a PCMCIA Type II slot on a portable notebook, laptop or pen-based computer. It has a separate antenna unit that attaches to the back of the notebook computer display.

The Product Package

Each RangeLAN2 7250 adapter package comes with:

- A standard PC Card (PCMCIA Type II).

- An antenna unit (Antenna options are an end cap antenna or a tethered dipole antenna.) These antennas work interchangebly with the 7250 PC Card, and may be ordered separately.

- ❑ Three 3 1/2" disks -- one containing DOS drivers and utilities; one containing Windows 95 drivers and utilities; one containing Windows NT drivers and utilities.
- ❑ This RangeLAN2 User's Guide.

If any of these items are missing or damaged, please contact your reseller or Proxim Technical Support.

RangeLAN2 7250 LEDs

There are two LEDs on the RangeLAN2 7250 card. They are NOT visible through the end cap antenna on the RangeLAN2 7260.

- ❑ The yellow LED indicates the card is transmitting.
- ❑ The green LED lights whenever the card detects another unit that is transmitting.

System Requirements

To begin using your RangeLAN2 7250 adapter, you need the following minimum requirements:

- ❑ A computer with a PCMCIA Type II slot. The computer must have either Card and Socket Services V2.1 or an Intel 82365SL PCMCIA controller chip.
- ❑ An application that uses ODI or NDIS drivers like NetWare 3.1X/4.X, Personal NetWare, or Windows for Workgroups.
- ❑ At least one other RangeLAN2 product installed on the network.

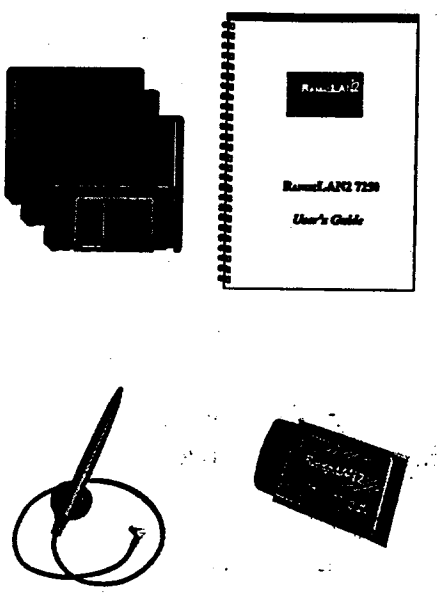


Figure 1
RangeLAN2 7250 Components

2. Quick Installation

If you are familiar with installing and setting up network cards in a PCMCIA slot, you may wish to use the following instructions. For detailed setup, turn to chapter 6.

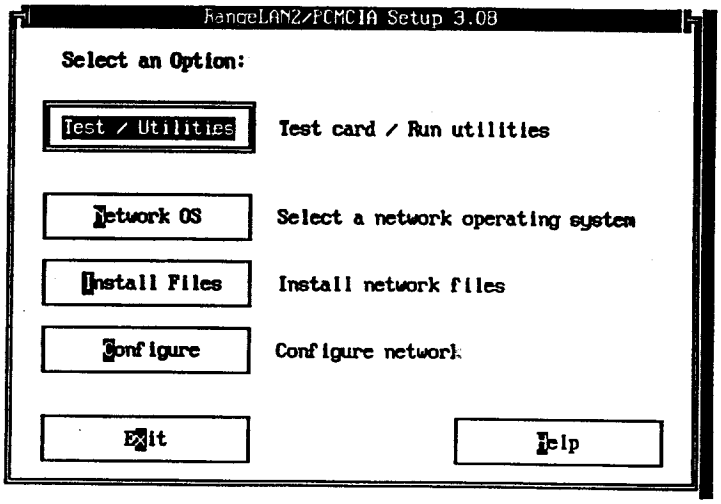
1. Install the RangeLAN2 7250 card in your computer's Type II PCMCIA slot.

2. Put the appropriate RangeLAN2 7250 driver diskette in a floppy drive on your computer and run the setup program:

```
C:\> A:

A:\> RL2SETUP
```

3. Follow the on-screen instructions in the RL2SETUP program to install and configure the RangeLAN2 7250 software.



You may use either a mouse or keyboard to make selections in the RL2SETUP program. If using a keyboard, press <Alt> followed by the highlighted letter to make a selection. Additionally, at any time you may press <Enter> to accept changes and close the dialog box. Pressing the <Tab> key will cycle through the buttons displayed. Pressing the <Escape> key returns to the previous screen aborting any changes.

You should proceed through the five buttons <Test / Utilities>, <Network OS>, <Install Files>, <Configure>, and <Exit> starting with <Network OS>. After configuring, choose <Test / Utilities> to verify your selections do not conflict with other devices in the PC.

NOTE:

You may also choose to bypass the setup program entirely, and follow the instructions in chapters 6 -13 to install the RangeLAN2 7250 software.

3. Network Topologies

Network operating system consist of servers and clients. Servers store the information and clients access it. The way these computers are configured and communicate depends on the type of network operating system.

Client/Server Network Operating Systems

In a client/server network operating system, one machine is the dedicated file server. Typically, it cannot be used for any other functions while acting as the file server. NetWare is an example of a client/server operating system.

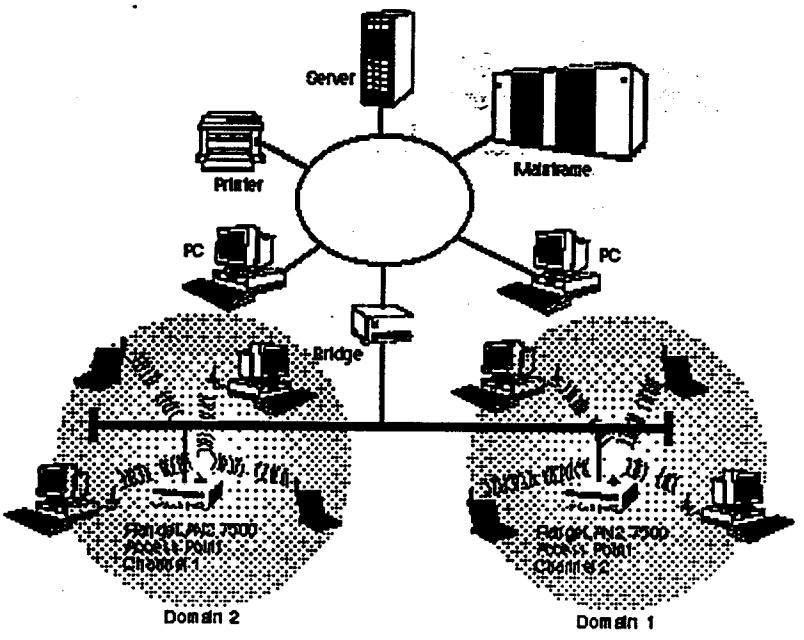


Figure 2
A Client/Server Network Operating System with Wired and Wireless Clients

Peer-to-Peer Network Operating Systems

In a peer-to-peer network operating system, each machine can be configured as both a server and a client. Servers are typically non-dedicated and can, therefore, be used as someone's desktop machine.

In the peer-to-peer environment, all stations can communicate with all other stations directly provided they have the same cabling type. In the wireless arena, this means that all wireless stations can talk to all other wireless stations. In order to have wireless stations communicate with wired Ethernet clients, you need a RangeLAN2 7500 Access Point attached to the Ethernet wire. If you have multiple RangeLAN2 7500 Access Points, your wireless clients will also be able to roam.

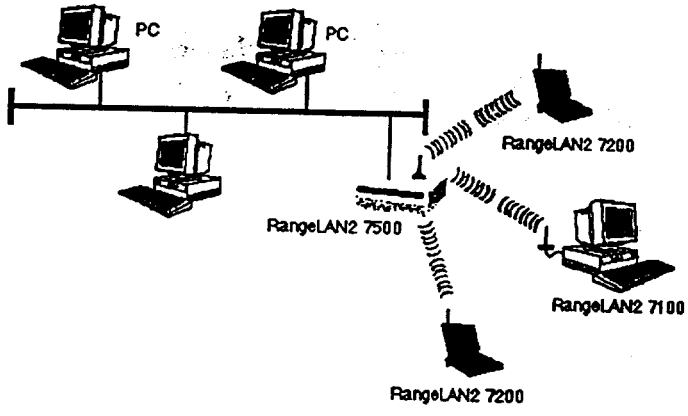


Figure 3
A Peer-to-Peer Network Operating System with Wired and Wireless Clients

4. Understanding RangeLAN2

This chapter lays the background for understanding the options that are settable when a RangeLAN2 7250 is installed. Refer to chapters 6-14 for instructions on how to install the driver that is appropriate for your network.

RangeLAN2 radios use a radio technology called frequency hopping spread spectrum. This means that the radio signal is constantly moving from one frequency to another while sending packets of data. This hopping technique allows for multiple hopping patterns to be used in the same area and minimizes interference.

RangeLAN2 Software Parameters

Station_Type

In order for this system to work, in each subnetwork there must be one unit that coordinates the hops. This station is called the Master. It might help you to think of the Master as the conductor of a frequency hopping orchestra. The Master keeps time so all units know when to hop and what frequency to hop to.

Units classified as Stations synchronize to the Master and follow its signal to learn what frequency in the pattern the Master is currently using.

