

Copyright Statement

Copyright ©1997 PLANET Corporation

No part of this publication may be reproduced in any form or by any means or used to make any derivative such as translation, transformation, or adaptation without permission from PLANET Technology Corporation.

Trademarks

This guide and the accompanying product are each provided “as is,” without warranty as to their performance, merchantability or fitness for any particular purpose. PLANET Technical Corporation reserve the right to revise this publication and to make changes to its contents at any time, without obligation to notify any person or entity of such revisions or changes.

Reversion

This guide is used for PLANET ISDN Router, IRT-1000 series:

**Model: IRT-1001ST, IRT-1002ST,
IRT-1001U, IRT-1002U**

Reversion: 1.0 (April, 1998)

Part No.: EMIRT1000

Table of Contents

INTRODUCTION.....	1
FEATURES	1
<i>Ease of Installation</i>	2
<i>ISDN Basic Rate Interface (BRI)</i>	2
<i>ISDN Leased Line</i>	2
<i>Multiple Networking Protocol Support</i>	3
<i>Dial On Demand</i>	3
<i>Bandwidth On Demand</i>	3
<i>Full Network Management</i>	3
<i>RADIUS (Remote Authentication Dial In User Service)</i>	4
<i>PPP Security</i>	4
<i>MS (Microsoft) CHAP</i>	4
<i>RIP-1/RIP-2</i>	4
<i>DHCP Support (Dynamic Host Configuration Protocol)</i>	5
<i>Call Control</i>	5
<i>Data Compression</i>	5
<i>Networking Compatibility</i>	5
APPLICATIONS FOR YOUR IRT-1001 OR IRT-1002	5
<i>Internet Access</i>	5
<i>Internet Single User Account (SUA)</i>	6
<i>Multiprotocol LAN-to-LAN Connection</i>	6
<i>Telecommuting Server</i>	6
WHAT THIS MANUAL COVERS	6
WHAT THIS MANUAL DOESN'T COVER.....	7
OTHER RESOURCES	7
PACKING LIST	8
ADDITIONAL INSTALLATION REQUIREMENTS	8
BEFORE YOU BEGIN.....	9
ROAD MAP AND FLOW	9
COMPLETING THE WORKSHEET	10
<i>Ordering Your ISDN Line</i>	11
<i>Collecting General Setup Information</i>	11
<i>Collecting ISDN Phone Line Information</i>	12

<i>Collecting Ethernet Setup Information</i>	13
INSTALLATION	19
A WARNING ON CONNECTION CABLES	19
CONNECTING YOUR COMPUTER AND YOUR IRT-1001 OR IRT-1002	20
<i>Connecting the RS-232 Cable to the Router</i>	20
<i>Connecting an ISDN Line to the Router</i>	20
<i>Connecting an Ethernet Cable to the Router</i>	21
<i>Connecting a Power Adapter to the Router</i>	21
THE YOUR IRT-1001 OR IRT-1002'S FRONT PANEL	21
POWERING UP YOUR IRT-1001 OR IRT-1002	22
NAVIGATING THROUGH THE SYSTEM MANAGEMENT TERMINAL (SMT)	
INTERFACE	23
SYSTEM MANAGEMENT TERMINAL INTERFACE SUMMARY	25
GENERAL SETUP	25
ISDN SETUP	27
<i>North American ISDN</i>	27
<i>DSS1 & ITR6 ISDN</i>	28
ETHERNET SETUP	30
<i>General Ethernet Setup</i>	30
<i>TCP/IP Ethernet Setup and DHCP</i>	31
<i>Novell IPX Ethernet Setup</i>	34
<i>Bridge Ethernet Setup</i>	34
CONFIGURING FOR INTERNET ACCESS	35
IP ADDRESSES AND THE INTERNET	35
INTERNET ACCESS CONFIGURATION	37
SINGLE USER ACCOUNT	39
CONFIGURATION FOR SINGLE USER ACCOUNT	41
CONFIGURING BACKUP ISP ACCOUNTS	42
REMOTE NODE CONFIGURATION	43
BANDWIDTH ON DEMAND	48
EDITING PPP OPTIONS	50
DIAL-IN CONFIGURATION	53
TELECOMMUTING	54
DIAL-IN SERVER APPLICATION	54

DEFAULT DIAL-IN SETUP	55
DIAL-IN USERS SETUP	59
<i>More on CLID</i>	61
TCP/IP CONFIGURATION	63
IP SUBNET MASK	63
LAN-TO-LAN APPLICATION	64
<i>Remote Node Setup</i>	64
<i>Static Route Setup</i>	67
NOVELL IPX CONFIGURATION.....	71
IPX NETWORK ENVIRONMENT	71
<i>Frame Type</i>	71
<i>Network Numbers</i>	71
IRT-1002 ON LAN WITH SERVER	72
IRT-1002 ON LAN WITHOUT SERVER.....	72
IPX SPOOFING	72
IPX ETHERNET SETUP.....	73
LAN-TO-LAN APPLICATION	74
<i>Remote Node Setup</i>	75
STATIC ROUTE SETUP	77
BRIDGING CONFIGURATION.....	81
IPX SPOOFING	81
BRIDGE ETHERNET SETUP.....	81
LAN-TO-LAN APPLICATION	83
<i>Remote Node Setup</i>	83
<i>Default Dial-In Setup for Bridge</i>	84
<i>Bridge Static Route Setup</i>	85
FILTER CONFIGURATION	87
ABOUT FILTERING.....	87
IRT-1000'S FILTER STRUCTURE	88
CONFIGURING A FILTER SET	88
CONFIGURING A FILTER RULE	91
<i>TCP/IP Filter Rule</i>	91
<i>Generic Filter Rule</i>	95
<i>Novell IPX Filter Rule</i>	97

SNMP	99
ABOUT SNMP	99
CONFIGURING YOUR IRT-1002 FOR SNMP SUPPORT	99
SYSTEM SECURITY	103
CONFIGURING THE SMT PASSWORD	104
USING RADIUS AUTHENTICATION	105
<i>Installing a RADIUS Server</i>	105
<i>Configuring the IRT-1002 for RADIUS Authentication</i>	106
<i>Adding Users to the RADIUS Database</i>	107
<i>Using RADIUS Authentication for CLID</i>	108
TELNET CONFIGURATION AND CAPABILITIES	109
ABOUT TELNET CONFIGURATION	109
TELNET CAPABILITIES	110
<i>Single Administrator</i>	110
<i>System Timeout</i>	110
SYSTEM MAINTENANCE	111
SYSTEM STATUS.....	111
TERMINAL BAUD RATE	114
LOG AND TRACE.....	115
<i>View Error Log</i>	116
<i>Syslog And Accounting</i>	116
DIAGNOSTIC	117
BACKUP CONFIGURATION	120
RESTORE CONFIGURATION.....	121
SOFTWARE UPDATE.....	121
COMMAND INTERPRETER MODE.....	122
CALL CONTROL.....	122
<i>Call Control Parameters</i>	123
<i>Blacklist</i>	124
<i>Budget Management</i>	124
<i>Call History</i>	125
TROUBLESHOOTING	127
PROBLEMS STARTING UP THE YOUR IRT-1001 OR IRT-1002	127
<i>None of the LEDs are on when you power up the router</i>	127

<i>Connecting the RS-232 cable, cannot access the SMT</i>	127
PROBLEMS WITH THE ISDN LINE	128
<i>The ISDN initialization failed</i>	128
<i>The ISDN loopback test failed</i>	128
PROBLEMS WITH THE LAN INTERFACE.....	129
<i>Can't PING any station on the LAN</i>	129
PROBLEMS CONNECTING TO A REMOTE NODE OR ISP	129
PROBLEMS CONNECTING TO A REMOTE USER	130
ISDN SWITCH TYPES	131
PROVISIONING FOR U.S. SWITCHES.....	131
<i>Provisioning For the AT&T 5ESS Switches</i>	131
<i>Provisioning For the Northern Telecom Switch</i>	133
GLOSSARY	135

Introduction

Congratulations on your purchase of a PLANET IRT-1000 series Remote Access Router. In a modem-sized box, your router offers inexpensive yet complete telecommunications and Internetworking solutions for your home or branch office. It is ideal for everything from Internet browsing to receiving calls from Remote Dial-in Users and making LAN-to-LAN connections to Remote Nodes.

Distinguishing features of the IRT-1000 series include support for a full range of networking protocols such as TCP/IP (Transmission Control Protocol/Internet Protocol, also known as IP), Novell IPX (Internet Packet Exchange), and Transparent Bridging.

- ◆ IRT-1001ST : ISDN S/T interface, IP routing
- ◆ IRT-1001U : ISDN U interface, IP routing
- ◆ IRT-1002ST : ISDN S/T interface, IP/IPX routing, bridging
- ◆ IRT-1002U : ISDN U interface, IP/IPX routing, bridging

This complete solution also includes Remote Dial-in User support, an Internet Single User Account (Network Address Translation) option, extensive Network Management, and solid security features.

NOTE: Throughout the remainder of this manual, the term “IRT-1001” refers to any IRT-1001ST or IRT-1001U, and the term “IRT-1002” refers to any IRT-1002ST or IRT-1002U.

Features

Each IRT-1000 series router is packed with features that give it the flexibility to provide a complete networking solution for almost any user.

Ease of Installation

Your IRT-1001 or IRT-1002 is a self-contained unit that is quick and easy to install. Physically, it resembles an external modem except for the fact that it is a router and uses an Ethernet cable to connect to the host network.

ISDN Basic Rate Interface (BRI)

Using a standard S/T or U Interface (the IRT-1001ST and IRT-1002ST use the S/T interface, while the IRT-1001U and IRT-1002U use the U interface) the IRT-1001ST and IRT-1002ST support a full range of switch types. The switch type depends on the CO (Central Office) switch your ISDN line is connected to. See the ISDN Switch Types chapter for more information on North American, European, and Asian ISDN firmware and switch types supported by these routers.

The two B-channels can be used independently for two destinations. Or they can be bundled for one connection to support bandwidth-on-demand.

ISDN Leased Line

If the router is set up for an ISDN leased line (that is, if any option but "Switch/Switch" or "Switch/Unused" is selected for the B Channel [Usage control] in setup menu 2, [ISDN Setup], and the [Transfer Type control] is set to Leased in either setup menu 4, [Internet Access Setup], or setup menu 11.1, [Remote Node Profile]), the router will automatically initialize the leased-line connection each time it is powered up or setup menu 2, 4, or 11.1 is saved.

The IRT-1001ST and IRT-1002ST implement the PPP echo mechanism for verifying ISDN leased line status. The setting of the Idle Timeout control in setup menu 11.1 will be used as the interval between two LCP_Echo_Req messages. It is supposed that there exists an echo reply corresponding to an echo request. Whenever an echo request is sent, the counter will be incremented by one.

The send counter will be reset to zero after an echo response is received. The leased-line error recovery mechanism will be triggered after the send counter reaches 4. If the Idle Timeout control is set to zero, the PPP echo mechanism will not be used.

Multiple Networking Protocol Support

The IRT-1002 is a multi-protocol router. It supports TCP/IP, Novell IPX, and Transparent Bridging.

Dial On Demand

The Dial On Demand feature allows a IRT-1001 or IRT-1002 to automatically place a call to a Remote Node whenever there is traffic coming from any workstation on the LAN to that remote site.

Bandwidth On Demand

Your IRT-1001 or IRT-1002 supports bandwidth up to 128 Kbps over a single ISDN BRI line. It incorporates PPP/MP (Point-to-Point Protocol/Multilink Protocol) to bundle two B channels over a BRI line. In addition, the router dynamically allocates bandwidth between the two B channels, increasing or decreasing bandwidth as needed to allow for greater efficiency in data transfer. It supports BAP (Bandwidth Allocation Protocol) and BACP (Bandwidth Allocation Control Protocol) to manage the number of links in multilink bundle.

Full Network Management

The IRT-1002ST incorporates SNMP (Simple Network Management Protocol) support and menu-driven network management via an RS-232 or Telnet connection. In addition, both the IRT-1001ST and the IRT-1002ST offer the Call Detail Record (CDR) function to help you analyze and manage your telephone bill.

RADIUS (Remote Authentication Dial In User Service)

The RADIUS feature allows you to use a central external Unix-based server to support thousands of users (IRT-1002ST only).

PPP Security

The IRT-1001 and IRT-1002 support PAP (Password Authentication Protocol) and CHAP (Challenge Handshake Authentication Protocol).

MS (Microsoft) CHAP

Your IRT-1001 or IRT-1002 and a Microsoft Windows 95 or Windows NT server can authenticate each other using Microsoft's proprietary CHAP algorithm. No special setup is needed to support MS CHAP. Everything is done through PPP negotiation between the router and the server.

RIP-1/RIP-2

Your IRT-1001 or IRT-1002 supports both RIP-1 and RIP-2 (Routing Information Protocol versions 1 and 2) exchanges with other routers. RIP version controls in setup menus 3.2 (TCP/IP and DHCP Ethernet Setup) and 11.3 (Remote Node Network Layer Options) let you control RIP use, and offer the following version options: RIP-1 (accept and send RIP-1 messages only), RIP-2B (accept RIP-1 and RIP-2 messages, both broadcast and multicast, and send RIP-2 messages in broadcast format), and RIP-2M (accept RIP-1 and RIP-2 messages, both broadcast and multicast, and send RIP-2 messages in multicast format).

(The suggested choice in both menus is RIP-2B, except in environments where there are routers that do not understand RIP-2 packets at all. "Broadcast," above, means a destination MAC or IP host address consisting of all binary ones; "multicast" means a MAC address of 01:00:5E:00:00:09 hex or an IP destination address of 224.0.0.9.)

DHCP Support (Dynamic Host Configuration Protocol)

DHCP (Dynamic Host Configuration Protocol) allows you to dynamically and automatically assign IP address settings to hosts on your network.

Call Control

Your IRT-1001 or IRT-1002 provides budget management for outgoing calls and maintains a “blacklist” of unreachable phone numbers in order to save you the expense of unnecessary charges.

Data Compression

The IRT-1001 and IRT-1002 incorporate Stac data compression and CCP (Compression Control Protocol).

Networking Compatibility

The IRT-1001 and IRT-1002 are compatible with remote access products from other companies such as Ascend, Cisco, and 3Com. Furthermore, they support Microsoft Windows 95 and Windows NT remote access capability.

Applications For Your IRT-1001 or IRT-1002

Some applications for the IRT-1001 and IRT-1002 include:

Internet Access

Your IRT-1001 or IRT-1002 supports the TCP/IP protocol, which is the language used for the Internet. It is also compatible with access servers manufactured by major vendors such as Cisco and Ascend.

Internet Single User Account (SUA)

For small office environments, the IRT-1001 and IRT-1002 offer a Single User Internet Account (also known as a Network Address Translator, or NAT) from an ISP (Internet Service Provider). This allows multiple users on the LAN (Local Area Network) to access the Internet concurrently for the cost of a single user.

Single User Account address mapping can also be used for LAN to LAN connections.

Multiprotocol LAN-to-LAN Connection

The IRT-1001 and IRT-1002 can dial to or answer calls from another remote access router connected to a different network. The IRT-1002 supports TCP/IP and Novell IPX, and has the capability to bridge any Ethernet protocol.

Telecommuting Server

The IRT-1001 and IRT-1002 allow Remote Dial-in Users to dial in and gain access to your LAN. This feature enables users that have workstations with remote access capabilities, e.g., Windows 95, to dial in using an ISDN terminal adapter (TA) to access the network resources without physically being in the office.

What This Manual Covers

This manual is divided into five parts.

1. Part One—**Getting Started**—is structured as a step-by-step guide to help you connect, install, and set up your IRT-1001 or IRT-1002 to operate on your LAN.

2. Part Two — **The Internet**—describes how to configure the router to connect to the Internet.
3. Part Three — **Setting Up Advanced Applications**—describes how to use the router for more advanced applications, such as TCP/IP routing and Bridging.
4. Part Four — **Advanced Management** —provides information on advanced management features for network managers.
5. Part Five — **System Maintenance** —describes maintenance features for checking system status and logging errors.

Regardless of the application, it is important that you follow the steps outlined in Part One to correctly connect your IRT-1001 or IRT-1002 to your LAN. You can then refer to other chapters of the manual depending on which applications you wish to use.

What This Manual Doesn't Cover

This manual assumes that you know how to use your computer and are familiar with your communications software. If you have questions about using either one, refer to the manual for the product.

Other Resources

For more information about your IRT-1001 or IRT-1002 check the following sources:

- ◆ Quick Start Guide.
- ◆ Support disk.

Packing List

Before you proceed further, check all items you received with your IRT-1001 or IRT-1002 against this list to make sure nothing is missing. The complete package should include:

- ◆ One IRT-1001 or IRT-1002 ISDN router.
- ◆ One power adapter.
- ◆ One RS-232 cable.
- ◆ One LAN straight cable.
- ◆ One Support Disk.
- ◆ This *User's Guide*.

Additional Installation Requirements

In addition to the contents of your package, there are other hardware and software requirements you need before you can install and use your router. These requirements include:

- ◆ An ISDN telephone line.
- ◆ An Ethernet connection to your computer.
- ◆ A computer equipped with an RS-232 port and communications software configured to the following parameters:
 - ◇ VT100 terminal emulation.
 - ◇ 9600 Baud rate.
 - ◇ No parity, 8 Data bits, 1 Stop bit.

After the router has been successfully connected to your network, you can make future changes to the configuration using a Telnet client application.

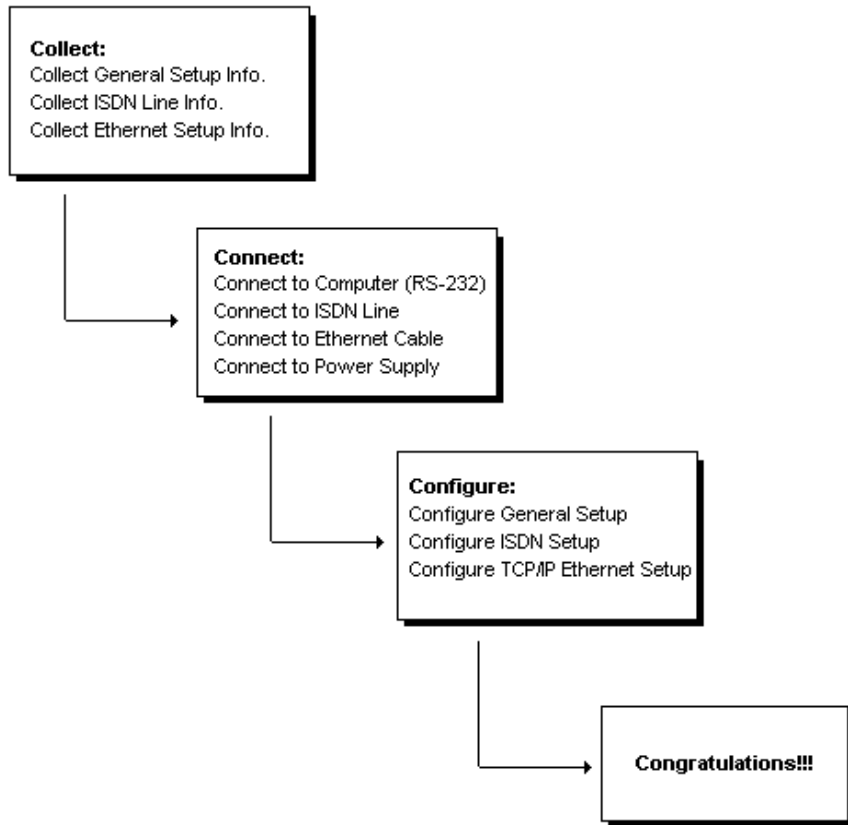
Before You Begin

To ensure successful installation of your IRT-1001 or IRT-1002, we strongly recommend that you carefully follow the steps outlined in the next two chapters. These chapters are designed as a guide for you to collect the necessary information about your ISDN phone line and the LAN that you will be connected to. Once this information has been collected, it will be used to configure your router.

After you have successfully configured your IRT-1001 or IRT-1002, see the appropriate chapters to set up your applications. For Internet Access, see the Configuring for Internet Access chapter starting on page 35.

Road Map and Flow

The chart below is provided as a step by step guide to successfully installing your IRT-1001 or IRT-1002.



Completing the Worksheet

Before you continue, locate the worksheet at the end of this chapter. This information worksheet has been provided to help you get through setup and installation of your IRT-1001 or IRT-1002 as easily as possible.

Ordering Your ISDN Line

If you do not have the ISDN line installed already, we suggest that you order it from your telephone company as soon as possible to avoid the long waiting period common when ordering a new line. Use the information in this section to place the order (see the ISDN Switch Types chapter for information on provisioning your ISDN line). If you have already installed your ISDN line, you can check the following section to make sure that you can use all the features of your IRT-1001 or IRT-1002.

1. Contact your local telephone company's ISDN Ordering Center.
2. Find out what type of ISDN service is available. Refer to the ISDN Switch Types chapter to find out the provisioning information for the appropriate switch type and ISDN service. For the U.S., the IRT-1001U and IRT-1002U (U Interface) have been approved by Bellcore and have IOC (ISDN Ordering Code) "S" Capability, EZ-ISDN 1.
3. Provide your telephone company with the proper provisioning information.
4. When the telephone company installs your ISDN line, be sure to obtain the following information:
 - ◇ ISDN switch type.
 - ◇ ISDN telephone number(s).
 - ◇ ISDN Service Profile Identifier (SPID) number(s) (only for North America).

