Megabit Modem CRA-C
User Manual

↯PAIRGAIN

Megabit Modem CRA-C User Manual
P/N 425-613-150-02
Revision 02
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FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communication.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the grantee of this device voids the user's authority to operate the equipment.

DECLARATION OF CONFORMITY

Manufacturer's name	PairGain Technologies, Inc.
and address:	14402 Franklin Ave
	Tustin, CA 92780-7013
	U.S.A.

declares that

Product name:	Megabit Modem CRA-C

conforms to the following

Standards:	EN55022 (1987), EN50082-1 (1992), EN60950 (1994)
Application of Council Directives:	89/336/EEC, 73/23/EEC

I, the undersigned, hereby declare that the equipment specfied above conforms to the above directives and standards.

Signature:

Roy Stephens,
Director of Quality Assurance

Place:	Tustin, CA, U.S.A.
Date:	March 16, 1998

USING THIS MANUAL

This manual helps you:

- understand the features of the PairGain® Megabit Modem™ CRA-C and how the unit operates as a component within a network

- install the Megabit Modem CRA-C

- configure your unit to operate within the network

- contact PairGain if you need additional help

Three types of messages with icons appear in the text:

Notes inform you of special circumstances.

Cautions indicate the possibility of damage to equipment.

Warnings indicate the possibility of personal injury.

CONTENTS

ABOUT THE MEGABIT MODEM CRA-C

The PairGain® Megabit Modem™ CRA-C uses Asymmetric Digital Subscriber Line (ADSL) technology to provide, on a single pair telephone line, a multi-megabit Ethernet connection between the subscriber and the service provider. The Megabit Modem CRA-C transmits data up to 3.16 Mbps from a service provider and receives data up to 1.08 Mbps from a subscriber. The Megabit Modem CRA-C is rate adaptive; its speed is adjusted to the maximum attainable data rate depending on distance and line condition. Additionally, ADSL technology allows ordinary telephone service to coexist with the high-speed data service on the same wire pair.

The rate-adaptive Megabit Modem allows the service provider to deliver the best possible data rate for any subscriber. Typically, a subscriber closest to the provider receives the highest data rate available, while subscribers farther away receive data at a lower transmission rate.

The Megabit Modem CRA-C has field-proven Carrierless Amplitude-modulation and Phase-modulation (CAP) line coding. The 2-dimensional, 8-state Trellis coding with Viterbi decoding and the Reed-Solomon forward-error-correction provide robust transmission in harsh environments.

Use the Megabit Modem CRA-C for application solutions, particularly those requiring high-speed transmission to the subscriber, such as:

- Internet access

- remote Local Area Network (LAN) access

- telecommuting

- small office or home office

Other features of the Megabit Modem CRA-C include:

- embedded Simple Network Management Protocol (SNMP) agent

- IEEE 802.1d transparent MAC level bridging with Spanning Tree protocol support

- static IP routing to provide secure access to the Internet

- BOOTP and TFTP to download software

- 10BASE-T Ethernet port for connection to an Ethernet LAN

- line port for Rate-adaptive ADSL single-pair connection

- console port for maintenance and management

Use the Megabit Modem CRA-C with these other PairGain products:

- Megabit Modem CRA (at subscriber site)

- S1 Network Interface Device (network interface at subscriber site)

About Rate Adaptive Transmission

The following definitions are useful for understanding the operation of the Megabit Modem:

- Bit Error Rate (BER) is the ratio of received bits that are in error relative to the total number of bits received, measured over time. For example, 10^{-7} BER means that on average one error occurs per 10^7 bits received.

- Signal to Noise Ratio (SNR) is the ratio (typically expressed in dB) of the received signal power to the received noise power. It is a measure of the quality of the transmission. The theoretically achievable BER can be extrapolated from the measured SNR.

- Margin (SNR margin) is the amount of degradation in SNR that the system can tolerate under the current conditions and still achieve a 10^{-7} BER. A margin of 6 dB, for example, would mean that the SNR can degrade by 6 dB and still provide a performance of 10^{-7} BER. The PairGain Megabit Modem CRA-C has a margin configuration option that defaults to 6 dB, but may be set anywhere between -3 dB to 9 dB.

- Reach is the longest loop length that the system can support with a given margin and a BER of less than 10^{-7} at the given data rate.

Rate Adaptation

With PairGain's rate adaptive technology, the Megabit Modem CRA-C can automatically adjust to the fastest speed possible, given the transmission distance and line conditions. Alternatively, the provider can manually set the modem to a specific rate. The available data rates are:

- downstream (transmit) rates: 3.168 Mbps, 2.528 Mbps, 2.208 Mbps, 1.888 Mbps, 1.568 Mbps, 1.248 Mbps, 928 Kbps, 608 Kbps

- upstream (receive) rates: 1.080 Mbps, 944 Kbps, 808 Kbps, 672 Kbps, 536 Kbps, 400 Kbps, 264 Kbps, 82.66 Kbps

The Megabit Modem CRA-C can be set to any one of three modes that determine how the data rate is selected. It is important to note that rate adaptation occurs only during startup. The Megabit Modem CRA-C will not change its data rate while the link is up. The three startup modes are:

- *Full startup always:* In the full startup mode, the system figures out the highest upstream and downstream data rates it can support under the current line conditions, with a margin greater than or equal to the configured margin. This is done during every ADSL startup attempt. The system will always attempt a full startup where it will set a transmission rate up to the maximum specified. It determines this rate by assessing the signal quality data (line length and noise conditions, for example) and the margin configuration setting. It then comes up in the highest available rate based on this information.

- *Session startup:* In session startup mode, the system uses the data rates set during a previous full startup, rather than re-assessing the signal quality data. In this mode the system performs a full startup upon every powerup or reset and would also revert back to a full startup attempt when a session startup is not successful for 30 seconds.

- *Fixed data rate:* In a fixed-rate mode (fixed data rate), the user programs both the upstream and the downstream data rates using the Transceiver Configuration Menu. The user can select from available data rates shown above. Another configuration parameter is the startup SNR margin that is also configurable using the Transceiver Configuration Menu. The system will attempt to come up to the programmed data rates with a margin greater than or equal to the configured margin. Failure to complete startup with the desired margin results in repeated attempts to accomplish it.

When a connection is lost in any mode (the cable disconnected, for example), the system attempts reconnection as if it has been reset.

Reach, Data Rate, SNR Margin, and Noise Environment

The maximum transmission rate of the Megabit Modem CRA-C is determined by distance, SNR margin, and the condition of the line (wire gauge, condition noise environment). Figure 1 shows the relationship between reach and data rate for a given set of conditions. The plots can be used to determine the achievable reach at a given data rate, or they may be used to determined the achievable data rates at a given distance. In all of the cases except the no noise case, a margin of 6 dB was allocated above the SNR that provides a Bit Error Rate (BER) of 10^{-7}.

These line conditions fall within the range of the plots shown in Figure 1:

- no noise (0 dB margin)

- low noise (-140 dBm-Hz Additive White Gaussian Noise (AWGN))

- 24 ISDN lines in the same binder group

- 24 HDSL lines in the same binder group

- 24 ADSL lines in the same binder group

- 10 T1 lines in an adjacent binder group

- one T1 line in the same binder group

The performance shown is "typical" for PairGain Megabit Modem CRA products. Due to variations in environment and test setup, PairGain does not guarantee performance to the figures shown.

One of the configuration options in the Megabit Modem CRA-C is the startup margin setting. This setting defaults to 6 dB but may be set from -3 dB to 9 dB. The modems will attempt to come up at the programmed margin setting. Setting the margin high allows for a cushion against changing line conditions and impulse noise. Setting the margin low provides less protection but allows the modems to come up at a higher data rate (if in the rate-adaptive modes) or at a longer loop length (if in the fixed data rate mode). The default setting of 6 dB is recommended and provides an overall BER better than 10^{-10}. Reducing the setting to 0 dB will only provide a BER of less than 10^{-7} and is not recommended.

Reach / 26 AWG/ Downstream

Reach / 26 AWG/ Upstream

Reach / 24 AWG/ Downstream

Reach / 24 AWG/ Upstream
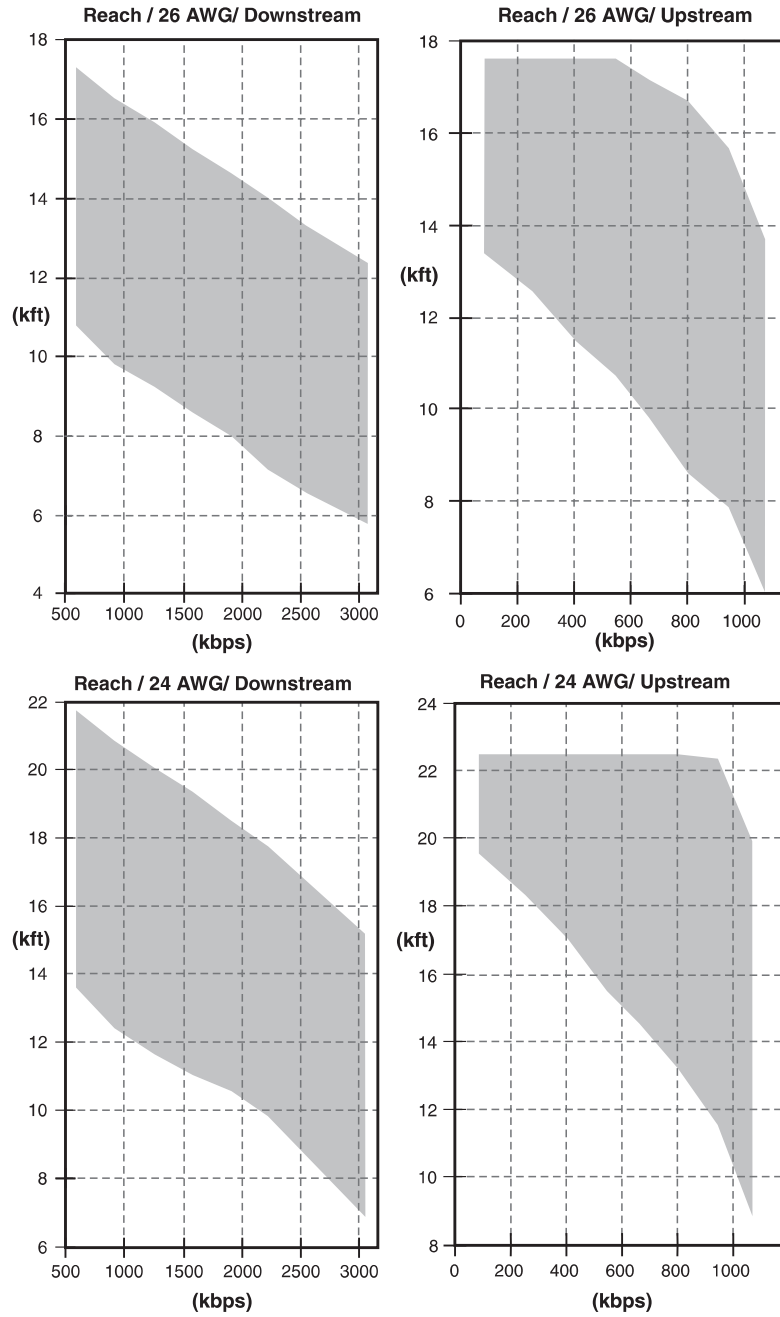
Note: Charts show typical operating range.

Figure 1. *Reach for a Rate Adaptive ADSL Megabit Modem*

INSTALL THE MEGABIT MODEM CRA-C

Install the Megabit Modem CRA-C using these sections:

Unpack and Inspect the Shipment

Upon receipt of the equipment:

1 Unpack each container and visually inspect it for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to your sales representative. Order replacement equipment if necessary.

2 Check the contents to the packing list to ensure complete and accurate shipment. If the shipment is short or irregular, contact your sales representative. If you must store the equipment for a prolonged period, store the equipment in its original container.

The shipping carton contains, in addition to the Megabit Modem CRA-C and this manual, the cables described in Table 1.

Table 1. *Cables for Megabit Modem CRA-C*

Item	Description	Function
Straight-through Category 3 cable	Black unshielded twisted-pair (UTP) cables terminated with RJ-45 connectors.	Connects the Megabit Modem CRA-C Ethernet MDI-X port to a network device with an MDI port.
Cross-over Category 5 cable	Yellow UTP cable terminated with RJ-45 connectors.	Connects the Megabit Modem CRA-C Ethernet MDI-X port to a network device with an MDI-X port.
ADSL cable	Gray UTP cable terminated with RJ-11 and RJ-45 connectors.	Connects the Megabit Modem CRA-C to the ADSL line.
Console cable	Flat, silver, eight-wire cable with RJ-45 connectors at each end.	Plugs into the Console port to connect the Megabit Modem CRA-C to an ASCII terminal. Do not use as a 10BASE-T Ethernet cable.
Console adapter	A rectangular DB-9 (F) to RJ-48 adapter with two captive mounting screws.	Optional. Connects the Megabit Modem CRA-C to an ASCII terminal for configuration and viewing status.
Power supply	An AC to DC power supply that plugs into the power outlet.	Provides primary power to the Megabit Modem CRA-C and establishes a safety ground.

 Do not tamper with the power supply safety prong. It is a critical element for the secondary lightning protection provided within the Megabit Modem CRA-C. If you tamper with the safety prong, you risk serious injury.

Identify LEDs and Connectors

The Megabit Modem CRA-C front panel has LEDs that show status for power and data transmission. The rear panel has external interface connectors and a power switch.

Front Panel

Figure 2 and Table 2 describe the LEDs on the Megabit Modem CRA-C front panel.
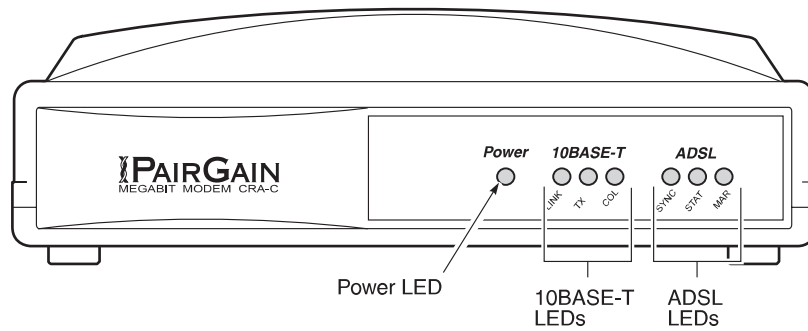
***Figure 2.** Megabit Modem CRA-C Front Panel*

Table 2. *Front Panel LEDs*

LED	Mode	Description
Power	Green	Indicates power is on.
10BASE-T		
LINK	Green	Ethernet connection up.
	Off	Ethernet connection down.
TX	Green	Transmit activity at port.
	Off	No transmit activity at port.
COL	Green	Collisions occurring on the port.
	Off	No collisions occurring on the port.
ADSL		
SYNC	Solid green	Normal operation.
	Flashing green	Training in progress.
	Off	Megabit Modem CRA not synchronized with Megabit Modem CRA-C.
STAT	Solid green	Normal operation.
	Flashing green	Test/Alarm condition exists.
MAR	Solid green	Margin is above threshold.
	Flashing green	Margin is below threshold.