An acting "Master" can be configured either as a Master or Alternate Master. Alternate Masters act either as a Master or a Station. If an Alternate Master unit is unable to locate any other Master within range, it acts as a Master. If a Master station is already present, then the Alternate Master acts as a Station. When there are multiple Alternate Masters, they coordinate amongst themselves to determine who will become the Master.

There must be at least one station on the network designated the Master station. For most network operating systems, the RangeLAN2 7100 card in the server or RangeLAN2 7500 Access Point should be the Master and all clients are defined as Stations. In a roaming environment, all RangeLAN2 7500s will be configured as Masters. The RangeLAN2 7100 and RangeLAN2 7250 clients are all configured as Stations and roam from one Master to another.

In peer-to-peer network operating systems without a RangeLAN2 7500, you may choose the machine with the RangeLAN2 7100 card to be the Master since it is likely in a non-mobile computer. You need to place the Master station within range of the other workstations on the network. It is a good idea to set up at least one additional station on the network as an Alternate Master station as well. However, you will want to set as few machines as Alternate Master as possible to increase performance. For performance considerations regarding the setting of this parameter, refer to Chapter 13, "Performance Hints."

The Station_Type settings are as follows:

- ❑ Master = 2
- ❑ Alternate Master = 1
- ❑ Station = 0

Domain *default=0*

In order to establish communications, all Station_Types require the same Domain number. Radios on different Domains cannot communicate with each other. The Domain is a software filter which does not affect the actual radio frequency or the frequency hop sequence.

You may want to set everyone on your network to the same Domain. For larger wireless networks, use the Domain to establish roaming subnetworks throughout your building. For example, the Engineering Department may use Domain 2 and the Sales Department may use Domain 5. Then engineers can only roam within the geographical area mapped out by RangeLAN2 7500 Access Points with a Domain setting of 2.

The Domain is a number between 0 and 15 with 0 being the default setting.

Channel *default=1*

Each Master can select one of 15 Channels to establish communications with Stations. Each Channel number sets a unique frequency hopping sequence allowing for multiple subnetworks with higher data rate transmission capability in the same air space. You may think of the Channel as a pipe. In order to communicate, radios must be on the same Channel and there must be one (and only one) Master that provides the timing for that Channel.

There are 15 independent Channels designated 1 through 15 with 1 being the default setting. This means that there are 15 different sequences of frequency hops. Each Channel is at a different frequency at a different time. For networks with multiple Masters (like in a roaming environment), set each Master to a different channel for optimum performance.

You need only set the Channel on a Master or Alternate Master. Stations will ignore the parameter if it is set.

Subchannel *default=1*

The Subchannel is a software code that is appended to each radio packet. It does not affect the frequency hopping sequence like a Channel does. Use a Subchannel if you need more than 15 Masters in the same area and, therefore, all the Channels are used.

For example, you can use Channel 1, Subchannel 1 for Network A and Channel 1, Subchannel 2 for Network B. The two networks will not communicate with one another. They are, however, still sharing the 1.6 Mbps pipe since they are both using Channel 1.

The Subchannels are designated 1 through 15 with 1 being the default setting.

You need only set the Subchannel on a Master or Alternate Master. Stations will ignore the parameter if it is set.

Master_Name *optional*

This optional parameter of up to 11 characters specifies an alphanumeric name to simplify the identification of each Master in your network. You may not have spaces in the name.

You need only set the Master_Name on a Master or Alternate Master. Stations will ignore the parameter if it is set.

Security ID

To further improve the security of a wireless subnetwork, each unit requires the same security ID to establish communication. The Security ID is used on all RangeLAN2 products and all Station_Types. This ID is encrypted and stored on the RangeLAN2 7250 card itself, not in software. It cannot be accessed but you may change it. If you do change it, however, you will need to change the Security ID on all other radios with which this one was communicating.

There are 1,048,576 unique choices for the Security ID.

Change the security ID by using the RL2SETUP program. To set the security ID, refer to Appendix A.

MAC_Optimize *default=1*

This parameter can help improve throughput for small networks. If you have 8 or fewer wireless nodes communicating with a RangeLAN2 7500 at the same time, set this parameter to Light. (You can have more than 8 nodes synchronized to a RangeLAN2 7500 but only 8 or fewer communicating at the same time for the Light parameter setting.) In networks with more than 8 concurrent wireless users, set the parameter to Normal.

You need only set the MAC_Optimize parameter on a Master or Alternate Master. Stations will ignore the parameter if it is set.

The MAC_Optimize settings are as follows:

- ❑ Light = 0
- ❑ Normal = 1

Roam_Config *default=1*

The Roam_Config parameter allows you to determine how quickly stations will roam from one RangeLAN2 7500 to another. In areas with many RangeLAN2 7500 units that provide heavy overlapping coverage, set this parameter to Fast to maintain high throughput for each of the wireless nodes.

In most networks, set the Roam_Config parameter to Normal. Wireless node throughput will not change noticeably, and an overabundance of RangeLAN2 7500 units is not required.

If the wireless coverage area provided by RangeLAN2 7500 units is sparse, set the Roam_Config parameter to Slow. Wireless node will not roam under they are nearly out of range of the RangeLAN2 7500.

You need only set the Roam_Config parameter on a Station or Alternate Master. Masters will ignore the parameter if it is set.

The Roam_Config settings are as follows:

- ❑ Slow = 0
- ❑ Normal = 1
- ❑ Fast = 2

Peer_to_Peer *default=Y*

If the Peer_to_Peer parameter is set to Yes, wireless clients can communicate with one another. If set to No, the wireless nodes will only communicate with the Master unit. This results in a shorter synchronization time between the wireless clients and the Master unit. There are programs whose timings are inappropriate for wireless networking, resulting in the wireless nodes losing the network connection unless this parameter box is unchecked.

You need only set the Peer_to_Peer parameter on a Station or Alternate Master. Masters will ignore the parameter if it is set.

PC Card Options

RangeLAN2 7250 uses some additional parameters and terms: **Inactivity Timeout** and **Card and Socket Services.**

Inactivity Timeout *default=30 seconds*

To conserve battery life, the RangeLAN2 7250 card has an inactivity sleep mode. The sleep mode is automatically engaged when a certain period of time has elapsed since the computer sent or received data over the network. Once the card is asleep, it can be awoken by a Master station attempting to send data to it. However, if the sleeping machine is acting as the Master station, you will lose all communication on your network. Do not set an inactivity timeout on a Master station. The time before sleeping is calculated by adding the Inactive_Min and Inactive_Sec parameters and rounding to the nearest 5 second interval.

Card and Socket Services

RangeLAN2 7250 supports computers with either Card and Socket Services V2.1/3.0 or an Intel 82365SL PCMCIA controller chip. By default, the driver is set to work with Card and Socket Services. However, if this software is not detected, the driver will next look for an Intel 82365SL chip.

RangeLAN2 Roaming

In order to enhance our wireless solutions, Proxim offers roaming capability to break the wireless distance barrier. To accomplish this, install RangeLAN2 7500 Access Points throughout your building. The coverage of each RangeLAN2 7500 Access Point should overlap in order to provide uninterrupted wireless access at any location within the building. The RangeLAN2 7500 Access Points act as "cells," similar in concept to those of a cellular phone network. With the installed wireless network, mobile clients attach to any RangeLAN2 7500 within range.

Each RangeLAN2 7500 within a roaming network should be configured as a Master (not Alternate Master) on a unique Channel/Subchannel pair, but all must have the same Domain number and Security ID. The portable PCs are equipped with RangeLAN2 7250 cards which are also set to the same Domain. As the portable PC *seamlessly* switches from cell to cell, its network connectivity is preserved.

The user can move freely between the RangeLAN2 7500 Access Points in the network. When the roaming PC leaves the transmission range of one RangeLAN2 7500, the software automatically polls the other RangeLAN2 7500 in the same Domain to continue the network connection.

See the following illustration for an example of a network set up with a RangeLAN2 roaming domain. **Note that the cells must overlap to ensure that there are no gaps in coverage, and that the roaming PC will always have a connection available.**

Note:
Roaming stations will only roam among RangeLAN2 7500 Access Points with the same Domain and Security ID.