Collecting General Setup Information

Your IRT-1001 or IRT-1002 requires the following system information. You can obtain all the pertinent information from your network administrator. Record this information into the worksheet as it becomes available. This worksheet will later be referred to as you configure your router.

- ◆ **System Name**—This is the name given to the router for identification purposes. This name should be no more than 8 alphanumeric characters. Spaces are not allowed, but “-” and “_” are accepted. This name can be obtained remotely via the SNMP management protocol and will be displayed as the prompt when the user enters Command Interpreter Mode.
- ◆ **Route IP Field**—For Internet access, you will need to enable the Route IP Field. See the Configuring for Internet Access chapter starting on page 35 for more details on configuring your router for Internet access. To support Novell IPX, or Bridging, enable the appropriate protocol and reference the related chapters for detailed information.

You have now collected all of the general setup information you need. Make sure that you have entered all the values onto the worksheet before proceeding to the next section.

Collecting ISDN Phone Line Information

After you have successfully installed the ISDN phone line or if you already have one installed, you need to use the ISDN line information to complete the worksheet and configure your router. Your telephone company can give you the following information to configure the Your IRT-1001 or IRT-1002:

Switch Type	Geography	No. of Phone #s	No. of SPIDs
AT&T 5ESS NI-1	North America	2	2
AT&T 5ESS Point to Point	North America	1	0
AT&T 5ESS Multipoint	North America	2	2
Northern Telecom NI-1	North America	2	2
Northern Telecom Custom	North America	2	2
DSS1	Europe, Asia	2	N/A
1TR6	Germany	2	N/A

- ◆ **Switch Type**—This is the type of switch used by your telephone company. Check with your telephone company and choose the appropriate option on the worksheet. For North America, select your ISDN switch type. For DSS1 and 1TR6, verify this field to make sure that you have the proper firmware loaded.

- ◆ **B Channel Usage**—Determine which connection is appropriate for your B channel and check the corresponding option on the worksheet.

If your IRT-1001 or IRT-1002 is the only device using the ISDN line, configure B Channel Usage to **Switch/Switch** so the router device will use both B channels to communicate. If the router is sharing the ISDN line with other devices, configure B Channel Usage to **Switch/Unused**. If your IRT-1001 or IRT-1002 is on a leased line, configure B channel usage to **Leased/Leased** or **Leased/Switch**, depending on the setting of the line.

- ◆ **Telephone Number(s)**—Record on the worksheet the telephone number(s) given to you by your ISDN provider. Some switch types only have one telephone number. These phone numbers should be in a standard digit format (for example, 5551212). Note that these fields will only accept digits, so dash "-" and spaces will not be accepted.
- ◆ **SPID Number(s)**—(For North America only) The SPID (Service Profile Identifier) is a number used by a central office switch for identification purposes. With the switch information, see the previous table for the number of SPIDs you must enter.

You have now collected all of the necessary information about your ISDN phone line. Make sure that these values are entered into your worksheet before you continue to the next section. For DSS1 and 1TR6 ISDN, refer to the install chapter starting on page 18.

Collecting Ethernet Setup Information

This section assumes that you are setting up your router for a TCP/IP connection. If you want to configure the system for other protocols (e.g., IPX), refer to the appropriate chapters.

- ◆ **Ethernet Interface**—Your IRT-1001 or IRT-1002 is equipped with an NWay auto-sensing 10/100-Mbps port. Just plug in the cable, and the router will automatically determine the network speed (10 Mbps or 100 Mbps) and mode (full or half duplex) based on the capability and configuration of the attached device.

- ◆ **IP Address**—An IP Address is required for TCP/IP protocol. The IP Address is a unique 32-bit number assigned to your router. It is written in dotted decimal notation (four 8-bit numbers, between 0 and 255, separated by periods), e.g., 192.68.203.5.

Record the IP Address into the worksheet as assigned by your network administrator. Note that every machine on a TCP/IP network (the global Internet, for example) must have a unique IP address; do not assign an arbitrary address to any machine.

- ◆ **IP Sub-net Mask**—This field is required for TCP/IP protocol. An IP address consists of two parts, the network ID and the host ID. The IP Subnet Mask is used to specify the network ID portion of the address, expressed in dotted decimal notation. Your IRT-1001 or IRT-1002 will automatically calculate this mask based on the IP address that you assign. Unless you have special need for subnetting, use the default mask as calculated by the router.

The table below lists some examples of IP subnet masks and the number of hosts that are allowed. Consult your network administrator if you are unsure of this value.

IP Subnet Mask	Number of Host IDs	Number of Bits
255.255.255.0	254	24
255.255.255.128	126	25
255.255.255.192	62	26
255.255.255.224	30	27
255.255.255.255	1	32

IRT-1001/IRT-1002 Setup and Installation Worksheet

General Setup Information

- ◆ **System Name (for identification purposes):**

- ◆ **Protocol(s):**

TCP/IP

IPX (IRT-1002ST only)

Bridging (IRT-1002ST only)

ISDN Setup Information

- ◆ **Switch Type (check one):**

AT&T 5ESS NI-1

AT&T Point to Point

AT&T 5ESS Multipoint

Northern Telecom NI-1

Northern Telecom Custom

DSS1

1TR6

- ◆ **B-Channel Usage (check one):**

Switch/Switch

Switch/Leased

Leased/Switch

Leased/Unused

Unused/Leased

Leased/Leased

Leased128

___Switch/Unused

North American ISDN

◆ **1st Telephone Number:**

◆ **1st SPID Number:**

◆ **2nd Telephone Number:**

◆ **2nd SPID Number:**

DSS1 ISDN

◆ **ISDN Data Number & Subaddress:**

◆ **Outside Line Prefix Number:**

◆ **PBX Number (S/T Bus Number):**

◆ **Incoming Number Matching:**

___MSN

___Calling Party Subaddress

___Don't Care

1TR6 ISDN:

◆ **ISDN Data Number:**

◆ **Outside Line Prefix Number:**

◆ **PBX Number (S/T Bus Number):**

◆ **Incoming Number Matching:**

___EAZ

___Don't Care

Ethernet Setup Information

◆ **IP Address:**

_____._____._____._____

◆ **IP Subnet Mask:**

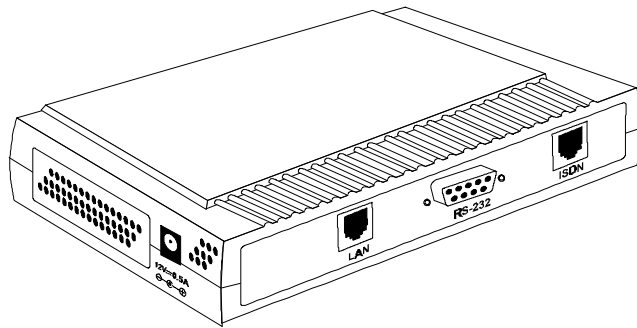
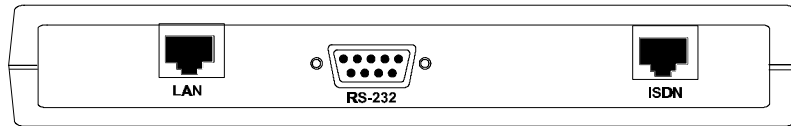
_____._____._____._____

Notes:

This Page was deliberately left blank.

Installation

This chapter outlines how to connect your IRT-1001 or IRT-1002 to your LAN and ISDN line. Refer to the diagram below to identify all of the ports on your device when you make connections.



A Warning On Connection Cables

The RS-232, ISDN line, and Ethernet cable, are very similar to each other. It is important that you use the correct cable for each connection; otherwise, your router could be damaged.

Connecting Your Computer and Your IRT-1001 or IRT-1002

For the initial setup of your IRT-1001 or IRT-1002, you must use RS-232 and communications software.

After the router has been successfully installed, you can modify the configuration through a remote Telnet connection. See the Telnet Configuration and Capabilities chapter for detailed instructions on using Telnet to configure your IRT-1001 or IRT-1002.

Connecting the RS-232 Cable to the Router

An RS-232 cable is included in your package. To connect this cable, connect the 9-pin end of the cable to the DCE port on the router's back panel. Connect the other end to the RS-232 cable connected to the serial port (COM1, COM2, or any other COM port) of your computer.

Connecting an ISDN Line to the Router

Plug one end of your ISDN phone line into the socket on the rear panel of the router labeled ISDN and the other end into the ISDN wall jack.

- ◆ **S/T interface**—This can only connect to your NT-1 (Network Termination) device.

NOTE: Do not under any circumstances connect directly to the ISDN wall jack.

-
-
- ◆ **U interface**—This allows you to connect directly to your ISDN wall jack.

NOTE: The ISDN jack is for ISDN line connection only. Connection of a phone line may result in damage to your IRT-1000 product.

Connecting an Ethernet Cable to the Router

Your IRT-1001 or IRT-1002 is equipped with an RJ-45 jack for connection to a 10BASE-T Ethernet or 100BASE-TX Fast Ethernet hub or switch via a standard straight-through twisted-pair cable.

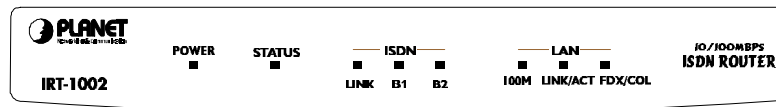
Connecting a Power Adapter to the Router

Plug a 12V DC, 500 mA power adapter into the jack on the router's side panel labeled POWER

At this point, you should have connected the RS-232 cable, the ISDN phone line, the Ethernet cable, and the power supply. You can now power up your IRT-1001 or IRT-1002.

The Your IRT-1001 or IRT-1002's Front Panel

Names and descriptions of your router's front panel LEDs are given below:



POWER—Comes on as soon as you connect the router to the power supply.

STATUS—Should be blinking if the router is functioning properly.

ISDN: LINK—Indicates that the router has an ISDN line connected to the WAN interface and it has been successfully initialized.

ISDN: B1 and **B2**—On if there is an active WAN session on that channel or if that channel is making or receiving a call.

LAN: 10/100—When you connect a network cable to the Your IRT-1001 or IRT-1002, the router will automatically detect the network speed. The 10/100 LED will light up if the LAN is operating at 100 Mbps.

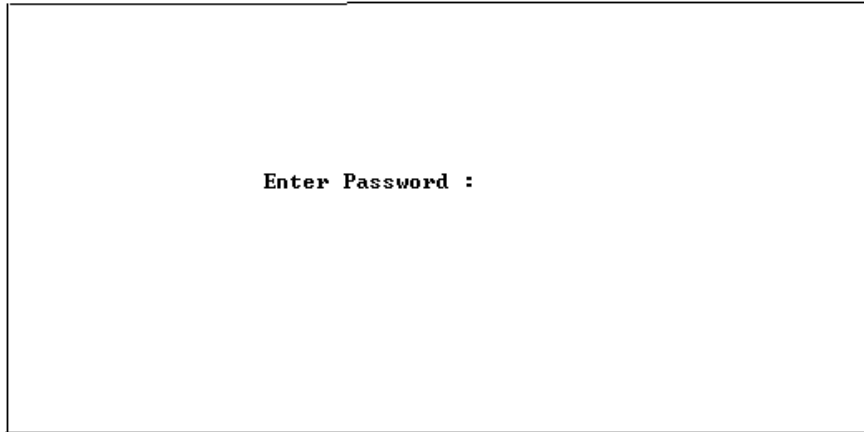
LAN: Link/Act—When the LAN connection is ready but idle, the Link/Act LED will shine steadily. When data are being transmitted or received, this LED will blink off and on.

LAN: FDX/COL—The FDX/COL LED will shine green when the LAN connection uses full-duplex signaling. It will flash yellow when the router and another device on the LAN transmit at the same time. Occasional collisions are normal. If collisions are too frequent, the LAN must be reconfigured to reduce traffic loads.

Powering Up Your IRT-1001 or IRT-1002

When you power up your IRT-1001 or IRT-1002, the router will perform several internal tests and do an ISDN line initialization. After ISDN line initialization, the router will ask you to press **ENTER** to continue.

When you press **ENTER**, the router will display a login screen and ask you to enter the password, as shown below:



Enter the default password, **1234**, to get into the Main Menu of the System Management Terminal (SMT). Note that once you are in the SMT and if there is no activity for more than 5 minutes, the router will automatically log you out and display a blank screen. If you see a blank screen, press **ENTER** to bring up the password screen.

Navigating Through the System Management Terminal (SMT) Interface

The SMT is the interface that you use to configure your IRT-1001 or IRT-1002. Several operations that you should be familiar with before you attempt to modify the configuration of your router are listed below:

- ◆ **Moving Forward to Another Menu.** To move forward to a sub-menu below the current one, type in the number of the sub-menu and press **ENTER**.
- ◆ **Moving Backward to a Previous Menu.** Press the **Escape** key to move back to the previous menu.
- ◆ **Moving the Cursor.** Within a menu, press **ENTER** (carriage return) to move to the next field. You can also use the **Up** and

Down keys to move to the previous and the next field, respectively.

- ◆ **Entering Information.** There are two types of fields that you will need to fill in. The first requires you to type in the appropriate information. The second gives you choices to choose from. In the second case, press the **space bar** to cycle through the available choices.
- ◆ **Required Fields.** Some of the fields in the SMT are essential in order to configure the Your IRT-1001 or IRT-1002. These fields will initially show question marks, indicating that the information must be filled in before that menu can be saved.
- ◆ **N/A Fields.** Some of the fields in the SMT will show a N/A. This symbol refers to an option that is not available or not applicable.
- ◆ **Saving Your Configuration.** You can save your configuration by pressing **ENTER** at the message 'Press ENTER to confirm or ESC to cancel'. Saving the data on the screen will take you in most cases to the previous menu.

The SMT main menu is shown below:

PLANET Technology Corp.

IRT-1002 Main Menu

Getting Started	Advanced Management
1. General Setup	21. Filter Set Configuration
2. ISDN Setup	22. SNMP Configuration
3. Ethernet Setup	23. System Security
4. Internet Access Setup	24. System Maintenance
Advanced Applications	
11. Remote Node Setup	
12. Static Routing Setup	
13. Default Dial-in Setup	
14. Dial-in User Setup	99. Exit

System Management Terminal Interface Summary

This section summarizes all major SMT Menus:

#	Menu Title	Description
1	General Setup	Set up general information and enable routing or bridging of specific protocols
2	ISDN Setup	Set up ISDN configuration
3	Ethernet Setup	Set up Ethernet configuration
4	Internet Access Setup	A quick and easy way to setup Internet connection
11	Remote Node Setup	Set up Remote Node for LAN-to-LAN connection including Internet connection. A Your IRT-1001 or IRT-1002 can have up to four Remote Nodes.
12	Static Routing Setup	Set up static routes for different protocols. Up to four static routes can be set for each protocol.
13	Default Dial-in Setup	Set up default dial-in parameters such that your IRT-1001 or IRT-1002 can be a dial-in server for the Remote Node and Remote Dial-in User.
14	Dial-in User Setup	Set up Remote Dial-in User. Your IRT-1001 or IRT-1002 can directly support up to eight Remote Dial-in Users.
21	Filter Set Configuration	Set up filters to be used in Menu 3 and Menu 11 to provide security, call control, etc.
22	SNMP Configuration	Set up SNMP-related parameters (IRT-1002ST only)
23	System Security	Set up security related parameters
24	System Maintenance	Provide system status, diagnostics, firmware upload, etc.
99	Exit	To exit from SMT and return to the blank screen

General Setup

This menu contains administrative and system-related information. Enter **1** in the main menu to go to Menu 1—General Setup.

```
Menu 1 - General Setup

System Name= ABCD
Location= San Jose
Contact Person's Name= Robert

Route IP= Yes
Route IPX= No
Bridge= No

Press ENTER to Confirm or ESC to Cancel:
```

1. **System Name**—Give the router a descriptive name for identification purposes, e.g., **ABCD**. This name should be no more than 8 alphanumeric characters. Spaces are not allowed, but “-” and “_” are accepted. This name can be retrieved remotely via SNMP, used for CHAP authentication, and will be displayed as the prompt in command interpreter mode. See the Dial-In Configuration chapter starting on page 53 for more information on CHAP; see the System Maintenance chapter starting on page 111 for more information on command interpreter mode.
2. **Location**—Enter the geographic location (up to 31 characters) of your IRT-1001 or IRT-1002, e.g., San Jose.
3. **Contact Person’s Name**—Enter the name (up to 8 characters) of the person in charge of the router. The Location and the Contact Person fields are optional.
4. **Protocols**—Turn on or off the individual protocols for your particular application. Unsupported protocols will have a N/A in their fields.

ISDN Setup

Menu 2 is for entering information about your ISDN line. Different telephone companies deploy different types of switches for ISDN service. Depending on the switch for your particular installation, you will have a different number of telephone numbers, and if you are in North America, you may also have SPIDs. Make sure that you have correct and complete telephone numbers and SPIDs. You need to pass the ISDN setup before your system can make an outgoing call or answer an incoming call.

North American ISDN

```
Menu 2 - ISDN Setup
Switch Type= Northern Tel Custom
B Channel Usage= Switch/Switch
1st Phone #- 5552000
SPID #- 0555200001
Analog Call= Phone 1
2nd Phone #- 5554000
SPID #- 0555400001
Analog Call= Phone 2

Press ENTER to Confirm or ESC to Cancel:
Press Space Bar to Toggle.
```

- 1. Switch Type**—Verify the switch type information with your telephone company. For North America, select the type of switch used by your telephone company. If your switch type is not currently shown, press the **space bar** to change to the next switch; repeat until you see the correct switch type. The router will not be able to place or to receive calls if the wrong switch type is specified. If you are not sure, contact your telephone company to confirm the exact switch type.

2. **B Channel Usage**—If you are using one B channel of your router with another device on the S/T bus, then select **Switch/Unused**. If not choose **Switch/Switch**. The following table shows the relationship between the **B Channel Usage** setting and ISDN B channels.

B Channel Usage	B1	B2
Switch/Switch	Switch	Switch
Switch/Leased	Switch	Leased
Leased/Switch	Leased	Switch
Leased/Unused	Leased	N/A
Unused/Leased	N/A	Leased
Leased/Leased*	Leased	Leased
Leased128**	Leased	Leased
Switch/Unused	Switch	N/A

*Leased/Leased = B1 and B2 channels connect to different remote nodes.

**Leased128 = B1 and B2 channels connect to the same remote node.

3. **SPID Number(s)**—SPIDs are numbers used by a switch for identification purposes. Depending on your switch type, you may have zero, one, or two SPIDs assigned to your line. For example, if your switch type is Northern Telecom Custom, you will have to enter two SPID numbers.

DSS1 & 1TR6 ISDN

```

Menu 2 - ISDN Setup

Switch Type: DSS-1
B Channel Usage= Switch/Switch

ISDN Data      =                Subaddress=

Dial Prefix to Access Outside Line=
PABX Number (Include S/T Bus Number)=
Incoming Phone Number Matching= Multiple Subscriber Number (MSN)

Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.

```

```
Menu 2 - ISDN Setup

Switch Type: 1TR6
B Channel Usage= Switch/Switch

ISDN Data      =                Subaddress=

Dial Prefix to Access Outside Line=
PABX Number (Include S/T Bus Number)=
Incoming Phone Number Matching= Endgeraete Auswahl Ziffer (EAZ)

Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

1. **Switch Type**—This field is fixed as DSS1 or 1TR6.
2. **B Channel Usage**—This field is fixed as Switch/Switch.
3. **ISDN Data & Subaddress**—Enter the telephone number and subaddress assigned to the ISDN data call for the router. It will be used as the outgoing CGPN(Calling Party Number) setting for ISDN data calls. Note that the router only accepts digits; do not include—and spaces in this field. This field should be no longer than 19 digits for the number and 5 digits for the Subaddress. The Subaddress is only available for DSS1.
4. **Dial Prefix to Access Outside Line**—Enter the prefix number if the router is connected to an ISDN PBX. This number will be added to all outgoing calls and should be no longer than 3 digits. Otherwise, leave this field blank.
5. **PBX Number (with S/T Bus Number)**—Enter the S/T bus number if the router is connected to an ISDN PBX. If this field is left as blank then the loopback test will be skipped.

When you are finished, press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** to cancel. When you press ENTER, the router will use the information that you entered to initialize the ISDN link to the telephone company switch. It should be noted that whenever the switch type is changed, the ISDN initialization

will take slightly longer. In addition, if you are using the U-interface, the system will also take slightly longer to initialize.

At this point, you will be asked if you wish to check if your ISDN line has been successfully connected to your router. If you select Yes, the router will perform a loop-back test to check the ISDN line. If the loop-back test fails, note the error message that you receive and take the appropriate troubleshooting action.

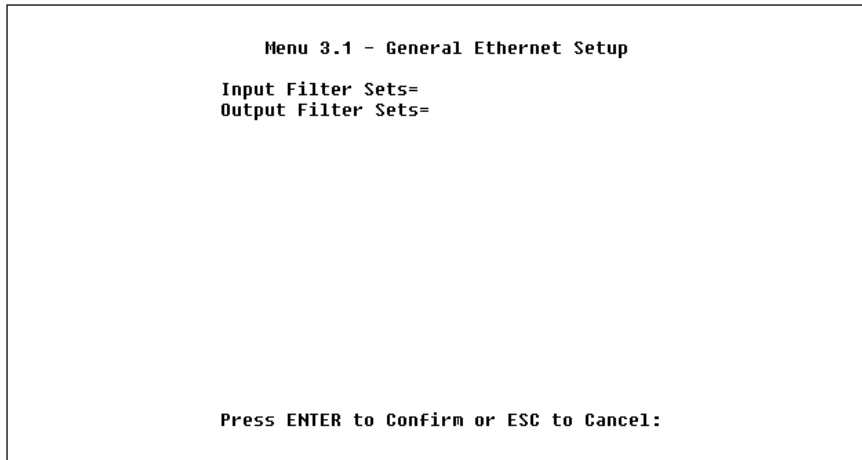
```
Setup LoopBack Test...
Dialing to 40002 ...
Sending and Receiving Data...
Disconnecting...
*** LoopBack Test completed. OK ***
### Hit any key to continue.###
```

Ethernet Setup

Menu 3 is used to enter Ethernet related information. Depending on the protocols (TCP/IP or IPX) on your LAN, you will need to configure each protocol separately.

General Ethernet Setup

This menu determines the type of Ethernet interface you are using as well as the filter sets you wish to implement to monitor your Ethernet traffic. From Menu 3—Ethernet Setup, enter **1** to go to menu 3.1 - General Ethernet Setup.



Input and Output Filter Sets—Filter sets are used to block certain packets to reduce traffic and to prevent a security breach. Filtering is a very involved subject, so leave these fields blank for the time being. After you have studied the Filter Configuration chapter starting on page 87, come back and define the filter sets.

TCP/IP Ethernet Setup and DHCP

If you are setting up your network for the first time, read the Configuring for Internet Access chapter before proceeding. The chapter contains important information on how to assign IP addresses for your network.

From Menu 3—Ethernet Setup, enter **2** to go to Menu 3.2—TCP/IP Ethernet Setup.