Rear Panel

Figure 3 and Table 3 describe the Megabit Modem CRA-C rear panel features.
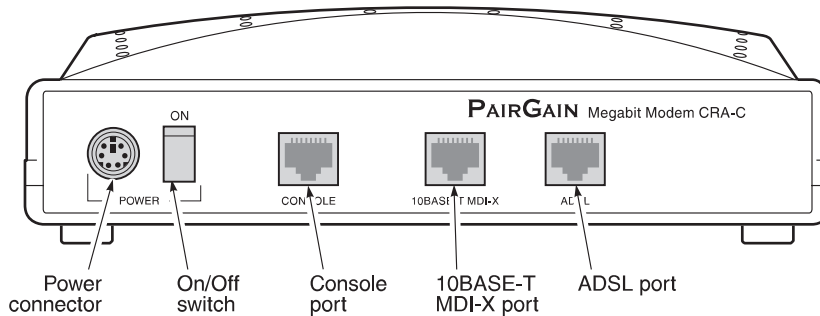
Figure 3. *Megabit Modem CRA-C Rear Panel*

Table 3. *Rear Panel Components*

Name	Function
POWER connector	6-pin mini-DIN type port that supplies power to Megabit Modem CRA-C. **Do not connect any other wall-plug supply to the Megabit Modem CRA-C unit, otherwise, you can permanently damage the unit.**
ON/OFF switch	Toggle switch used to turn modem ON and OFF.
CONSOLE port	RJ-45 connector (RS-232 compatible) used to connect an ASCII terminal for configuring the Megabit Modem(s).
10BASE-T MDI-X port	RJ-45 MDI-X (cross-over) port used to connect the Megabit Modem CRA-C to a 10BASE-T port of a data network device.
ADSL port	RJ-48 port used to connect the Megabit Modem CRA-C to the ADSL transmission line.

Install the Megabit Modem CRA-C

Complete the steps in the order listed to install the Megabit Modem CRA-C:

- connect to the ADSL line

- connect to the data network

Connect to the ADSL Line

The Megabit Modem CRA-C requires a single pair of telephone wires to connect the subscriber to the service provider. One wire is the Tip and the other is the Ring. See Table 4 for pinouts. Connect the Tip and Ring wires to your Megabit Modem CRA-C:

1 Plug the RJ-45 connector of the ADSL cable (gray) into the ADSL port on the Megabit Modem CRA-C rear panel (Figure 4).

2 Connect the RJ-11 connector to the ADSL line.
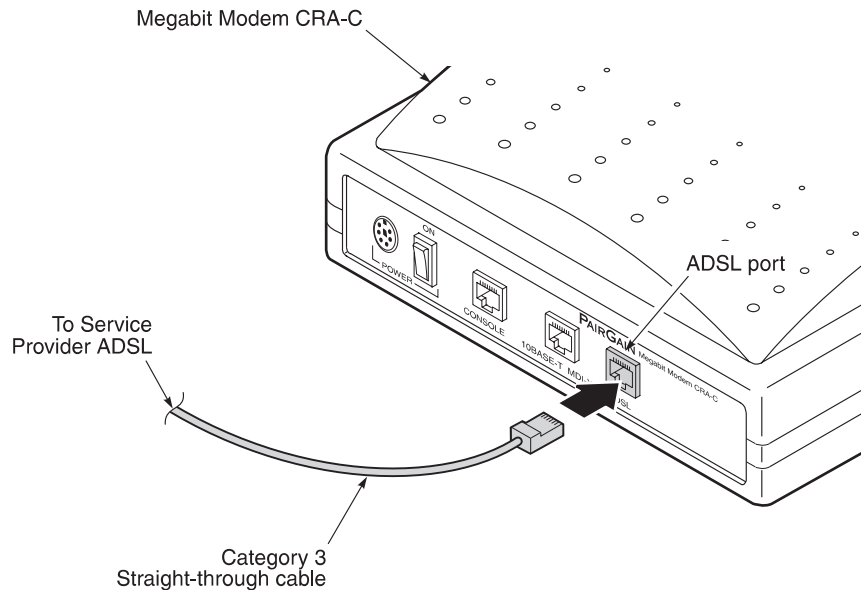
Figure 4. Connecting to the ADSL Line

Table 4. *ADSL Pin Assignments for RJ-45 Connector*

Pin	Signal
1	Not Used
2	Not Used
3	Not Used
4	ADSL (Ring)
5	ADSL (Tip)
6	Not Used
7	Not Used
8	Not Used

Connect to the Data Network

The 10BASE-T MDI-X port connects the Megabit Modem CRA-C to the data network. If the data network has an MDI-X port, use the yellow cross-over Category 3 or better cable. If the data network has an MDI port, use the black straight-through Category 3 or better cable.

Table 5 and Figure 5 show the 10BASE-T Ethernet interface data signals for both MDI and MDI-X configurations.

Table 5. *10BASE-T Interface Control Signals*

MDI Pin	MDI-X Pin	Signal	Description
1	3	TD+	Transmit Data (+)
2	6	TD-	Transmit Data (-)
3	1	RD+	Receive Data (+)
4	4	-	-
5	5	-	-
6	2	RD-	Receive Data (-)
7	7	-	-
8	8	-	-

Straight-through cable
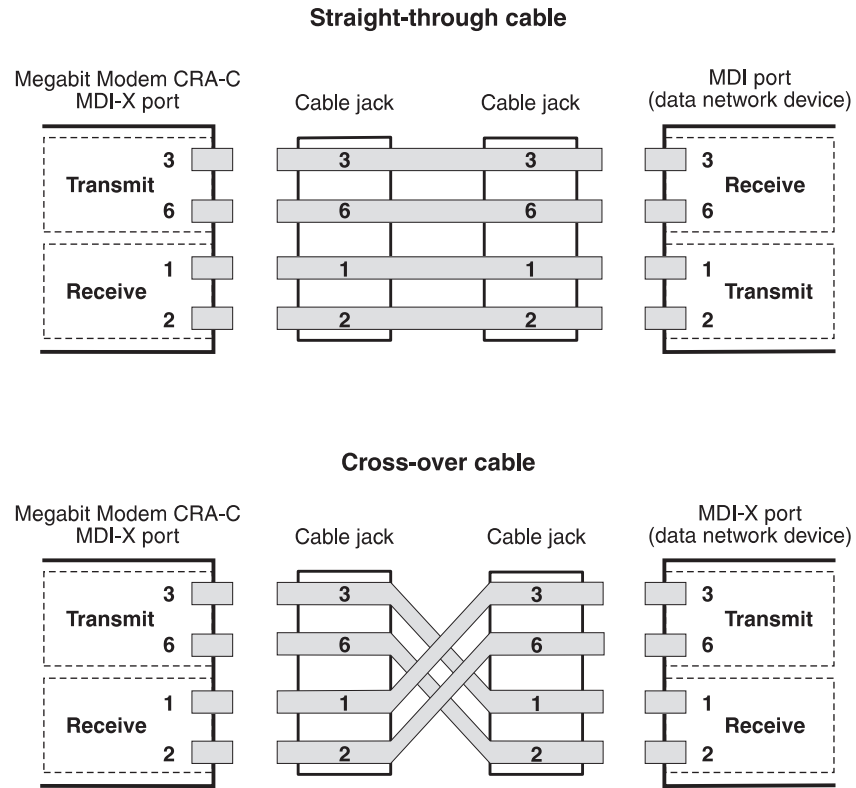
Cross-over cable

Figure 5. *Straight-through and Cross-over Cable Pinouts*

Connect to the data network using either the black straight-through cable or the yellow cross-over cable:

1 Plug the RJ-45 connector of the Category 3 cable into the 10BASE-T MDI-X connector on the Megabit Modem CRA-C rear panel (Figure 6).

2 Attach the other end of the Category 3 cable to the 10BASE-T port of your data network.

Megabit Modem CRA-C

Data network device

10BASE-T MDI-X port

10BASE-T port

Category 3 (or better) cable
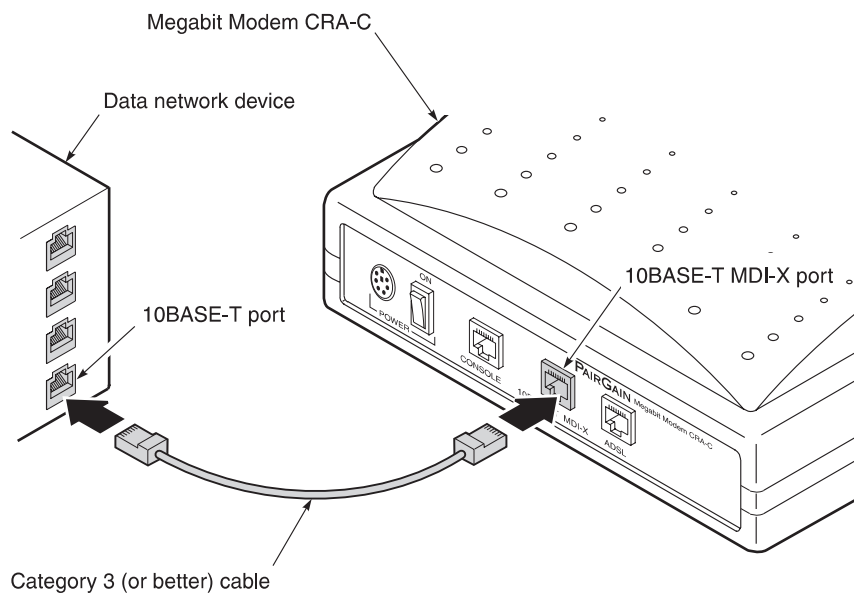
Figure 6. *Connecting to the Data Network*

Power Up and Check LEDs

Install the power cable and power up the Megabit Modem CRA-C:

1 Plug the mini-DIN connector on the wall-plug supply into the power connector on the rear of the Megabit Modem CRA-C, then plug the wall-plug supply into the facility power.

> **Do not connect any other wall-plug supply to the Megabit Modem CRA-C. If you use another wall-plug supply, you can permanently damage the unit.**

2 Turn ON the ON/OFF switch on the rear panel. The unit enters a self-test mode with the following LED indications:

- ADSL STAT LED flashes green

- ADSL SYNC LED flashes green

- Power LED lit solid green

Allow the Megabit Modem CRA-C approximately 30 to 60 seconds to synchronize with the Megabit Modem CRA at the other end of the ADSL line.

3 Verify the following LED indications (after the self test is completed):

- 10BASE-T LINK LED is solid green (when the Ethernet port is connected)

- ADSL SYNC LED is solid green

- ADSL STAT LED is solid green

- ADSL MAR LED is solid green

If conditions other than those listed above exist, check the installation.
See Table 2 for a description of the front panel indications.

CONFIGURE AND VIEW STATUS

In this chapter, you configure the Megabit Modem CRA-C or view system status using an ASCII terminal connected to the console port. Go to the following sections:

Connect to an ASCII Terminal

Connect the Megabit Modem CRA-C to an ASCII terminal:

1 Plug the console adapter into the standard 9-pin COM port on the ASCII terminal and tighten the captive screws until they are snug (Figure 7). (Skip this step if the ASCII terminal has an RJ-48 jack.)

2 Connect one end of the silver console cable to the console adapter.

3 Connect the other end of the silver console cable to the console port on the Megabit Modem CRA-C rear panel.
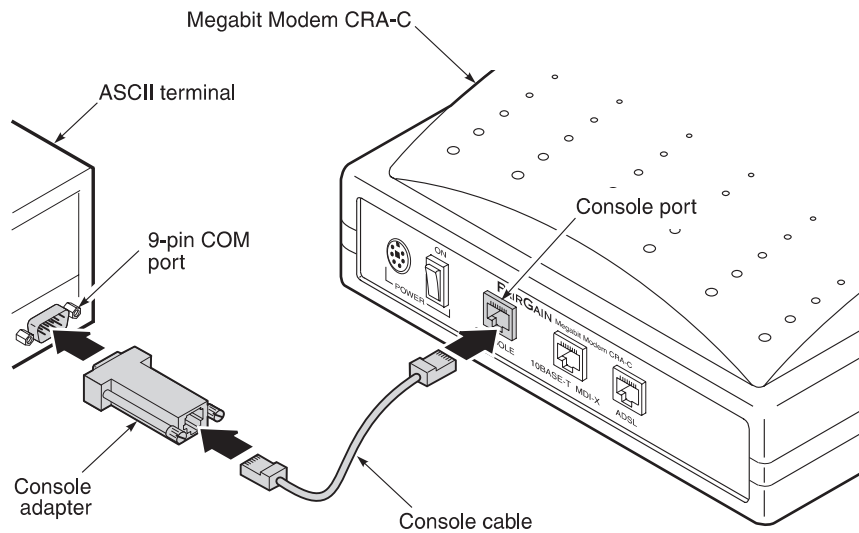
Figure 7. *Connecting to an ASCII Terminal*

4 Configure these communication settings for the ASCII terminal:

- 9600 to 19,200 baud

- no parity

- 8 data bits

- stop bit

- flow control to OFF

5 Select ANSI for terminal emulation.

How to Log On and Navigate the Menus

This section shows you how to log on and then how to navigate the menu structure. Every console screen has a menu header which displays the time in the upper right corner and the date in the upper left corner.

Through the menus, you can configure a local and a remote modem. The header on each menu screen identifies the modem being monitored or configured:

- *ATU-C* is the ADSL Transceiver Unit (ATU) at the service provider site which is the Megabit Modem CRA-C.