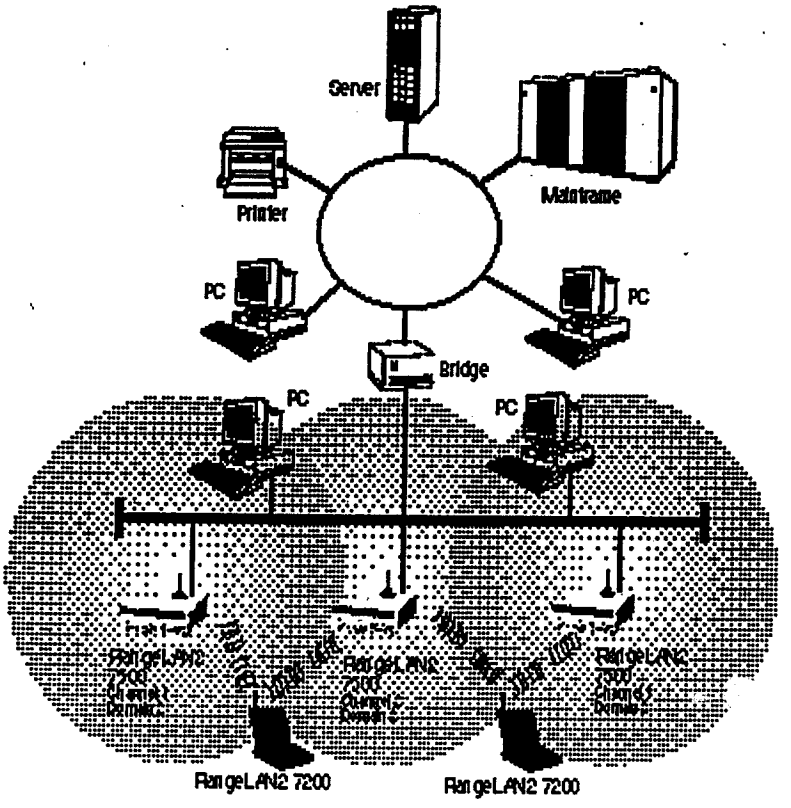


Figure 4
A Network with RangeLAN2 Roaming

Guidelines for Wireless Network Setup

- ❑ Roaming occurs between RangeLAN2 7500 Access Points (not between RangeLAN2 7100s that are installed in file servers).
- ❑ All RangeLAN2 7500s should be configured as Masters.
- ❑ All RangeLAN2 7500s in the same network must have the same Domain and Security ID.
- ❑ All RangeLAN2 7500s have a unique Channel/ Subchannel pair. Preferably, they should have unique Channels. Only use the Subchannel once you have used all 15 Channels in the same coverage area.
- ❑ All workstations with RangeLAN2 7100 or RangeLAN2 7250 cards should be configured as Stations and their Domain and Security ID should match those of the RangeLAN2 7500s they will roam amongst.
- ❑ Position the RangeLAN2 7500 Access Points so that their ranges overlap to ensure seamless coverage for roaming.
- ❑ Roaming will not occur across routers unless you are using a roaming protocol like Mobile IP or Mobile IPX.

5. Installing the RangeLAN2 Hardware

This chapter provides guidelines for installing the RangeLAN2 7250 card and antenna unit. Install the hardware before installing the network driver software.

Installing the RangeLAN2 7250 Card

The exact installation procedure for the card varies depending on the model of computer you are using. The computer must have a Type II PCMCIA slot.

Install the RangeLAN2 7250 card by following the instructions in the hardware manual provided with your computer for general installation of PCMCIA Type II cards.

The following figure shows a typical installation of the RangeLAN2 7250 card in a notebook computer.

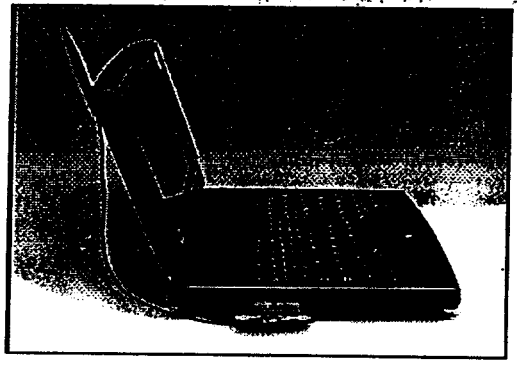


Figure 5
RangeLAN2 7250 Installation with Tethered Antenna

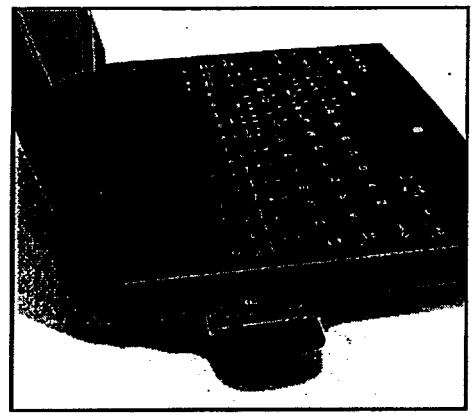


Figure 6
RangeLAN2 7250 Installation with End Cap Antenna

Attaching the Antenna

After you install the RangeLAN2 7250 card in your computer, you can connect the antenna unit to the card. There are two antenna choices for the RangeLAN2 7520 unit.

- ❑ The flexible end cap antenna plugs directly into the PCMCIA card and extends for less than one inch. To attach it, hold down the two buttons on the bottom of the antenna, and make sure the connector and slots are aligned, with the Proxim logo facing up.

Figure 7
Attaching the End Cap Antenna

- The tethered dipole antenna attaches to the PCMCIA card. The antenna is supplied with a clip that is attached to the back of a notebook computer or handheld device. Because there is 12" of antenna cable, insert the card into the PCMCIA slot before attaching the "U" clip. The clip should be positioned so that the holder can be read as a capital "U."

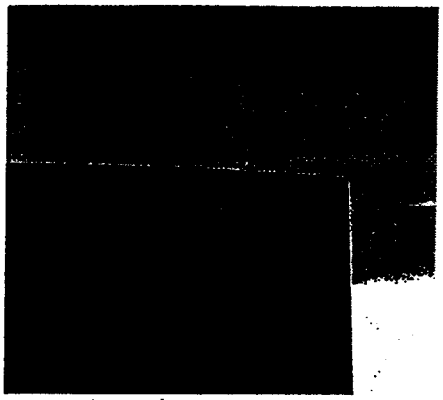


Figure 8
The "U" Clip

The antenna can be stationed in four positions, so if the "U" is diagonal the antenna will not stay in an upright position.

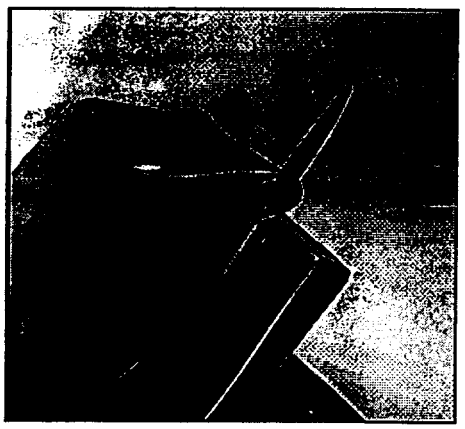


Figure 9
Attaching the Tethered Antenna

Rotate the antenna 90 degrees for storage, but be careful not to bend the antenna cable more than 1" radius or you may cause damage.

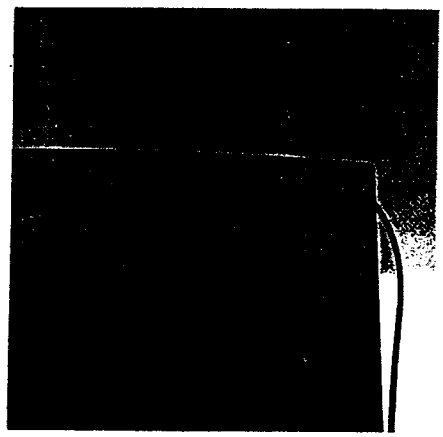


Figure 10
Rotating the Tethered Antenna for Storage

Detaching the Antenna

Proxim recommends that you leave the end cap antenna inserted at all times to increase connector life. If you must remove the antenna, first press the two buttons on the bottom of the antenna.

6. Setting RangeLAN2 Configuration Parameters

RangeLAN2 7250 can be thought of as a standard Ethernet network interface card without the need for a cable. It is fully compliant with the IEEE Ethernet addressing and packet type standards. The card is supplied with DOS ODI, real-mode NDIS, Windows 95 and Windows NT drivers. Therefore, any Network Operating System (NOS) that is compatible with Ethernet DOS ODI, NDIS, Windows 95 or Windows NT drivers should allow for wireless networking with RangeLAN2.

At least one other RangeLAN2 wireless node must exist on your network before a wireless connection can be made. This may be either another station (RangeLAN2 7100, 7200, 7260 or 7270) or a RangeLAN2 7500 Access Point.

Note

If you intend to communicate with wired Ethernet clients, you will need a RangeLAN2 7500 Access Point attached to the Ethernet cable. *Without a RangeLAN2 7500, you will only be able to communicate with other wireless stations and will not having roaming capabilities.*

Installing RangeLAN2 Software Using the NOS' Installation Procedure

In general, most NOS's have an installation procedure. Some of these procedures are defined in chapters 7-14. A general overview of NOS installation procedures using the RangeLAN2 drivers is described here.

At some point in the installation, the user is asked to pick from a list of network interface cards. Look for an "OEM-supplied" option which will allow you to supply a diskette with the RangeLAN2 software drivers. The RangeLAN2 driver to be installed is usually either RL2PCM.COM or RL2PCM.DOS. RL2PCM.COM is a DOS ODI driver. There are also Windows 95 and Windows NT drivers. RL2PCM.DOS is a DOS real-mode NDIS 2 driver. When prompted, put the RangeLAN2 driver diskette into the floppy drive.