```
Menu 3.2 - TCP/IP and DHCP Ethernet Setup

DHCP Setup:
  DHCP= None
  Client IP Pool Starting Address= N/A
  Size of Client IP Pool= N/A
  Primary DNS Server= N/A
  Secondary DNS Server= N/A

TCP/IP Setup:
  IP Address= 192.68.1.254
  IP Subnet Mask= 255.255.255.0
  RIP Direction= Both
  Version= RIP-2B

Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

1. **DHCP**—This field determines whether the router will act as a DHCP (Dynamic Host Configuration Protocol) server. If this control is set to None, DHCP will not be used. If it is set to Server, the router will act as a DHCP server, capable of automatically assigning IP addresses to Windows 95, Windows NT, and other systems that support the DHCP client. When DHCP is used, the following four items need to be set.

Do not set this field to Server if there is already a DHCP server on your network.

2. **Client IP Pool Starting Address**—DHCP can assign IP addresses to hosts dynamically instead of requiring that each system have a fixed IP address. IP addresses are allocated from a block of addresses, usually assigned by your Internet provider. The Client IP Pool Starting Address gives the first address in the reserved block, which is also used as the LAN network address of the router itself. This address will also serve as the default gateway for DHCP clients.
3. **Size of Client IP Pool**—Gives the size of the block of addresses reserved for DHCP address assignment. The default is 6 addresses; the maximum is 32. The router itself uses the first address in the block, and the remaining addresses in the pool are assigned to clients.

4. **Primary DNS Server/Secondary DNS Server**—These two fields are used by DHCP clients (such as Windows 95 and Windows NT systems) for Domain Name Servers. Usually your Internet provider will provide one or more name service hosts.
5. **IP Address**—Enter the IP address of the Your IRT-1001 or IRT-1002 in dotted decimal notation (four 8-bit numbers, between 0 and 255, separated by periods), e.g., 192.68.135.5. Note that every machine on the TCP/IP network must have a unique IP address.
6. **IP Subnet Mask**—An IP address consists of two parts, the network ID and the host ID. The IP Subnet Mask is used to specify the network ID portion of the address, expressed in dotted decimal notation. Your IRT-1001 or IRT-1002 will automatically calculate this mask based on the IP address that you assign. Unless you have special need for subnetting, use the default subnet mask calculated by the router.
7. **RIP Direction**—This parameter determines how the Your IRT-1001 or IRT-1002 handles RIP (Routing Information Protocol). If set to Both (default), the router will broadcast its routing table on the LAN, and incorporate RIP broadcasts by other routers into its routing table. If set to In Only, the router will not broadcast its routing table on the LAN, if set to Out Only, the router will broadcast its routing table but ignore any RIP broadcast packets that it receives. If set to None, the router will not participate in any RIP exchange with other routers.

Usually, you should leave this parameter at its default of Both and let RIP propagate the routing information automatically.

8. **RIP Version**—Determines what versions of the RIP Routing Information Protocol the router accepts. Choices are:
 - ◇ **RIP-1** The router will accept and send RIP version 1 messages only.
 - ◇ **RIP-2B** The router will accept RIP-1 and RIP-2 messages (both broadcast and multicast), and sends RIP-2 messages in broadcast format.

- ◇ **RIP-2M** The router will accept RIP-1 and RIP-2 messages (both broadcast and multicast), and sends RIP-2 messages in multicast format.

Unless there are routers in your environment that do not understand RIP-2 packets, you should probably set this field to RIP-2B.

When you are finished, press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** at any time to cancel them.

Novell IPX Ethernet Setup

Refer to the chapter on Novell IPX configuration.

Bridge Ethernet Setup

Refer to the chapter on Bridging configuration.

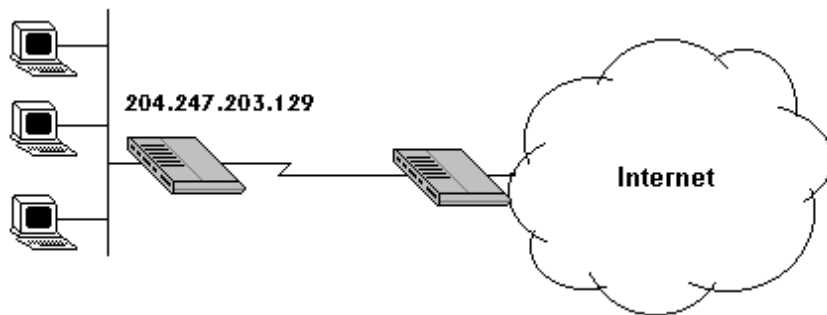
Configuring for Internet Access

Menu 4 of the SMT allows you to configure Internet access on one screen. Before you configure your IRT-1001 or IRT-1002 for Internet access, you need to collect the following information from your ISP (Internet Service Provider).

- ◆ IP address of the ISP's gateway (optional).
- ◆ Telephone number(s) of your ISP.
- ◆ Login name.
- ◆ Password for ISP authentication

For your Workstation:

- ◆ Domain Name Server (DNS)



IP Addresses and the Internet

Conventionally, the Internet (with a capital I) refers the large-scale interconnected networks across the world that was originally developed by the US Department of Defense. The Internet uses exclusively the TCP/IP suite of protocols. The term “Internet” (lower case i), however,

refers to any interconnected networks using any protocol. An Internet can be as simple as two hosts on a LAN, or it can be as complex as the Internet itself.

Every machine on the Internet must have a unique address within that Internet. If your networks are isolated from the Internet, e.g., only between your two branch offices, you can assign any IP addresses to the hosts without problems. However, the Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of IP addresses specifically for private networks:

10.0.0.0 – 10.255.255.255
172.16.0.0 – 172.31.255.255
192.168.0.0 – 192.168.255.255

For this reason, it is recommended that you choose your network number from the above list.

You can obtain your IP address from the IANA, from an ISP, or assigned from a private network. If you belong to a small organization and your Internet access is through an ISP, the ISP can provide you with the Internet addresses for your local networks. On the other hand, if you are part of a much larger organization, you should consult your network administrator for the appropriate IP addresses.

NOTE: **Regardless of your particular situation, do not create an arbitrary IP address; always follow the guidelines above. For more information on address assignment, refer to RFC 1597, *Address Allocation for Private Internets* and RFC 1466, *Guidelines for Management of IP Address Space*.**

Once you have determined the IP address range for your local network, you may want to use DHCP (Dynamic Host Configuration Protocol) to assign addresses to individual hosts on the network, as an alternative to manually configuring each host's IP settings. See the TCP/IP Ethernet Setup and DHCP section on page 31 for more information about DHCP.

Internet Access Configuration

The following steps describe the set-up procedure to configure your IRT-1001 or IRT-1002 for Internet access. The information you will need to provide will be indicated in **bold** type.

```
Menu 4 - Internet Access Setup

ISP's Name= ?
ISP IP Addr=
Pri Phone #= ?
Sec Phone #=
My Login=
My Password= *****
Single User Account= No
  IP Addr= N/A
  Server IP Addr= N/A
Telco Option:
  Transfer Type= 64K

Multilink= Off

Press ENTER to Confirm or ESC to Cancel:
```

1. From the Main Menu, enter 4 to go to Menu 4 - Internet Access Setup, as seen above.
2. **ISP's Name**—Enter the name of your Internet Service Provider, e.g., myisp. This information is for identification purposes only.
3. **ISP IP Addr**—Enter the IP Address of the remote gateway at the ISP's site. If you do not have this data, just leave it blank.
4. **Pri(mary) Phone #** and **Sec(ondary) Phone Number**—Both the Primary and the Secondary Phone number refer to the number that your IRT-1001 or IRT-1002 will dial to connect to the ISP. The router will always call your ISP using the Primary Phone number first. If the Primary Phone number is busy or does not answer, the router will call the Secondary Phone number if available. Once connected, the router will use the BACP (Bandwidth Allocation Control Protocol) to establish the second B-

channel if PPP/MP is enabled, and the ISP also supports MP and BACP.

5. **My Login Name**—Enter the login name given to you by your ISP.
6. **My Password**—Enter the password associated with the login name above. Note that this login name/password pair is only for the router to connect to the ISP's gateway. When you use TCP/IP applications, e.g., FTP, to access the Internet from your workstation, you will need a separate login name and password for each server.
7. **Single User Account**—See the following section for a more detailed discussion on the Single User Account feature. The default is No.
8. **Telco Options: Transfer Rate**—This field (which only applies to outgoing calls) controls the rate at which the data is transferred between your router and the Internet. The options for this field are:
 - ◇ **64K**—The router will place 64Kbps (bits per second) digital data calls.
 - ◇ **56K**—(For the North America only) The router will place 56Kbps digital data calls.
 - ◇ **Lease**—The router will place leased-line calls.
9. **Multilink**—Determines whether or not Multilink PPP should be used. Available options are:
 - ◇ **Off**—The base transfer rate and maximum transfer rate will be 64Kbps.
 - ◇ **BOD** (Bandwidth On Demand)—The base transfer rate will be 64Kbps, and the maximum transfer rate will be 128 Kbps.
 - ◇ **Always**—Multilink will always be on; both the base transfer rate and maximum transfer rate will be 128 Kbps.
10. Press **ENTER** at the message 'Press ENTER to Confirm...' to confirm your selections, or press **ESC** at any time to cancel your selections.

11. At this point, the SMT will ask if you wish to test the Internet connection. If you select Yes, the router will call the ISP to test the Internet connection. If the test fails, note the error message that you receive and take the appropriate troubleshooting steps.

Single User Account

Typically, if there are multiple users on the LAN wanting to concurrently access the Internet, they will have to subscribe to multiple IP addresses or a Class C subnetwork from the ISP. In either case, these two approaches will cost more than a single user account.

The Single User Account (SUA) feature allows customers to have the same benefits as having a Class C address, but still only pay for one IP address, thus saving significantly on subscription fees. (Check with your ISP before you enable this feature).

This feature may also be used to connect to TCP/IP remote nodes other than Internet Service Providers. For example this feature can be used to simplify the allocation of IP addresses when connecting branch offices to the corporate network.

The IP address for the Single User Account can be either fixed or dynamically assigned by the ISP (or other remote node). In addition, you can also configure a server, e.g., a Web server, on your local network and make it accessible by outside users.

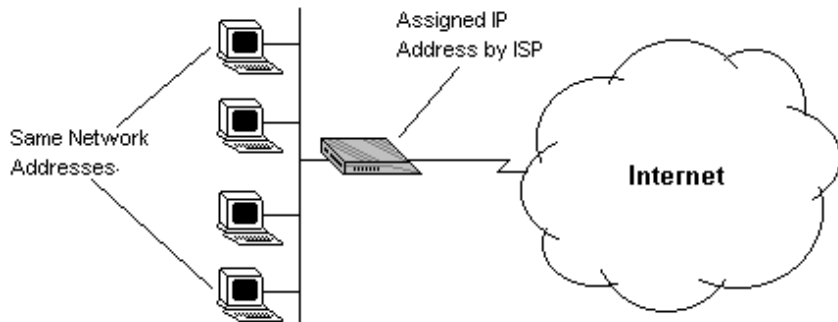
If you do not set a server IP address, SUA offers the additional benefit of firewall protection. This is because if no server is defined, all incoming inquiries will be filtered out by the router even if you do have a server on your network. This can prevent intruders from probing your system.

The router accomplishes this address sharing by translating the internal LAN IP addresses to a single address that is globally unique on the Internet. For more information on IP address translation, refer to RFC 1631, *The IP Network Address Translator (NAT)*.

In summary:

1. SUA is an ideal, cost-effective solution for small offices with less than 20 hosts using a LAN to concurrently access the Internet or other remote TCP/IP network.
2. SUA can provide one server address to be accessed by Remote Dial-in Users, thus controlling the incoming packets.
3. SUA can provide firewall protection if you do not configure a server IP address. All incoming inquiries will be filtered out by the Your IRT-1001 or IRT-1002. Therefore, servers on your network are protected.
4. UDP and TCP datagrams can be routed. In addition, ICMP echo can also be routed.

The figure below shows an example of a small office connected to the Internet via a Single User Account using a Your IRT-1001 or IRT-1002. Note that if you enable the Single User Account feature, your local IP address **MUST** be selected from the list of IP addresses for private networks as defined by the IANA.



Configuration for Single User Account

The steps for configuring your IRT-1001 or IRT-1002 for Single User Internet Access are identical to conventional Internet Access, with the exception that you need to fill in three extra fields.

Note that enabling the Single User Account feature will automatically create a new entry in the Remote Node Setup menu (**menu 11**). Before enabling the Single User Account feature, check the Remote Node Setup menu to make sure there is space for a new entry (there must be no more than three entries before you enable the Single User Account feature).

Follow steps 1-4 from the previous section, Internet Access Configuration.

- 1. Single User Account**—Enter Yes to enable the Single User Account feature. Use the space bar to toggle between Yes and No.
- 2. Single User Account: IP Addr**—If your ISP assigns you a dynamic IP address, enter 0.0.0.0 here. If your ISP assigns you a static IP address enter that IP address here.
- 3. Single User Account: Server IP Addr**—If you want to make a single server, e.g., a Web server, accessible to outside users, enter that server's IP address here.

Press **ENTER** at the message 'Press ENTER to Confirm...' to confirm your selections or press **ESC** at any time to cancel your selections.

At this point, the router will ask if you wish to test the Internet connection. If you select Yes, the router will call the ISP to test the Internet connection. If the test fails, note the error message that you receive and take the appropriate troubleshooting steps.

Configuring Backup ISP Accounts

Sometimes it may be desirable to configure more than one ISP account for backup purposes. The Single User Account feature can be enabled for all of these accounts, making it convenient to switch Internet Service Providers in the event of a failure.

To configure a backup ISP,

- 1.** Configure your primary ISP using Menu 4, as described earlier in this chapter.
- 2.** Enter Menu 11, then select the number of an unused remote node.
- 3.** In Menu 11.1, choose a name for your backup ISP account, set the Active field to No, and enter your outgoing login name, password, and phone number(s). The Remote IP Address field should be set to 1.1.1.1.
- 4.** In Menu 11.3, set the remote node's subnet mask to 0.0.0.0, and set RIP to None.
- 5.** Save the new configuration.

Once you have done this, if you need to change from your primary ISP to a backup ISP follow the steps below:

- 1.** Enter Menu 11 and select your Primary ISP.
- 2.** In Menu 11.1, set the Active field to No.
- 3.** Enter Menu 11 again and select your backup ISP.
- 4.** In Menu 11.1, set the Active field to Yes.

You will now be able to access the Internet through the backup ISP Remote Node.

Remote Node Configuration

A Remote Node represents both a remote gateway and the Internet behind it, across an ISDN connection. A Remote Node is required for placing calls to or answering calls from a remote network. Note that when you use Menu 4 to configure the Internet, your IRT-1001 or IRT-1002 will automatically add a Remote Node for you. Once a Remote Node is configured properly, traffic to the remote LAN will trigger the router to make a call automatically (i.e., Dial-On-Demand). Similarly, calls from the remote LAN will be answered automatically and security will be checked.

In this chapter, we will discuss the parameters that are protocol independent. The protocol dependent configuration will be covered in subsequent chapters. For TCP/IP, see the TCP/IP Configuration chapter on page 62. For IPX, see the Novell IPX Configuration chapter on page 71. For bridging, see the Bridging Configuration chapter on page 80.

From the Main Menu, enter **11** to go to Menu 11—Remote Node Setup. When in menu 11, enter the number of the Remote Nodes (1 to 4) that you wish to configure as shown below:

```
Menu 11 - Remote Node Setup

1. SJHQ
2. _____
3. _____
4. _____

Enter Node # to Edit:
```

Enter the Remote Node number to edit and you will go to the next submenu: 11.1 - Remote Node Profile, as shown below:

```
Menu 11.1 - Remote Node Profile

Rem Node Name= SJHQ          Route= IP
Active= Yes                 Bridge= No
Call Direction= Both

Incoming:
Rem Login= abcd            Edit PPP Options= No
Rem Password= *****     Rem IP Addr= 198.23.34.5
Rem CLID=                  Edit IP/IPX/Bridge= No
Call Back= No             Telco Option:
                          Transfer Type= 64K
                          Allocated Budget(min)= 0
                          Period(hr)= 0
Outgoing:
My Login= wxyz            Session Options:
My Password= *****     Input Filter Sets=
Authen= CHAP/PAP         Output Filter Sets=
Pri Phone #= 5551230     Call Filter Sets=
Sec Phone #= 5551231     Idle Timeout(sec)= 300

Press ENTER to Confirm or ESC to Cancel:
```

- 1. Rem Node Name**—This is a required field. Enter a descriptive name for the Remote Node, e.g., SJHQ. The name can be up to eight characters long, and must be different from any other Remote Node name or Remote Dial-in User name.
- 2. Active**—Press the space bar to toggle between Yes and No. When a Remote Node is deactivated, it has no effect on the operation of the router, even though it is still kept in the database, and can be activated in the future. Deactivated nodes are displayed with a minus sign [-] at the beginning of the name in Menu 11.
- 3. Call Direction**—If this parameter is set to Both, your IRT-1001 or IRT-1002 can both place and receive calls to/from this Remote Node. If set to Incoming, the router will not place a call to this Remote Node. If set to Outgoing, the router will drop any call from this Remote Node.

Several other fields in this menu depend on this parameter. For example, in order to enable Call Back, the Call Direction must be Both.

4. **Incoming: Rem Node Login Name**—Enter the login name that this Remote Node will use when it calls into the router. The login name in this field combined with the Rem Node Password will be used to authenticate the incoming calls from this node.
5. **Incoming: Rem Node Password**—Enter the password used when this Remote Node calls into the router.
6. **Incoming: Rem CLID**—This field is active only if Call Direction is either Both or Incoming. Otherwise, an N/A appears in the field. This is the Calling Line ID (the telephone number of the calling party) of this Remote Node. If you enable the CLID Authen field in Menu 13—Default Dial In, the router will check this number against the CLID in the incoming call. If they do not match and the CLID Authen is Required, then the router will reject the call.
7. **Incoming: Call Back**—This field will be valid only if Call Direction is Both. Otherwise, an N/A appears in the field. This field determines whether or not you wish the router to call back after receiving a call from this Remote Node. If this option is enabled, the router will disconnect the initial call from this node and call it back at the Outgoing Primary Phone Number (see below).
8. **Outgoing: My Login Name**—This is a required field if Call Direction is either Both or Out. Enter the login name for the router when it calls this Remote Node. If the login name is longer than 24 characters, only the first 23 will be displayed, with a + displayed at the end.
9. **Outgoing: My Password**—This is a required field if Call Direction is either Both or Out. Enter the password for the router when it calls this Remote Node. If the password is longer than 20 characters then a + will be displayed at the end.
10. **Outgoing: Authen**—This field sets the authentication protocol used for outgoing calls.

Your IRT-1001 or IRT-1002 supports two authentication protocols: PAP (Password Authentication Protocol) and CHAP (Challenge Handshake Authentication Protocol).

- ◇ **PAP** sends the user name and password in plain text.
- ◇ **CHAP** scrambles the password before it is sent over the wire.

Generally speaking, CHAP is more secure than PAP; however, PAP is readily available on more platforms. The recommendation is to use CHAP whenever possible. Turning off the authentication is STRONGLY discouraged.

Options for this field are:

- ◇ **CHAP/PAP**—The router will try CHAP when CHAP is requested by the Remote Node or PAP when PAP is requested by the Remote Node.
- ◇ **CHAP**—use CHAP only.
- ◇ **PAP**—use PAP only.

11.Outgoing: Pri(mary) Phone Sec(ondary) Phone Number—

Both the Primary Phone number and the Secondary Phone number refer to the number that the router will dial to connect to the Remote Node. The router will always call the Remote Node using the Primary Phone number first. If the Primary Phone number is busy or does not answer, the router will call the Secondary Phone number if available. Once connected, the router will use the BACP (Bandwidth Allocation Control Protocol) to establish the second B-channel if Multilink PPP is enabled, and the Remote Node supports MP and BACP.