- *ATU-R* is the remote Megabit Modem CRA at the subscriber site

Log on to the Megabit Modem CRA-C:

1 Press the spacebar several times to activate the autobaud feature and to display the Logon Password screen.

```
07/2/97          PAIRGAIN TECHNOLOGIES          08:42:36
          ATU-C ADSL MEGABIT MODEM TERMINAL  01.01




















LOGON PASSWORD>
```
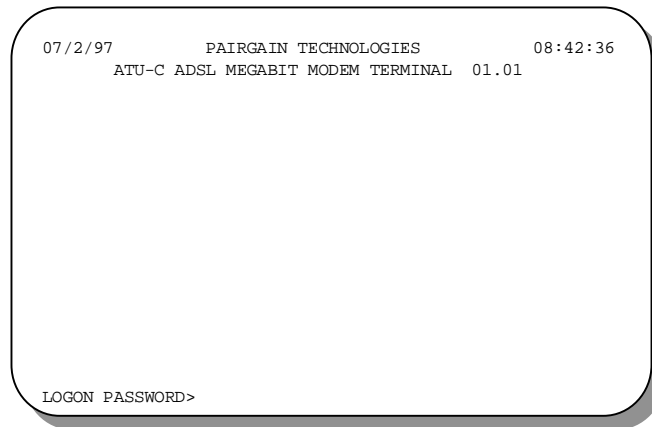
> **ENTER is the factory-default password. If you
> establish a different password, you must type the new
> password at the LOGON PASSWORD prompt on a
> subsequent log on.**

2 Type your password at the password prompt or press ENTER
(factory default password) if you have not customized
your password. The Main Menu displays.

```
07/02/97        PAIRGAIN TECHNOLOGIES            08:43:18
         ATU-C ADSL MEGABIT MODEM TERMINAL   01.01



                         MAIN MENU

               1. SYSTEM STATUS AND CONFIGURATION
               2. ADSL MENU
               3. BRIDGE/ROUTER MENU
               4. REMOTE LOGON



               Q. LOGOUT

  ENTER CHOICE-->
```

See the section, "Configure System Settings," to establish a new
password.

Figure 8 shows the structure for the Megabit Modem CRA-C menus. Type the
number of the menu item you want to view or configure.
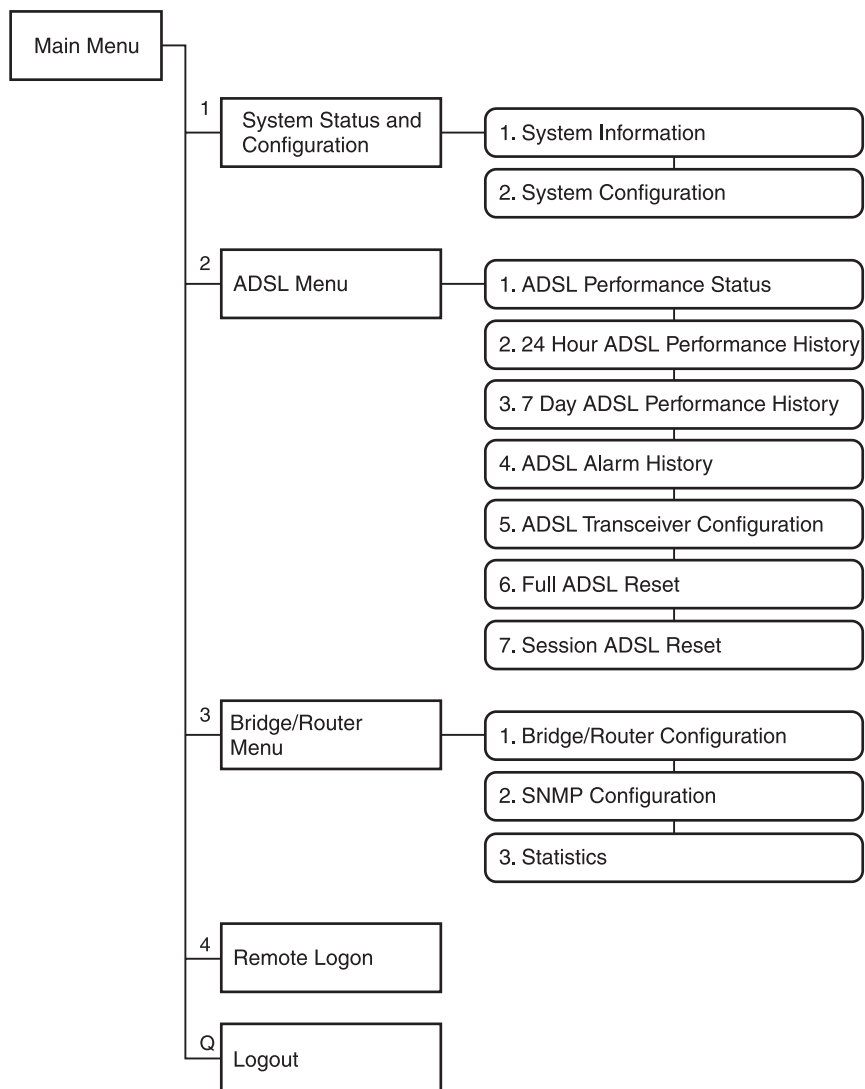
Figure 8. Megabit Modem CRA-C Menu Structure

Table 6 shows the ASCII terminal key functions used to navigate the menus and to select settings.

Table 6. *Keyboard Functions*

Key	Function
`ESC`	Restores the parameter to the last saved setting. Applies to parameters where you type a value but not to parameters you toggle.
`M`	Goes to Main Menu.
`Q`	Performs a log out from the Main Menu.
`R`	Returns to the next higher-level menu.
`Ctrl` `R`	Refreshes the current screen.
`Ctrl` `T`	Toggles between ATU-C and ATU-R menus.
Status Menus and Reports	
`C`	Clears the current values.
`N`	Selects the next page.
`P`	Selects the previous page.
`U`	Restores previous setting by undoing the last action.

When configuring Megabit Modem CRA-C parameters:

- Toggle among predefined optional settings (for example, select STARTUP OPTION in the ADSL Configuration Menu and then toggle through the choices) as follows:

  1 Type the number of the option.

  2 Press the spacebar to select the new setting, then press `ENTER`.

- Type required information (for example, to change system time, type in the hour, minute, and second as hh:mm:ss) as follows:

  1 Type the number of the option. The screen prompts you to type specific information.

  2 Type the information, following the instructions on the screen, then press `ENTER`.

How to Configure a Remote Unit

From the Megabit Modem CRA-C, you can view system parameters and set configuration options for the remote Megabit Modem CRA. The remote console menu header reflects the remote unit as ATU-R. This shows that the console program is physically connected to the unit at the service provider site (ATU-C), but is virtually configuring the unit at the subscriber site (ATU-R).

At the Main Menu, type **4** for Remote Logon to display the configuration and status menus for Megabit Modem CRA (remote ATU-R).

```
07/02/97        PAIRGAIN TECHNOLOGIES            08:43:18
        ATU-C ADSL MEGABIT MODEM TERMINAL   01.01



                        MAIN MENU

            1. SYSTEM STATUS AND CONFIGURATION
            2. ADSL MENU
            3. BRIDGE/ROUTER MENU
            4. REMOTE LOGON



            Q. LOGOUT

ENTER CHOICE-->
```
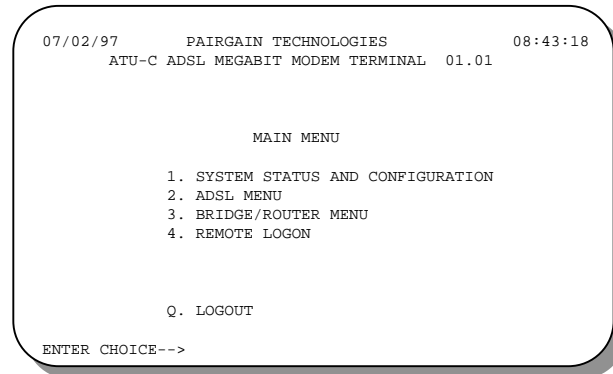
The following Remote Logon screen is displayed.

```
07/02/97        PAIRGAIN TECHNOLOGIES            08:42:28
        ATU-R ADSL MEGABIT MODEM TERMINAL   01.01








LOGON PASSWORD>
```
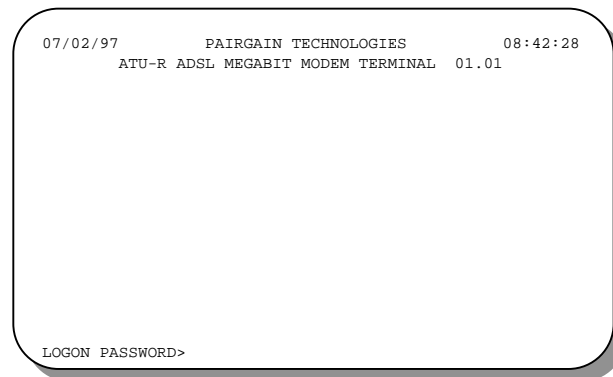
Optionally, you can press **Ctrl** **T** at the logon screen or at any menu shown in the menu tree (Figure 8) to toggle between the local and remote Megabit Modems.

Configure the System Settings

This section describes configurable system settings. You can change factory default settings like time and date, or create a password and unique ID for the unit.

1   On the Main Menu, type **1** to display the System Status and Configuration menu.

```
07/02/97          PAIRGAIN TECHNOLOGIES            08:43:23
          ATU-C ADSL MEGABIT MODEM TERMINAL  01.01



                  SYSTEM STATUS AND CONFIGURATION


                  1. SYSTEM INFORMATION
                  2. SYSTEM CONFIGURATION




                            (M)ain

  ENTER CHOICE-->
```
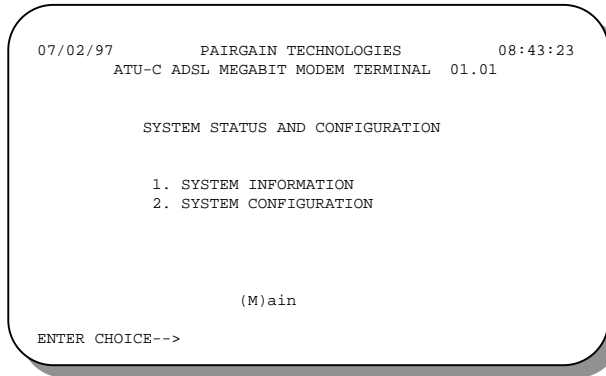
2   Type **2** to display the System Configuration menu.
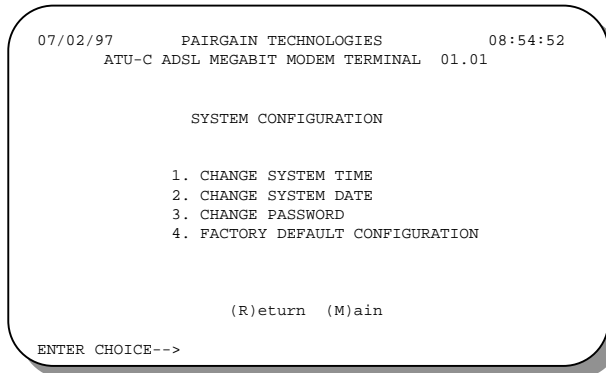
```
07/02/97          PAIRGAIN TECHNOLOGIES            08:54:52
          ATU-C ADSL MEGABIT MODEM TERMINAL  01.01


                        SYSTEM CONFIGURATION


                  1. CHANGE SYSTEM TIME
                  2. CHANGE SYSTEM DATE
                  3. CHANGE PASSWORD
                  4. FACTORY DEFAULT CONFIGURATION



                        (R)eturn  (M)ain

  ENTER CHOICE-->
```

3 Do the following for each system setting option you want to change:

- Type the number of the option you want to configure.

- Type the appropriate information for each option as indicated in Table 7 then press `ENTER` .

Table 7. System Configuration Options

Type No.	For Option	Function
1	Change System Time	Type the new time in the 24-hour clock format hh:mm:ss at the prompt. The new time shows in the upper right corner of the screen.
2	Change System Date	Type the month, day, and year in the mm/dd/yy format at the prompt. The new date shows in the upper left corner of the screen.
3	Change Password	Enter a maximum of eight characters. To enter a new password, do the following: • Type `3` and the message `Creating user password, press ENTER` displays. Press `ENTER` . • When prompted `Please enter the new password`, type the new password then press `ENTER` . An * appears on the screen as you type each character of the password. • When prompted `Please retype the password`, type the new password again then press `ENTER` . You get this confirmation: `Password accepted.` If you change the default password, write it down and save it in a secure place. You cannot recover the password if it is forgotten.
4	Factory Default Configuration	Resets all ADSL transceiver and Ethernet bridge values to default. After you type `4` , a message warns you that you will reset these values. Select either N (no) or Y (yes) to reset. When you select Y, the modem restarts. Press the spacebar several times to autobaud. You must then log in again. All ADSL transceiver and Ethernet bridge values are now at default values, including the password.

Configure the ADSL Transceiver

The ADSL menu provides access to set ADSL configuration parameters and to view ADSL performance and alarm status (menu options 1 through 4). See "View Status" (page 41) for more information on options 1 through 4.

Configure parameters for ADSL data transmission in the "Configuration" section that follows. Then, reset the Megabit Modem CRA-C to make the changes effective using the "Reset the ADSL Transceiver" section (page 29).

From the Main Menu, type **2** to display the ADSL Menu.

```
07/02/97        PAIRGAIN TECHNOLOGIES         08:44:57
         ATU-C ADSL MEGABIT MODEM TERMINAL   01.01


                       ADSL MENU

             1. ADSL PERFORMANCE STATUS
             2. 24 HOUR ADSL PERFORMANCE HISTORY
             3. 7 DAY ADSL PERFORMANCE HISTORY
             4. ADSL ALARM HISTORY
             5. ADSL TRANSCEIVER CONFIGURATION MENU
             6. FULL ADSL RESET
             7. SESSION ADSL RESET

                       (M)ain

ENTER CHOICE-->
```

Configuration

Configure ADSL transmission parameters for the Megabit Modem CRA-C (ATU-C) only. The Megabit Modem CRA (ATU-R) uses the parameters specified for the Megabit Modem CRA-C.

1   Press **5** at the ADSL Menu to display the ADSL Configuration Menu.

```
05/05/98    PAIRGAIN TECHNOLOGIES            08:51:00
       ATU-C ADSL MEGABIT MODEM TERMINAL   01.01

            ADSL CONFIGURATION MENU

1. STARTUP OPTION          SESSION STARTUP
2. MAX UP DATA RATE        1080
3. MAX DOWN DATA RATE      3168
4. STARTUP SNR MARGIN      6dB
5. MARGIN THRESHOLD        4
6. ES THRESHOLD            100
7. ALARM CONFIGURATION     LOF=E MAR=E ES=E SES=E SELF=E
8. TRANSMIT SPECTRUM       STANDARD

         (C)onfirm (U)ndo (R)eturn (M)ain

ENTER CHOICE-->
```

2   Do the following for each system setting option you want to change:

- Type the number of the option you want to configure.

- Select, using the spacebar, or type the appropriate information for each option as indicated in Table 8 then press `ENTER` .

3   After you type `R` or `M` and have made changes to the ADSL transceiver, you are prompted `Save current settings (Y/N)?` Type Y for yes or N for no. You then return to the ADSL Menu.