If the installation procedure does not have an "OEM-supplied" option, choose a network interface card from the given list. This card's ODI or NDIS driver will then be installed. After installation, you will need to manually search for all instances of this driver and replace them with either RL2PCM.COM if an ODI driver was installed or RL2PCM.DOS if an NDIS driver was installed. Additionally, you will need to replace the installed driver's configuration with the RangeLAN2 options in the ASCII-editable NET.CFG or PROTOCOL.INI file for the ODI or NDIS driver respectively. A sample NET.CFG and PROTOCOL.INI file are listed:

ODI - NET.CFG

```
LINK DRIVER RL2PCM
```

`int`	`5`	Sets Interrupt (IRQ) line to be used. Valid options are 3, 4, 5, 7, 10, 11, 12, or 15.
`port`	`270`	Sets the I/O Port Address.
`mem #1`	`D000`	Sets the PCMCIA CIS memory space.
`domain`	`0`	Sets the network Domain. This must match the Domain of the server or RangeLAN2 7500 to which you want

		to connect, and be a number between 0 and 15.
station_type	0	Sets the status of the RangeLAN2 7200 card as Master (2), Alternate Master (1), or non-master (0) Station.
frame	ethernet_802.3	Indicates that RangeLAN2 sends Ethernet packets that follow the 802.3 specification.
socket	A	Sets the PCMCIA socket to A, B, C, or D
initialize_365	Y	Determines whether to initialize the Intel 82365SL PCMCIA controller chip
inactivity_min	0	Sets the amount of inactivity time in minutes before which the driver will put the station to sleep.
inactivity_sec	30	Sets the amount of inactivity time in seconds before which the driver will put the station to sleep.
channel	1	Sets the Channel to be used when this machine is acting as the Master. It is a number between 1 and 15.
subchannel	1	Sets the Subchannel to be used when this machine is acting as the Master. It is a number between 1 and 15.
master_name		Sets the name of this machine when it is acting as a Master station. The NAME may be up to 11 characters in length with no spaces.

`mac_optimize`	`1`	Optimizes for the number of concurrent nodes. Choose Light (0) or Normal (1).
`roam_config`	`1`	Sets the roaming speed. Choose Fast (2), Normal (1), or Slow (0).
`peer_to_peer`	`Y`	Turns on or off the ability to talk to other RangeLAN2 peers.

NDIS - PROTOCOL.INI

`[RL2PCM]`	
`DriverName=rl2pcm$`	
`Int=5`	Sets Interrupt (IRQ) line. Valid options are 3, 4, 5, 7, 10, 11, 12, or 15.
`Port=0x270`	Sets the I/O Port Address. This Port must match the dip switch setting.
`Memory_address=D000`	Sets the PCMCIA CIS memory space
`Socket=A`	Sets the PCMCIA socket to A, B, C, or D
`Initialize_365=Y`	Determines whether to initialize the Intel 82365SL PCMCIA controller chip
`Inactivity_min=0`	Sets the amount of inactivity time in minutes before which the driver will put the station to sleep.
`Inactivity_sec=0`	Sets the amount of inactivity time in seconds before which the driver will put the station to sleep.

`Channel=1`	Sets the Channel to be used when this machine is acting as the Master. It is a number between 1 and 15.
`Subchannel=1`	Sets the Subchannel to be used when this machine is acting as the Master. It is a number between 1 and 15.
`Domain=0`	Sets the network Domain. This must match the Domain of the server to which you want to connect, and be a number between 0 and 15.
`Station_type=1`	Sets the status of this machine as Master (2), Alternate Master (1), or non-master (0) Station.
`Master_name=MASTER`	Sets the name of this machine when it is acting as a Master station. The NAME may be up to 11 characters in length with no spaces.
`MAC_optimize=1`	Optimizes for the number of concurrent nodes. Choose Light (0) or Normal (1).
`Roam_config=1`	Sets the roaming speed. Choose Fast (2), Normal (1), or Slow (0).
`Peer_to_peer=Y`	Turns on or off the ability to talk to other RangeLAN2 peers.

When the RangeLAN2 7250 card is being used as a Master or Alternate Master, you will use the parameters Channel, Subchannel, Master_Name, and MAC_Optimize.

When the RangeLAN2 7250 card is being used as a Station, you do not need to set the Channel, Subchannel, Master_Name, or MAC_Optimize parameters. If set, they will be ignored. The Station will adopt those parameters from any Master to which it connects (roams).

See Chapter 4 "RangeLAN2 Software Parameters" for a list of all the possible values for the different settings and a discussion of Channels, Subchannels, Domains, and Master / non-master Stations.

Installing RangeLAN2 Software Using RL2SETUP

If your NOS does not have an installation procedure, you may use RL2SETUP to install the ODI or NDIS driver software.

Put the RangeLAN2 7250 driver diskette in a floppy drive on your computer and run the setup program:

```
C:\> A:    (or B:)
A:\> RL2SETUP
```

If you wish to install the ODI driver, choose ODI Peer-to-Peer or ODI with Access Point (depending on whether or not the station will communicate through a RangeLAN2 7500) as the NOS and then <Install Files>. If you wish to install the NDIS driver, choose Generic NDIS Peer-to-Peer or NDIS with Access Point (depending on whether or not the station will communicate

through a RangeLAN2 7500) as the NOS and then <Install Files>. Set the directory name to match that of the NOS directory. The proper driver and configuration file will be installed. Next, choose <Configure> and set the proper software options.

See Chapter 4 "RangeLAN2 Software Parameters" for a list of all the possible values for the different settings and a discussion of Channels, Subchannels, Domains, and Master / non-master Stations.

7. Installing RangeLAN2 Software for NetWare

This section describes the installation of RangeLAN2 7250 into a NetWare environment. Proxim provides an Ethernet compliant ODI driver for the RangeLAN2 7250 client.

There are two methods of providing access to wireless clients on a NetWare network:

- ❑ Install a RangeLAN2 7100 card directly in the NetWare file server, OR
- ❑ Attach a RangeLAN2 7500 anywhere on the Ethernet wire.

Note

If you choose to install a RangeLAN2 7100 card in the file server, all wireless clients must be within range of the file server. Additionally, you will not have roaming capabilities.

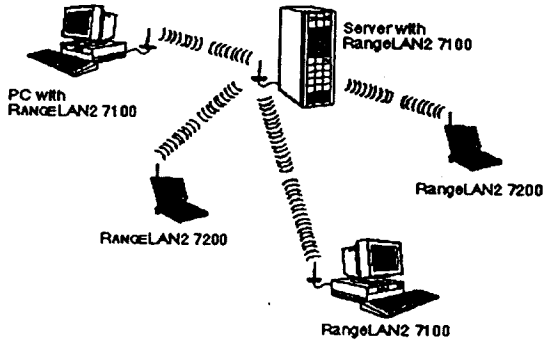


Figure 6

Wireless access to a NetWare network through the file server

NetWare Client Installation

RangeLAN2 uses a standard ODI driver at the client. This driver can be found on the diskette in the DOSODI directory. Copy the files from the DOSODI directory to a directory on the workstation's hard disk or boot floppy diskette. To load the driver and attach to the network, load the files in the following order:

```
c:\nwclient> lsl
c:\nwclient> rl2pcm
c:\nwclient> ipxodi
c:\nwclient> vlm
c:\nwclient> login
```

NOTE:

The files IPXODI, LOGIN, VLM, and other VLM modules are provided by Novell in the NetWare client software package.

If you will use VLM on a NetWare 3.11 network, you may choose to load Novell's PBURST.NLM on the file server for increased performance.

8. Installing RangeLAN2 Software for Personal Netware

Follow these steps to install RangeLAN2 7250 in a Personal NetWare network:

1. Follow the instructions in your Novell Personal NetWare user's manual. During installation, you will be asked to pick a Network Interface Card and Driver from a list. Select "OEM supplied driver" from the dialog box.

2. You will be prompted for the diskette containing the driver for RangeLAN2. Insert the RangeLAN2 diskette. Proxim RangeLAN2 7250 will be selected.

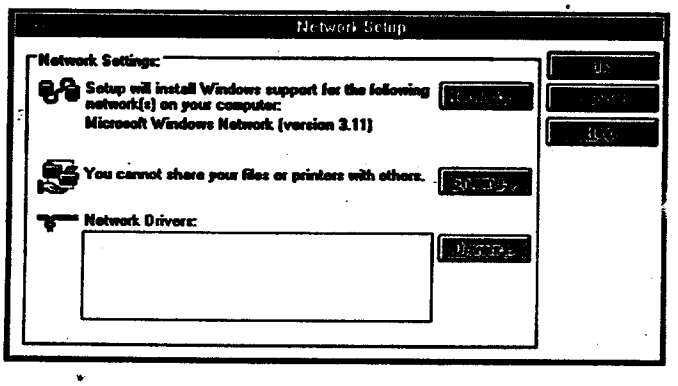
3. Continue with the Personal NetWare installation. After installation, the RangeLAN2 7250 ODI driver will be installed and automatically loaded.

9. Installing RangeLAN2 Software for Windows for Workgroups

Follow these steps to install RangeLAN2 7250 in a Windows for Workgroups network:

1. Windows for Workgroups should be running. Open the Network Setup icon from the Network group.

2. The Network Setup window appears. Choose the <Drivers> button.

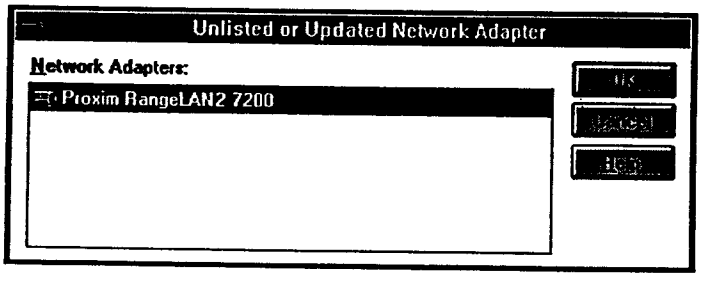


3. The Network Drivers dialog box appears, displaying options for network drivers to be used on your network. If no other network adapters have been installed, the dialog box does not list any adapters. Choose the <Add Adapter> button.