Some areas require dialing # before the phone number for local calls. A # symbol may be included at the beginning of the Primary Phone number or Secondary Phone number.

12.Route—This field determines the protocols that your IRT-1001 or IRT-1002 will route. The choices of this field are determined by the features enabled on your router.

13.Bridge—Bridging is used (on the IRT-1002ST only) for protocols that are not supported or not turned on in the previous Route field, e.g., SNA. When bridging is enabled, the IRT-1002ST will forward any packet that it does not recognize to this Remote Node; otherwise, the unrecognized packets are discarded. The

disadvantage of bridging is that it usually generates large amounts of traffic. Press the space bar to select either Yes or No.

14.Edit PPP Options—To edit the PPP options for this Remote Node, move the cursor to this field, use the space bar to select **Yes** and press **ENTER**. This will bring you to Menu 11.2—Remote Node PPP Options For more information on configuring PPP options, see the section Editing PPP Options.

15.IP Addr—This is a required field if Route is set to IP. Enter the IP address of this Remote Node.

16.Edit IP/IPX/Bridge Options—To edit the parameters of the protocols, go to this field, select Yes and press ENTER. This will bring you to Menu 11.3—Remote Node Network Layer Options. For more information on filling out this screen, refer to the chapter pertaining to your specific protocol.

17.Telco Options: Transfer Rate—This field (which only applies to outgoing calls) controls the rate at which the data is transferred between your router and the Remote Node. The options for this field are:

- ◇ **64K**—The router will place 64Kbps (bits per second) digital data calls.
- ◇ **56K**—(For North America only) The router will place 56Kbps digital data calls.
- ◇ **Lease**—The router will place leased-line calls.

18.Telco Options: Allocated Budget (min)—This field will set a budget outgoing call time for the Remote Node. The default for this field is 0 for no budget control.

19.Telco Options: Period (hr)—This field will set the time interval to reset the above outgoing call budget control.

20.Session Option: Input Filter Sets, Output Filter Sets and Call Filter Sets—In these fields, select which filter set(s) you would like to implement to filter the incoming and outgoing traffic between this Remote Node and the router. You can choose from 12 different filter sets. In addition, you can link up to 4 filter sets

together for further customization (e.g., 1, 5, 9, 12). Note that spaces and commas are accepted in this field.

For more information on customizing your filter sets, see the Filter Configuration chapter starting on page 87. The default is blank, i.e., no filters defined.

21.Session Option: Idle Timeout (sec)—This value specifies the number of idle seconds that elapses before the Remote Node is automatically disconnected. Idle seconds is the period of time where no data is passed between the Remote Node and your IRT-1001 or IRT-1002. Administrative packets such as RIP are not counted as data. The default is 300 seconds (5 minutes).

Once you have completed filling in Menu 11.1—Remote Node Profile, press ENTER at the message ‘Press ENTER to Confirm...’ to confirm your selections, or press ESC at any time to cancel your selections.

Bandwidth on Demand

The Bandwidth on Demand (BOD) feature allows you to bundle both B channels in one connection. The second channel is added and subtracted dynamically according to traffic demand. The router uses the Bandwidth Allocation Control Protocol (BACP) and the Multilink Protocol (MP) to implement bandwidth on demand.

The configuration of bandwidth on demand focuses on the Base Transmission Rate (BTR) and the Maximum Transmission Rate (MTR). The relationship between BTR and MTR are shown below:

BTR & MTR Setting	No. of channel(s) used to initiate call	Max No. of channel(s) used	Bandwidth on demand
BTR = 64, MTR = 64	1	1	Off
BTR = 64, MTR = 128	1	2	On
BTR = 128, MTR = 128	2	2	Off

When bandwidth on demand is enabled, a second channel will be brought up if traffic on the initial channel is higher than the high Target

Utility number for longer than the specified Add Persist value. Similarly, the second channel will be dropped if the traffic level falls below the low Target Utility number for longer than the Subtract Persist value.

The Target Utility specifies the line utilization range at which you want your IRT-1001 or IRT-1002 to add or subtract bandwidth. The range is 30 to 64 kbps (kilobits per second). The parameters are separated by a - . For example, 30-60 means the add threshold is 60 kbps and subtract threshold is 30 kbps. The router will perform bandwidth on demand only if it initiates the call. Addition and subtraction are based on the value set in the BOD Calculation field. If this field is set to Transmit or Receive, then traffic in either direction will be calculated to determine if a link should be added or dropped. Transmit will only use outgoing traffic to make this determination, and Receive will only use incoming traffic to make this determination.

If, after making the call to bring up a second channel, the second channel does not succeed in joining the Multilink Protocol bundle (because the remote device does not recognize the second call as coming from the same device), the router will hang up the second channel and continue with the first channel alone.

Editing PPP Options

```
Menu 11.2 - Remote Node PPP Options
Encapsulation= Standard PPP
Compression= Yes

Multiple Link Options:
BOD Calculation= Transmit or Receive
Base Trans Rate(Kbps)= 64
Max Trans Rate(Kbps)= 128
Target Utility(Kbps)= 32-48
Add Persist(sec)= 5
Subtract Persist(sec)= 5

Enter here to CONFIRM or ESC to CANCEL:
```

- 1. Encapsulation**—Select CCP (Compression Control Protocol) for the PPP or MP link. There are two options in this field.
 - ◇ **Standard PPP**—Standard PPP options will be used.
 - ◇ **CISCO PPP**—Cisco PPP options will be used.
- 2. Compression**—Turn on the Stac Compression. The default for this field is Off.
- 3. Multiple Link Options: BOD Calculation**—Select the direction of the traffic you wish to calculate in order to determine when to add or subtract a link. The default for this field is Transmit or Receive.
- 4. Multiple Link Options: Base Trans Rate**—Select the base data transfer rate for this Remote Node. This parameter is in kilobits per second (Kbps). There are two options for this field:
 - ◇ **64**—Only one channel will be used.
 - ◇ **128**—Two channels will be used when a packet triggers a call.

5. **Multiple Link Options: Max Trans Rate**—Enter the maximum data transfer rate allowed for this Remote Node. This parameter is in kilobits per second. There are two options for this field:
 - ◇ **64**—At most one channel can be used.
 - ◇ **128**—A maximum of two channels can be used.
6. **Multiple Link Options: Target Utility**—Enter the two thresholds separated by a— for subtracting and adding the second channel. The default is 32-48.
7. **Multiple Link Options: Add Persist**—This parameter specifies the number of seconds where traffic is above the adding threshold before the router will bring up the second channel. The default is 5 seconds.
8. **Multiple Link Options: Subtract Persist**—This parameter specifies the number of seconds where traffic is below the subtraction threshold before the router drops the second channel. The default is 5 seconds.

Once you have completed Menu 11.2—Remote Node PPP Options, press **ENTER** at the message 'Press ENTER to Confirm...' to confirm your selections, or press **ESC** to cancel your selections.

Dial-In Configuration

You can configure your IRT-1001 or IRT-1002 to receive calls from Remote Dial-in Users (e.g., telecommuters) and Remote Nodes. There are several differences between Remote Dial-in Users and Remote Nodes:

1. The router can make calls to or answer calls from a Remote Node. However, it will only answer calls from Remote Dial-in Users.
2. Each Remote Node can have its own set of parameters such as Bandwidth On Demand, Protocol, Security, etc., while all Remote Dial-in Users share one common set, as defined in the Default Dial In Setup (Menu 13).
3. Generally, Remote Dial-in Users are individual users who dial in to the Your IRT-1001 or IRT-1002 directly from their workstations, while Remote Nodes represent networks and are used for LAN-to-LAN connections.

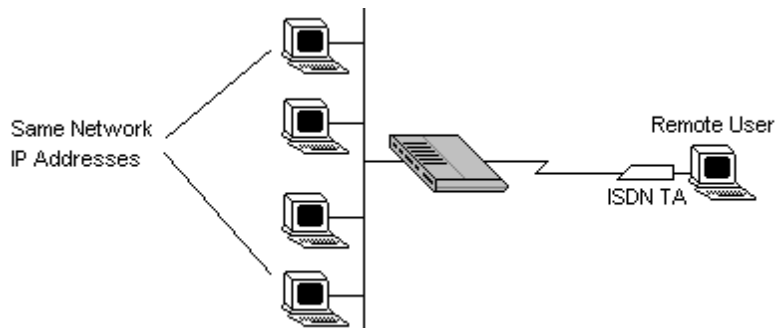
This chapter discusses how to set up Default Dial-in parameters for both Remote Node and Remote Dial-in Users. The following sections give two examples of how a Your IRT-1001 or IRT-1002 can be configured as a dial-in server for either or both.

By default, your IRT-1001 or IRT-1002 allows information for up to eight users to be kept. To let more than eight remote dial-in users access a IRT-1002, you can use a separate RADIUS server to provide remote authentication services. For details on using a separate RADIUS server, see the *Using RADIUS Authentication* section on page 108.

Telecommuting

Telecommuting enables people to work at remote sites and still have access to the resources in the business office. Typically, a telecommuter will use a client workstation with TCP/IP or IPX and dial-out capabilities, e.g., a Windows 95 PC or a Macintosh and an ISDN Terminal Adapter (TA). For telecommuters to call in to your LAN, you need to configure a Dial-In User Profile for each telecommuter. Additionally, you need to configure the Default Dial-In Setup to set the operational parameters for all dial-in users. You can configure up to eight Remote Dial-in Users for your IRT-1001 or IRT-1002.

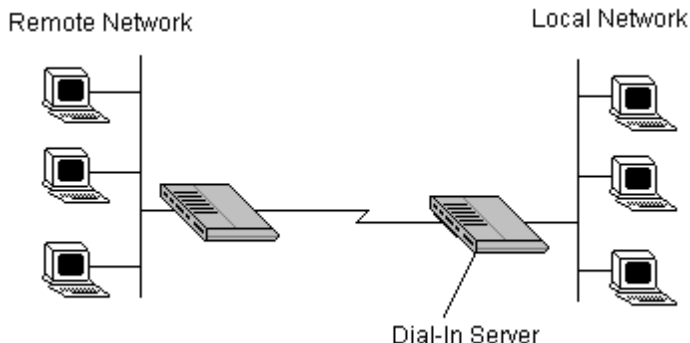
An example of Remote Dial-in User application, telecommuting, is shown below:



Dial-In Server Application

As Your IRT-1001 or IRT-1002 can also be used as a dial-in server. This application allows the router to provide services for workstations on a remote network. For the router to be set up as a dial-in server, you need to configure the Default Dial-In Setup to set the operational parameters for incoming call. Additionally, you will have to create a Remote Node for the router on the remote network (see the *Remote Node Configuration* chapter starting on page 43). An example of a

Your IRT-1001 or IRT-1002 being used as a dial-in server is shown below:



Default Dial-In Setup

This section covers the default dial-in parameters. The parameters in Menu 13 affect incoming calls from all Remote Dial-in Users and Remote Nodes before authentication is completed. Once authentication is completed, and if it matches a Remote Node, the router will use parameters from that particular Remote Node.

```
Menu 13 - Default Dial-in Setup

Telco Options:
  CLID Authen= None
  IP Address Supplied By:
    Dial-in User= Yes
    IP Pool= No
    IP Start Addr= N/A
    IP Count(1,2)= N/A

PPP Options:
  Recv Authen= CHAP/PAP
  Compression= Yes
  Mutual Authen= No
  PAP Login= N/A
  PAP Password= N/A
  Multiple Link Options:
    Max Trans Rate(Kbps)= 128
  IPX Net Num Supplied By:
    IPX Pool= No
    IPX Start Net Num= N/A
    IPX Count(2,16)= N/A

Callback Budget Management:
  Allocated Budget(min)= 0
  Period(hr)= 0
  Session Options:
    Input Filter Sets=
    Output Filter Sets=
    Idle Timeout= 300

Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

From the Main Menu, enter 13 to go to Menu 13 - Default Dial-in Setup. This section will describe how to configure the protocol-independent fields in this menu. For the protocol-dependent fields, refer to the appropriate chapters.

1. **Telco Options: CLID Authen.**—This field sets the CLID authentication parameter for all incoming calls. There are three options for this field:
 - ◇ **None**—No CLID is required.
 - ◇ **Required**—Must provide CLID, or call is disconnected.
 - ◇ **Preferred**—If the CLID is available then CLID will be used to do authentication. If the CLID is not available the call will continue.
2. **PPP Options: Recv. Authen.**—This field sets the authentication protocol used for incoming calls. User names and passwords are configured in the next section (Remote users/Dial-in Users Setup). Options for this field are:
 - ◇ **CHAP/PAP**—The router will try CHAP first, but PAP will be used if CHAP is not available.
 - ◇ **CHAP**—Use CHAP only.
 - ◇ **None**—No authentication required.
3. **PPP Options: Compression**—The setting in this field determines if Stac compression will be used. The default setting is **Yes**.
4. **PPP Options: Mutual Authen.**—Some vendors, e.g. Cisco, implement a type of mutual authentication. That is, the node that initiates the call will request a user name and password from the far end that they are dialing to. If the Remote Node that is dialing in implements this type of authentication, set this field to **Yes**.
5. **PAP Login**—This field will only be enabled if the Mutual Authen. field is set to **Yes**. Enter in the login name to be used to respond to the far end's PAP authentication request. This field does not apply to CHAP authentication.

6. **PAP Password**—This field will only be enabled if the Mutual Authen. field is set to Yes. Enter in the PAP password to be used to respond to the far end's authentication request. This field does not apply to CHAP authentication.
7. **Multiple Link Options: Max Trans Rate**—Enter the maximum data transfer rate between your router and the Remote Dial-in User. The unit is in bits per second. There are two options for this field:
 - ◇ **64**—At most, one B channel will be used.
 - ◇ **128**—A maximum of two channels can be used.When the Your IRT-1001 or IRT-1002 calls back to the Remote Dial-in User the maximum data transfer rate is always 64.
8. **Callback Budget Management: Allocated Budget (min)**—This field will set a budget callback time for all the Remote Dial-in Users. The default for this field is 0 for no budget control.
9. **Callback Budget Management: Period (hr)**—This field will set the time interval to reset the above callback budget control.
10. **Dial-In IP Address Supplied By: Dial-in User**—If set to Yes, it tells the Your IRT-1001 or IRT-1002 to allow a remote host to specify its own IP address. This is to prevent the remote host from using an invalid IP address and potentially disrupting the whole network. If set to No, the remote host must use the IP address assigned by the Your IRT-1001 or IRT-1002 from the IP pool, configured below. The default is Yes.
11. **Dial-In IP Address Supplied By: IP Pool**—This field tells your IRT-1001 or IRT-1002 to provide the remote host with an IP address from the pool. This field is required if Dial-In IP Address Supplied By: Dial-in User is set to No. You can configure this field even if Dial-in User is set to Yes, in which case the Your IRT-1001 or IRT-1002 will accept the IP address if the remote peer specifies one; otherwise, an IP address is assigned from the pool. If Dial-in User is Yes and this field is No, the remote peer *must* supply its own IP address, or communication will not be possible. The default is No.

- 12.IP Pool: IP Start Addr**—This field is active only if you selected Yes in the Dial-In IP Address Supplied By: IP Pool field. The IP pool contains contiguous IP addresses and this field specifies the first one in the pool.
- 13.IP Count (1,2)**—In this field, enter the number (1 or 2) of the addresses in the IP Pool. For example, if the starting address is 192.168.135.5 and the count is 2, then the pool will have 192.68.135.5 and 192.68.135.6
- 14.Dial-In IPX Net. Num. Supplied By: IPX Pool**—This field tells the IRT-1002 to provide the remote host with an IPX network number from the pool. Otherwise, the router will generate a random IPX network number. The default is No.
- 15.IPX Start Net. Num.**—This field is active only if you selected Yes in the Dial-In IPX Net. Num. Supplied By: IPX Pool field. The IPX pool contains contiguous IPX network numbers and this field specifies the first one in the pool.
- 16.IPX Count (1,16)**—In this field, enter the number (1—16) of network numbers in the IPX Pool. For example, if the starting number is 12345678, and the count is 2, then the pool will have 12345678 and 12345679.
- 17.Session Options: Input Filter Sets and Session Options: Output Filter Sets**—In these fields, you need to select the filter set(s) to filter the incoming and outgoing traffic between your IRT-1001 or IRT-1002 and the Remote Dial-in User. Keep in mind that these filter set(s) will only apply to all Remote Dial-in Users but not the Remote Nodes.

You can choose from 12 different filter sets. In addition, you can link up to 4 filter sets together for further customization (e.g., 1, 5, 9, 12). Note that spaces and commas are accepted in this field. For more information on customizing your filter sets, see the

Filter Configuration chapter on page 87. The default is blank, i.e., no filters.

18.Session Options: Idle Timeout—This value is the number of idle seconds that elapses before the dial-in user is automatically disconnected. Idle Timeout is the period of time when there is no data traffic between the dial-in user or Remote Node and the router. This field will only be used if Recv. Authen is set to None and the call is not mapped to any Remote Node or Remote Dial-in User, or the router calls back to the Remote Dial-in User.

Once you have completed filling in Menu 13—Default Dial-in Setup, press **ENTER** at the message ‘Press ENTER to Confirm...’ to save your selections, or press **ESC** at any time to cancel your selections.

Dial-In Users Setup

The following steps describe the setup procedure for adding a Remote Dial-in User. From the Main Menu, enter 14 to go to 14. Dial-in User Setup is shown below:

Menu 14 - Dial-in User Setup

- 1. joesmith
- 2. _____
- 3. _____
- 4. _____
- 5. _____
- 6. _____
- 7. _____
- 8. _____

Enter Menu Selection Number:

Select one of eight users by number, this will bring you to the next screen, Menu 14.1 - Edit Dial-in User.

Menu 14.1 - Edit Dial-in User

```
User #: 1
User Name= joesmith
Active= Yes
Passwd= *****
Callback= No
  Phone # Supplied by Caller= N/A
  Callback Phone #= N/A
Rem CLID=
Idle Timeout= 300
```

Press ENTER to Confirm or ESC to Cancel:

1. **User Name**—This is a required field. This will be used as the login name for authentication. Choose a descriptive word for login, e.g., kathyg.
2. **Active**—You can disallow dial-in access to this user by setting this field to Inactive. When set to inactive, the user record is still kept in the database for later activation. Deactivated users are displayed with a—(minus sign) at the beginning of the name in Menu 14.
3. **Password**—Enter the password for the Remote Dial-in User.
4. **Callback**—This field determines if the Your IRT-1001 or IRT-1002 will allow callback to the Remote Dial-in User upon dial-in. If this control is set to Optional, the router will be able to call back to the Remote Dial-in User if so requested by that user's system; if the control is set to Mandatory, the router will attempt callback in all cases. Callback entails disconnecting the call and dialing the specified callback number (see below). The default setting of this control is No.
5. **Phone # Supplied by Caller**—This control allows the Remote Dial-in User to specify the callback telephone number on a call-by-call basis. This is useful for when the Your IRT-1001 or IRT-1002 returns a callback to a mobile user at different numbers,

e.g., a sales rep in a hotel. Note that the default is No, i.e., the router always calls back to the fixed callback number.

6. **Callback Phone #**—If Callback is Yes, then this is a required field. Otherwise, N/A will appear in the field. Enter the telephone number to which the router will call back.
7. **Rem CLID**—If you have enabled the CLID Authen field in Menu 13, you need to specify the telephone number from which this Remote Dial-in User calls. Your IRT-1001 or IRT-1002 will check this number against the CLID in the incoming call. If they do not match and the CLID Authen is Required, the router will reject the call.
8. **Idle Time-out**—Enter the idle time (in seconds). This time-out determines how long the dial-in user can be idle before the Your IRT-1001 or IRT-1002 disconnects the call. Idle time is defined as the period of time where there is no data traffic between the dial-in user and the router. The default is 300 seconds (5 minutes).

More on CLID

CLID allows your IRT-1001 or IRT-1002 to authenticate the caller before a call is answered, thus saving the cost of a connection. The router uses the caller ID in the ISDN call setup message to match against the CLID in the database.

However, CLID may not be available due to your switch configuration.

Besides authentication, another application of CLID is to *combine* it with callback. For instance, your company pays for the connection charges for telecommuting employees, and you are using the Your IRT-1001 or IRT-1002 as the dial-in server. You can turn on both the CLID authentication and callback options for the dial-in users. By doing so, all usage are charged to the company instead of the employees, and your accounting department can avoid the hassles of accountability and reimbursement.

Once you have completed filling in Menu 14.1—Edit Dial-in User, press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** at any time to cancel your selections.

This Page was deliberately left blank.

TCP/IP Configuration

This chapter shows you how to configure your IRT-1001 or IRT-1002 for TCP/IP. Depending on your particular applications, you will need to configure different menus. For instance, Internet access is the most common application of TCP/IP. For this application, you should configure Menu 4. We will illustrate the configuration for other applications in the following sections.

IP Subnet Mask

A subnet mask is a 32-bit quantity that, when logically ANDed with an IP address, yields the network number. For instance, the subnet masks for class A, B and C networks without subnetting are 255.0.0.0, 255.255.0.0 and 255.255.255.0, respectively.

To create more network numbers, you shift some bits from the host ID to the network ID. For instance, to partition a class C network number 192.68.135.0 into two, you shift 1 bit from the host ID to the network ID. Thus the new subnet mask will be 255.255.255.128; the first subnet will have network number 192.68.135.0 with hosts 192.68.135.1 to 129.68.135.126 and the second subnet will have network number 192.68.135.128 with hosts 192.68.135.129 to 192.68.135.254.

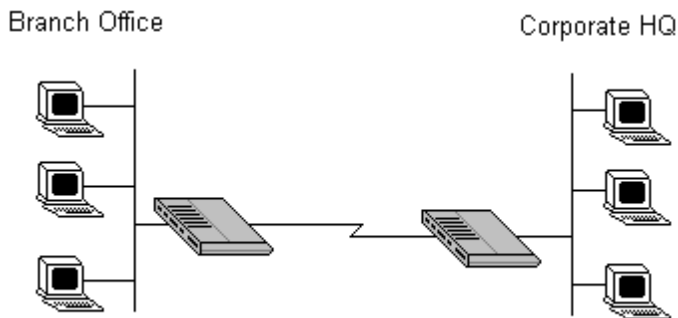
It is recommended that you use the same subnet mask for all physical networks that share an IP network number. The table below lists the additional subnet mask bits in dot decimal notations. To use to following table, write down the original subnet mask and substitute the higher order 0s with the dot decimal of the additional subnet bits. For instance, to partition your class C network 204.247.203.0 with subnet mask 255.255.255.0 into 16 subnets (4 bits), the new subnet mask becomes 255.255.255.240.

Number of Bits	Dot Decimal
1	128

Number of Bits	Dot Decimal
2	192
3	224
4	240
5	248
6	252
7	254
8	255

LAN-to-LAN Application

A typical LAN-to-LAN application is to use the Your IRT-1001 or IRT-1002 to call from a branch office to the headquarters, as depicted in the following diagram.



For the branch office, you need to configure a Remote Node in order to dial out to the headquarters. Additionally, you may also need to configure Static Routes if some services reside beyond the immediate remote LAN.

Remote Node Setup

Follow the procedure in the *Remote Node Configuration* chapter starting on page 43 to fill the protocol-independent parameters in Menu 11, Remote Node Profile. For the protocol-dependent parameters, follow the instructions below. If you are configuring the

router to receive an incoming call, you also need to set the default dial-in parameters in menu 13 (see the Dial-In Configuration chapter starting on page 53).

1. **Route**—Make sure IP is among the protocols in the Route field.
2. **IP Address**—Enter the IP address of the gateway at the remote site (in this case, headquarters). If the remote router is using a different IP address than the one entered here, your IRT-1001 or IRT-1002 will drop the call.
3. **Edit IP/IPX/Bridge**—Press the space bar to change it to Yes and press Enter to go to the Menu 11.3—Remote Node Network Layer Options menu shown below:

```
Menu 11.3 - Remote Node Network Layer Options

IP Options:
Rem IP Addr= 204.5.1.1
Rem Subnet Mask= 255.255.255.0
My WAN Addr= 0.0.0.0
Single User Account= No
Server IP Addr= N/A
Metric= 2
Private= No
RIP Direction= Both
Version= RIP-2B

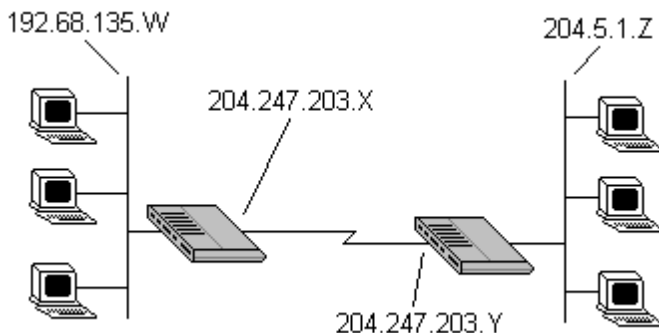
IPX Options:
Dial-On-Query= N/A
Rem LAN Net #= N/A
My WAN Net #= N/A
Hop Count= N/A
Tick Count= N/A
W/D Spoofing(min)= N/A
SAP/RIP Timeout(min)= N/A

Bridge Options:
Dial-On-Broadcast= N/A
Ethernet Addr Timeout(min)= N/A

Enter here to CONFIRM or ESC to CANCEL:
```

1. **Rem IP Address**—This will show the IP address you entered for this Remote Node in the previous menu.
2. **Rem IP Subnet Mask**—Enter the subnet mask for the remote network.
3. **My WAN Addr**—Some implementations, especially the UNIX derivatives, require hosts on both ends of the ISDN link to have separate addresses from the LAN, and that the addresses must have the same network number. If this is the case, enter the IP address assigned to the WAN port of your IRT-1001 or IRT-1002.

Note that this is the address assigned to the local Your IRT-1001 or IRT-1002, not the remote router.



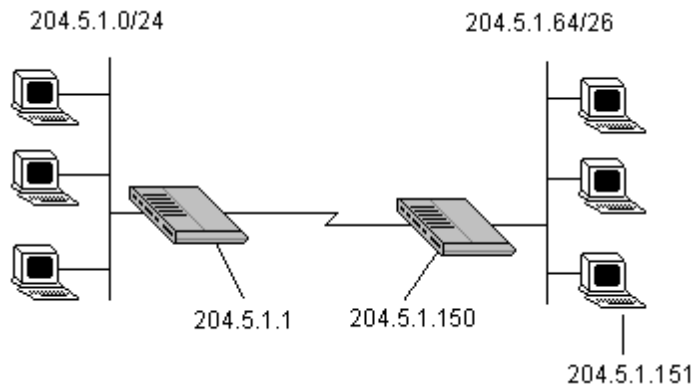
1. **Single User Account**—This field should be set to yes to enable the Single User Account (Network Address Translator) feature for this site. Use the space bar to toggle between yes and no. See page 39 for more information on the Single User Account feature.
2. **Server IP address**—If you are using the Single User Account feature and you want to make a server accessible on your LAN, e.g., a web server, accessible to outside users, enter that servers IP address here.
3. **Metric**—The metric represents the “cost” of transmission for routing purpose. IP routing uses hop count as the measurement of cost, with a minimum of 1 for directly connected networks. Enter a number that approximates the cost for this link. The number need not be precise, but it must be between 1 and 16. In practice, 2 or 3 is usually a good number.
4. **Private**—This parameter determines if your IRT-1001 or IRT-1002 will include the route to this Remote Node in its RIP broadcasts. If set to yes, this route is kept private and not included in RIP broadcasts. If no, the route to this Remote Node will be propagated to other hosts through RIP broadcasts.
5. **RIP**—This parameter determines how your IRT-1001 or IRT-1002 handles RIP (Routing Information Protocol), and the default is Both. If set to Both, your router will broadcast its routing table on

the WAN and incorporate RIP broadcasts from the other router into its routing table. If set to In Only, your router will not broadcast its routing table on the WAN; if set to Out Only, it will broadcast its routing table but ignore any RIP broadcast packets that it receives. If set to None, your IRT-1001 or IRT-1002 will not participate in any RIP exchange with other routers. Usually, you should leave this parameter at its default of Both and let RIP propagate the routing information automatically.

Once you have completed filling in the Network Layer Options Menu, press **ENTER** to return to Menu 11. Press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** at any time to cancel your selections.

Static Route Setup

On a directly connected to the Internet, RIP usually handles the routing automatically. However, RIP cannot propagate across isolated networks, as in the case before a connection is made between the two subnetworks using one Class C IP address. Without a route, no packets can be forwarded to their destinations. A static route is used to resolve this problem by providing the Your IRT-1001 or IRT-1002 with some static routing information. As a matter of fact, when you configure the Internet Access or a Remote Node, a static route is implicitly created. An example is given below. In the example, stations on the 204.5.1.0/24 subnetwork can access the remote stations using the static route. The route will have a destination of 204.5.1.64/26 with the gateway address being that of the Remote Node (204.5.1.150).



Note that in normal circumstances, your IRT-1001 or IRT-1002 will have adequate routing information after you configure it for Internet access and Remote Nodes; you do not need to configure additional static routes. You will need to configure static routes only for unusual cases, e.g., subnetting. To create additional static routes for IP, use Menu 12, Static Route Setup, as shown below:

```

Menu 12 - Static Route Setup

IP Static Route
1. RimNet (ISP)
2. ISDN2_1
3. _____
4. ISDN2_2

IPX Static Route
11. _____
12. _____
13. _____
14. _____

Bridge Static Route
21. _____
22. _____
23. _____
24. _____

Enter Menu Selection Number:

```

Menu 12.1 - Edit IP Static Route

```
Route #: 1
Route Name=
Active= No
Destination IP Address= ?
IP Subnet Mask= ?
Gateway IP Address= ?
Metric= 2
Private= No
```

Press ENTER to Confirm or ESC to Cancel:

1. **Route Name**—Enter a descriptive name for this route. This is for identification purpose only.
2. **Active**—This field allows you to activate/deactivate this static route.
3. **Destination IP Address**—This parameter specifies the IP *network* address of the final destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID.
4. **IP Subnet Mask**—Enter the subnet mask for this destination. Follow the discussion on IP subnet mask in this chapter.
5. **Gateway IP Address**—Enter the IP address of the gateway. The gateway is an *immediate* neighbor of the Your IRT-1001 or IRT-1002 that will forward packets to the destination. On the LAN, the gateway must be a router on the same segment as your IRT-1001 or IRT-1002; over ISDN, the gateway must be the IP address of one of the Remote Nodes.
6. The **Metric** and the **Private** parameters have the same meaning as those in the Remote Node Setup.

Once you have completed filling in the menu, press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** at any time to cancel your selections.

Novell IPX Configuration

This chapter shows you how to configure the IRT-1002 for IPX. Depending on your particular applications, you will need to configure different menus. We will illustrate the configuration for some applications in the following sections.

IPX Network Environment

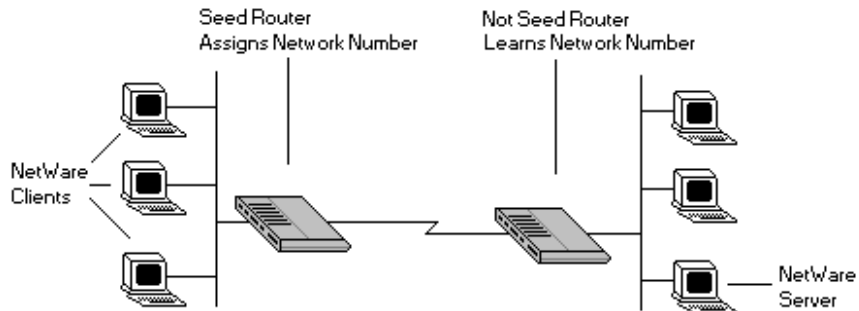
Frame Type

The stations on an IPX network (both clients and servers) can run on four different frame types existing on one physical Ethernet cable. These frame types are 802.2, 802.3, Ethernet II (DIX), and SNAP.

Network Numbers

Whenever you are setting up an IPX routing environment, it is important to correctly configure the network numbers on the LAN. On any IPX network, there is an external network number, that is, the number associated with the frame type on the Ethernet cable to which the stations on the network are joined. In addition to this external network number, each NetWare server has its own internal network number. It is important to remember that every network number has to be unique for that entire Internetwork. So if a server station has an internal network number of 00000011, there must be no other network number (internal or external) of 00000011 anywhere on the entire network.

There are two different scenarios in which you would connect your IRT-1002 to a LAN: one with a server (server side), and one without a server (client side).



IRT-1002 on LAN with Server

If the IRT-1002 will be connected to a LAN with an existing NetWare server, you will not need to configure the IRT-1002 as a seed router, and hence there will be no need for a network number parameter in the Ethernet Setup Menu for the IRT-1002. Rather, the IRT-1002 will learn the network number of the network it is attached to through the regular RIP broadcasts sent by the server, and it will add this route to its routing table.

IRT-1002 on LAN without Server

If the IRT-1002 is connected to a LAN without an existing NetWare server station, then it needs to create a unique external network number to apply to that frame on the LAN. This IRT-1002 must then be configured as a Seed Router, and the network number can be configured in the Ethernet Setup Menu. The network number must be unique and not used anywhere else on the entire Internetwork.

IPX Spoofing

The IRT-1002 comes with several pre-defined call filters designed to prevent certain IPX packets from triggering a call to a Remote Node.

These filters should inform your IRT-1002 which packets should be ignored as traffic.

When you are routing IPX packets, the default call filters are defined as follows:

- ◆ Block periodical SAP and RIP response messages.
- ◆ Block NetWare serialization packets.
- ◆ Allow SAP and RIP inquiry packets.

These call filters prevent the IRT-1002 from making a call to the Remote Node, thus preventing the expense of an unnecessary phone call.

IPX Ethernet Setup

The first step is to set up the IRT-1002 on the LAN. From menu 3, select option 3 to go to Menu 3.3—Novell IPX Ethernet Setup, shown below:

```
Menu 3.3 - Novell IPX Ethernet Setup
Seed Router= Yes
Frame Type 802.2= Yes
IPX Network #= 12345678
Frame Type 802.3= No
IPX Network #= N/A
Frame Type Ethernet II= No
IPX Network #= N/A
Frame Type SNAP= No
IPX Network #= N/A

Press ENTER to Confirm or ESC to Cancel:
```

1. **Seed Router**—Determine if the IRT-1002 is to act as a seed router. This value depends on the existing network. If there is a NetWare server providing the network number, select No. If there is no NetWare server providing the network number, select Yes.

2. Frame Type—For every frame type that the IRT-1002 needs to support, you need to set the corresponding field to Yes. The frame type(s) selected here must be the same frame type(s) as the server or client stations on that network. Otherwise, the devices will not be able to communicate. You can select one or more of these four frame types:

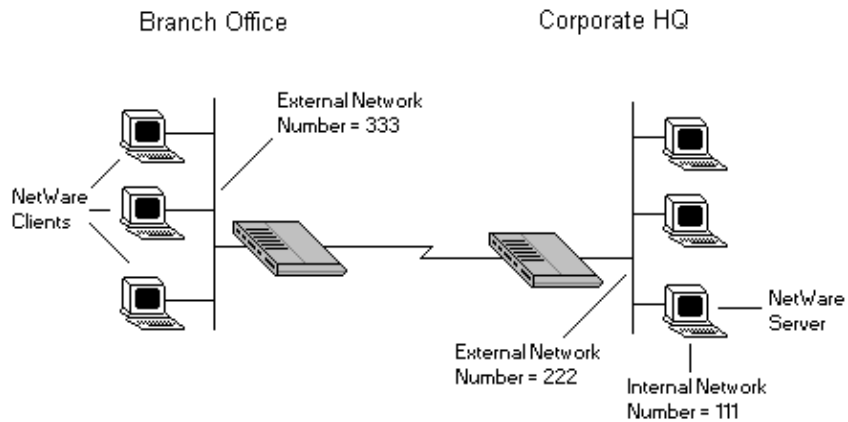
- ◇ 802.2
- ◇ 802.3
- ◇ Ethernet II
- ◇ SNAP

3. IPX Network #—If you selected the IRT-1002 to act as a seed router, you need to provide a unique network number to be associated with the network that the IRT-1002 has joined. Keep in mind that this number must not be used anywhere else on the entire Internetwork.

Once you have completed filling in the Menu 3.3, press **ENTER** at the save message to save your selections, or press **ESC** at any time to cancel your selections.

LAN-to-LAN Application

A typical LAN-to-LAN application is to use the IRT-1002 to call from a branch office to headquarters such that all of the stations on the branch office network have access to the server at the headquarters, as depicted in the following diagram:



For the branch office, you need to configure a Remote Node in order to dial out to headquarters.

Remote Node Setup

Follow the procedures in the *Remote Node Configuration* chapter starting on page 43 to fill the protocol-independent parameters in Menu 11, Remote Node Profile. For the protocol-dependent parameters, follow the ensuing instructions. If the IRT-1002 is configured to receive an incoming call, you can configure the default dial-in parameters in menu 13 (see the Dial-In Configuration chapter starting on page 53).

1. Route—Make sure IPX is among the protocols in the Route field.
2. Edit IP/IPX/Bridge—Press the space bar to change it to Yes and press Enter to go to the network layer options menu.

```

Menu 11.3 - Remote Node Network Layer Options

IP Options:
Rem IP Addr= 204.5.1.1
Rem Subnet Mask= 255.255.255.0
My WAN Addr= 0.0.0.0
Single User Account= No
Server IP Addr= N/A
Metric= 2
Private= No
RIP Direction= Both
Version= RIP-2B

IPX Options:
Dial-On-Query= N/A
Rem LAN Net #= N/A
My WAN Net #= N/A
Hop Count= N/A
Tick Count= N/A
W/D Spoofing(min)= N/A
SAP/RIP Timeout(min)= N/A

Bridge Options:
Dial-On-Broadcast= N/A
Ethernet Addr Timeout(min)= N/A

Enter here to CONFIRM or ESC to CANCEL:

```

1. **Dial-On-Query**—This field is necessary for the IRT-1002 on the client side LAN. When set to Yes, any Get Service SAP or RIP broadcasts coming from the LAN will trigger the IRT-1002 to make a call to that Remote Node. If it is set to No, the IRT-1002 will not make the outgoing call.
2. **Rem LAN Net #**—In this field, enter the internal network number of the NetWare server on the remote side LAN. The router will create a route to access this server.
3. **My WAN Net #**—In this field, you can enter in the WAN network number of the device that you are connecting to. This number will be used for negotiation between the router and the remote device. If you leave this field as 00000000, the router will select the greater WAN network number between the two devices.
4. **Hop Count**—This field indicates the number of intermediate networks that must be passed through to reach the Remote Node. The default is one (1).
5. **Tick Count**—This field indicates the time-ticks required to reach the Remote Node. The default is two (2).
6. **W/D Spoofing (min)**—This field is used for the router when it is on the server side LAN. The router can spoof a response to a server's watchdog request after the connection is dropped. In this

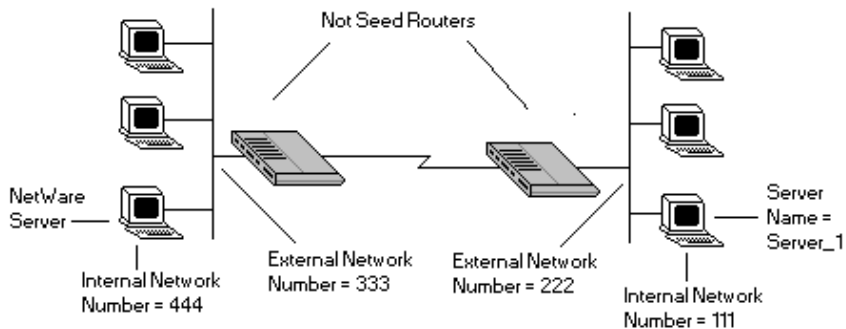
field, enter in the time (number of minutes) that you want the router to spoof the watchdog response.

- 7. SAP/RIP Timeout (min)**—This field indicates the amount of time that you want the router to maintain the SAP and RIP entries learned from this Remote Node in its internal tables after the connection has been dropped. If this information is retained, then the router will not have to get the SAP information when the line is brought back up. Enter the time (number of minutes) in this field.

Once you have completed filling in the Network Layer Options Menu, press **ENTER** to return to Menu 11.1. Press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** at any time to cancel your selections.

Static Route Setup

If your LAN-to-LAN application has NetWare servers on both sides of the link, then all NetWare client stations will have access to a server on their LAN as shown below:



This may present a problem if you desire your client station to access a server at a remote site. For example, in the above diagram, suppose that a client station on the network on the left wishes to access the NetWare server on the right (internal network number = 111). However, the SAP broadcasts will receive a response from the server on the left

(internal network number = 444). A static route is used to resolve this problem by providing the router with some static routing information to access the remote server.

From Menu 12, select one of the four possible IPX Static Routes as shown below:

```
Menu 12.2 - Edit IPX Static Route

Route #= 11
Server Name= Server_1
Active= Yes
Network #= 00000222
Node #= 000000000001
Socket #= 0451
Type #= 0004
Hop Count= 2
Tick Count= 3
Gateway Node= 1