Table 8. *ADSL Transceiver Options*

Type No.	For Option	Function
1	Startup Option	Select one of three startup options using the spacebar. The unit uses the option you select to achieve a transmission rate for the ADSL line at a reboot or if the line is dropped and recovered.
		Full startup always - System will always attempt a full startup where it will set a transmission rate up to the maximum specified in options 2 and 3 for maximum upstream and downstream data rate. It determines this rate by assessing the signal quality data (line length and noise conditions, for example) and the SNR value set in option 4 for SNR startup margin. It then uses the highest available rate based on this information.
		Session startup - Session startup uses the data acquired during a full startup to achieve a transmission rate, rather than re-assessing the signal quality data. In this mode, the system performs a session startup upon every powerup or reset and would also revert back to a full startup attempt when a session startup is not successful for 30 seconds. This is the default.
		Fixed data rate - At startup, the system attempts only the data rates that you select in options 2 and 3 for maximum upstream and downstream data rates. The system attempts to come up at the programmed data rates with a margin greater than or equal to the configured margin. If the data rates cannot be obtained, then the system will continue to attempt the data rate. If it does not achieve it, sync will not occur.
2*	Max Up Data Rate	Select a maximum data rate for the upstream channel (from subscriber to service provider). Use the spacebar to scroll through the available rates.

(continued)

Table 8. *ADSL Transceiver Options (continued)*

Type No.	For Option	Function
3*	Max Down Data Rate	Select a maximum data rate for the downstream channel (from service provider to subscriber). Use the spacebar to scroll through the available rates.
4	Startup SNR Margin	Press the spacebar to select a startup SNR margin from –3 to 9 dB or NA (don't care about startup SNR margin). The default is 6 dB.
5	Margin Threshold	Type a dB value from 0 to 15. The Margin Threshold, in dB, is the excess SNR relative to the SNR at 10^{-7} BER operation. When the margin falls below the threshold, this causes an SNR margin alarm and the MAR LED on the front panel to blink. The default value is 4.
6	ES Threshold	Type in a value from 0 to 255 for the ES (errored second) Threshold. If the current 15-minute interval ES exceeds the set value, then this causes an ES alarm. The default is 100.
7	Alarm Configuration	Configure each alarm as either major or minor alarm or disable the alarm. Enabling alarms affects the ADSL STAT LED, but not the alarm history. The available options for each alarm are (E) for enabled minor alarm, (D) for disabled alarms, and (M) for enabled major alarm. Type 7 then press N until you highlight the alarm you want to configure. Press the spacebar to toggle among the choices listed above and press ENTER to select. When you disable an alarm, it affects the system ALARM/STATUS LED or alarm relays, but it does not affect the reporting of alarm information in the menu displays.
8	Transmit Spectrum	Select downstream power option of either STANDARD (default) or HI-PERFORMANCE. Unit uses the selected option to set the upper limit of the downstream power spectral density (PSD) during data transmission. PSD for STANDARD is set to -40 dBm/Hz. PSD for HI-PERFORMANCE is set to -34 dBm/Hz for frequencies higher than 220 kHz.

* Certain data rate combinations are invalid. If such a combination is selected in fixed data mode, the modem will change the rates to a valid combination. When such a combination is selected in full startup mode, the modem accepts it, but the actual data rate to be achieved will not match the setting regardless of the line quality.

Reset the ADSL Transceiver

When you change any of the options 1 through 4 at the ADSL Menu, Reset
the ADSL transceiver to make the changes effective and re-establish the
ADSL link.

```
07/02/97          PAIRGAIN TECHNOLOGIES          08:44:57
           ATU-C ADSL MEGABIT MODEM TERMINAL  01.01


                       ADSL MENU

              1. ADSL PERFORMANCE STATUS
              2. 24 HOUR ADSL PERFORMANCE HISTORY
              3. 7 DAY ADSL PERFORMANCE HISTORY
              4. ADSL ALARM HISTORY
              5. ADSL TRANSCEIVER CONFIGURATION MENU
              6. FULL ADSL RESET
              7. SESSION ADSL RESET

                        (M)ain

ENTER CHOICE-->
```
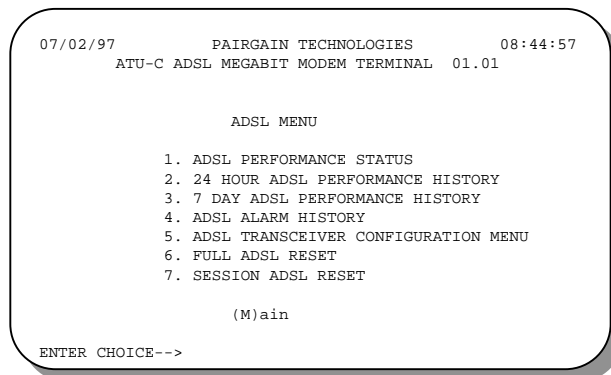
Type either 6 or 7 from the ADSL Menu to Reset the ADSL transceiver.
Table 9 describes the Reset options.
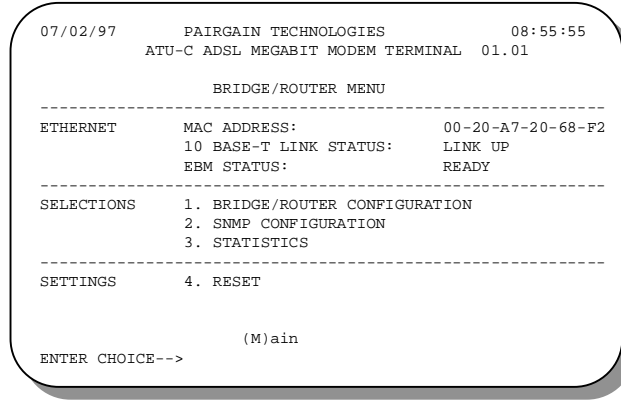
Table 9. *Reset ADSL Transceiver Options*

Type No.	For Option	Function
6	Full ADSL Reset	Select this option to reset and set a transmission rate up to the maximum specified in options 2 and 3 of the ADSL Transceiver Configuration Menu. It determines this rate by assessing the signal quality data (line length and noise conditions, for example) and the SNR value set in option 4 of the ADSL Transceiver Configuration Menu.
7	Session ADSL Reset	Select this option to reset and use the data rates acquired during the previous full startup rather than re-assessing the signal quality data and determining new rates.

Configure the Bridge/Router

This section describes how to configure the Ethernet interface (bridge) of the modem as either a bridge or a router. Then, configure the management protocol options through the SNMP Configuration menu.

On the Main Menu, type **3** to display the Bridge/Router Menu.

```
07/02/97        PAIRGAIN TECHNOLOGIES           08:55:55
              ATU-C ADSL MEGABIT MODEM TERMINAL  01.01

                     BRIDGE/ROUTER MENU
-----------------------------------------------------------
ETHERNET      MAC ADDRESS:               00-20-A7-20-68-F2
              10 BASE-T LINK STATUS:     LINK UP
              EBM STATUS:                READY
-----------------------------------------------------------
SELECTIONS    1. BRIDGE/ROUTER CONFIGURATION
              2. SNMP CONFIGURATION
              3. STATISTICS
-----------------------------------------------------------
SETTINGS      4. RESET


                     (M)ain
ENTER CHOICE-->
```

The Bridge/Router Menu shows the MAC address for the unit you are viewing and current 10BASE-T and Ethernet Bridge Mode link status. See "View Status" (page 41) for more information on the Statistics menu.

Through the Bridge/Router Configuration menu, you can configure the Megabit Modem as either a bridge to forward Ethernet data based on MAC addresses or as a router to route Ethernet data based on IP addresses. You must configure both Megabit Modems (local and remote) with the same mode (both as bridges or both as routers).

Bridge mode can be a less secure method of sending data because the desired MAC address is broadcast over the network, but it allows protocols other than IP to be forwarded. Router mode provides security by statically mapping route entries. Routing can prevent eavesdropping and provide broadcast filtering. Select either the "Configure as a Bridge" section (page 31) or the "Configure as a Router" section (page 34).

After you change Bridge/Router Configuration or the SNMP Configuration options, "Reset the Ethernet bridge" (page 40) to make the changes effective.

Configure as a Bridge

Configure Bridge parameters at the Bridge/Router Menu. Bridge configuration options are maintained and restored through the system's local service port and are kept in NVRAM to be used in subsequent initializations.

1 Type **1** at the Bridge/Router Menu to display the Bridge Configuration Menu.

2 Type **1**, press the spacebar to toggle to Bridge, then press **ENTER**. At the prompt, Save current setting (Y/N), type Y to display this screen. Ensure the mode setting is Bridge.

```
07/02/97        PAIRGAIN TECHNOLOGIES         08:54:11
        ATU-C ADSL MEGABIT MODEM TERMINAL  01.01


               BRIDGE CONFIGURATION MENU

----------------------------------------------------------------
SETTINGS   1. BRIDGE/ROUTER MODE        BRIDGE
           2. LOCAL IP ADDR             192.168.240.10
           3. LOCAL SUBNET MASK         255.255.255.0
           4. BOOT ROUTER IP ADDR       0.0.0.0
           5. DEFAULT ROUTER IP ADDR    192.168.240.1
           6. SPANNING TREE             DISABLE
           7. BOOT SERVER IP ADDR       0.0.0.0
           8. BOOT MODE                 LOCAL
           9. IMAGE FILE NAME
           A. IMAGE LOAD MODE           LOCAL
           B. PACKET ENCAPSULATION      HDLC
----------------------------------------------------------------


           (C)onfirm (U)ndo (R)eturn (M)ain

ENTER CHOICE-->
```

3 Do the following for each Bridge Configuration option you want to change:

- Type the number or letter of the option you want to configure.

- Select, using the spacebar, or type in the appropriate information for each option as indicated in Table 10 then press **ENTER**.

Table 10. *Bridge Configuration*

Type No.	For Option	Function
2	Local IP Addr	Configure for the modem to respond to an application that uses IP protocol including SNMP and TFTP. The default is 0.0.0.0. You can either type in the address supplied by a system administrator or get the IP address via the boot server when boot mode is set to Network.
3	Local Subnet Mask	Determines if a host (TFTP server, SNMP management station, or trap receiver) is on the same local subnet. If it is, the modem sends messages directly to the host. If it is not, the Megabit Modem CRA-C sends messages through a default router. The default is 255.255.255.0
4	Boot Router IP Addr	Sets the IP address of the Boot Router used to forward BOOTP requests to the proper BOOTP server. When configured, the modem sends its BOOTP requests directly to this device rather than sending a broadcast packet. The default is 0.0.0.0.
5	Default Router IP Addr	Sets the address of the router which must be used to reach a host (TFTP server, SNMP management station, or trap receiver) located on another network. The default is 0.0.0.0.
6	Spanning Tree	Select either Enable or Disable (default) for Spanning Tree mode.
7	Boot Server IP Addr	Type the IP address of the TFTP server. The default is the value of the BOOTP server if you have not configured a different TFTP server address on the BOOTP configuration file.
8	Boot Mode	Select either Local (default) or Network for how the Megabit Modem CRA-C learns its protocol and network configuration (boot information) during power on or reset. Local Boot configuration is contained in NVRAM. When Network is selected, the Megabit Modem CRA-C learns its configuration over the network via a BOOTP server. It is recommended that the BOOTP server be connected to the same segment as the Megabit Modem CRA-C 10BASE-T port.

(continued)

Table 10. *Bridge Configuration (continued)*

Type No.	For Option	Function
9	Image File Name	Read-only value. This parameter can be configured only in the BOOTP configuration file and is acquired when Boot Mode and Image Load Mode are set to network. This name must match the name of a file on the TFTP server in order for an image file download to occur.
A	Image Load Mode	Specifies how the operational image code is loaded for the Ethernet bridge. The Megabit Modem CRA-C supports both local and remote loading. Local image code is contained in flash devices for local loading of operation code. When loading over the network, use BOOTP (RFC 951) and TFTP (RFC 783) to obtain image files.
		Set Local (default) to load the image file from the application sector of the Megabit Modem CRA-C non-volatile device, if valid. The code is valid if the CRC calculated on power-up matches the expected CRC. If it does not, the Megabit Modem CRA-C attempts to get a new image using the TFTP.
		Set Network (with local backup) to attempt to download the image file over the network. It first issues a BOOTP request to get the image filename and image server IP address, then it initiates a TFTP session. If the BOOTP fails, the TFTP fails, or the downloaded image is invalid, the image file is loaded using the local image mode.
		If no image is loaded after cycling through the TFTP process at least five times, the Megabit Modem CRA-C resets and repeats the process.
B	Packet Encapsulation	Indicates the format used to encapsulate the Ethernet packets over ADSL. Choices are HDLC (default) and PPP.

Configure as a Router

Configure Router parameters at the Bridge/Router Menu. Router configuration options are maintained and restored through the system's local service port and are kept in NVRAM to be used in subsequent initializations.

1 Type **1** at the Bridge/Router Menu to display the Bridge/Routing Configuration Menu.

```
07/02/97          PAIRGAIN TECHNOLOGIES              08:54:33
          ATU-C ADSL MEGABIT MODEM TERMINAL   01.01

              BRIDGE/ROUTING CONFIGURATION MENU
---------------------------------------------------------------
MODE SETTING     1. BRIDGE/ROUTER  MODE     ROUTER
IP STATIC ROUTING DESTINATION       SUBNET MASK  GATEWAY ADDRESS
   TABLE         2. DEFAULT                        192.168.240.1
                 3. 192.168.242.0 255.255.255.0 172.16.100.2
                 4. 0.0.0.0        0.0.0.0       0.0.0.0
                 5. 0.0.0.0        0.0.0.0       0.0.0.0
LAN PORT CONF.   6. LAN IP ADDR:               192.168.240.10
                 7. LAN SUBNET MASK:           255.255.255.0
LINE PORT CONF.  8. LINE IP ADDR:              172.16.100.1
                 9. LINE SUBNET MASK:          255.255.255.0
OTHER CONF.      A. BOOT SERVER IP ADDR:   0.0.0.0
                 B. BOOT MODE:             LOCAL
                 C. IMAGE FILE NAME:
                 D. IMAGE LOAD MODE:       LOCAL
                 E. PACKET ENCAPSULATION:  HDLC
---------------------------------------------------------------
                 C(o)nfirm (U)ndo (R)eturn (M)ain
ENTER CHOICE-->
```

2 Type **1** , press the spacebar to toggle to Router, then press **ENTER** . At the prompt, Save current setting (Y/N), type Y to display the screen below. Ensure the mode setting is Router. The following screen shows configuration for a Megabit Modem CRA-C (ATU-C) routed toward a remote Megabit Modem CRA (ATU-R), using IP addresses from the example in Figure 12.

