IOLINK-520

and

IOLINK-PRO

VPN Menus Reference Manual

Issue 1

Software Version 51V.04.06.xx

Software Version 52V.04.06.xx

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Part # 197--41707

Throughout this manual, information that is presented by the router and entered into the router will be shown in a bordered box, as shown here.

```
Screen information being displayed or entered.
```

Initial Router & Management Console Power-Up

The following screen information will be seen on the console connected to the router when it is first powered on:

```
Terminals supported:

 teletype ansi, avt, ibm3101, qvt109, qvt102, qvt119, tvi925, tvi950,
 vt52,vt100, wyse-50, wyse-vp

Enter terminal type:
```

As the terminal type is not yet defined at the very first power-up, this screen may be slightly mixed up. Enter at least one <RETURN> (up to three if necessary) on the Network Console in order for the router to determine the baud rate of the terminal used for the console (i.e. auto-baud) and then proceed.

Select your terminal if listed and enter its name in lower case at the prompt, or choose the terminal type **teletype** if your terminal is not listed. The **teletype** terminal type operates in scroll mode and may be used successfully until a custom terminal definition is created.

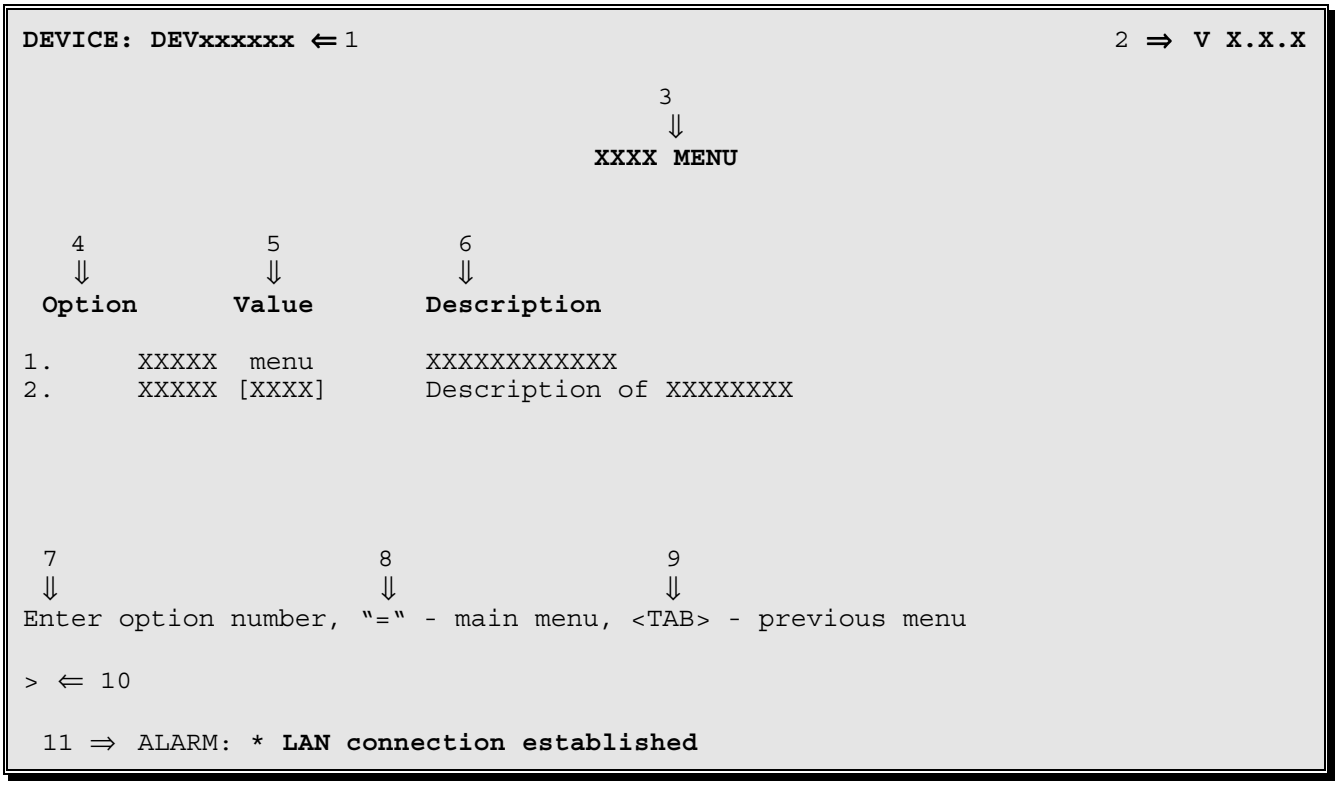
Menu Command Entry

Once the terminal type is specified, the MAIN (LOGIN) MENU will be displayed.