4. The Add Network Adapter dialog box appears. Choose Unlisted or Updated Network Adapter from the list.

5. The Install Driver dialog box appears, prompting you to insert a disk containing the network drivers you want to install. Insert the RangeLAN2 disk which contains the NDIS driver into the appropriate floppy drive and click <OK>.

6. The Unlisted or Updated Network Adapter dialog box appears displaying the RangeLAN2 7250 driver. Click <OK> to continue.



7. Windows for Workgroups installs the NDIS driver, and then returns to the Network Drivers dialog box displaying the current driver settings.

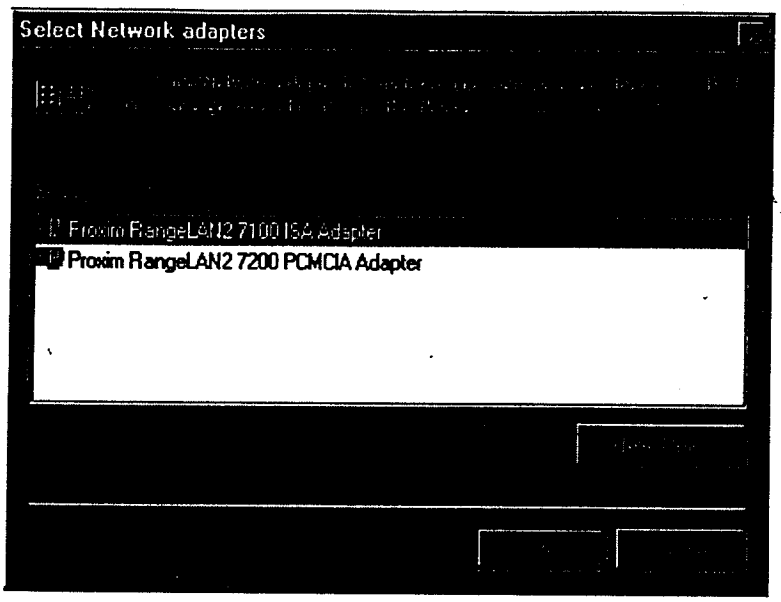
10. Installing RangeLAN2 Software for Windows 95

NOT AVAILABLE FOR BETA TEST

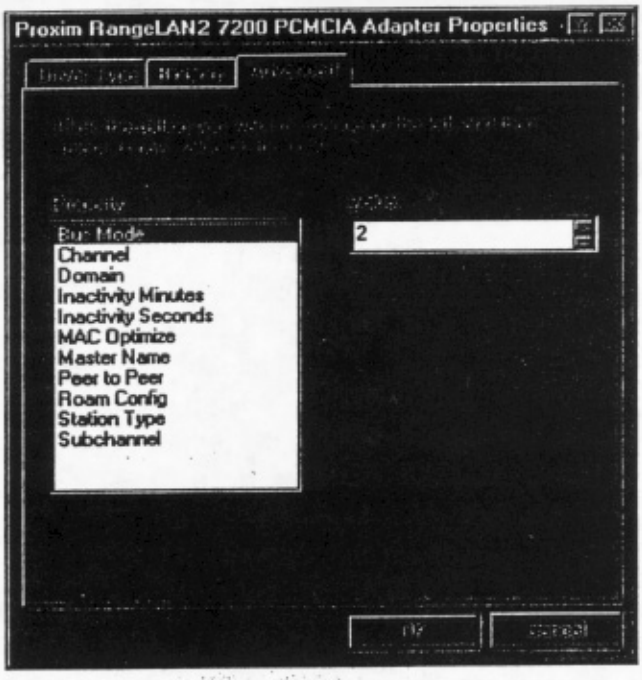
Follow these steps to install RangeLAN2 7250 in a Windows 95 machine:

1. The first time you insert the RangeLAN2 7250 PC Card, Windows 95 will prompt you for a driver diskette. Insert the driver diskette and follow the on-screen instructions.

2. If you chose to not install the RangeLAN2 7250 driver the first time you were prompted, you may install the driver as follows: From the Start / Settings / Control Panel / Network icon, click the <Add> button. Then highlight Adapter and click on the <Add> button again. Next pick the <Have Disk> button.



3. Insert the Windows 95 driver diskette when prompted. Select **RangeLAN2 7250 PCMCIA Adapter**. Click <OK>. The driver will be added and you can then configure the network and the RangeLAN2 settings.



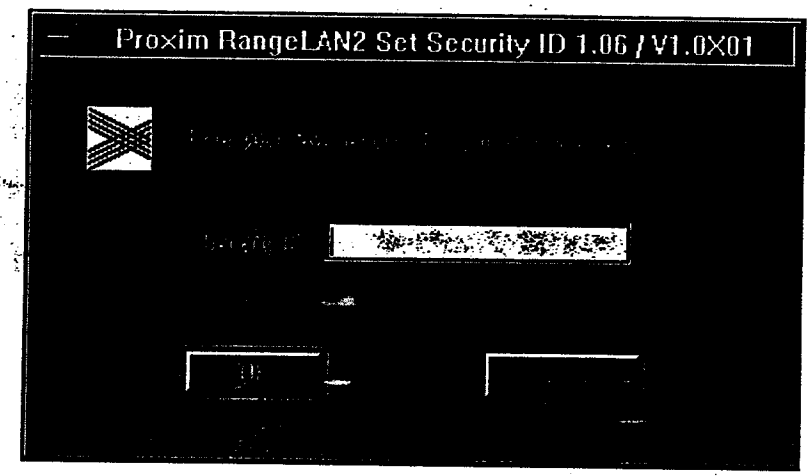
4. To change the RangeLAN2 settings, highlight the adapter name and pick Properties. That will bring up the screen shown above. Choose the property you wish to change, and you will be able to enter a new value.

Setting the Security ID

To change the Security ID of a card in a Windows 95, you must first install the RangeLAN2 Driver API protocol and the Proxim Security application. Follow these instructions to install this software:

1. Go into Control Panel and open the Network icon. Click the <Add> button, then choose Protocol and click the <Add> button again. Pick the <Have Disk> button and insert the Windows 95 driver diskette when prompted. The Proxim RangeLAN2 Driver API protocol will be your only choice. Choose OK and the protocol will be installed.
2. To verify a successful installation, view the Properties of the RangeLAN2 driver and choose Bindings. The Proxim RangeLAN2 Driver API should be listed as one of the bound protocols.
3. Restart the computer when prompted.

4. Next, you must install the **Security** application program. From the Start button, choose Run and type in A:\SETUP. (If you are using a different drive designator replace the A: with the correct drive letter.) Follow the on-screen prompts to install the Security program. When the installation is complete, an additional Start menu program called **Security** will be available. When you run this program, you will be prompted to type in a Security ID for the card installed in the computer.

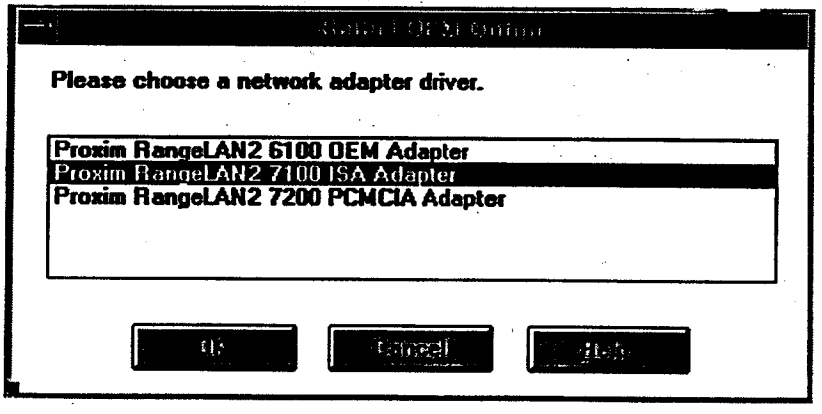


11. Installing RangeLAN2 Software for Windows NT

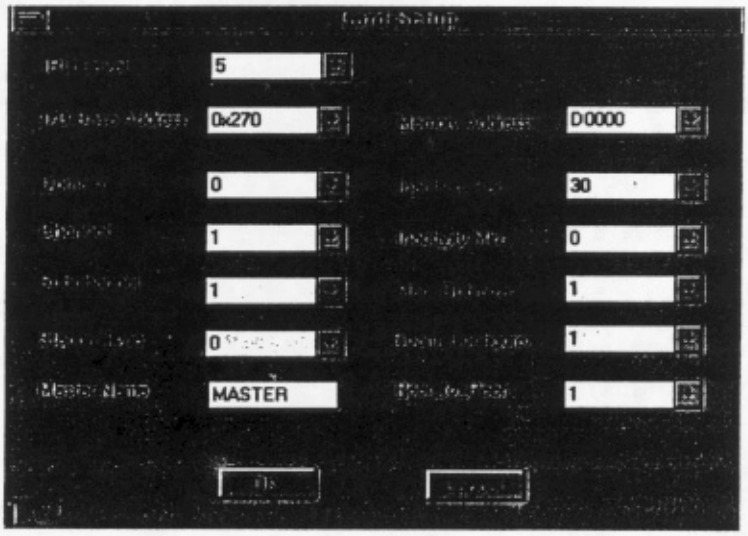
NOT AVAILABLE FOR BETA TEST

Follow these steps to install RangeLAN2 7250 in a Windows NT machine:

1. Windows NT should be running. Open the Network icon from the Control Panel, and choose the Drivers button. Choose the <Add Adapter> button, and then choose <Other> from the list. The Insert Disk dialog box appears, prompting you to insert a disk containing the network drivers you want to install. Insert the RangeLAN2 diskette and click <OK>.