The following screen shows configuration for a Megabit Modem CRA (ATU-R) routed toward a Megabit Modem CRA-C (ATU-C), using IP addresses from the example in Figure 12.

```
07/02/97          PAIRGAIN TECHNOLOGIES              08:54:33
          ATU-R ADSL MEGABIT MODEM TERMINAL   01.01

              BRIDGE/ROUTING CONFIGURATION MENU
---------------------------------------------------------------
MODE SETTING    1. BRIDGE/ROUTER  MODE    ROUTER
IP STATIC ROUTING DESTINATION       SUBNET MASK  GATEWAY ADDRESS
   TABLE        2. DEFAULT                        172.16.100.1
                3. 0.0.0.0        0.0.0.0        0.0.0.0
                4. 0.0.0.0        0.0.0.0        0.0.0.0
                5. 0.0.0.0        0.0.0.0        0.0.0.0
LAN PORT CONF.  6. LAN IP ADDR:                  192.168.242.1
                7. LAN SUBNET MASK:              255.255.255.0
LINE PORT CONF. 8. LINE IP ADDR:                 172.16.100.2
                9. LINE SUBNET MASK:             255.255.255.0
OTHER CONF.     A. BOOT SERVER IP ADDR:   0.0.0.0
                B. BOOT MODE:             LOCAL
                C. IMAGE FILE NAME:
                D. IMAGE LOAD MODE:       LOCAL
                E. PACKET ENCAPSULATION:  HDLC
---------------------------------------------------------------
                  C(o)nfirm (U)ndo (R)eturn (M)ain
ENTER CHOICE-->
```

3 Do the following for each Router Configuration option you want to change:

- Type the number or letter of the option you want to configure.

- Select, using the spacebar, or type in the appropriate information for each option as indicated in Table 11 then press ENTER .

Table 11. *Router Configuration*

Type No.	For Option	Function
2	Default	Contains the address of the default gateway
3 4 5	IP Static Routing Table	Consists of the Destination, Subnet Mask, and Gateway. Must be configured for the Megabit Modem CRA-C to operate as a static IP router. 0.0.0.0 is the format for each field and the default.
6	LAN IP Addr	Input the network address of the Megabit Modem CRA-C 10BASE-T port. It is necessary for static IP mapping to function properly. 0.0.0.0 is the format for the field.
7	LAN Subnet Mask	Input the subnet mask of the Megabit Modem CRA-C 10BASE-T port. Necessary for static IP mapping to function properly. 0.0.0.0 is the format for the field. 255.255.255.0 is the default.
8	Line IP Addr	Input the network address of the Megabit Modem CRA-C ADSL port. Necessary for static IP mapping to function correctly.
9	Line Subnet Mask	Input the subnet of the Megabit Modem CRA-C ADSL port. Necessary for static IP mapping to function correctly. 255.255.255.0 is the default.
A	Boot Server IP Addr	Gives the address of the TFTP server. The default is the value of the BOOTP server if you have not configured a different TFTP server address on the BOOTP configuration file.
B	Boot Mode	Describes the manner in which the Megabit Modem CRA-C learns its protocol and network configuration during power-on or reset. Supports both local and remote loading of Boot information (IP configuration only). Local Boot configuration is contained in NVRAM. The Megabit Modem CRA-C obtains its configuration using values found in NVRAM when Local (the default) is selected. When Network is selected, the Megabit Modem CRA-C learns its configuration over the network via a BOOTP server.

(continued)
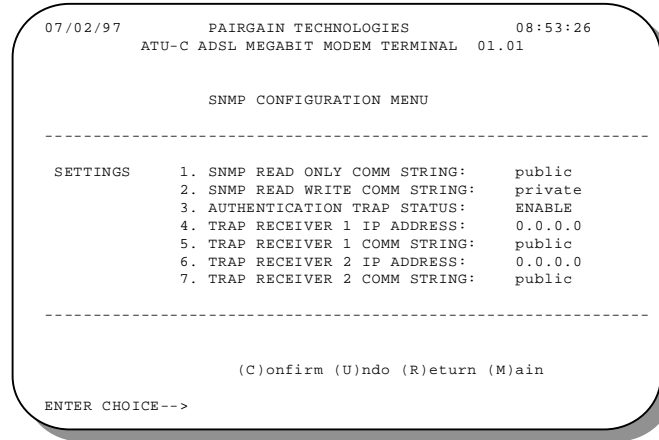
Table 11. *Router Configuration (continued)*

Type No.	For Option	Function
C	Image File Name	Read-only parameter. The name must match the name of a file on the TFTP server for an image file download to occur.
D	Image Load Mode	Specifies how the Ethernet bridge code is loaded. The Megabit Modem CRA-C supports both local and remote loading. Local image code is contained in flash devices for local loading of operation code. When loading over the network, use BOOTP (RFC 951) TFTP (RFC 783) to obtain image files.

Set Local (default) to load the image file from the application sector of the Megabit Modem CRA-C non-volatile device, if valid. The code is valid if the CRC calculated on power-up matches the expected CRC. If it does not, the Megabit Modem CRA-C attempts to get a new image via the TFTP.

Set Network (with local backup) to attempt to download the image file over the network. It first issues a BOOTP request to get the image filename and image server IP address, then it initiates a TFTP session. If the BOOTP fails, the TFTP fails, or the downloaded image is invalid, the image file is loaded using the local image mode.

If no image is loaded after cycling through the TFTP process at least five times, the Megabit Modem CRA-C resets and repeats the process. |
| E | Packet Encapsulation | Indicates the encapsulation format used to envelope the Ethernet packets over ADSL. Choices are HDLC (default) and PPP. |

Configure SNMP

Configure SNMP parameters and trap addresses at the SNMP
Configuration menu.

1   Type **2** at the Bridge/Router Menu to display the SNMP
Configuration Menu.

```
07/02/97          PAIRGAIN TECHNOLOGIES           08:53:26
           ATU-C ADSL MEGABIT MODEM TERMINAL   01.01


                   SNMP CONFIGURATION MENU

----------------------------------------------------------------

 SETTINGS    1. SNMP READ ONLY COMM STRING:     public
             2. SNMP READ WRITE COMM STRING:    private
             3. AUTHENTICATION TRAP STATUS:     ENABLE
             4. TRAP RECEIVER 1 IP ADDRESS:     0.0.0.0
             5. TRAP RECEIVER 1 COMM STRING:    public
             6. TRAP RECEIVER 2 IP ADDRESS:     0.0.0.0
             7. TRAP RECEIVER 2 COMM STRING:    public


----------------------------------------------------------------



                 (C)onfirm (U)ndo (R)eturn (M)ain

 ENTER CHOICE-->
```

2   Do the following for each SNMP Configuration option you want
to change:

- Type the number of the option you want to configure.

- Select, using the spacebar, or type in the appropriate
  information for each option as indicated in Table 12 then
  press **ENTER** .

Table 12. *SNMP Configuration Options*

No.	For Option	Function
1	SNMP Read Only Comm String	Provides the authentication string used for SNMP read-only operations. At the prompt NEW COMMUNITY STRING:, type in appropriate community string. Typically, use either Public or Private. The read-only community string setting must match the network manager community string setting of Public or Private. The authentication string is required for the Megabit Modem CRA-C to correctly respond to SNMP set and get requests.
2	SNMP Read Write Comm String	Provides the authentication string used for SNMP read-write operations. At the prompt NEW COMMUNITY STRING:, type either Public (default) or Private. The read-write community string setting must match the network manager community string setting of Public or Private. The authentication string is required for the Megabit Modem CRA-C to correctly respond to SNMP set and get requests
3	Authentication Trap Status	Select Disable (default) or Enable for use of authentication error trap generation. The trap is sent to the trap receiver address when an SNMP request is received with an invalid or incorrect community string.
4	Trap Receiver 1 IP Address	Sets the first IP address for the server receiving the trap.
5	Trap Receiver 1 Comm String	Enter the first string used for trap authentication is entered. Trap Receiver 1 Community String is blank if no trap is being used. The field is case sensitive.
6	Trap Receiver 2 IP Address	Enter the second IP address for the server receiving the trap.
7	Trap Receiver 2 Comm String	Enter the second string used for trap authentication. Trap Receiver 2 Community String is blank if no trap is being used. The field is case sensitive

Reset the Ethernet Bridge

Changes you make to the Ethernet bridge through the Bridge/Router Configuration menus (pages 31 and 37) and SNMP Configuration menu (page 38) write immediately to flash memory when changes are confirmed. However, they do not take effect until the Megabit Modem CRA-C Ethernet bridge is reset. The Reset option causes the bridge to reboot with the new configuration.

Reset the Megabit Modem CRA-C Ethernet bridge:

1 Type **3** at the Main Menu to display the Bridge/Router menu.

```
07/02/97        PAIRGAIN TECHNOLOGIES              08:55:55
            ATU-C ADSL MEGABIT MODEM TERMINAL   01.01

                    BRIDGE/ROUTER MENU
    ------------------------------------------------------------
    ETHERNET      MAC ADDRESS:               00-20-A7-20-68-F2
                  10 BASE-T LINK STATUS:     LINK UP
                  EBM STATUS:                READY
    ------------------------------------------------------------
    SELECTIONS    1. BRIDGE/ROUTER CONFIGURATION
                  2. SNMP CONFIGURATION
                  3. STATISTICS
    ------------------------------------------------------------
    SETTINGS      4. RESET


                       (M)ain
    ENTER CHOICE-->
    WARNING: This will bring down all connections. Are you sure? (Y/N)
```
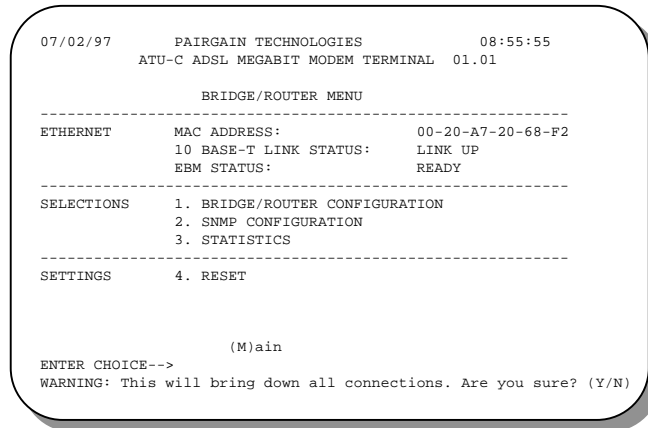
2 Make all changes in the Bridge/Routing Configuration menu and the SNMP Configuration menu.

3 Type **4** to select Reset.

4 Type either Y for yes to Reset or N for no to cancel Reset.

When you select Y to Reset, the Megabit Modem CRA-C Ethernet link is dropped, the bridge is reset, then the Ethernet link is re-established. The changes made to the Ethernet bridge are now effective.

View Status

This section describes status menus. You can view information such as current alarm status, performance history, and product information. See the following section for:

- system information (page 41)

- ADSL transceiver status (page 42)

- Ethernet bridge statistics (page 48)

System Information

The System Information screen provides general product information for the units at both the service provider (ATU-C) and subscriber (ATU-R) sites. This includes hardware and software revision information as well as the product number and manufacturing information.

Access the System Information screen by typing `1` on the Main Menu then typing `1` on the System Status and Configuration menu to display the System Information screen.

```
07/02/97           PAIRGAIN TECHNOLOGIES           08:43:44
           ATU-C ADSL MEGABIT MODEM TERMINAL  01.01


                      SYSTEM INFORMATION

                                   ATU-C           ATU-R
MODEM          PRODUCT NUM         1704-01         1704-02
               HARDWARE REV        P00             P00
               MANUF DATE          01/01/96        01/01/96
               SERIAL NUM          000000000000    000000000000
               SOFTWARE REV        01.01           01.01
               PROM CHECKSUM       5D7D/1038       300C/AFF9
TRANSCEIVER    HARDWARE NUM        1752-01         1764-01
               HARDWARE REV        P00             P00
BRIDGE MODULE  SOFTWARE REV        V2.22           V2.22
               PROM CHECKSUM       1234            1234
HISTORY        DAY IN OPERATION    4               4




                      (R)eturn (M)ain

ENTER CHOICE-->
```

ADSL Transceiver Status

From the Main Menu, type **2** to display the ADSL Menu.

```
07/02/97          PAIRGAIN TECHNOLOGIES         08:44:57
          ATU-C ADSL MEGABIT MODEM TERMINAL   01.01


                      ADSL MENU

              1. ADSL PERFORMANCE STATUS
              2. 24 HOUR ADSL PERFORMANCE HISTORY
              3. 7 DAY ADSL PERFORMANCE HISTORY
              4. ADSL ALARM HISTORY
              5. ADSL TRANSCEIVER CONFIGURATION MENU
              6. FULL ADSL RESET
              7. SESSION ADSL RESET

                      (M)ain

 ENTER CHOICE-->
```

Select options 1 through 4 to view status for the ADSL transceiver. The ADSL
ES counts, UAS counts, and minimum SNR margins are updated every second
and can be viewed from the ADSL Performance History screens shown on
pages 43 through 47.

ADSL Performance Status. The ADSL Performance Status screen is updated every second and provides a summary of the ADSL parameters and outstanding ADSL-related alarms. This screen displays the upstream and downstream ADSL links. The SNR (signal-to-noise ratio) margin column displays both the current SNR margins as well as the minimum SNR margins for the current 24-hour period.

Press `1` on the ADSL Menu to display the ADSL Performance Status screen.

```
07/02/97           PAIRGAIN TECHNOLOGIES           08:45:10
          ATU-C ADSL MEGABIT MODEM TERMINAL  01.01

                    ADSL PERFORMANCE STATUS

  DOWN ALARMS:    NONE
  UP ALARMS:      NONE
  SYSTEM STATE:   DATA

                       DOWNSTREAM          UPSTREAM
                       ----------          --------
                        cur/min             cur/min

  SNR MARGIN (dB):  13.1/13.1              7.6/7.6
  LINE ATTN          -0.1                   -0.7
  24 HOUR ES:         3                      3
  24 HOUR UAS:        38                     38
  DATA RATE (kbps): 3168                   1080

                         (C)lear (R)eturn (M)ain

  ENTER CHOICE-->
```

Do not type `C` unless you want to clear the ADSL performance and alarm counters in both the local and remote units.

Type `C` to clear the ADSL performance and alarm counters. This also clears the counts in the remote Megabit Modem CRA.

Table 13 describes the ADSL Performance Status screen fields.