The IOLINK router uses a "hotkey " Menu. A menu option is chosen by selection of the desired option number.

Entry of parameters is from the "**>**" prompt. When a parameter is required, enter the necessary string and end it with a <Return>. If the entry is not accepted, an error message will be reported and the parameter will have to be re-entered. Should you make an error, the <BACKSPACE> key (for most terminals) deletes the most recently entered characters.

Menu Structure



The Menu Screens are structured with 11 primary elements:

1. Device Name
2. Software Version
3. Menu Name
4. Option Number and Option Name
5. Option Value
6. Option Description
7. Choosing an Option
8. Returning to the Main Menu
9. Returning to the Previous Menu
10. Command Prompt
11. ALARM display for a just-happened alarm event

Elements of the Menu Screens:

1. **Device Name**
   A default Device Name in the format DEVxx-xx-xx is supplied by the system for each router. (xxxxxx are the last 6 digits of the MAC address of the router). The Device Name may be changed in the Device Set-Up Menu.

2. **Software Version**
   The version of the software currently installed in the router is shown in the upper right-hand corner of each menu display.

3. **Menu Name**
   Each MENU is named to indicate its grouped Options.

4. **Option Number and Option Name**
   Choosing the number for the Option makes the selection. If you prefer a command-style interface, typing the first few unique letters of the desired Option is enough to identify the Option. Enter the selection with a <Return>.

5. **Option Value**
   The Value of an Option may indicate several parameters—for example:

State	[enabled], [disabled], [present], [not_present], ...
Setting	[5 sec.], [5 min.], ...
Path	"menu" indicates a sub-menu
Name	[vt100], [Bridge_5], [none]

6. **Option Description**
   This is a single-line description of the Option.

7. **Choosing an Option**
   Select the Option by entering its number or unique first letters at the prompt.

8. **Returning to the Main Menu**
   The equals ("=") sign returns you to the Main Menu. (All major menu paths start at the Main Menu. If you want to switch to the Main Menu, enter " = ").

9. **Returning to the Previous Menu**
   To go back to the previous higher level menu, enter a <TAB>.

10. **Command Prompt >**
    All data entry is made at the Command Prompt.

11. **ALARM display for an occurring event**
    The display of an ALARM notifies a viewing router manager that an event of significance has occurred. Since not every ALARM can be viewed as it occurs, the latest 199 ALARMs are recorded and can be viewed from the Network Events Menu.

Note: Depending on the configuration setting of this device, some options are not always displayed and some menus will have different options. Display lines with these options are in italics in this manual. If the option may appear on the menu screen with various numbers, the possible numbers are listed in the write up for the option, for example:

3/4 ISDN Set-Up.

Login Menu

```
                                LOGIN MENU

    Option          Description
 1. Login         - Initiate operator session
 2. Help          - Read menu introduction









Enter option number


>
```

This is the **LOGIN MENU** seen when powering up a console connected to the router.

1 - Login

The Login option allows entry of the password for the router. The default password is "BRIDGE"; change it if security is desired. See the Installation & Applications Guide for information on restoring the default password to the router.

Action to Take:

Choose the Login Option and use the default password "BRIDGE." The characters will not be echoed on the screen. Once the password is accepted, you will be given the expanded MAIN MENU for full access to router management features.

2 - Help

The Help option provides a brief description of menu format and usage.

Main Menu

```
                                MAIN MENU

    Option                Value          Description

 1. Configuration         menu         - Define operating parameters
 2. Statistics            menu         - Device LAN and WAN statistics
 3. Diagnostics           menu         - Access troubleshooting tools
 4. Network events        menu         - View network event history
 5. Save configuration                 - Save configuration immediately
 6. Logout                             - End operator session
 7. Help                               - Read menu introduction

Enter option number

>
```

The **MAIN MENU** is a starting and ending point for management of the router. This menu allows access to menus and provides the Logout Option. Options 1-4 are major paths. To switch major paths, return to the MAIN MENU by entering "=".

1 - Configuration

The Configuration option takes you to the Configuration Menu, where all the various router parameters are defined. Take this path to define the operating parameters of the terminal used for the router console.

2 - Statistics

The Statistics option takes you to the Statistics Menu, where statistics can be examined to evaluate router, LAN, and link performance.

3 - Diagnostics

The Diagnostics option takes you to the Diagnostics Menu, where special diagnostic functions can be used to analyze LAN, link, and router problems.

4 - Network Events

The Network Events option takes you to the Network Events Menu, where the 199 latest Alarms can be examined.

5 – Save Configuration

The settings of any configuration options that have been changed from their default values are saved.