Press ENTER to Confirm or ESC to Cancel:
```

1. **Server Name**—In this field, enter in the name that has been configured for the server. This name must be the *exact* name configured in the NetWare server.
2. **Network #**—This field contains the internal network number of the remote server which you wish to access. Do not use 00000000 or FFFFFFFF for this field.
3. **Node #**—This field contains the address of the node on which the server resides. If you are using a Novell IPX implementation, this value is 000000000001.
4. **Socket #**—This field contains the socket number on which the server will receive service requests. The default for this field is hex 0451.
5. **Type #**—This field identifies the type of service the server provides. The default for this field is hex 0004.

6. Gateway Node—In this field, enter the number (1-4) of the Remote Node that is linked to this static route. That is, the Remote Node that you wish to route the packet to.

The Hop Count and Tick Count fields have the same meaning as those in the Remote Node Setup.

Once you have completed filling in the menu, press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** at any time to cancel your selections.

This Page was deliberately left blank.

Bridging Configuration

This chapter shows you how to configure the Bridging options for the IRT-1002. Depending on your particular applications, you will need to configure different menus. We will illustrate the configuration for some applications in the following sections.

IPX Spoofing

The IRT-1002 comes with several pre-defined call filters designed to prevent certain IPX packets from triggering a call to a Remote Node. These filters should inform your IRT-1002 which packets should be ignored as traffic.

When you are bridging IPX packets, the default call filters are defined as follows:

- ◆ Block periodical SAP and RIP response messages.
- ◆ Block SAP and RIP inquiry packets if set to Handle IPX as Server.
- ◆ Allow SAP and RIP inquiry packets if set to Handle IPX as Client or None.

These call filters prevent the IRT-1002 from making a call to the Remote Node, thus preventing the expense of an unnecessary phone call.

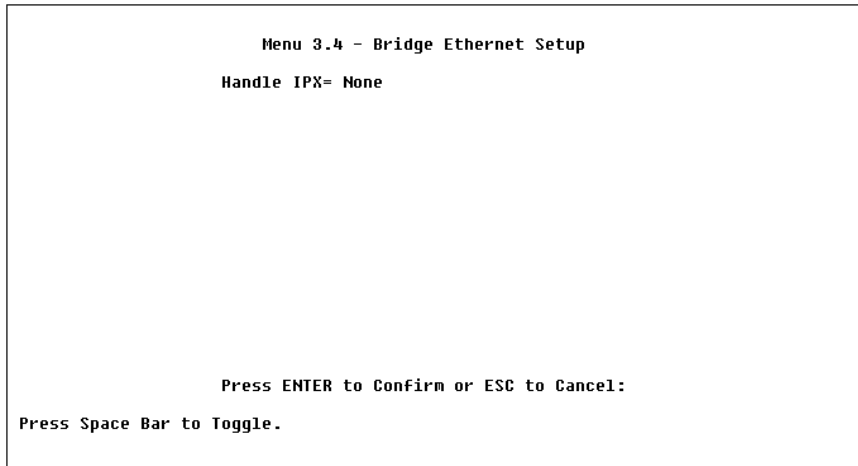
Bridge Ethernet Setup

Bridging is used to forward packets of unsupported protocols whose destination is not on the local Ethernet to the WAN.

Basically, all non-local packets are bridged to the WAN; however, the IRT-1002 applies special handling for certain IPX packets to reduce the number of calls, depending on the setting of the “Handle IPX” field.

- ◆ If this field is set to **None**, nothing is done to IPX traffic.
- ◆ If it is set to **Client**, all RIP and SAP (Service Advertising Protocol) periodical response packets will not trigger the call.
- ◆ If it is set to **Server**, no RIP or SAP packets will trigger the call. In addition, during the time when the ISDN line is down, the IRT-1002 will reply to the server’s watchdog messages on behalf of remote clients. The period of time that the IRT-1002 will do this is linked to the *Ethernet Address Timeout* parameter in each Remote Node (see the *Remote Node Configuration* chapter starting on page 43). When a remote Ethernet address is aged out, there is no need to maintain its connection to the IPX server.

From Menu 3—Ethernet Setup, enter “4” to go to Menu 3.4—Bridge Ethernet Setup shown below:



- ◆ **Handle IPX**—Set this parameter to None if there is no IPX traffic on the LAN or if you do not want to apply any special handling for IPX. Set it to Client if there are only client workstations on the LAN. Set to Server if there are only IPX servers on the LAN.

If there are both clients and servers on the LAN, then the setting depends on if the local clients will access the remote servers. If they do, set to **Client** and set Dial-On-Broadcast in menu 11.2 to **Yes** to allow the client queries to trigger the call. If they do not, set it to **Server**.

When you are finished, press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** at any time to cancel them.

LAN-to-LAN Application

A typical LAN-to-LAN application is to use the IRT-1002 to call from one office to another office such that stations on one network have access to stations on the remote side and vice versa. You will need to configure a Remote Node in order to dial out to another office.

Remote Node Setup

Follow the procedure in the *Remote Node Configuration* chapter starting on page 43 to fill the protocol-independent parameters in Menu 11, Remote Node Profile. For the protocol-dependent parameters, follow the ensuing instructions:

1. **Bridge**—Make sure this field is set to Yes.
2. **Edit IP/IPX/Bridge**—Press the space bar to change it to Yes and press Enter to go to the network layer options menu as seen below:

```

Menu 11.3 - Remote Node Network Layer Options

IP Options:
Rem IP Addr= 204.5.1.1
Rem Subnet Mask= 255.255.255.0
My WAN Addr= 0.0.0.0
Single User Account= No
Server IP Addr= N/A
Metric= 2
Private= No
RIP Direction= Both
Version= RIP-2B

IPX Options:
Dial-On-Query= N/A
Rem LAN Net #= N/A
My WAN Net #= N/A
Hop Count= N/A
Tick Count= N/A
W/D Spoofing(min)= N/A
SAP/RIP Timeout(min)= N/A

Bridge Options:
Dial-On-Broadcast= N/A
Ethernet Addr Timeout(min)= N/A

Enter here to CONFIRM or ESC to CANCEL:

```

1. **Dial-On-Broadcast**—This field is necessary for the IRT-1002 on the caller side LAN. When set to Yes, any broadcasts coming from the LAN will trigger the IRT-1002 to make a call to that Remote Node. If it is set to No, the IRT-1002 will not make the outgoing call.
2. **Ethernet Addr Timeout (min)**—In this field, enter the time (number of minutes) that you wish the IRT-1002 to retain the Ethernet Addr information in its internal tables while the line is down. If this information is retained, the IRT-1002 will not have to re-negotiate the protocol and recompile the tables when the line is brought back up.

Once you have completed filling in the Network Layer Options Menu, press **ENTER** to return to Menu 11. Press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** at any time to cancel your selections.

Default Dial-In Setup for Bridge

There is only one parameter you need to fill out for Bridging applications.

- ◆ **PPP Options: Recv. Authen.**—verify that this field is *not* set to None. Bridging applications must have some sort of authentication turned on in order to match to a Remote Node.

Once you have completed filling in the menu, press ENTER at the message 'Press **ENTER** to Confirm...' to save your selections, or press **ESC** at any time to cancel your selections.

Bridge Static Route Setup

You can configure Bridge static routes for your Bridging applications.

```
Menu 12.3 - Edit Bridge Static Route

Route #: 21
Route Name=
Active= No
Ether Address= ?
IP Address=
Gateway Node= 1

Press ENTER to Confirm or ESC to Cancel:
```

1. **Route Name**—For identification purposes enter a name for the bridge static route.
2. **Active**—Indicates whether the static route is active or not.
3. **Ether Address** -Enter the MAC address of the destination device that you wish to bridge your packets to.
4. **IP Address**—If available, enter the IP address of the destination device that you wish to bridge your packets to.

5. Gateway Node—Enter the number (1-4) of the Remote Node that is linked to this static route. When an incoming packet's destination Ether (MAC) address matches the value entered above, then it will trigger a call to this Remote Node.

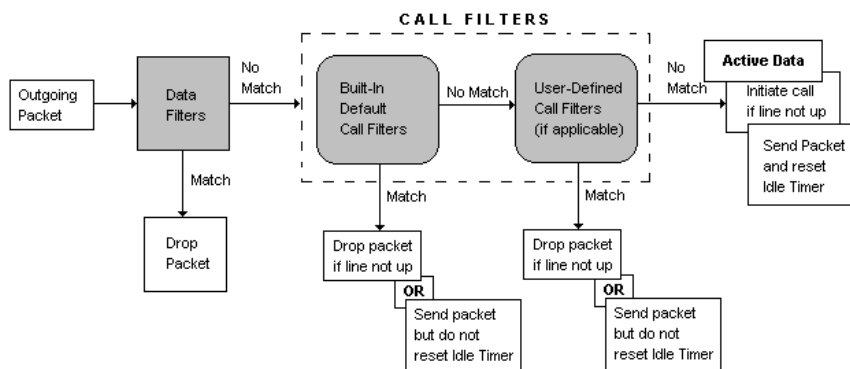
Once you have completed filling in the menu, press **ENTER** at the message 'Press ENTER to Confirm...' to save your selections, or press **ESC** at any time to cancel your selections.

Filter Configuration

About Filtering

Your IRT-1001 or IRT-1002 uses filters to decide whether or not to allow passage of a data packet and/or to make a call over the ISDN line. There are three types of filters involved: incoming data filters, outgoing data filters, and call filters. Data filters screen the data to determine if the packet should be allowed to pass. Call filters are used to determine if a call should be placed.

Outgoing packets must pass through the data filters before they encounter the call filters. Call filters are divided into two groups: default call filters and user-defined call filters. The router has default call filters that filter out administrative packets, e.g., RIP and SAP packets. The router applies the default filters first, and then the user-defined call filters if applicable, as shown below:



For incoming packets, your IRT-1001 or IRT-1002 applies data filters only. Packets are processed depending upon whether a match is made.

The router allows you to customize the filter sets that you wish to use. The following sections describe how to configure the router's filter sets.

IRT-1000's Filter Structure

You can configure up to twelve filter sets with six rules in each set. Therefore, your IRT-1001 or IRT-1002 allows you to customize up to 72 filter rules (12 × 6).

When implementing these filter sets, you can link up to four of the filter sets together to screen the data packet. Therefore, with each filter set having up to six rules, you can have a maximum of 24 rules active for a single filtering application.

Configuring a Filter Set

In order to distinguish between the 12 filter sets, each filter set should have a name or some comments. You can edit these comments in the following way.

1. From the Main Menu, select option 21. This will take you to Menu 21—Filter Set Configuration.
2. This menu lets you choose from twelve filter sets. Select the filter set you wish to configure (1-12).

This will take you to the **Edit Comments** field. You can edit the comments you wish to use to identify that filter set. The comments for any given filter set can contain up to 15 characters.

Once you have completed filling in **Edit Comments** field, press **ENTER** at the message 'Press ENTER to Confirm...' to confirm your selections, or press **ESC** at any time to cancel your selections. The new information will now be displayed in the read-only section of Menu 21—Filter Set Configuration as shown below:

Menu 21 - Filter Set Configuration			
Filter Set #	Comments	Filter Set #	Comments
1	Filter Set #1	7	_____
2	Filter Set #2	8	_____
3	_____	9	_____
4	_____	10	_____
5	_____	11	_____
6	_____	12	_____

Enter Filter Set Number to Configure= 0
 Edit Comments=
 Press ENTER to Confirm or ESC to Cancel:

After you press ENTER, you will be taken to Menu—21.1—Filter Rules Summary as seen below. The information displayed in this menu is read-only. From here, you can examine the parameters of each rule that you have configured for that set. Following are brief descriptions of the column headings in this menu.

- ◆ **#**—Refers to the filter rule number (1-6).
- ◆ **A**—Refers to Active. **Y** means the filter rule is active and **N** means the filter rule is inactive.
- ◆ **Type**—Refers to the type of filter rule. This can display GEN for generic, IP for TCP/IP, or IPX for Novell IPX.
- ◆ **Filter Rules**—The filter rule parameters will be displayed here (see below).
- ◆ **M**—Refers to More. **Y** means there are more rules to check, **N** means there aren't.
- ◆ **m**—Refers to Action Matched. **F** means to forward the packet, **D** means to drop the packet, and **N** means check the next rule. The Action Matched control has no effect when the More control (see preceding) is set to **Y**.

- ◆ **n**—Refers to Action Not Matched. **F** means to forward the packet, **D** means to drop the packet, and **N** means check the next rule. The Action Not Matched control has no effect when the More control is set to **Y**.

Menu 21.1 - Filter Rules Summary							
#	A	Type	Filter Rules			M	n
1	Y	IP	Pr=17, SA=204.247.203.2, SP=520, DA=192.68.135.1			N	F D
2	Y	Gen	Off=4, Len=2, Mask=ffff, Value=0802			N	D N
3	Y	IPX	Pr=ad, SS<2222, DS!=1111			N	F N
4	Y	APT	DT=244, DN=[32-64], DS!=200, SN=[100-450], SS>100			N	D F
5	N						
6	N						

Enter Filter Rule Number (1-6) to Configure: _

If the filter type is IP (TCP/IP), the following abbreviations will be used:

- ◆ **Pr**—Protocol.
- ◆ **SA**—Source Address.
- ◆ **SP**—Source Port number.
- ◆ **DA**—Destination Address.
- ◆ **DP**—Destination Port number.

If the filter type is GEN (generic), the following abbreviations will be used:

- ◆ **Off**—Offset.
- ◆ **Len**—Length.

If the filter type is IPX (Novell IPX), the following abbreviations will be used:

- ◇ **PT**—IPX Packet Type.
- ◇ **SS**—Source Socket.
- ◇ **DS**—Destination Socket.

For more information on configuring the filter rule parameters, refer to the next section.

To configure a specific filter rule, simply select the number of the filter rule (1-6) you wish to configure and press ENTER. This will take you to Menu 21.1.1—TCP/IP Filter Rule (next section).

Configuring a Filter Rule

There are four types of filter rules that you can configure. Some of the parameters will differ depending on the type of rule. When you first enter the filter rule menu, you will be presented with Menu 21.1.1—TCP/IP Filter Rule. If you wish to configure another type of filter rule, you need to select the appropriate type (by pressing SPACE bar) under the **Filter Type** field and press ENTER. This will bring you to the corresponding menu.

TCP/IP Filter Rule

This section will show you how to configure a TCP/IP filter rule for your router. The fields in the menu are indicated in **bold** type.

```
Menu 21.1.1 - TCP/IP Filter Rule

Filter #: 1,1
Filter Type= ICP/IP Filter Rule
Active= Yes
IP Protocol= 17      IP Source Route= No
Destination: IP Addr= 192.68.135.1
              IP Mask= 255.255.255.255
              Port # = 520
              Port # Comp= None
Source:       IP Addr= 204.247.203.2
              IP Mask= 255.255.255.255
              Port # = 520
              Port # Comp= Equal

TCP Estab= N/A
More= No      Log= None
Action Matched= Forward
Action Not Matched= Drop

Press ENTER to Confirm or ESC to Cancel:
Press Space Bar to Toggle.
```

- 1. Active**—In this field, you can make the filter rule active or inactive. There are two options:
 - ◇ Yes.
 - ◇ No.
- 2. IP Protocol**—Protocol refers to the IP specific number of the protocol. The range for this value should be between 0 and 255. For example, 6 refers to the TCP protocol.
- 3. IP Source Route**—Determine, Yes or No, whether to check the source route.
- 4. Destination: IP Addr**—In this field, enter the destination IP Address of the packet you wish to filter. The address is usually written in dotted decimal notation such as a.b.c.d where a, b, c, and d are numbers between 0 and 255.
- 5. Destination: IP Mask**—In this field, enter the IP mask that will be used to mask the bits of the IP Address given in **Destination: IP Addr**.
- 6. Destination: Port #**—Enter the destination port of the packets that you wish to filter. The range of this field is 0 to 65535.

- 7. Destination: Port # Comp**—In this field, you can select what comparison quantifier you wish to enable to compare to the value given in **Destination: Port #**. There are five options for this field:
- ◇ None.
 - ◇ Less.
 - ◇ Greater.
 - ◇ Equal.
 - ◇ Not Equal.
- 8. Source: IP Addr**—In this field, enter the source IP Address of the packet you wish to filter. The address is usually written in dotted decimal notation such as a.b.c.d where a, b, c, and d are numbers between 0 and 255.
- 9. Source: IP Mask**—In this field, enter the IP mask that will be used to mask the bits of the IP Address given in **Source: IP Addr**.
- 10. Source: Port #**—Enter the source port of the packets that you wish to filter. The range of this field is 0 to 65535.
- 11. Source: Port # Comp**—In this field, you can select what comparison quantifier you wish to use to compare to the value given in **Source: Port #**. There are five options for this field:
- ◇ None.
 - ◇ Less.
 - ◇ Greater.
 - ◇ Equal.
 - ◇ Not Equal.
- 12. TCP Estab**—This field is dependent upon the IP Protocol field. This field will be inactive (N/A) unless the value in that field is 6 (TCP protocol). In this field you specify what type of TCP packets will be filtered. There are two options:
- ◇ Yes—filter match only established TCP connections.

- ◇ No—filter match both initial and established TCP connections.

13.More—In this field, you can determine if you want to pass the packet through the next filter rule before an action is taken. There are two options for this field:

- ◇ Yes.
- ◇ No.

If More is Yes, then Action Matched and Action Not Matched will be N/A.

14.Log—In this field, you can determine if you wish to log the results of packets attempting to pass the filter rule. These results will be displayed on the System Log (see the *Log and Trace* section on page 115). There are 4 options for this field:

- ◇ None—No packets will be logged.
- ◇ Action Matched—Only packets that match the rule parameters will be logged.
- ◇ Action Not Matched—Only packets that do not match the rule parameters will be logged.
- ◇ Both—All packets will be logged.

15.Action Matched—If the conditions for the filter rule are met, you can specify what to do with the packet. There are three options for this field:

- ◇ Check Next Rule.
- ◇ Forward.
- ◇ Drop.

16.Action Not Matched—If the conditions for the filter rule are not met, you can specify what to do with the packet. There are three options for this field:

- ◇ Check Next Rule.
- ◇ Forward.
- ◇ Drop.

Once you have completed filling in Menu 21.1.1—TCP/IP Filter Rule, press **ENTER** at the message 'Press ENTER to Confirm...' to confirm your selections, or press **ESC** at any time to cancel your selections. This data will now be displayed on Menu 21.1—Filter Rules Summary.

Generic Filter Rule

This section will show you how to configure the protocol-independent parameters for a Generic filter rule for your IRT-1001 or IRT-1002. For information on the protocol-dependent fields, refer to the previous section, TCP/IP Filter Rule and the following section, Novell IPX Filter Rule. The fields in the menu are indicated in **bold** type.

```
Menu 21.1.2 - Generic Filter Rule
Filter #: 1,2
Filter Type= Generic Filter Rule
Active= Yes
Offset= 4
Length= 2
Mask= ffff
Value= 0802
More= No           Log= None
Action Matched= Drop
Action Not Matched= Check Next Rule

Press ENTER to Confirm or ESC to Cancel:
Press Space Bar to Toggle.
```

1. **Offset**—Offset refers to the value of the byte that you want to use as your starting offset. That is, in the data packet, at what point do you want to begin the comparison. The range for this field is from 0 to 255. *Default = 0*
2. **Length**—This field refers to the length (in bytes) of the data in the packet that the router should use for comparison and masking. The starting point of this data is determined by **Offset**. The range for this field is 0 to 8. *Default = 0*

3. **Mask**—In this field, specify (in Hexadecimal) the value that the router should logical-AND with the data in the packet. The mask must have the number of bytes indicated in the **Length** field. For example, if **Length** is 4, one possible **Mask** setting would be 1155ABF8.
4. **Value**—In this field, specify (in Hexadecimal) the value that the router should use to compare with the masked packet. The value should align with **Offset**, and must have the number of bytes indicated in the **Length** field. For example, if **Length** is 4, one possible **Value** setting would be 1155ABF8. If the result from the masked packet matches **Value**, then the packet is considered matched.
5. **Action Matched**—If the conditions for the filter rule are met, you can specify what to do with the packet. There are three options for this field:
 - ◇ Check Next Rule.
 - ◇ Forward.
 - ◇ Drop.
6. **Action Not Matched**—If the conditions for the filter rule are not met, you can specify what to do with the packet. There are three options for this field:
 - ◇ Check Next Rule.
 - ◇ Forward.
 - ◇ Drop.

Once you have completed filling in Menu 21.1.1—Generic Filter Rule, press **ENTER** at the message ‘Press ENTER to Confirm...’ to confirm your selections, or press **ESC** at any time to cancel your selections. This data will now be displayed on Menu 21.1—Filter Rules Summary.

Novell IPX Filter Rule

This section will show you how to configure the protocol-dependent parameters for an IPX filter. The fields in the menu are displayed in **bold** type.

```
Menu 21.1.3 - IPX Filter Rule
Filter #: 1,3
Filter Type= IPX Filter Rule
Active= Yes
IPX Packet Type= ad
Destination: Network #= 12345678
              Node #= abcdef123456
              Socket #= 1111
              Socket # Comp= Not Equal
Source: Network #= 87654321
         Node #= 654321fedcba
         Socket #= 2222
         Socket # Comp= Less
Operation= N/A
More= No           Log= None
Action Matched= Forward
Action Not Matched= Check Next Rule
Press ENTER to Confirm or ESC to Cancel:
Press Space Bar to Toggle.
```

1. **IPX Packet Type**—Enter the IPX packet type value of the packet you wish to filter. This setting should be a one-byte value, expressed in hexadecimal..
2. **Destination/Source Network #**—Enter the four hex-byte destination/source network numbers of the packet that you wish to filter.
3. **Destination/Source Node #**—Enter in the six hex-byte value for the destination/source node number of the packet you wish to filter.
4. **Destination/Source Socket #**—Enter the destination/source socket number of the packets that you wish to filter. This should be a 4-byte hex value.
5. **Destination/Source Socket # Comp**—You can select what comparison quantifier you wish to use to compare to the value given in Destination Socket # and Source Socket #.

6. Operation—This field is only active if one of the Socket # fields is 0452 or 0453 indicating SAP and RIP packets. There are seven options for this field which determines the operation for the IPX packet.

- ◇ None.
- ◇ RIP Request.
- ◇ RIP Response.
- ◇ SAP Request.
- ◇ SAP Response.
- ◇ SAP Get Nearest Server Request.
- ◇ SAP Get Nearest Server Response.

The **More**, **Log**, **Action Matched**, and **Action Not Matched** controls work as described in the preceding sections.

Once you have completed filling in Menu 21.1.3—IPX Filter Rule, press **ENTER** at the message 'Press ENTER to Confirm...' to confirm your selections, or press **ESC** at any time to cancel your selections. This data will now be displayed on Menu 21.1—Filter Rules Summary.



SNMP

About SNMP

The Simple Network Management Protocol (SNMP) is a protocol governing network management and the monitoring of network devices and their functions. The IRT-1002 supports the use of SNMP to regulate communication between management stations and agent stations on a network. Basically, the IRT-1002, when connected to the LAN, acts as an agent station. In this way, a management station on your LAN can monitor the IRT-1002 as it would another station on the network. Keep in mind that SNMP is only available if TCP/IP is configured on your IRT-1002.

Configuring Your IRT-1002 For SNMP Support

Following is a description of how to configure the IRT-1002ST for SNMP management.