Table 13. *ADSL Performance Status Screen Fields*

Field	Meaning
Down Alarms	Identifies the current alarms in the path to the subscriber.
Up Alarms	Identifies the current alarms in the path from the subscriber.
System State	Describes the state of the ADSL system. Startup states: DATA (normal operation) HAND (handshake) TRAIN (training transceivers for loop conditions) WSYNC (waiting for frame synchronization)
SNR Margin (dB)	Identifies the current (cur) and minimum (min) margin values for the ADSL loop for the current 24-hour period. The SNR margin represents the margin relative to the SNR required for a BER of 10^{-7}. A margin greater than zero indicates a performance better than 10^{-7}. The system provides a default margin of 6 dB, which translates to a performance of 10^{-10} BER or better. See page 2 for information on SNR margin and BER.
Line Attn (dB)	Indicates the decrease in amplitude of the transmitted upstream and downstream signals as measured at the ADSL respective receivers for that channel (upstream or downstream).
24 Hour ES	Indicates the total number of ES that have been detected on the ADSL link during the previous 24-hour period.
24 Hour UAS	Indicates the total number of unavailable seconds (UAS) that have been detected on the ADSL link during the previous 24-hour period. This figure represents the amount of time that the lines were not available for transmission since power on or last clear.
Data Rate (kbps)	Identifies the actual data rates of the ADSL link.

24 Hours ADSL Performance History. The 24 Hour ADSL Performance History report consists of eight screens. Each screen displays three hours of data, providing a 24-hour report in 15-minute increments.

Type 2 on the ADSL menu to open the 24 Hour ADSL Performance History screen.

```
 07/02/97            PAIRGAIN TECHNOLOGIES            08:45:54
          ATU-C ADSL MEGABIT MODEM TERMINAL   01.01


                24 HOUR ADSL PERFORMANCE HISTORY
             (errored seconds/unavailable seconds/snr)

                  DOWNSTREAM              UPSTREAM
        08:45     000/000/  13.1          000/000/   7.6
        08:30     000/000/  13.1          000/000/   7.6
        08:15     000/000/  13.1          000/000/   7.6
        08:00     000/000/  13.1          000/000/   7.6
        07:45     000/000/  13.1          000/000/   7.6
        07:30     000/000/  13.1          000/000/   7.6
        07:15     000/000/  13.1          000/000/   7.6
        07:00     000/000/  13.1          000/000/   7.6
        06:45     000/000/  13.1          000/000/   7.6
        06:30     000/000/  13.1          000/000/   7.6
        06:15     000/000/  13.1          000/000/   7.6
        06:00     000/000/  13.1          000/000/   7.6

          (C)lear (P)revious (N)ext (R)eturn (M)ain

 ENTER CHOICE-->
```

Type C to clear all ES, UAS counts, including the equivalent counts in the remote unit. The minimum SNR for the period is reset to the current SNR.

The 24 Hour ADSL Performance History data is lost when the Megabit Modem CRA-C is turned off.

7 Days ADSL Performance History. The 7 Day ADSL Performance
History menu displays the ES and UAS counts, and the minimum SNR
margins for the previous 6 days and the current day. The division of the
intervals is based on 12 am midnight as the dividing boundary, and the current
day count is not necessarily equal to the total count for the past 24 hours.

Type 3 on the ADSL Menu to open the 7 Day ADSL Performance
History menu.

```
07/02/97              PAIRGAIN TECHNOLOGIES                  08:46:07
             ATU-C ADSL MEGABIT MODEM TERMINAL   01.01


                     7 DAY ADSL PERFORMANCE HISTORY

            (errored seconds/unavailable seconds/snr)


                          DOWNSTREAM              UPSTREAM
         07/02/97         00000/00000/  13.1      00000/00000/    7.6
         07/01/97         00003/00038/  13.1      00003/00038/    7.6
         06/30/97         00000/00000/    NA      00000/00000/     NA
         06/29/97         00000/00000/    NA      00000/00000/     NA
         06/28/97         00000/00000/    NA      00000/00000/     NA
         06/27/97         00000/00000/    NA      00000/00000/     NA
         06/26/97         00000/00000/    NA      00000/00000/     NA




                    (C)lear (R)eturn (M)ain
  ENTER CHOICE-->
```

Type **C** to clear all ES and UAS counts, including the equivalent counts in
the remote unit. The minimum SNR for the period is reset to the current SNR.

**The 7 Day ADSL Performance History data is lost
when the Megabit Modem CRA-C is turned off.**

ADSL Alarm History. The ADSL Alarm History screen consists of five columns. Table 14 describes the information found in each column.

Type 4 on the ADSL Menu to open the ADSL Alarm History screen.

```
 09/08/97            PAIRGAIN TECHNOLOGIES            08:47:54
              ATU-C ADSL MEGABIT MODEM TERMINAL   01.01


                          ADSL ALARM HISTORY

    Type          First               Last            Current  Duration(s)

    LOF, DOWN     09/08/97-16:50:46  09/08/97-17:53:20   OK
    LOF, UP       09/08/97-16:50:46  09/08/97-17:53:20   OK
    MARGIN, DOWN                                         OK
    MARGIN, UP                                           OK
    ES, DOWN                                             OK
    ES, UP                                               OK
    SES, DOWN                                            OK
    SES, UP                                              OK
    SELFTEST                                             OK

    LAST CLEARED: 09/08/97-16:50:45


                     (C)lear (R)eturn (M)ain

  ENTER CHOICE-->
```

Type C to update the first and last date/time stamps and clear the time to 0.

The Alarm History data is lost when the Megabit Modem CRA-C is turned off.

Table 14. ADSL Alarm History Screen Columns

Name	Description
Type	Identifies local, remote, and ADSL link alarms. LOF: Loss of frame failure MARGIN: Low SNR margin alarm ES: Excessive errored seconds SES: Severely errored seconds SELF: Self test
First	Lists the first time an alarm is detected.
Last	Lists the last time an alarm was detected.
Current	Identifies the current status of the alarm.
Durations	Indicates the total accumulated number of seconds the system was in alarm condition since the last clear.

Ethernet Bridge Statistics

The Megabit Modem CRA-C provides real-time, non-disruptive monitoring of system performance. This menu displays a count of the valid Ethernet and ADSL frames received and forwarded by the 10BASE-T MDI-X and the line ports, respectively. The display is updated every 10 seconds and whenever you access this menu.

Access the Statistics screen for the bridge by typing **3** on the Main Menu then typing **3** on the Bridge/Router Menu.

```
07/02/97            PAIRGAIN TECHNOLOGIES         08:55:07
          ATU-C ADSL MEGABIT MODEM TERMINAL  01.01

                    BRIDGE STATISTICS MENU
-------------------------------------------------------------
ETHERNET PORT:    INPUT FRAMES:            10443613
                  OUTPUT FRAMES:            5277712
                  DISCARDED FRAMES:               0
                  ERRORED FRAMES:                 0
-------------------------------------------------------------
ADSL PORT:        INPUT FRAMES:             5278375
                  OUTPUT FRAMES:           10437290
                  DISCARDED FRAMES:               0
                  ERRORED FRAMES:                 0
-------------------------------------------------------------
                    (R)eturn (M)ain
ENTER CHOICE-->
```

Table 15 describes the Bridge Statistics fields.

Table 15. *Bridge Statistics Fields*

Field	Definition
Ethernet Port	
Input Frames	The number of frames correctly received.
Output Frames	The number of frames correctly transmitted.
Discarded Frames	The number of frames dropped due to an overflow of the input or output buffer for the port.
Errored Frames	The number of frames received in error (CRC, alignment, and dribbling bit) from the input buffer.
ADSL Port	
Input Frames	The number of frames correctly received.
Output Frames	The number of frames correctly transmitted.
Discarded Frames	The number of frames dropped due to an overflow of the input or output buffer for the port.
Errored Frames	The number of frames received in error (CRC, alignment, and dribbling bit) from the input buffer.

Log Out

Log out from the Main Menu by pressing **Q** .

NETWORK AND MANAGEMENT OVERVIEW

Through the console menus, you can configure the Megabit Modem CRA-C as a bridge to forward Ethernet data based on MAC addresses or as a router to route Ethernet data based on IP addresses. Additionally, you can configure parameters for management and encapsulation protocols using the Megabit Modem CRA-C console menus.

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MAC layer bridging and spanning tree protocol	51
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Management protocols	61
Network configuration and image code download	64
Encapsulation protocols	66

MAC Layer Bridging and Spanning Tree Protocol

MAC Layer Bridging. A bridge moves information across an internetwork from a source to a destination at the link layer (of an OSI reference model). The information is sent to a physical address known as a Media Access Control (MAC) address.

The Megabit Modem CRA-C provides transparent Ethernet MAC level bridging. It is a completely self-contained bridge with a CPU, memory subsystems (RAM, Flash, etc.), an Ethernet controller and Ethernet drivers, and other glue logic. It provides complete main bridging tasks of learning, forwarding, filtering, and hashing/buffer management. Additionally, it offers 802.1d Spanning Tree protocol, packet encapsulation (via HDLC or PPP framing), and other local tasks.

Forwarding performance is at 2.7 kpps (kilo packets per second) and filtering performance is at full Ethernet rate of 14 kpps for 64-byte frames (minimum size).

Spanning Tree. Spanning Tree protocol eliminates loops in a LAN topology by partitioning out redundant links between LAN segments. This ensures that there is only one path, or link, between any two nodes on the network. If this link goes down, Spanning Tree enables the partitioned links to create a new loop-free topology, if possible. An example of the active topology is shown in Figure 9.

Example LAN Physical Network

This physical configuration is valid only when used with
Spanning Tree to eliminate loops.
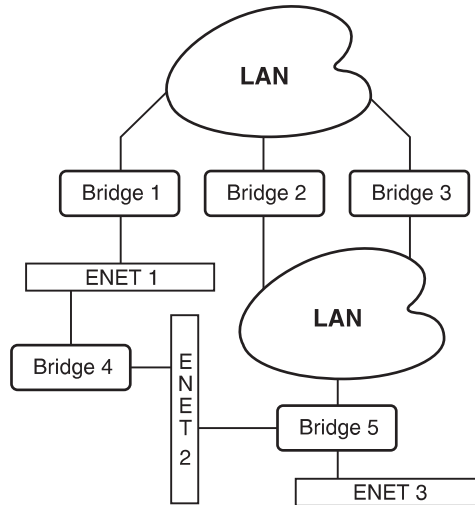
**Loop-free Topology
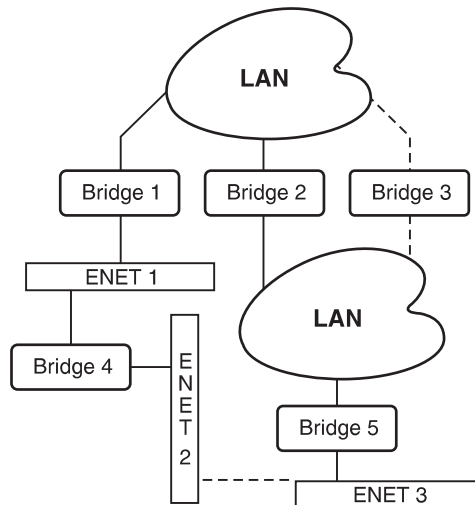Using Spanning Tree Protocol**

Figure 9. Spanning Tree Topology

You can enable or disable Spanning Tree on the Bridge/Router Configuration Menu. The Megabit Modem CRA-C uses the Spanning Tree defaults shown in Table 16. These values are user-configurable through SNMP as part of the Spanning Tree group in RFC 1493.

Table 16. Spanning Tree Defaults

Spanning Tree Attribute	Default Value
ST Bridge Priority	Hx0000
ST Max Age	30 seconds
ST Hello Time	10 seconds
ST Hold Time	10 second
ST Forward Delay	10 second
ST Port 1 Priority (LAN)	0
ST Port 2 Priority (ADSL)	0
ST Port Path Cost	1

Static IP Routing

Through the static IP routing feature, you can configure the Megabit Modem CRA-C as an IP router with statically programmed route entries. You can enable this function as a security feature to prevent eavesdropping and to provide broadcast filtering, as well as to specify multiple destination gateways. When static IP routing is enabled, you can access only specific remote IP subnets or hosts.

Since IP routers make forward or filter decisions based on the network-layer IP address instead of the MAC hardware address, MAC-level broadcast frames are prevented from reaching unwanted destinations in the network. The example in Figure 10 shows a simple Internet Service Provider (ISP) site that uses the static IP routing feature to filter MAC-level broadcast frames sourced by ISP Subscriber A from reaching ISP Subscriber B.
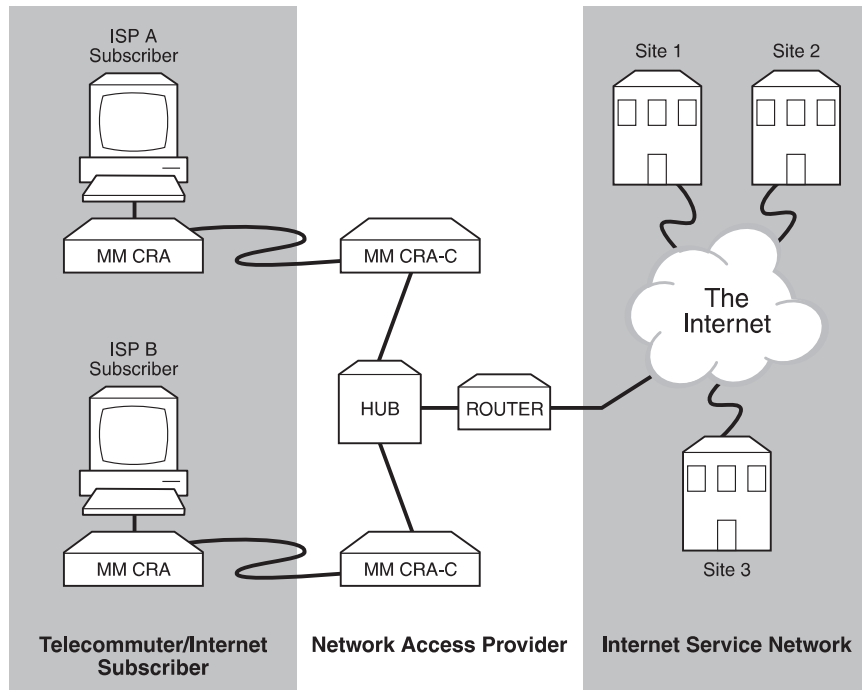
Figure 10. *Simple Configuration for Static IP Routing*

Figure 11 shows a more complex example of multiple gateways that use static IP routing to route packets sourced from specific users to different destination gateways.
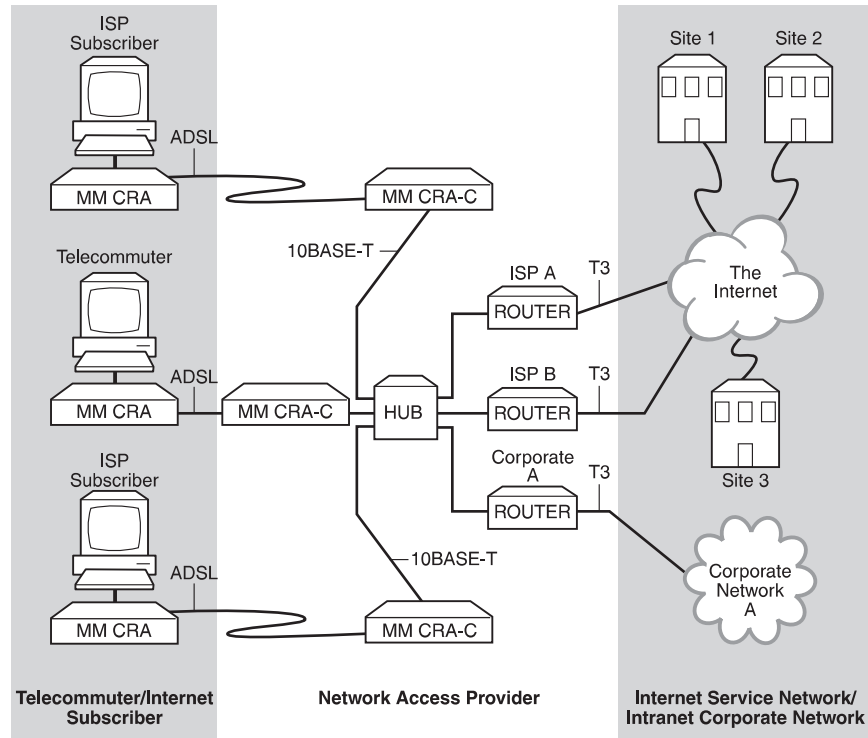
Figure 11. *Multiple Gateways Specified for Static IP Routing*

When you configure the static IP routing feature, set the parameters defined in Table 17 through the Megabit Modem CRA-C console menus. Set the parameters defined in Table 18 in an external router (used as a gateway).