2. The Select OEM Option dialog box appears, displaying the available Proxim RangeLAN2 drivers. Choose the **Proxim RangeLAN2 7250**. Click <OK> to continue. Windows NT will load the appropriate object files from the diskette.

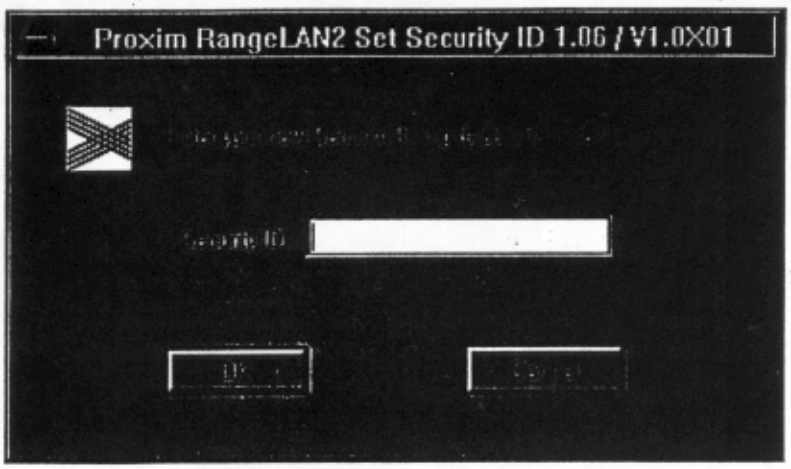


3. The next dialog box , RangeLAN2 Adapter Card Setup, allows you to change the current driver settings. The default values are shown above. Choose parameter values that are consistent with other RangeLAN2 stations on your network. When you are satisfied with your selections, choose <OK> and Windows NT will install the driver. In the future, you may change the driver settings from the <Configure> button under Network Settings in the Network icon.

Setting the Security ID

To change the Security ID of a card in a Windows-NT, you must first install the Proxim Security application. Follow these instructions to install this software:

From File Manager, choose File-Run and type in A:\SETUP. (If you are using a different drive designator replace the A: with the correct drive letter.) Follow the on-screen prompts to install the Security program. When the installation is complete, an additional group called **Security** will be created with an icon called Security. When you run the **Security** program, you will be prompted to type in a Security ID for the card installed in the computer.


Proxim RangeLAN2 Set Security ID 1.06 / V1.0X01

14. Installing RangeLAN2 Software for NetManage Chameleon

Follow these steps to install the RangeLAN2 7250 NDIS driver in a Chameleon network:

1. **Follow the instructions in your NetManage Chameleon user's manual.**

2. **Run the Custom application either as part of the initial installation or separately and choose Ethernet as the interface type.** Choose the Setup menu from Custom.

3. Choose the Hardware command to select the network adapter. You will be asked to select from a vendor list. Select "Other" as the vendor.

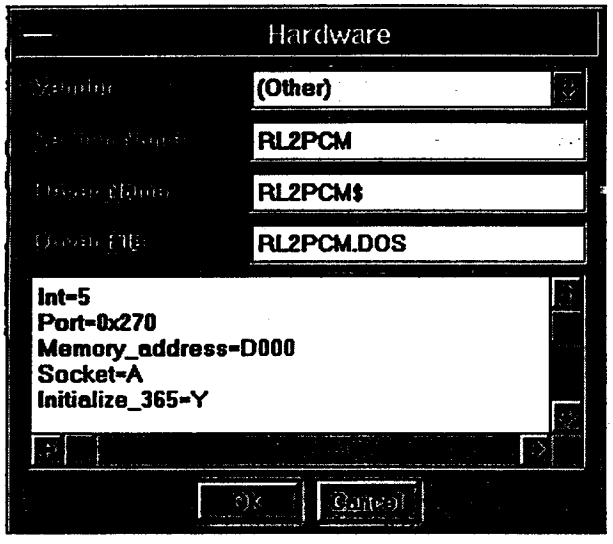
4. Enter RL2PCM as the section name.

5. Enter RL2PCM$ as the driver name.

6. Enter RL2PCM.DOS as the driver file.

7. In the last dialog box, add the following parameters for the PROTOCOL.INI file:

```
Int=5
Port=0x270
Memory_Address=D000
Socket=A
Initialize_365=Y
Inactivity_Min=0
Inactivity_Sec=0
Channel=1
Subchannel=1
Domain=0
Station_Type=1
Master_Name=MASTER
Roam_Config=1
Peer_to_Peer=Y
```



8. When prompted, insert the RangeLAN2 driver diskette.

9. Continue with the installation. After installation, the RangeLAN2 7250 Wireless Adapter NDIS driver will be installed.

Follow these steps to install the RangeLAN2 7250 ODI driver in a Chameleon network:

1. Copy the files from the DOSODI directory of the RangeLAN2 7250 driver diskette to a directory on your hard disk:

```
C:\ODI> COPY A:\DOSODI
```

2. Edit your AUTOEXEC.BAT file and append the file lines:

```
C:\NWCLIENT\LSL
C:\NWCLIENT\RL2PCM
```

3. Reboot your computer so that the RangeLAN2 7250 ODI driver loads.

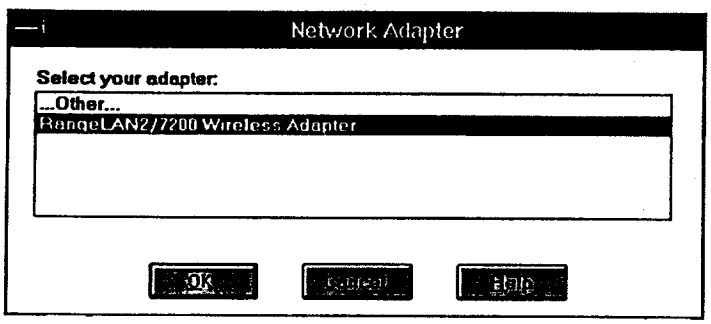
4. Install the NetManage Chameleon software. The presence of the RangeLAN2 ODI driver will be automatically detected.

14. Installing RangeLAN2 Software for Frontier Technologies Super-TCP for Windows

Follow these steps to install the RangeLAN2 7250 NDIS driver in a Frontier Technologies Super-TCP for Windows network:

1. **Follow the instructions in your Frontier Technologies Super-TCP for Windows user's manual.**

2. **When you come to the Subnetwork Address Mapping dialog box, choose NDIS Driver as the driver type. Then click the <Setup> button. You will be prompted to insert the Super-TCP for Windows Driver Disk. Insert the RangeLAN2 diskette.**



3. Continue with the installation. After installation, the RangeLAN2 7250 Wireless Adapter NDIS driver will be installed.

Follow these steps to install the RangeLAN2 7250 ODI driver in a Frontier Technologies Super-TCP for Windows network:

1. Copy the files from the DOSODI directory of the RangeLAN2 7250 driver diskette to a directory on your hard disk:

   ```
   C:\ODI> COPY A:\DOSODI
   ```

2. Load the RangeLAN2 7250 ODI driver before entering Windows:

   ```
   C:\NWCLIENT> LSL
   C:\NWCLIENT> RL2PCM
   ```

3. Follow the installation instructions in your Frontier Technologies Super-TCP for Windows user's manual.

4. When you come to the Subnetwork Address Mapping dialog box, choose ODI Driver as the driver type. Then click the <Setup> button.

15. Performance Hints

This section gives the user some ideas as to how to increase performance and network satisfaction on a wireless network.

Running Large Executable Files Efficiently

You may notice that certain executable files like Novell's LOGIN program can take a long time to start up. You can make this more efficient if you copy the file to your local hard disk. This way the server is only accessed to read data files, which will allow for better performance.

Novell's VLM Technology

The RangeLAN2 7250 ODI driver supports Novell's VLM technology which is the new standard interface for NetWare and Personal NetWare clients. If you choose to use VLM.EXE instead of NETX.EXE when attaching a NetWare or Personal NetWare client, you will achieve greater performance by up to 82%, according to Novell's Systems Research Department tests. On a NetWare 3.11 server, you must load PBURST.NLM in order for the VLM technology's performance enhancements to take effect.

Determining Master Stations and Alternate Master Stations

RangeLAN2 uses a spread spectrum frequency hopping technique. This means that the radio signal is constantly moving from one frequency to another in a predefined sequence. In order for several RangeLAN2 radios to communicate, they must be at the same frequency at the same time.

Proxim devised a method whereby one unit, called the Master station, sets the pace for the other radios. All stations look to the Master station to determine where and when to hop. If there is no Master station present, a station configured as an Alternate Master station will decide to become the Master for that session.