```
Menu 22 - SNMP Configuration

SNMP:
Get Community= public
Set Community= netman
Trusted Host= 204.247.203.142
Trap:
Community= public
Destination= 0.0.0.0

Press ENTER to Confirm or ESC to Cancel:
```

1. From the Main Menu, select option 22. SNMP Configuration. This will bring you to Figure 12.1 Menu 22—SNMP Configuration.
2. You will then be prompted to enter the following information. Steps 3 -7 will describe the specific parameters involved in the configuration. The parameters you will have to fill in will be indicated in **bold** type.
3. **Get Community**—From this field, you can determine what the Get Community is for your IRT-1002. The value entered into this field will be used to authenticate the community field for incoming Get- and GetNext- requests from the management station. The default is public.
4. **Set Community**—In this field, enter the Set Community for your IRT-1002. The value entered in this field will be used to authenticate the community field for incoming Set- requests from the management station. The default is public.
5. **Trusted Host**—Enter the IP address of the Trusted Host SNMP management station. If this field is configured, the IRT-1002 will only respond to SNMP messages coming from this address. If you leave the field blank (default), the IRT-1002 will respond to all SNMP messages it receives, regardless of origin.

6. **Trap: Community**—In this field, enter the community name that is sent with each trap to the SNMP manager. This should be treated like a password and must match what the SNMP manager is expecting. The default is public.
7. **Trap: Destination**—This field contains the IP address of the station that you wish to send your SNMP traps to.

Once you have completed filling in Menu 22—SNMP Configuration, press **ENTER** to confirm your selections or press **ESC** to cancel your selections.

If you are unsure how to configure the fields for the SNMP configuration, consult your network administrator.

This Page was deliberately left blank.

System Security

Your IRT-1001 or IRT-1002 incorporates a number of security measures to prevent unauthorized access to your network. For example, it supports both PAP (Password Authentication Protocol) and CHAP (Challenge Handshake Authentication Protocol) for authenticating a Remote Node. More information on CHAP and PAP can be found in the Dial-In Configuration chapter starting on page 53.

By default, the router can store information about up to eight different users. If more dial-up users are necessary, an external RADIUS (Remote Authentication Dial In User Service) server can be used to provide centralized user security.

In addition, the IRT-1001 and IRT-1002 implement a user password to get into the SMT screen. You will have three attempts to enter the correct system password. If you do not do so, the SMT will kick you out. In addition, the router will support only one user in the SMT at one time.

Configuring the SMT Password

```
Menu 23.1 - System Security - Change Password
Old Password= ?
New Password= ?
Retype to confirm= ?

Enter here to CONFIRM or ESC to CANCEL:
```

The following steps describe a simple setup procedure for configuring the SMT password.

1. From the Main Menu, select option 23. System Security. This will bring you to Menu 23 - System Security.
2. From this menu, you can select option 1. Change Password. This will bring you to Menu 23.1—System Security—Change Password.
3. Type in your previous system password and press **ENTER**.
4. Type in your new system password and press **ENTER**.
5. Re-type your new system password for confirmation purposes and press **ENTER**.

You will now need to enter in this password when you try to get into the SMT. In addition, this password will also be used when a network administrator attempts to telnet to the router.

Using RADIUS Authentication

In addition to the IRT-1002's built-in dial-up user list, which can hold up to eight users, this model also supports an external authentication server which may provide password storage and usage accounting for thousands of users.

Installing a RADIUS Server

To use RADIUS authentication, you will need to have a UNIX-based machine on your network to act as a `radiusd` server, as well as a copy of the `radiusd` server program itself. You can obtain a copy of the RADIUS software, along with documentation for the server, at

<http://www.livingston.com/Tech/FTP/pub/le-radius.shtml>

or at

<ftp://ftp.livingston.com/pub/le/radius/>

Follow the included instructions to install the server on your UNIX-based server.

Once you have installed the server, you will need to edit the dictionary file in the RADIUS configuration directory (which will usually be `/etc/raddb`). Using any text editor, add the following lines to the dictionary file:

```
# PLANET proprietary attributes
ATTRIBUTE PLANET-Callback-Option 192 integer
VALUE     PLANET-Callback-Option  None      0
VALUE     PLANET-Callback-Option  Optional  1
VALUE     PLANET-Callback-Option  Mandatory 2

# Callback phone number source
ATTRIBUTE PLANET-Callback-Phone-Source 193 integer
VALUE     PLANET-Callback-Phone-Source Preconfigured 0
VALUE     PLANET-Callback-Phone-Source User           1
```

These changes allow the RADIUS server to be used with PLANET CLID authentication, as described in the section below.

Configuring the IRT-1002 for RADIUS Authentication

To configure the IRT-1002 to use the RADIUS server set up in the previous section, select option 23, System Security, from the main menu. This will bring you to Menu 23—System Security. Then from this menu, select option 2, External Server. This will bring you to Menu 23.2—System Security—External Server.

```
Menu 23.2 - System Security - External Server

Authentication Server:
Active= Yes
Type: RADIUS
Server Address= 192.68.135.1
Port #= 1645
Key= ?

Press ENTER to Confirm or ESC to Cancel:
```

The fields in the System Security - External Server menu are as follows:

1. **Active**—Determines whether the external security facility is enabled. If this field contains No, only the built-in dial-up user list will be used. If this field contains Yes, the built-in dial-up user list will be searched first, then the external authentication server.
2. **Type**—Determines the type of the external authentication server. At present only the RADIUS type is supported.
3. **Server Address**—The IP address of your network's UNIX-based RADIUS server.

4. **Port #**—The IP port address used by the authentication server. The default value of 1645 should be used.
5. **Key**—A “password” used to identify the IRT-1002 as a valid client of the RADIUS authentication service.

The Key password should be stored in the `client` file in the RADIUS server's `/etc/raddb` directory. Lines of the form

```
# Client Name          Key
#-----
192.168.0.1           1234
```

should be added to the `client` file. The Client Name field in the file gives the IP address of the IRT-1002, and the Key field should be the same as the Key field in Menu 23.2.

After a RADIUS server has been configured, the IRT-1002 will use it to authenticate all users that it can't find in its internal Dial-Up User List (Menu 14).

Adding Users to the RADIUS Database

The IRT-1002 only uses the RADIUS database for user authentication; except for `Password`, `Dialback-No`, and the PLANET extensions `PLANET-Callback-Option` and `PLANET-Callback-Phone-Source` (described below), most standard RADIUS attribute fields are ignored by the IRT-1002.

To add a user to the RADIUS database, edit the `users` file in the RADIUS server's `/etc/raddb` directory, and add a line similar to the following:

```
joeuser          Password = "joepassword"
```

Each user should have a user name/password record in the `users` database.

Using RADIUS Authentication for CLID

To use RADIUS for CLID authentication, create a user record in the `users` file, where the user name (the first field) is the telephone number, and the password (the second field) is always `PLANET-CLID` (case-sensitive). The regular user name is put in a `User-Name` field. The following is an example of a CLID user record:

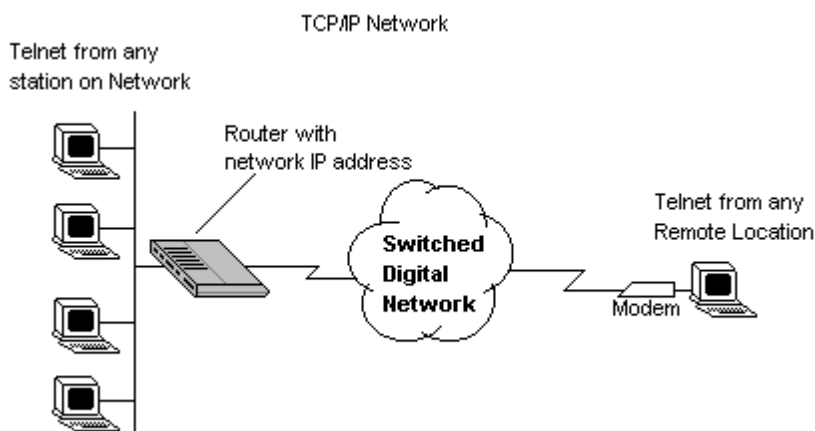
```
5551212 Password = "PLANET-CLID"  
      User-Name = "joeuser",  
      PLANET-Callback-Option = Mandatory,  
      PLANET-Callback-Phone-Source = Preconfigured  
      Dialback-No = "5551212"
```

Note that if CLID is turned off in the IRT-1002ST, you still need to have a separate user record for `joeuser` so the regular user name/password mechanism still works.

Telnet Configuration and Capabilities

About Telnet Configuration

When you first configure your IRT-1001 or IRT-1002, it must be done via a computer connected to the RS-232 port. However, once the router has been initially configured, you can use `telnet` to configure it remotely as shown below:



In order to configure your IRT-1001 or IRT-1002 in this way, you must first assign it an IP Address and connect it to your network. See the Configuring for Internet Access chapter starting on page 35 for more information on assigning an IP Address. Once this is configured, any station on the LAN or remote network that has TCP/IP installed can use `telnet` remote management. If your IRT-1002 is configured for IPX routing but not IP in menu 1, `telnet` will still be available provided you assign the router an IP address.

Telnet Capabilities

Single Administrator

To prevent confusion and discrepancy on the configuration, your IRT-1001 or IRT-1002 will allow only one terminal connection at any time. The router also gives priority to the RS-232 connection over `telnet`. If you have already connected to the router via `telnet`, you will be logged out if another user is connecting to it via the RS-232 cable. Only after the other administrator has been disconnected will you be able to `telnet` to the router again.

System Timeout

When you are connected to your IRT-1001 or IRT-1002 via `telnet`, there is a system timeout of 5 minutes (300 seconds). If you are not configuring the device and leave it inactive for this timeout period, the router will automatically disconnect you.

System Maintenance

Your IRT-1001 or IRT-1002 provides diagnostic tools that you can use to maintain your device. Some of these tools include updates on system status, ISDN B channel status, log and trace capabilities and upgrades to the system software. This chapter will describe how to use these tools in greater detail.

System Status

System Status is a tool that can be used to monitor your IRT-1001 or IRT-1002. Specifically, it will give you information on the status of your system software version, ISDN telephone line, number of packets sent and number of packets received.

```
Menu 24 - System Maintenance
1. System Status
2. Terminal Baud Rate
3. Log and Trace
4. Diagnostic
5. Backup Configuration
6. Restore Configuration
7. Software Update
8. Command Interpreter Mode
9. Call Control

Enter Menu Selection Number: _
```

```

Menu 24.1 -- System Maintenance - Status

CHAN  Link      Type      TXPkt      RXPkt      Error  CLU  ALU  Up Time
 1    Down      0Kbps      0           0           0     0%  0%  0:00:00
 2    Down      0Kbps      0           0           0     0%  0%  0:00:00

Total Outcall Time:      0:00:00

Ethernet (U 1.0)          Name:
Status: 100M/Full Duplex RAS S/W Version: U1.4x(C.01) | 9/18/97
TX Pkt: 2                ISDN F/W Version: U 066
RX Pkt: 59510            Ethernet Address: 00:80:c8:00:03:01
Collision: 0              Country Code: 66

LAN Packet Which Triggered Last Call:

Press Command:

COMMANDS: 1-Drop Ch1  2-Drop Ch2  3-Reset Counters  4-Drop All  ESC-Exit

```

1. To get to the System Status display, select option 24. System Maintenance. This will bring you to Menu 24 - System Maintenance.
2. From this menu, select option 1. System Status.
3. There are four (4) possible commands in Menu 24.1 - System Maintenance—Status. Entering **1** will disconnect the current channel 1 call; **2** will disconnect the current channel 2 call; **3** will reset the counters; **4** will disconnect channel 1 and channel 2; and **ESC** will exit the screen.
4. Items 5 through 25 describe the fields present in Menu 24.1—System Maintenance—Status. It should be noted that these fields are READ-ONLY and are meant to be used for diagnostic purposes.
5. **CHAN**—shows statistics for channel 1 and channel 2, respectively. Following is the information displayed for each channel:
6. **Link**—shows the Remote Node the channel is currently connected to or the status of the channel (Idle, Calling, or Answering).

7. **Type**—the current connecting speed (56K or 64K).
8. **TXPkt**—the number of transmitted packets on this channel.
9. **RXPkt**—the number of received packets on this channel.
10. **Error**—the number of error packets on this channel.
11. **CLU (Current Line Utilization)**—percentage of current bandwidth used on this channel.
12. **ALU (Average Line Utilization)**—average CLU for this channel.
13. **Up Time**—time this channel has been connected to the current Remote Node.
14. **Total Outgoing call Time**—shows the total outgoing call time for both channel 1 and channel 2 since the system was powered up.
15. **Ethernet**—shows the current status of the LAN connection on your IRT-1001 or IRT-1002.
16. **Status**—shows the LAN's current speed (10 Mbps or 100 Mbps) and manner of data flow (half-duplex or full-duplex).
17. **TX Pkt**—the number of packets transmitted to the LAN.
18. **RX Pkt**—the number of packets received from the LAN.
19. **Collision**—number of collisions.
20. **Name**—displays the system name of your router. This information can be modified in Menu 1—General Setup.
21. **RAS S/W Version**—refers to the version of the current RAS software.
22. **ISDN F/W Version**—refers to the version of the current ISDN firmware.
23. **Ethernet Address**—refers to the Ethernet MAC address assigned to your IRT-1001 or IRT-1002.
24. **Country Code**—refers to the one byte country code value (in decimal notation), e.g., 255 indicates North America.

25.LAN Packet Which Triggered Last Call—shows the first 48 octets of the LAN packet that triggered the last outgoing call. There are three different types of packets: IP, IPX, and RAW. By viewing the packet information, you can determine which station has sent a packet to cause the router to make an outgoing call.

Two example figures are shown below. the first of an ICMP Ping packet (Type: IP) triggering the call and the second with a SAP packet (Type: IPX) triggering the call. With this information, you can determine the source IP address of the packet or the source MAC address of the packet.

```

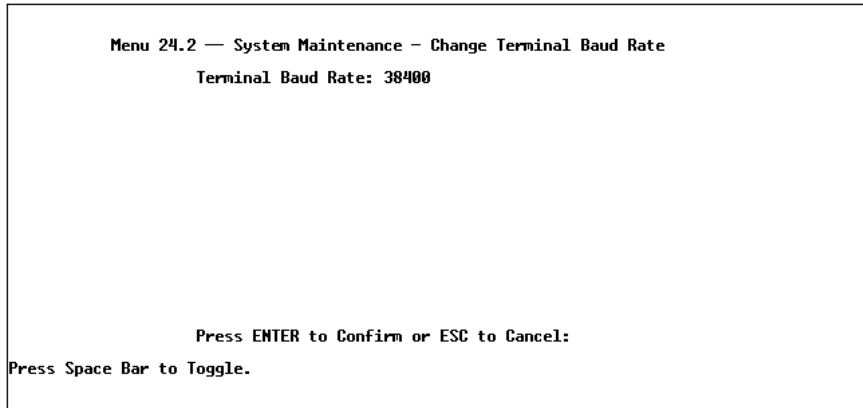
LAN Packet Which Triggered Last Call: (Type: IP)
45 00 00 3C 02 12 00 00 38 01 36 49 00 00 00 00 C0 44 87 22 08 00 62 2B
20 04 00 00 00 08 A9 D0 C0 44 87 22 00 01 02 03 04 05 06 07 08 09 0A 0B

LAN Packet Which Triggered Last Call: (Type: IPX)
FF FF 00 2C 01 11 10 00 00 01 00 00 00 00 00 01 04 51 31 11 11 00 80
C8 83 44 7A 40 02 22 22 13 06 01 00 17 00 05 16 06 00 00 00

```

Terminal Baud Rate

Users can set different baud rates for the RS-232 connection through menu 24.2 Terminal Baud rate. The router supports 9600 (default), 19200, and 38400 bps for the RS-232 connection.



Log and Trace

Log and trace tools allow users of the Your IRT-1001 or IRT-1002 to view the error logs and trace records to troubleshoot any errors that may occur. The router is also able to generate syslog to send to other machines.

1. To get to the Log and Trace, select option 24. System Maintenance. This will bring you to Menu 24 - System Maintenance.
2. From this menu, select option 3. Log and Trace. This will bring you to Menu 24.3 - System Maintenance - Log and Trace.
3. You will be given two options.
 - ◇ View Error Log.
 - ◇ Syslog and Accounting.

The following list describes the fields involved in the trace and log options:

View Error Log

Selecting the first option from Menu 24.3—System Maintenance—Log and Trace will display the Error Log in the system. In addition to providing error messages, the Error Log is a valuable source of information about your IRT-1001 or IRT-1002.

You can also clear the Error Log on your IRT-1001 or IRT-1002. After each display, you are prompted with an option to do so. Enter the appropriate choice and press ENTER.

Syslog And Accounting

Syslog and Accounting can be configured in Menu 24.3.2—System Maintenance—Syslog and Accounting. This menu configures the router to send UNIX syslog messages to another machine.

```
Menu 24.3.2 — System Maintenance - Syslog and Accounting
Syslog:
Active= No
Syslog IP Address= ?
Log Facility= Local 1

Press ENTER to Confirm or ESC to Cancel:
Press Space Bar to Toggle.
```

The User needs to configure the following 3 parameters to activate syslog:

1. **Active**—Use the space bar to turn the syslog option on or off.

2. **Syslog IP Address**—Input the IP Address that you wish to send your syslog to. The address is usually written in dotted decimal notation such as a.b.c.d where a, b, c, and d are numbers between 0 and 255.
3. **Log Facility**—Use the space bar to toggle between the 7 different Local options. This feature is used for UNIX applications.

Your IRT-1001 or IRT-1002 will send three different types of syslog messages: Call information messages (i.e. CDR), Error information messages, and Session information messages. Some examples of these messages are shown below:

Call Information Messages:

```
line 1 channel 1, call 41, C01, Incoming Call, 40001
line 1 channel 1, call 41, C01, ANSWER Connected, 64K 40001
line 1 channel 1, call 41, C01, Incoming Call, Call Terminated
```

Error Information Messages:

```
line 1, channel 1, call 44, E01, CLID call refuse
line 1, channel 1, call 45, E02, IP address mismatch
```

Session Information Messages:

```
line 1, channel 1, call 41, I01, IPCP up, 306L
line 1, channel 1, call 41, I01, IPCP down, 306L
```

Diagnostic

The diagnostic functions on your IRT-1001 or IRT-1002 allow you to test aspects of your device to determine if they are working properly. The following list provides a short description to the types of diagnostic tests available to your system.

```
Menu 24.4 - System Maintenance - Diagnostic

ISDN                                     System
 1. Hang Up CHAN 1 Call                 21. Reboot System
 2. Hang Up CHAN 2 Call                 22. Command Mode
 3. Reset ISDN
 4. ISDN Connection Test
 5. Manual Call

TCP/IP
11. Internet Setup Test
12. Ping Host

Enter Menu Selection Number:

Manual Call Remote Node= N/A
Host IP Address= N/A
```

1. From the Main Menu, select option 24. System Maintenance. This will bring you to Menu 24 - System Maintenance.
2. From this menu, select option 4. Diagnostic. This will bring you to Menu 24.4—System Maintenance—Diagnostic.
3. Items 4–12 will describe the nine (9) options to test your router and its connections.
4. **Hang Up CHAN1 Call**—This tool hangs up the channel 1 line. This will only be useful if the line is currently connected to a Remote Node or a dial-in user.
5. **Hang Up CHAN2 Call**—This tool hangs up the channel 2 line. This will only be useful if the line is currently connected to a Remote Node or a dial-in user.
6. **Reset ISDN**—This command will re-initialize the ISDN link to the telephone company.
7. **ISDN Connection Test**—You can use this command to see if your ISDN line has been successfully connected to your IRT-1001 or IRT-1002. This command will trigger the router to perform a loop-back test to check the functionality of the ISDN line. If your line is working properly, the test will succeed. Otherwise, note the

error message that you receive and consult your network administrator.

- 8. Manual Call**—This provides a way for the users of the Your IRT-1001 or IRT-1002 to place a manual call to a Remote Node. This tests the connectivity to that Remote Node. When you use this command, you will see traces displayed on the screen showing what is happening during the call setup and protocol negotiation. Below is an example of a successful connection.

```
Start dialing for node<1>
### Hit any key to continue.###
Dialing chan<2> phone(last 9-digit):40101
Call CONNECT speed<64000> chan<2> prot<1>
LCP up
CHAP send response
CHAP login to remote OK!
IPCP negotiation started
IPCP up
```

Below is an example of a failed Trace Display for a Successful IPCP Connection via Manual Call.