Table 17. *Megabit Modem CRA-C Static IP Routing Parameters*

Parameter	Definition
Bridge/Router Mode	Select router for the Megabit Modem CRA-C to route based on IP addresses. Both the Megabit Modem CRA-C and Megabit Modem CRA units connected via ADSL must be set to router mode.
Packet Encapsulation	Select either PPP or HDLC. PPP is the preferred encapsulation for routing when interfacing with non-PairGain equipment. HDLC is lower overhead and preferred when interfacing PairGain to PairGain equipment.
Default Router IP Address	Specify the next hop default router entry. This entry tells Megabit Modem CRA-C what to do with a packet that has a destination address which is not in the Static IP Routing table.
IP Static Routing Table	Specify up to three static routes and one default route. The default route specifies where to send packets which do not match any of the other configured static routes.
LAN IP Address and Subnet Mask	Configure the IP address and the Subnet Mask for the 10BASE-T port. These must be configured for static IP mapping to function properly.
Line IP Address and Subnet Mask	Configure the IP address and Subnet Mask for the ADSL WAN port

Table 18. *External Router Static Route Entry*

Parameter	Definition
Static Route Entry in External Routers	Configure a Static Route entry in any of the external routers which may have been specified as a Default Router or as a Gateway. This is required because the static IP routing feature does not send periodic route updates using protocols like Routing Information Protocol (RIP) or Open Shortest Path First (OSPF) so that other external routers can automatically update their routing tables. This implementation prevents other parties from discovering routes through eavesdropping. The format of this entry will vary among different router vendors, but it will typically be in the form of Destination, Mask, and Next Hop Gateway. Destination is the remote IP subnet or host address. Gateway is the IP address of the Megabit Modem CRA-C on the same subnet as the external router.

Figure 12 shows an example of a point-to-point ADSL system and hypothetical values of parameters defined in Tables 17 and 18.

LAN   ADSL   LAN
                             Line

| | Remote Site
ADSL Modem | Local Site
ADSL Modem | | Router to
172.20.0.0 |

Remote
User

IP Address
  192.168.200.5

Subnet Mask
  255.255.255.0

Default Router
  192.168.200.1

Bridge/Routing Mode	Bridge/Routing Mode
Router	*Router*
Packet Encapsulation	Packet Encapsulation
PPP	*PPP*
IP Static Routing Table	IP Static Routing Table
empty	Destination 172.20.0.0
empty	Gateway 172.16.100.1
empty	Destination 172.30.0.0
empty	Gateway 172.16.100.2
empty	Destination 192.168.200.5
empty	Gateway 10.10.10.1
Default Router IP Address	Default Router IP Address
10.10.10.2	*172.16.100.3*
LAN IP Address	LAN IP Address
192.168.200.1	*172.16.100.4*
LAN Subnet Mask	LAN Subnet Mask
255.255.255.0	*255.255.255.0*
LINE IP Address	LINE IP Address
10.10.10.1	*10.10.10.2*
LINE Subnet Mask	LINE Subnet Mask
255.255.255.0	*255.255.255.0*

LAN IP Address
  172.16.100.1
Static Route to
  192.168.200.5 via
  172.16.100.4

Router to
172.30.0.0

LAN IP Address
  172.16.100.2
Static Route to
  192.168.200.5 via
  172.16.100.4

Default Router

LAN IP Address
  172.16.100.3
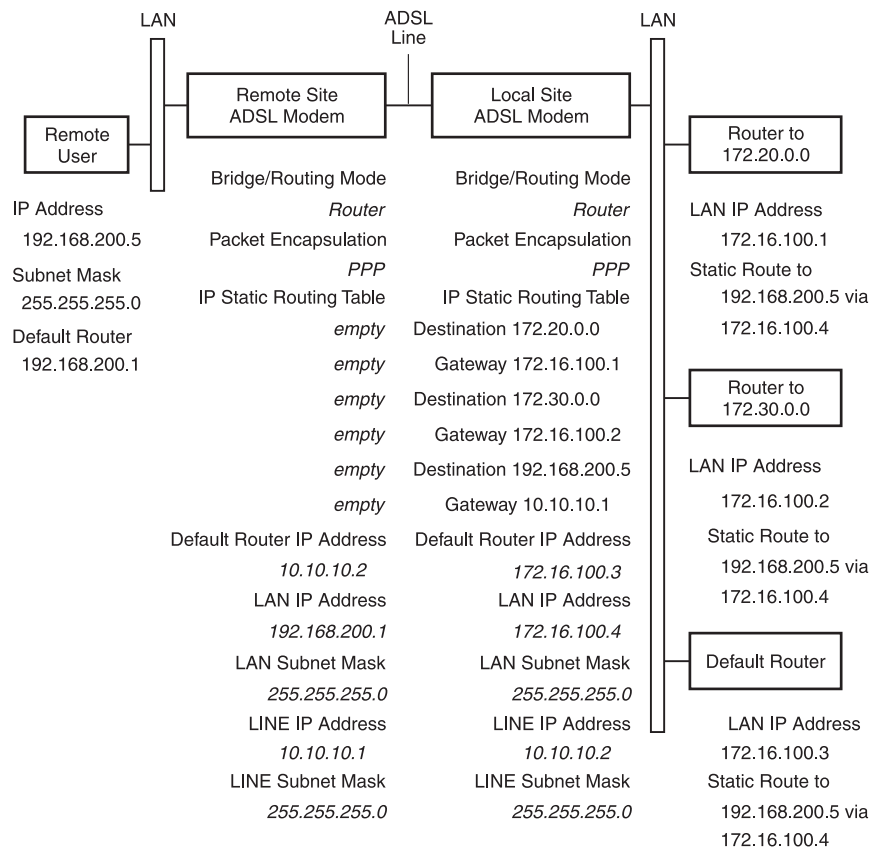Static Route to
  192.168.200.5 via
  172.16.100.4

Figure 12. *Example for Static IP Routing*

Megabit Modem CRA-C IP Addresses

The Megabit Modem CRA-C has two IP addresses, one for the ADSL WAN port and one for the Ethernet port. In Figure 13, the non-shaded side of the provider and subscriber modems indicates the LAN address for the Ethernet (10BASE-T) connection. The shaded side of the provider and subscriber modems is the IP Line address for the ADSL line connection. Note that the IP Line address is unique from the LAN addresses. When connecting a Megabit Modem CRA-C and a Megabit Modem CRA point-to-point via ADSL, the IP Line addresses are completely isolated and hidden from the rest of the network. As a result, any valid IP address can be assigned to these ports but should be on the same subnet.

When routing, data travels one hop at a time. Figure 13 shows destination and next hop IP addresses. The destination address indicates the network and subnetwork of the next hop for a common network topology . The default gateway is the router to which datagrams are sent that do not have an assigned route in the static routing table.

Use Figure 13 as a worksheet to help you determine/record static IP routing addresses.

Dft Gateway: upstream router address: 192.168.13.209
Destination: 192.168.242.0   Next Hop 192.168.240.10
Mask: 255.255.255.0   Next Hop:

IP: 192.168.13.210
Mask: 255.255.255.0

IP: 192.168.240.1
Mask: 255.255.255.0

The Internet

Provider Router

DNS Server IP: 192.168.240.20
Mask: 255.255.255.0

Provider Server

Dft Gateway: 192.168.240.1   Next Hop 172.16.100.2
Destination: 192.168.242.0
Mask: 255.255.255.0

Provider Modem

IP: 192.168.240.10
Mask: 255.255.255.0

IP: 172.16.100.1
Mask: 255.255.255.0

Dft Gateway: 172.16.100.1

IP: 172.16.100.2
Mask: 255.255.255.0

IP: 192.168.242.1
Mask: 255.255.255.0

IP: 192.168.242.5
Mask: 255.255.255.0
Default Gateway: 192.168.242.1
DNS: 192.168.240.20

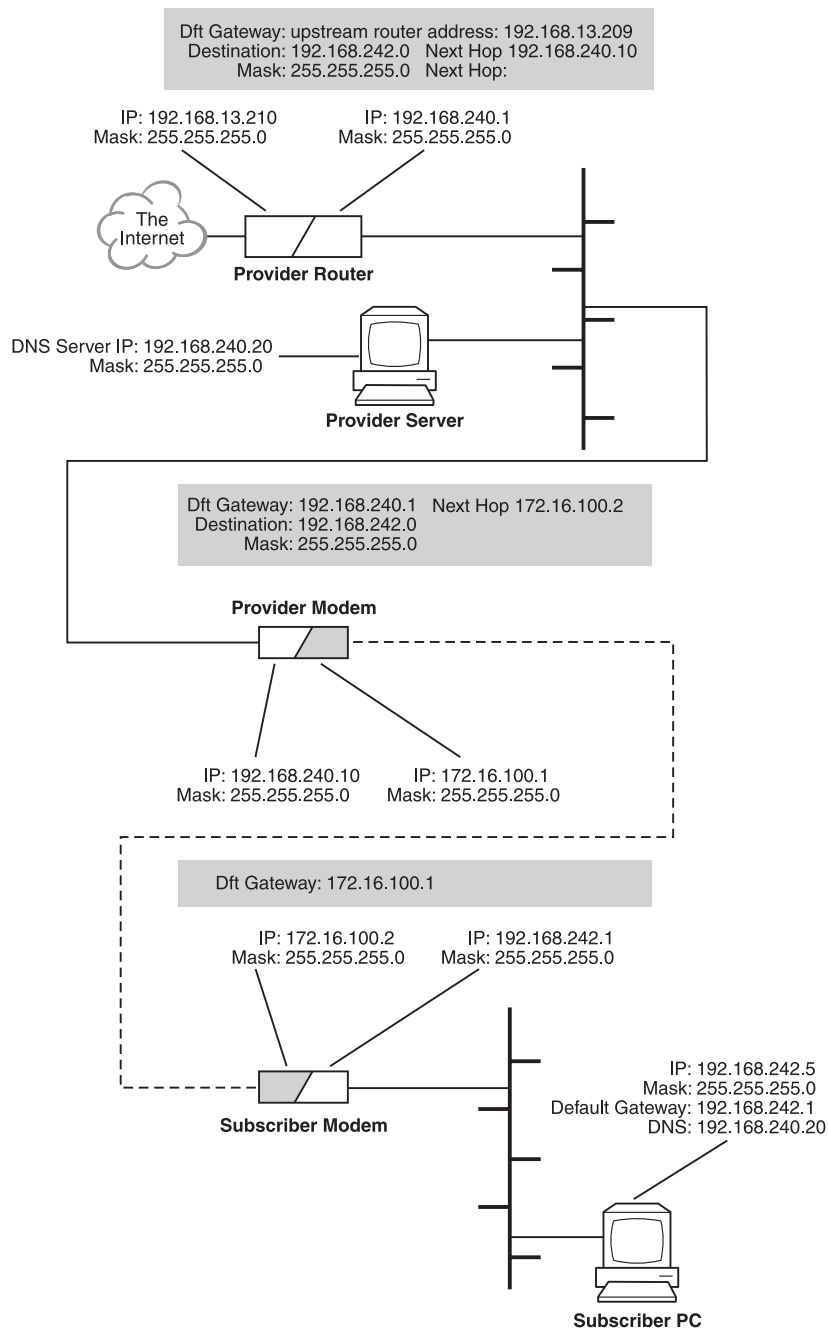**Subscriber Modem**

Subscriber PC

Figure 13. *IP Addresses*

Management Protocols

SNMP is used for configuring system and bridge parameters, monitoring statistics, and performing advanced management.

SNMP

This management protocol specifies how to send information between a Network Management System (NMS) and managed devices on a network. Managed devices (such as the Megabit Modem CRA-C) run a program called an agent. The agent interprets SNMP requests and responds to them. The NMS communicates with the agents in the managed devices to:

- set configuration

- get configuration

- get status

A Management Information Base (MIB) defines these configuration and status parameters. The Internet Engineering Task Force (IETF) specifies standard MIBs for certain types of devices, ensuring any NMS can manage them. Additionally, vendors can issue proprietary MIBs for their devices to fit specific needs.

Table 19 shows the Megabit Modem CRA-C SNMP configuration parameters that are maintained and restored through the local console port. These parameters are kept in the Megabit Modem CRA-C NVRAM and are parameters that must be configured for SNMP to work.