This configuration leaves the system administrator for the network with the task of configuring each wireless station on the network as Master station, Alternate Master station or just a Station. In most cases, using the default configurations for each of the drivers will work fine. But there may be times when the administrator wants to change the configuration for performance, or other issues. Here are several factors to consider:

1. In every wireless RangeLAN2 cell, at most one station must act as the Master Station. If you need to set up additional Master stations, they should be configured as Alternate Master stations so that there is only one true Master station at any single time in the cell.

2. The Master station must be within range of the other wireless stations on the network.

3. The Master station should not be a station which will be moved or turned off like a notebook computer or a user's personal machine.

4. In general, the RangeLAN2 7500s are configured as Master stations. This configuration allows for roaming capabilities of the clients.

5. If there is no RangeLAN2 7500 on the network, the server in a server-client based network is usually configured as Master. Without a RangeLAN2 7500, the clients will be unable to perform roaming capabilities.

6. If there is no RangeLAN2 7500 on a peer-to-peer network, one Master and at least one Alternate Master should be configured. The Alternate Master will take over Master functions in the event that the Master station is unavailable. Without a RangeLAN2 7500, the clients will be unable to perform roaming capabilities.

7. On a network with all notebook or pen-based computers, it may be advisable for all machines to be Alternate Master stations if there is no RangeLAN2 7500 configured as the Master.

8. You will achieve better performance by configuring the fewest number of machines possible as Masters or Alternate Masters.

Microwave Ovens

Microwave ovens operate in the same frequency band as RangeLAN2. Therefore, if you use a microwave within range of RangeLAN2 you may notice network performance degradation. However, both your microwave and your RangeLAN2 network will continue to function.

Range

Every environment is unique with different obstacles, barriers, materials, etc. and therefore, it is difficult to determine the exact range that will be achieved with testing. The site survey tool was developed to aid in this process. Additionally, Proxim has developed some guidelines to estimate the range that users will see when the product is installed in their facility, but there are no hard and fast specifications.

Radio signals may reflect off obstacles or be absorbed by others depending on their construction. For example, with two RangeLAN2 radios you may achieve up to 1000' in open space outdoors where the two antennas are line of sight, meaning they see each other with no obstacles. However, the same two units will only achieve up to 500' of range when they have to travel through the cubicles usually used in modern offices. If there are office walls to penetrate, the signal range may decrease even further to up to 300'.

Proper antenna placement can help improve RangeLAN2 performance. Try to place the antenna so that it extends above the top of the computer.

16. Troubleshooting

RangeLAN2 7250 is designed to be very easy to install and operate. If you do experience difficulties, however, use the information in this chapter to help diagnose and solve the problem. If you cannot resolve the problem, contact Proxim, as described in Appendix E, "How to Reach Technical Support."

How to Obtain Help with Your LAN Installation

If you require assistance to install your LAN, Proxim can put you in touch with a RangeLAN2 Reseller in your area. The reseller is an expert in the design, installation, and maintenance of LANs and will be able to examine your needs and recommend the most cost-effective solution for your LAN whether you are installing a new LAN or adding on to an existing one. For the location of the RangeLAN2 reseller nearest you, contact Proxim at 800-229-1630 and ask for the Sales Department.

General Problems

This section discusses some of the most common problems encountered when using RangeLAN2 and the possible solutions.

1. **IRQ, I/O Port Address, and Memory Address conflicts.** You may use the RL2SETUP program to verify that there are no hardware conflicts between your RangeLAN2 7250 card and other peripheral devices in your computer. If you are using an expanded memory manager such as Microsoft's EMM386 or Quarterdeck's QEMM, you have to exclude the region in memory that is used by RangeLAN2 7250.

   If RangeLAN2 7250 is using memory space D000 (the

default), and EMM386 is your memory manager, you need to exclude the region D000-D3FF when the memory manager loads in your CONFIG.SYS file with the parameter x=D000-D3FF. (For more information on this parameter, see the manual that came with your expanded memory manager.) If you are using Windows for Workgroups, you also need to set the EMMExclude parameter in Windows' SYSTEM.INI file to exclude the same region of memory. If RangeLAN2 7250 is using memory space D000, add the parameter EmmExclude=D000-D3FF. For more information, see your Windows manual.

2. **Invalid Int, Port, Memory Address, Channel, Subchannel, Domain, Socket, Inactivity_Min, or Inactivity_Sec.** Make sure that the selections you've chosen are valid options.

3. **Wrong socket.** Make sure you have specified the correct socket in which RangeLAN2 7250 is installed. If, however, you are using Card and Socket Services, the software will automatically determine the correct socket.

4. **Card and Socket Services.** In order to run with a RangeLAN2 7250 card, your computer must either have an Intel 82365SL controller chip or Card and Socket Services software revision 2.1.

5. **Out of range problems.** If the two RangeLAN2 cards are not within range you will be unable to establish reliable communication.

6. **Mismatched Domains and Security IDs.** If you are able to load the software driver successfully, but cannot communicate with another machine on the network, it is possible that you do not have the same Domain and Security ID as on the other machine.

7. **Sleep mode.** The RangeLAN2 unit that you are attempting to connect to may be in sleep mode. In this mode, it will not receive any radio signals. If the computer is set up as a server, disable sleep mode.

8. **Wrong frame type.** If you are able to load the RangeLAN2 driver on both a NetWare server and workstation, but they do not communicate, they may be using different frame types. Verify they are both set to the same frame type. For example, you may need to add the line FRAME ETHERNET_802.3 to the NET.CFG file. Or, you may need to specify a different frame type on the NetWare file server with the line FRAME=ETHERNET_802.3. When using a RangeLAN2 7500, the frame types must match between the Ethernet card whose cable is attached to the RangeLAN2 7500 and the RangeLAN2 7100 in the client machine.

9. **Multiple Masters or no Master.** There must always be exactly one acting Master on a subnetwork.

10. **RL2SETUP cannot find the card.** RL2SETUP cannot find the RangeLAN2 7250 card if the RL2PCM.COM or RL2PCM.DOS driver is already loaded. Unload the driver, or reboot the computer without loading the driver ,and try again.

RangeLAN2 7250 LEDs

There are two LEDs on the RangeLAN2 7250card. They are NOT visible through the end cap antenna on the RangeLAN2 7260.

- ❑ The yellow LED indicates the card is transmitting.
- ❑ The green LED lights whenever the card detects another unit that is transmitting.

Commonly Asked Technical Support Questions

Q. Why can't I log in to the network?
A. You may not be in range of your RangeLAN2 7500. Run a site survey to determine if you are in range.

Q. Why can't I synchronize to the Master?
A. You may have a different Domain or Security ID.

Q. RL2SETUP reports that I'm synchronized to my own MAC address. What does that mean?
A. You are the acting Master for this network. Either you are configured as the Master or as an Alternate Master. If you are an Alternate Master, you may be out of range or on a different Domain and Security ID from the true Master.

Q. RL2SETUP reports that I'm synchronized to the Master, but I can't get on the network.
A. Verify that the <Network OS> screen indicates the same directory the network software actually loads from.

Q. The driver failed to load.
A. Check that you do not have an I/O, IRQ or memory conflict.

Q. I installed the driver, but it doesn't find the card.
A. Verify you installed the correct driver for the correct product

Q. What happens if I go out of range?

A. This is determined by the network and the amount of time you are out of range, but you may be logged off the network. The same thing will happen if you unplugged a wired Ethernet cable.

Q. How do I know if I'm out of range?
A. Use the RL2SETUP program and run a site survey. With a Link Quality lower than 5, you are not at optimal range.

Q. Is my computer compatible with RangeLAN2 7250?
A. Your computer is compatible if it loads Card and Socket Services V2.x in the CONFIG.SYS or if it has an Intel 365 controller chip.

Q. How do I know if my computer has an Intel 365 controller chip?
A. Check the manual for the computer.

Q. How do I know if I have Card and Socket Services V2.x?
A. When the machine boots, you should notice files loading from CONFIG.SYS. One is called Card Services and usually displays a revision number; another is called Socket Services also displayed with a revision number.

Q. I've heard about hot swapping PCMCIA cards. Do I have to install the card before the driver will load?
A. Yes, the card must be in the socket when the driver is attempting to load. Once the driver is loaded, you can put the card in and out of the socket. However, when the card is not in the socket you will not be able to access the network.

Q. What do the green and yellow LEDs do?
A. The yellow LED indicates the card is transmitting. The green LED indicates a RangeLAN2 product is transmitting somewhere within range of this unit — it does not necessarily mean the packet is destined for this device.

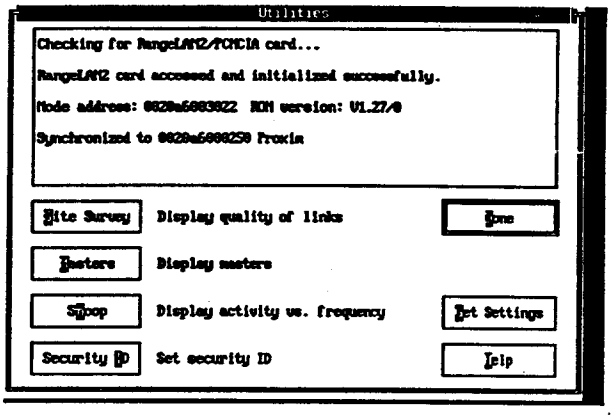
Q. What happens when my computer goes to sleep?
A. The RangeLAN2 7250 card will also go to sleep. It will be unable to send and receive messages to the network until the computer wakes up. Depending on the network configuration and the amount of time the machine is asleep, you may lose your network connection.