```
Start dialing for node<1>
### Hit any key to continue.###
Dialing chan<2> phone(last 9-digit):40101
Call CONNECT speed<64000> chan<2> prot<1>
LCP up
CHAP send response
***Login to remote failed. Check name/passwd.
Receive Terminate REQ
LCP down
Line Down chan<2>
```

9. **Internet Setup Test**—This test checks to see if your Internet access configuration has been done correctly. When this option is chosen, your IRT-1001 or IRT-1002 will PING the Internet IP Address. If everything is working properly, you will receive an appropriate response. Otherwise, note the error message and consult your network administrator.
10. **Ping Host**—This diagnostic test pings the host which determines the functionality of the TCP/IP protocol on your system.
11. **Reboot System**—This option reboots the system. This serves to implement any changes that may have been recently added to your system.
12. **Command Interpreter Mode**—This option allows the user to enter command interpreter mode. This mode allows you to diagnose and test your IRT-1001 or IRT-1002 using a specified set of commands.

Backup Configuration

Selecting option 5 from Menu 24—Maintenance will allow you to backup your current Your IRT-1001 or IRT-1002 configuration onto disk. Backup is highly recommended once your configuration is functioning.

You need to download the configuration onto disk. The procedure for downloading varies depending on the type of software used to access the router, but you must use the XMODEM protocol to perform the download.

Restore Configuration

Selecting option 6 from Menu 24—Maintenance will restore a backup configuration from disk to the Your IRT-1001 or IRT-1002. You need to upload a backup file to the router. The procedure for uploading varies depending on the type of software used to access the router, but you must use the XMODEM protocol to restore the configuration.

Keep in mind that configuration is stored in flash ROM, so even if a power failure occurs, your configuration is safe.

Software Update

Software updates are possible only through an RS-232 cable connection. You cannot use `telnet` to update the Your IRT-1001 or IRT-1002's software. Note that this function will delete the old software before installing the new software. Do not attempt to utilize this menu unless you have the new software version. There are two different software updates: RAS code and ISDN code.

- ◆ **RAS and ISDN code update**—Type `atur` and wait until the Your IRT-1001 or IRT-1002 responds with an OK to begin uploading the new software (upload procedure varies depending on the type of software used to access the router). You must use the XMODEM protocol to perform the upload. After the upload ends, type `atgo` to start the router. Below is an example of downloading RAS and ISDN.

```
To update software, system needs to be rebooted.
After system is rebooted, 'Enter Debug Mode' will be displayed.
Please enter 'atur' to upload RAS and ISDN code.
Do you want to continue (y/n):
Enter Debug Mode
atur
Now erase flash ROM for uploading ...

Starting XMODEM upload.....
■■
Programming successful...
OK
atgo
```

Command Interpreter Mode

This option allows the user to enter the command interpreter mode. This mode allows you to diagnose, test, and configure your IRT-1001 or IRT-1002 using a specified set of commands. A list of valid commands can be found by typing help at the command prompt. For more detailed information, contact PLANET technical support.

Call Control

Your IRT-1001 or IRT-1002 provides two Call Control Management functions for the Remote Node and Remote Dial-in User. They are Budget Management and Blacklist.

The Budget Management function provides budget control for outgoing calls and a way for users to set a limit on their ISDN utilization to prevent any accidental usage. It limits the total outgoing call duration over a period of time for each Remote Node or Remote Dial-in User (callback only). If the total outgoing call duration exceeds the set limit, future outgoing calls will not be made and the current call will be dropped.

The Blacklist function prevents the Your IRT-1001 or IRT-1002 from re-dialing an unreachable phone number. It is a list of phone numbers, up to a maximum of 14, to which the router will not make an outgoing call.

If the router tries to dial a phone number and fails a certain number of times (configurable through menu 24.9.1), the phone number will be put on the blacklist. The user will have to enable the number manually again for it to be dialed.

Call Control Parameters

```
Menu 24.9.1 - Call Control Parameters
Dialer Timeout:
Digital Call(sec)= 35

Retry Counter= 0
Retry Interval(sec)= N/A

Press ENTER to Confirm or ESC to Cancel: _
```

- ◆ **Dialer Timeout: Digital Call (sec)**—The IRT-1001 or IRT-1002 will “time out” (give up) if it can not set up an outgoing digital call within the timeout value. The default is 30.
- ◆ **Retry Counter**—How many times a busy or no-answer phone number is retried before it is put on the blacklist. The default is 0 and the blacklist control is not enabled.
- ◆ **Retry Interval (sec)**—Elapsed time after a call fails before another call may be retried. Applies before a phone number is blacklisted.

Blacklist

```
Menu 24.9.2 - Blacklist
Phone Number
1. 5551212
2. 40001
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.

Remove Selection(1-14):
```

The phone numbers on this list cannot be entered directly; instead, they are numbers which have had problems connecting in the past. The user can take a phone number off the list by entering its index number.

Budget Management

```
Menu 24.9.3 - Budget Management
Remote Node Connection Time/Total Budget Elapsed Time/Total Period
1. 3060 0:00/6:00 0:07/24:00
2. _____
3. _____
4. _____
5. Dial-in User 0:00/4:00 0:00/24:00

Reset Node (0 to update screen):
```

The total budget is the time limit for an outgoing call to a Remote Node or Dial-in User. When this limit is reached, the call will be dropped and further outgoing calls to that Remote Node or Remote Dial-in User (callback) will fail. After each period, the total budget is reset. The defaults for the total budget is 0 minutes and the period is 0 hours. This means no budget control. The user can reset the total outgoing call time through this menu. The total outgoing call timer can be program need to reset itself periodically through menus 11 and 13.

Call History

The call history is erased when you reset Your IRT-1001 or IRT-1002. The router keeps track of the first ten calls only; additional calls are not recorded.

Menu 24.9.4 - Call History							
	Phone Number	Dir	Rate	#call	Max	Min	Total
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

Enter Entry to Delete(0 to exit):

The columns in the Call History screen are described briefly below.

- 1. Phone Number**—The telephone number of the caller (incoming) or the called party (outgoing). Can contain up to fifteen digits.
- 2. Dir**—IN for incoming calls, OUT for outgoing calls.
- 3. Rate**—One of the following: 64K, 56K, X75, or V120. (X75 and V120 are available for DSS-1 and 1TR6 firmware only.)

4. **#call**—Number of calls to (OUT) or from (IN) this number.
5. **Max**—Duration of the longest call to or from this number.
6. **Min**—Duration of the shortest call to or from this number.
7. **Total**—Total duration of calls to or from this number.

Troubleshooting

This chapter contains some problems you may run into when using your router. After each problem description, we have provided some instructions to help you diagnose and solve the problem.

Problems Starting Up the Your IRT-1001 or IRT-1002

None of the LEDs are on when you power up the router

- ◆ Check the power cord and the power supply and make sure it is properly connected to your IRT-1001 or IRT-1002. If the error persists you may have a hardware problem. In this case you should contact technical support.

Connecting the RS-232 cable, cannot access the SMT

- ◆ Check to see if the Your IRT-1001 or IRT-1002 is connected to your computer's serial port.
- ◆ Check to see if the communications program is configured correctly. The communications software should be configured as follows:
 - ◇ VT100 terminal emulation.
 - ◇ 9600 Baud rate.
 - ◇ No parity, 8 Data bits, 1 Stop bit.

Problems With the ISDN Line

The ISDN initialization failed

This problem occurs when you attempt to save the parameters entered in menu 2, but receive the message 'Save successful, but Failed to initialize ISDN; Press ESC to exit'.

1. Check the error log (in menu 24.3.1), you should see a log entry for the ISDN initialization failure in the format, 'ISDN init failed. code<n>...'. Note the code number, n.
2. If the code is 1, the ISDN link is not up. The problem could be either that the ISDN line is not properly connected to the Your IRT-1001 or IRT-1002, or that the ISDN line is not activated. Verify that the ISDN line is connected to the Your IRT-1001 or IRT-1002 and to the wall outlet (to the telephone company).
3. If the code is 2, this indicates an SPID error. Verify the SPID(s) that you have entered in menu 2. If these are correct, try to initialize again from menu 24.4.3.
4. If the code is 3, this indicates a general failure. Verify the SPID(s) in menu 2. If these are correct, you may also need to verify the provisioning information for your switch by contacting your telephone company.

The ISDN loopback test failed

If the ISDN initialization has passed, then the loopback test should also pass. Verify the phone numbers that have been entered in menu 2. The loopback test will dial the number entered in the 2nd Phone # field (except for switch types with only one phone number). If you need to dial a prefix (e.g., 9) to get an outside line, then you have to enter the phone number as 95551212 or 914085551212. If it is an internal line, you may only need to enter the last four or five digits (according to your internal dialing plan), e.g., 51212.

Problems with the LAN Interface

Can't PING any station on the LAN

1. Check the LAN LED on the front panel of your router. If it is on, then the link is up. If it is off, then check the cables connecting the router to your LAN.
2. Verify with your network administrator that the IP address and the IP subnet mask configured in menu 3.2 are valid for that LAN.
3. Check the physical Ethernet cable, and make sure the connections on the router and the hub are secure.

Problems Connecting to a Remote Node or ISP

1. Check menu 24.1 to verify the ISDN status. If it indicates down then refer to the section on the ISDN line problems.
2. In menu 24.4.5, do a manual call to that Remote Node. You will see some messages printed onto the screen. The messages will show you whether the call has been connected or not. If the call is not connected, verify the following parameters in menu 11: Pri(primary) Phone #, Sec(ondary) Phone #, and Transfer Rate.
3. If the call is terminated immediately after a connection is established, there may be some kind of negotiation problem. Verify the following parameters in menu 11: My Login, My Password, Route, IP LAN Addr. Also verify your IP address in menu 3.2.
4. If you check the error log in menu 24.3.1, this will usually give you some logs regarding why the call was dropped. If there is nothing in the log, the call may have been dropped by the remote device that you dialed in to. Make sure that the configuration parameters between these two devices are consistent.

Problems Connecting to a Remote User

1. First verify that you have configured the authentication parameters in menu 13. These would be CLID Authen, Recv. Authen, and Mutual Authen.
2. If the Remote Dial-in User is negotiating IP, verify that the IP address is supplied correctly in menu 13. Check that either the Remote Dial-in User is supplying a valid IP address, or that the router is assigning a valid address from the IP pool.
3. If the Remote Dial-in User is negotiating IPX, verify that the IPX network number is valid from the IPX pool (if it is being used).
4. In menu 14, verify the user name and password for the Remote Dial-in User.

ISDN Switch Types

The following table summarizes the different types of switches supported by the IRT-1001 and IRT-1002, as well as some related information on the switch types (number of phone numbers and SPID numbers). It should be noted that the information in this table is for the common case and is recommended for those cases. Exceptions still exist to these figures. You can locate the provisioning information for the appropriate North American switch type in the next sections.

Switch Type	Geography	No. of Phone #s	No. of SPIDs
AT&T 5ESS NI-1	North American	2	2
AT&T 5ESS Point to Point	North American	1	0
AT&T 5ESS Multipoint	North American	2	2
Northern Telecom NI-1	North American	2	2
Northern Telecom Custom	North American	2	2
DSS1	Europe, Asia	2	N/A
1TR6	Germany	2	N/A

Provisioning For U.S. Switches

For the U.S., the IRT-1001 and IRT-1002 (both the U and S/T interface) have been approved by Bellcore and have the IOC (ISDN Ordering Code) "S" Capability, EZ-ISDN 1. Provide this information to your telephone company when you order your ISDN line. If your telephone company is not familiar with this IOC, then ask them what kind of switch you will be connected to and use the information under each switch type to order your ISDN line.

Provisioning For the AT&T 5ESS Switches

The AT&T 5ESS switch type supports three types of ISDN service. These are: National ISDN-1 (NI-1), Multipoint, and Point-to-Point.

For AT&T 5ESS National ISDN-1

Provisioning Feature	Setting
Term Type	A
Circuit Switched Voice (CSV)	1
CSV Additional Call Offering (ACO)	Unrestricted
CSV limit	2
CSV Notification Busy (NB) limit	1
Circuit Switched Data (CSD)	1
CSD Additional Call Offering (ACO)	Unrestricted
CSD limit	2
CSD Notification Busy (NB) limit	1
MTERM	2

For AT&T 5ESS Multipoint

Provisioning Feature	Setting
Term Type	D
Call Appearances (CA)	1
CA Quantity	1
Circuit Switched Voice (CSV)	1
CSV Flexible Call Offering (FCO)	Unrestricted
CSV limit	2
CSV Notification Busy (NB) limit	1
Circuit Switched Data (CSD)	1
CSD Flexible Call Offering (FCO)	Unrestricted
CSD limit	2
CSD Notification Busy (NB) limit	1
MTERM	2

For AT&T 5ESS Point-to-Point

Provisioning Feature	Setting
Term Type	A
Call Appearances (CA)	1
CA Quantity	1

Provisioning Feature	Setting
Circuit Switched Voice (CSV)	1
CSV Flexible Call Offering (FCO)	Unrestricted
CSV limit	2
CSV Notification Busy (NB) limit	1
Circuit Switched Data (CSD)	1
CSD Flexible Call Offering (FCO)	Unrestricted
CSD limit	2
CSD Notification Busy (NB) limit	1
MTERM	2

Provisioning For the Northern Telecom Switch

The Northern Telecom switch type supports two types of ISDN service. These are: National ISDN-1 and Custom.

For Northern Telecom National ISDN-1

Provisioning Feature	Setting
Signaling	Functional
Protocol Version Control (PVC)	2 (National ISDN-1)
TEI assignment	Dynamic
Maximum number of keys (maxkeys)	3 (1 to 64 OK)
Release key	No
Ringing indicator	No
Electronic Key Telephone System (EKTS)	Yes or No (set to opposite of ACO)
Additional Call Offering (ACO)	Yes or No (set to opposite of EKTS)
Number of call appearances	2
Notification Busy Limit	3

For Northern Telecom Custom

Provisioning Feature	Setting
Signaling	Functional
Protocol Version Control (PVC)	1 (Custom)
TEI assignment	Dynamic
Maximum number of keys (maxkeys)	3 (1 to 64 OK)

Provisioning Feature	Setting
Release key	No
Ringing indicator	No
Electronic Key Telephone System (EKTS)	Yes or No (set to opposite of ACO)
Additional Call Offering (ACO)	Yes or No (set to opposite of EKTS)



Glossary

100BASE-T/TX	100Mbps Ethernet LAN communications standard set by the IEEE (in standard 802.3u); also called “Fast Ethernet.”
100Mbps	100 million bits per second; an expression of transmission speed in a network.
10BASE-T	The original Ethernet LAN communications standard set by the IEEE (in standard 802.3); a 10Mbps standard.
10Mbps	10 million bits per second; an expression of transmission speed in a network.
Address	A number, set of numbers, or name which identifies a computer, network device, or network resource.
Agent	The subsystem in a managed network device that is responsible for responding to SNMP requests and commands, and for sending SNMP traps.
AppleTalk	A network protocol often used with computers running the MacOS operating system.
AUI	Attachment Unit Interface; a 10Mbps external transceiver interface.
Bandwidth	The range of frequencies available across a communications channel; in one sense, the “size” of the communications channel.
Bindery	A database containing information about a Novell NetWare file server’s configuration and users.

See also **NDS**.

BOOTP	The BOOTstrap Protocol, a method network devices can use to obtain TCP/IP configuration information from a central location on startup.
Bridge	A LAN device used to connect two different LANs so that packets can be transmitted from one to the other. A bridge works on a low level, and does not take higher-level protocols into consideration. A switching hub is a type of bridge.
Broadcast	A network transmission intended for all of the stations on a network.
Cascading	The practice of connecting identical or similar LAN devices such as hubs together directly so that they function as one device. A collection of cascaded devices is often called a stack.
Category 3, 4, 5	Communication cabling standards referring to the quality of the transmission medium and whether or not the cable includes transmission leakage shielding.
Collision	Simultaneous data transmission on a network medium, resulting in a garbled (and unreadable) transmission. See CSMA/CD .
Collision Domain	A section of a network isolated from other sections by a switch, bridge, or hub that detects and resolves collisions locally so that there is less impact on the entire network.
Community Name	A part of an SNMP request, used as a rudimentary form of password. An SNMP agent may grant different levels of access to requests with different community names.

Crossover Cable	A type of twisted-pair cable in which the wires at one end have been reversed in order to match pinouts on a hub or switch.
CSMA/CD	Carrier Sense Multiple Access with Collision Detection; a network communications protocol in which each transmission source (i.e., station, server, switch, etc.) monitors the main data channel for traffic before and during transmission, postponing transmission when the data channel is in use.
Cut-through	Bridge forwarding method where each packet with a valid address is passed on to the next node without waiting for the entire message to be received.
DHCP	Dynamic Host Configuration Protocol; a superset of BOOTP that allows TCP/IP address information to be determined automatically and dynamically.
Duplex (full/ half)	A method of transmitting data over a network in both directions. Full-Duplex (FDX) is simultaneous transmission of data over a network channel in both directions. Half-Duplex (HDX) is transmission in both directions but one at a time, not simultaneous.
Ethernet	A particular type of LAN described in a standard (802.3) established by the IEEE, with 10Mbps data transmission.
Fast Ethernet	An extension of Ethernet LAN (defined in standard 802.3u) to allow 100Mbps transmissions.
File Server	A computer specialized for providing file storage to client stations on a network.

Frame	A single packet of information transmitted on the network.
Frame Type	An arrangement for the information transmitted in a network frame.
Gateway	A router on a network which serves as a gateway to outside non-local networks such as the Internet.
Hub	The central device in a star-topology LAN used to connect each station to the network.
ICMP	Internet Control Message Protocol; part of the TCP/IP suite of protocols, used “behind the scenes” by the TCP/IP network subsystem for controlling and monitoring transmissions.
IEEE	Institute of Electrical and Electronics Engineers, an accredited professional group of scientists and engineers who help set standards for LAN communications technology.
In-band	Communications with a network device using the network medium itself. Contrast with out-of-band.
IP Address	A network address used on TCP/IP networks such as the Internet to uniquely identify the host or device. IP addresses are usually written in the form xxx.xxx.xxx.xxx, where each xxx is a number between 0 and 255 (for a total of 32 bits).
Jabber	A malfunction on a network where random data is continuously transmitted.
LAN	Local Area Network, an interconnected set of computers and other devices.
LED	Light Emitting Diode – an electronic device that lights up when electricity is passed through it.

LEDs are commonly used for status indicators on electronic devices.

MAC Address	Media Access Control (layer) address; a low-level network address which uniquely identifies the network interface. Ethernet addresses are normally written in hexadecimal in the form xx:xx:xx:xx:xx:xx. The first three groups identify the manufacturer of the Ethernet interface, and the last three identify the interface itself.
Mbps	Megabits per second; millions of bits per second.
MIB	Management Information Base; a well-defined collection of statistics and control variables accessible using SNMP.
MIB-II	A standard Management Information Base that provides access to a collection of management statistics common to most network devices.
MII	Media Independent Interface; a type of 100Mbps Fast Ethernet external transceiver connector similar in purpose to the AUI connectors used with 10Mbps Ethernet.
Multicast	A single network transmission intended for a collection of network stations, but not to all (compare Broadcast).
NDS	NetWare Directory Services; an expanded database of configuration and user information shared between a collection of NetWare file servers.
NetBEUI	NetBIOS Extended User Interface, the network protocol normally used with Microsoft Networking services.

NMS	Network Management System, a collection of software used for remotely monitoring and managing network devices.
Out-of-Band	Communications with a network device using some medium other than the network itself.
Packet	An addressed segment of data transmitted on a network.
Peer-to-Peer	A form of networking where all stations on the network can provide file service or other network services, without having to go through a central file server.
PING	Packet Internet Network Groper, a method of testing whether a particular Internet address is reachable.
PPP	Point to Point Protocol; a network protocol used for carrying higher-level protocols such as IPX or TCP/IP over point-to-point links such as serial lines or ISDN connections.
Preamble	Data bits at the beginning of each block of data, used for synchronization.
Punch-down Block	Physical connection in a network wiring closet.
Repeater	LAN signal regenerator. An Ethernet hub is a type of repeater.
Router	A device for forwarding packets between networks which uses higher-level network protocols (such as TCP/IP or IPX) to determine where packets should be sent. Most routers are capable of forwarding traffic to Wide Area Network (WAN) connections as well as between LANs.

Segment	Part of an Ethernet or other network on which all traffic is common to all nodes.
SLIP	Serial Line Internet Protocol; a method of encoding TCP/IP for transmission over serial lines or modems.
SNMP	The Simple Network Management Protocol; an industry-standard protocol for remotely monitoring and controlling network devices from a Network Management System (NMS). SNMP requests are usually transmitted using TCP/IP, though other means are possible.
Store-and-Forward	Message passing system where the entire message is received before being passed on to the next node.
STP	Spanning Tree Protocol; a network protocol defined in IEEE standard 802.1d, ensuring that a collection of bridges can forward packets throughout the entire interconnected network, while preventing endless network loops.
STP	Shielded Twisted Pair; twisted-pair wire with interference shielding.
TCP/IP	Transmission Control Protocol/Internet Protocol; a suite of transport and network layer communications protocols.
Telnet	Part of the TCP/IP suite of protocols, used for interacting with remote computers and devices using the keyboard and a text display.
TFTP	Trivial File Transfer Protocol; a low-overhead protocol for file transmission over TCP/IP networks. Often used for obtaining device configuration files or bootstrap image files.

Trap	An SNMP request that managed network devices send to network management stations, to inform them that some problem has been detected.
Twisted-pair	Wire such as is commonly used with telephones consisting of pairs of copper wire usually terminating in an RJ-45 connector.
UDP	User Datagram Protocol; part of the TCP/IP suite of protocols.
UTP	Unshielded Twisted Pair; twisted pair wire without shielding.
WAN	Wide Area Network (compare “LAN”).

ISDN ROUTER

IRT-1001 / IRT-1002

IP / IPX

LAN-to-LAN

Internet Access

Remote Access

Security

Bandwidth-On-Demand

EMIRT1000