Table 19. *SNMP Configuration Default Values*

Attribute	Factory Default
Download Image File Name	Not configurable via console
Local IP Address	0.0.0.0
Local Subnet Mask	255.255.255.0
Boot Router IP Address	0.0.0.0
Default Router IP Address	0.0.0.0
Boot Server IP Address	0.0.0.0
Boot Mode (local, network)	local
Image Load Mode (local, network)	local
SNMP RO Community String	public
SNMP RW Community String	private
Trap Receiver 1 IP Address	0.0.0.0
Trap Receiver 1 Community String	null string
Trap Receiver 2 IP Address	0.0.0.0
Trap Receiver 2 Community String	Null string
Authentication Trap enable/disable	disable
ST Enable/disable	disable

Megabit Modem CRA-C SNMP Agent

An agent is program resident in managed devices (for example, Megabit Modem CRA-C, modems, nodes, routers and hubs). Agents translate data into code the NMS can read. Agents and NMS communicate using SNMP as the transport mechanism. SNMP uses standard Internet Protocol (IP) to transport incoming and outgoing messages to the appropriate agent or NMS address. Each SNMP command requires an IP address or NMS from the agent to transport these messages.

The Megabit Modem CRA-C provides an SNMP agent that supports several MIBs for the management of the system. The SNMP agent can process datagrams received from both the Ethernet interface (LAN) and the ADSL interface (Line). The agent and the protocol stack complies with the following RFCs:

- RFC 1155 Structure of Management Information (SMI)

- RFC 1157 Simple Network Management Protocol (SNMP)

- RFC 826 Address Resolution Protocol (ARP)

- RFC 792 Internet Control Message Protocol (ICMP)

- RFC 791 Internet Protocol (IP)

- RFC 768 User Datagram Protocol (UDP)

MIB and Trap Support

Each managed device has configuration, status, and statistical information that defines its functionality and operational capabilities. These elements, together, are the MIB for the device being managed. The MIB defines the kind of information an NMS can retrieve from a managed device and the settings an NMS can control in a managed device.

Megabit Modem CRA-C supports the following MIBs:

- RFC 1213 MIB II Management Information Base for Network Management of TCP/IP-Based Internet:MIB-II supported groups: system, interfaces, IP, ICMP, UDP, and SNMP groups

- RFC 1215 A Convention for Defining Traps for Use with the SNMP supported objects: ColdStart, linkUp, linkDown, and authenticationFailure traps. Link status traps are sent for events related to Ethernet.

- RFC 1493 Definition of Managed Objects for Bridges supported objects: Base, Spanning Tree, and transparent bridging groups.

> **The Spanning Tree MIB can only be accessed if the Spanning Tree protocol is enabled.**

- PairGain REX MIB an enterprise specific MIB designed for the agent in the Megabit Modem CRA-C for managing the ADSL portion of the unit.

- The Ethernet interface has the ifIndex value of 1 and the WAN (ADSL) interface has an ifIndex of 2.

Access any PairGain-specific MIBs through the Internet at ftp.pairgain.com. Use the following:

- FTP `ftp.pargain.com`

- login using `anonymous` as you log-in name

- use `guest` or your e-mail address as you user password

- enter `cd snmp/rex/mibs`

- get `pgrexmib.txt`

Network Configuration and Image Code Download

BOOTP

BOOTP is used to supply network configuration information to Megabit Modem CRA-C from a BOOTP server. Used in conjunction with TFTP, you can use BOOTP to download image code. The Megabit Modem CRA-C initiates a BOOTP request in these situations:

- current configuration sector is determined to be invalid; this can occur when the CRC of configuration sector does not match the expected CRC on power-up

- user sets the value of Boot Mode to NETWORK, saves the configuration to flash, and then reboots the Megabit Modem CRA-C

BOOTP conforms to the following RFCs:

- RFC 951: Bootstrap Protocol (BOOTP)

- RFC 1533: DHCP Options and BOOTP Vendor Extensions

- RFC 1542: Clarification and Extensions for the Bootstrap Protocol (updates 951)

A BOOTP request is broadcast through the Ethernet port to the local network. The request is not sent from the ADSL port because the boot sector does not contain the code necessary to transmit over the WAN link. If a BOOTP server is on the local network and is configured correctly, it returns a BOOTP response. Once the Megabit Modem CRA-C receives a BOOTP response, it keeps the IP address, boot server, default router, and any other information associated with the module in the configuration sector of the flash. Subsequent BOOTP responses for the Megabit Modem CRA-C are ignored.

When a BOOTP server is not on the local network, the request fails unless there is a BOOTP agent on the network that recognizes and forwards the request to the server. The BOOTP server does not contain an entry that corresponds to the MAC address of the Megabit Modem CRA-C.

From the console interface, you can configure network parameters and save them to flash so the BOOTP operation can be bypassed. The BOOTP server should be connected to the same segment as the Megabit Modem 10BASE-T port.

TFTP

Trivial File Transfer Protocol (TFTP) is used to download networking image code to the Megabit Modem CRA-C from a TFTP server. This allows software upgrades to be performed over the network. The Megabit Modem CRA-C initiates a TFTP download of application code in these situations:

- current application code is not valid; this occurs when the CRC calculated on power-up doesn't match the expected CRC

- user sets the value of Image Load Mode to NETWORK, save the configuration to flash, and reboots the Megabit Modem CRA-C

In either case, the Megabit Modem CRA-C performs a BOOTP request first to get the most current network configuration. If the BOOTP fails, the TFTP session is attempted.

TFTP conforms to RFC 1350: The TFTP Protocol (Revision 2)

TFTP uses the connectionless User Datagram Protocol (UDP) for file transfer with minimum overhead.

Encapsulation Protocols

You can select from two packet encapsulation formats for data transported across the ADSL WAN link: Point-to-Point Protocol (PPP) or High-level Data Link Control (HDLC), which is the default. HDLC is the preferred when the system is terminated at each end with PairGain products that have Ethernet ports. PPP is used when interfacing to a WAN port on non-PairGain equipment. In PPP mode, the Megabit Modem CRA-C supports the Bridge Control Protocol (BCP) RFC 1638 when configured as a bridge and the Internet Protocol Control Protocol (IPCP) RFC 1332 when configured as a router.

TECHNICAL SPECIFICATIONS

ADSL Line

Signal Format	CAP Line Code
Transmit Signal Power	up to 23 dBm
Connector	RJ-48

Ethernet Port

Connector	RJ-45, 10BASE-T
Bandwidth Filtering	14 Kpps (64-byte packets, both directions)
Forwarding Performance	2.7 Kpps
Address Learning	2000 MAC addresses with aging
Encapsulation Format	Low-overhead HDLC or PPP
Bridging	IEEE 802.1d transparent with Spanning Tree Protocol
Routing	Static IP maps

Physical

Height	2.2 inches (5.6 cm)
Width	7.5 inches (19.0 cm)
Depth	9.5 inches (24.13 cm)

Electrical

Power Input	100 to 130 VAC, 60 Hz
Power Dissipation	8 W

Environmental

Temperature	0 to 50°C
Relative Humidity	0 to 85%
Electromagnetic Emissions	Per FCC Part 15 Class A

Management and Maintenance

Embedded SNMP Agent

BOOTP/TFTP download (with RFC 1542 extensions)

RFC 1533 Dynamic Host Configuration Protocol

RFC 1213 MIB II, RFC 1493 bridge MIB (base, ST, transparent groups)

PairGain xDSL bridge MIB extensions

RFC 1215 Traps (link state) and ST Traps (newRoot, topology Changed)

ASCII Terminal Maintenance Port

Type	RS-232C, RJ-45
Data Rate	Autobaud from 2400 to 19,200 baud
Hardware Flow Control	Not Supported

Agency Certifications

FCC B

UL

CE

CSA

PairGain reserves the right to change features and specifications without notice.

TECHNICAL ASSISTANCE

PairGain Technical Assistance is available 24-hours-a-day, 7-days-a-week by contacting PairGain's Customer Service Engineering group at one of the following numbers:

Telephone: (800) 638-0031
            (714) 832-9922

Fax: (714) 832-9924

During normal business hours (8:00 AM to 5:00 PM, Pacific Time, Monday - Friday, excluding holidays), technical assistance calls are normally answered directly by a Customer Service Engineer. At other times, a request for technical assistance is handled by an on-duty Customer Service Engineer through a callback process. This process results in a callback normally within 30 minutes of initiating the request.

World-Wide Web

PairGain product, company, and application information can be found at http://www.pairgain.com using any Web browser.

FTP

PairGain Management Information Bases (MIBs) are available using the Internet at ftp.pairgain.com, use:

- FTP `ftp.pargain.com`

- login using `anonymous` as you log-in name

- use `guest` or your e-mail address as you user password

- enter `cd snmp/rex/mibs`

- get `pgrexmib.txt`

LIMITED WARRANTY

PairGain Technologies, Incorporated warrants its products to be free of defective and faulty workmanship for a period of 60 months, under normal use, from the date of shipment. PairGain's obligation, under this warranty, is limited to replacing or repairing, at PairGain's option, any such product which is returned during the warranty period per PairGain's instructions and which product, in PairGain's sole option, is determined to be defective upon examination at our plant.

> **Do not disassemble the Megabit Modem CRA-C. The unit's components are not user serviceable. Opening the system chassis, or attempting to modify the unit in any way voids its warranty.**

The transportation charges from the Buyer to PairGain will be prepaid by the Buyer. When the equipment is shipped back to the Buyer, PairGain will pay the charges, unless no trouble is found (NTF), in which case the buyer will pay for the shipment.

PairGain may use reconditioned parts for such repair or replacement. This warranty *does not* apply to any product which has been repaired, worked upon, or altered by persons not authorized by PairGain or in PairGain's sole judgment has subjected to misuse, accident, fire or other casualty, or operation beyond its design range.

Repaired products have a 90-day warranty, or until the end of the original warranty period--whichever period is greater.

Modules sent to PairGain for repair will be repaired or replaced and returned to you as soon as possible. Normally, current products are repaired within 14 calendar days, and out-of-production products are repaired within 30 calendar days.

To return equipment to PairGain:

1   Call PairGain Customer Service at (800) 370-9670, or send a fx to (714) 730-2961, to get a *Return Material Authorization (RMA) Number* and instructions for returning your equipment.

For other information or questions, PairGain Technologies can be contacted by telephone at (800) 638-0031 or (714) 832-9922 or by fax at (714) 832-9924.

2   Provide the following information along with the equipment you're returning:

- Your company name, address, and the name of the person whom we can contact in case we have any questions.

- The same Purchase Order Number you gave us when you requested your RMA number.

- A description of the equipment, as well as the number of units you're returning to us. ***Don't forget*** to include the model and part number of each unit.

- Shipping address so that we can return your equipment to you.

3   So we can determine why you're sending the equipment to us, let us know which of the following applies to you:

- The equipment needs an ECO/ECN upgrade.

- The equipment is defective.

> **Please tell us what you observed just before the equipment malfunctioned. Be as detailed in your description as possible.**

- If there's another reason for returning the equipment, please let us know what it is so we can help you.

4   Pack the equipment in a shipping carton.

5   Write clearly on the outside of the carton, PairGain's address and the assigned *Return Material Authorization Number*:

PairGain Technologies, Inc.
14352 Franklin Avenue
Tustin, CA 92780-7013
Attention: **Repair and Return Department**

GLOSSARY

The Glossary defines technical terms and abbreviations used in this manual.

Access Provider	See Service Provider.
Access Rate	The transmission speed, in bits per second, of the physical access circuit between the end user and the network.
ADSL	Asymmetric Digital Subscriber Line. A method of transmitting at different downstream and upstream speeds.
Alarm	Any valid change of state from its normal condition detected at an alarm point.
Asymmetric Transmission	Transmission which sends data at different rates in each direction.
AWG	American Wire Gauge.
ATU-C	ADSL Terminal Unit at the service provider site.
ATU-R	ADSL Terminal Unit at the remote site.
Bandwidth	Used to describe the capacity or amount of traffic (data, voice, or video) a certain communications line is capable of accommodating.
BER	Bit Error Rate. The ratio of received bits that are in error.
Binder Group	A group of 25 or 50 pairs of wires.
Bit	In a binary system, the smallest unit of information. It is represented as a zero or a one.
Bridge	A two-port internetworking device that selectively filters or forwards traffic based or MAC addresses.
Bridged	A pair of wires connected in parallel across a single line to form a "T" Tap configuration.

CAP	Carrierless Amplitude Phase Modulation. A two-dimensional line code used in ADSL.
Crosstalk	Line noise that occurs due to coupling of signals between pairs in the same bundle.
Downstream	The direction of data reception from the Megabit Modem CRA-C to a remote unit.
Ethernet	A baseband LAN specification that has become a series of standards produced by IEEE referred to as IEEE 802.3.
HDLC	High-level Data Link Control.
Hub	A common wiring point for star-topology networks, and a common synonym for a concentrator.
IEEE	Institute of Electrical and Electronics Engineers. A professional organization that defines network standards.
I/F	Interface or Interface Card.
ISP	Internet service provider.
kbps	Kilobits per second. A measure of transmission speed at 1,000 bits per second.
kpps	Kilo packets per second.
LAN	Local Area Network. The means by which a local community of users and workgroups can share information and resources electronically.
LED	Light emitting diode.
Line code	Any method of converting digital information to analog form for transmission on a communicaton line.
Link	Another term used for transmission line.
MAC	Media Access Control. Associated with Layer 2 or the Data Link Layer of the ISO 7-layer protocol model.
Margin	An ADSL parameter, measured in dB. It indicates the excess SNR, relative to the performance of 10^{-7} BER, at the receiver point.

Mbps	Megabits per second. 1,000,000 bits per second.
MDI	Media Dependent Interface.
MDI-X	Media Dependent Interface (cross-over).
MIB	Management Information Base.
NVRAM	Non-Volatile Random Access Memory.
Port	An I/O interface. A point at which signals may be introduced or extracted in a similar manner.
POTS	Plain Old Telephone Service.
PPP	Point-to-Point Protocol.
RAM	Random Access Memory.
Repeater	Connects to line segments to amplify and reshape the analog waveform to extend network segment distances.
RFC	Request for Comment.
Router	Device that decides whether to forward a packet by looking at the protocol level address.
Service Provider	Organization providing and maintaining network services for subscribers.
SNMP	Simple Network Management Protocol. A network management standard initially established to allow multi-vendor networking devices to be managed more easily with common management tools.
SNR	Signal-to-Noise ratio.
Spanning Tree	An algorithm used to open bridging loops.
Telecommuter	A person who performs work at home while linked to the office by means of a telecommunications-equipped computer system.
Upstream	The direction of data transmission from the Megabit Modem CRA-C to a remote unit.
UTP	Unshielded Twisted Pair.

Corporate Office

14402 Franklin Avenue
Tustin, CA 92780

Tel: (714) 832-9922
Fax: (714) 832-9924

For Technical Assistance:

(800) 638-0031

ISO 9001

DNV

DNV Certification, Inc.
Certificated Firm

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