Other

If there is additional information that becomes available after the printing of this manual, there will be a README file on the Proxim distribution diskette included in your package.

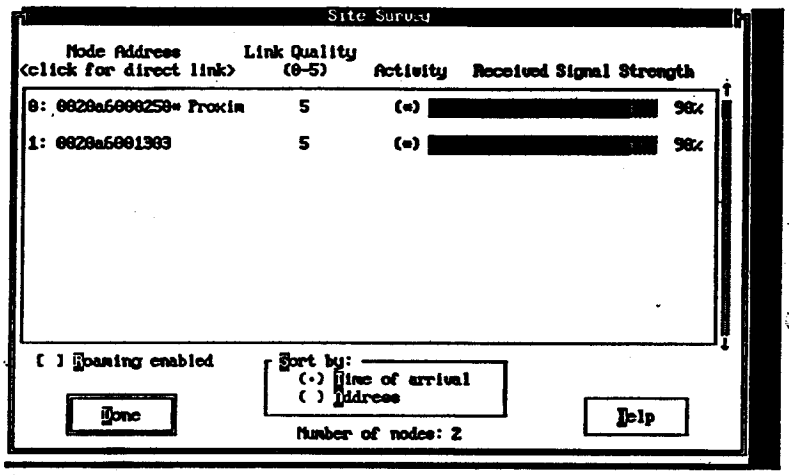
Diagnostics

To test the hardware settings of the RangeLAN2 7250 card, use the diagnostics in the RL2SETUP program. Start the RL2SETUP program and choose the <Test / Utilities> button. If you have a hardware conflict between RangeLAN2 7250 and another card in your computer, you will see an error message.



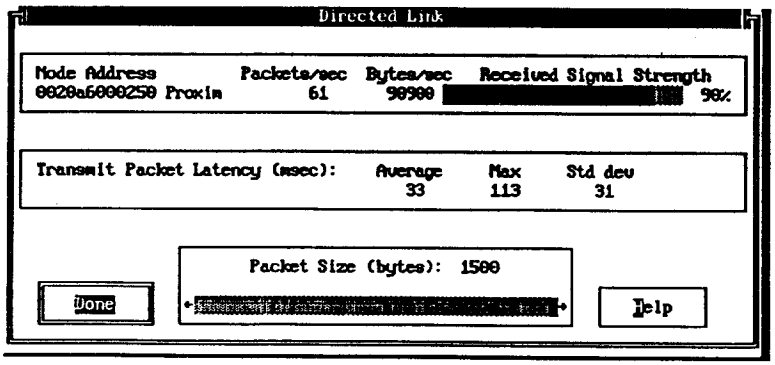
Site Survey

Performing a site survey may help you decide where to place the Master station. Once in the <Test / Utilities> box, choose the <Site Survey> button to read the Link Quality and Signal Strengths of the other RangeLAN2 products on the network. For more information and a detailed report on performing a Site Survey, contact your Proxim Sales Representative.



Point to Point Site Survey

An additional feature of the utility is the ability to determine the Link Quality between two specific machines. Once performing a site survey, click a node address with the mouse or press the <Spacebar> when the node address is highlighted. The Received Signal Strength, Packets per second, and Kilobytes per second are displayed giving you an indication of the Link Quality between the surveying machine and the node you selected. You can vary the packet sizes to simulate network performance.



Master Search

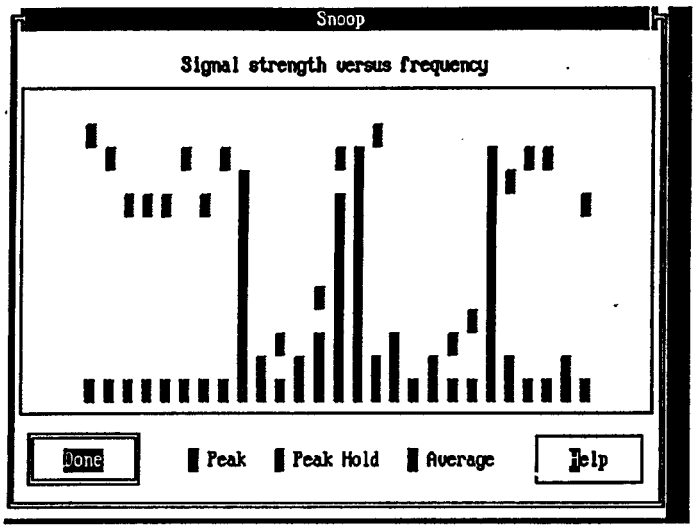
If you use the Roaming feature of the RangeLAN2 family, you may be interested in knowing which Master stations are within range. To display all the Master stations within range along with their Domain, Channel, Subchannel, and Master_name, choose the <Masters> button after <Test / Utilities> from the RL2SETUP program. Additionally, you can survey the units that are synchronized to a particular Master by choosing that Master from the displayed list.

Snoop

If you want to see the activity in the frequency band in which RangeLAN2 operates, you may want to "snoop" this band. To do so, choose the <Snoop> button after <Test / Utilities > from the RL2SETUP program.

Both the peak and average activity levels on the different frequencies are displayed. In addition, a mark is left indicating the highest level of activity on a given frequency.

If there are no other RangeLAN2 products running in an area, bars indicate potential sources of interference. If there are other RangeLAN2 products running in the area, you will see the frequency hops.



Setting the RangeLAN2 Security ID

As an added security measure, RangeLAN2 allows you to set a Security ID for each RangeLAN2 card installed on a network. **All cards must have matching Security IDs in order to communicate.**

To set the RangeLAN2 Security ID, use the RL2SETUP program that came on the driver diskette. If you have already installed the drivers using this program, you can find the RL2SETUP program in the directory containing your network files on your computer's hard disk.

Choose the <Test / Utilities> button followed by the <Security ID> button to set or change the Security ID on the RangeLAN2 7250 card in your computer.

To change the Security ID to default settings, leave the Security ID field blank and choose <OK>.

B. Glossary

Access Point - An internetworking device that seamlessly connects wired and wireless networks together.

Bandwidth - The size (In Hertz) of the frequency range that a signal transmission occupies. Typical narrow band signals occupy a 25 KHz bandwidth. The RangeLAN2 signal occupies a 1 MHz bandwidth.

Channel - In RangeLAN2 networks, the channel refers to the frequency hopping sequence the card follows.

CSMA/CA - (Carrier Sense Multiple Access/Collision Avoidance) - CSMA is a protocol in which each node senses whether or not a channel is in use before attempting to transmit information. CA is an optimization by which channel time is reserved to avoid collisions.

Frequency Hopping - A spread spectrum technique by which the band is divided into a number of channels and the transmissions hop from channel to channel in a pre-specified sequence.

Interference - A situation that occurs when an unwanted RF signal occupies the same frequency band as a desired signal.

Narrow Band - A channel of about 25 KHz bandwidth in the RF spectrum. The FCC allocates Narrow Band channels and issues a license to the user. Each user of a specific narrow band frequency range must obtain a site license from the FCC.

Spread Spectrum - A radio data transmission modulation technique by which the transmitted signal is spread over a bandwidth wider than the information bandwidth. Spread Spectrum bands are designated by the FCC and require no user license.

C. Parameters

Name	Range	Default
Port Address	100,120,140,218,270, 280, 290,298,2A0,2A8, 2E0,300,310,358,360,368	270
IRQ	3, 4, 5, 7, 10, 11, 12, 15	5
Memory Address	0xA000-0xFF00	0xD000
Station Type	0(Sta), 1(Alt), 2 (Mast)	0
Domain	0-15	0
^Channel	1-15	1
^Subchannel	1-15	1
^Master Name	11 char	MASTER
Security ID	0 - 20 char	blank
^MAC Optimize	0 (Light), 1(Normal)	1
+Roam Config	0 (Sl), 1(Norm), 2(Fast)	1
+Peer to Peer	Y, N	Y
+Inactivity Min	0-20	0
+Inactivity Sec	0-55 (incr of 5)	30
Socket	A - D	A
Intialize 365	Y, N	Y

^ Set on Master and Alternate Master only
+Set on Station and Alternate Master only

D. Specifications

The following technical specification is for reference purposes only. Actual product's performance and compliance with local telecommunications regulations may vary from country to country. Proxim, Inc. will only ship products that are type approved in the destination country.

Bus Interface	PCMCIA 2.0, Type II slot
Range	Up to 500' Indoors Up to 1000' Outdoors
Data Rate	1.6 Mbps
Media Access Protocol	RangeLAN2 CSMA/CA
Ethernet compatibility	Ethernet packet types and Ethernet Addressing
Frequency Band	2.4-2.483 GHz (in the U.S.) (spread spectrum frequency hopping)
Independent Channels	15
Output Power	100 mW
Size	PCMCIA Type II card
ETSI Testing	For purposes of ETS 300 328 type testing, the RangeLAN2 7250 PC Card Wireless LAN Adapter was tested in host computers over a temperature range of +5C to +35C.