6 - Logout

The Logout option terminates your session and secures the router. The next user must log in and enter the correct password to view or change the router configuration.

7 - Help

The Help option provides a brief, one-screen description of menu format and usage.

Configuration Menu

```
                          CONFIGURATION MENU

   Option                 Value         Description
 1. Access set-up         menu        - Establish access parameters
 2. Interfaces set-up     menu        - Define interface parameters
 3. Connections set-up    menu        - Configure connection operation
 4. Packet Services set-up menu       - Define packet services
 5. Applications set-up   menu        - Configure Internet applications




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **CONFIGURATION MENU** provides paths to menus for configuration of this router.

1 - Access Set-Up

The Access Set-up option takes you to the Access Set-Up Menu, where passwords, names, dates, and times are set and viewed. From this menu, you can save or restore the router configuration and connect to another router in the network of routers.

2 - Interfaces Set-Up

The Interfaces Set-up option takes you to the Interfaces Set-up Menu where controls for the LAN(s), WAN link(s) and the console terminal are set.

3 - Connections Set-Up

The Connections Set-up option takes you to the Connections Set-up Menu, where WAN connections to each remote site location are configured, login security is set, PPP parameters entered and IP address connection tables set.

4 – Packet Services Set-Up

The Packet Services Set-up option takes you to the Packet Services Set-up Menu, where data packet bridging, routing, IP security and filtering parameters are set.

5 - Applications Set-Up

The Applications Set-up option takes you to the Applications Set-up Menu, where the internet connection management applications for SNMP, DHCP, Firewalls, Network Address Translation and Syslog may be accessed.

Access Set-Up Menu

```
                          ACCESS SET-UP MENU

    Option               Value          Description
 1. Device set-up        menu        - Set security/time/names
 2. Telnet set-up        menu        - Set up remote communications
 2. Upgrade device       menu        - Perform feature upgrade
 4. Load FLASH set-up    menu        - Prepare for software update
 5. Console              menu        - Dump/restore configuration from console
 6. Hardware status                  - Display hardware information
 7. TFTP access         [disabled]   - Allow TFTP configuration saves/loads



Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **ACCESS SET-UP MENU** provides options for saving and restoring the router configuration as well as paths to menus for terminal, device, and remote access configuration.

1 - Device Set-Up

The Device Set-up option takes you to the Device Set-Up Menu, where the device name, password, dates, and times are set and viewed.

2 - Telnet Set-up

The Telnet Set-up option takes you to the Telnet Access Menu, where you can connect to another router in the network of routers.

3 – Upgrade Device

The Upgrade Device option takes you to the Upgrade Device Menu where an upgrade key may be entered to enable optional features on this router.

4 - Load FLASH Set-Up

The Load FLASH Set-up option takes you to the Load FLASH Set-Up Menu, where you can update the software in this device using TFTP or console Z-modem transfers.

Note: this operation cannot be performed from a secondary IP address.

5 - Console

The Console option takes you to the Console Menu, where the present configuration may be dumped to the console computer for storage or a stored configuration uploaded from the console computer.

6 - Hardware Status

The Hardware Status option displays the status of the router hardware.

```
                        Hardware Status


Boot Code version    : 51B1.4.1.4          System Code revision : 7a0
Boot Code revision   : 0                   Service reference    : 0/0
RAM size             : 8  MB               ROM size             : 2 MB
MAC check code       : b9876d23
LAN interface type   : 10BaseT        MAC address          : 02-03-04-05-06-07
LAN2 interface type  : 10BaseT        MAC address          : 02-03-04-05-06-07
Module types         : (1) BRI ST  (2) BRI ST
CPU type             : 68EH360
CPU speed            : 25 Mhz
Compression          : enabled
```

Boot Code version The software boot code version currently installed in this IOLINK router. This is the number that is displayed in the upper right of the menu screens when in console load mode.

Boot Code revision The software boot code revision number currently installed in this IOLINK router. A control number for tracking minor software revisions.

System Code revision The system code software revision number currently installed in this IOLINK router.

Service Reference Internal factory reference number.

MAC Address The MAC Address of the LAN port for this router.

MAC Check Code Check code used for feature upgrades.

RAM size The amount of RAM in this router.

ROM size Indicates the size of the FLASH EEPROM installed.

LAN Interface Type The type of LAN interface that is configured on this router. If this is an IOLINK-520 and the unit has an optional second LAN interface installed, this displays the type of interface on the first LAN of this router

LAN2 Interface Type If this is an IOLINK-520 and the unit has an optional second LAN interface installed, this displays the type of interface on the second LAN of this router.

Module Type The type of link interface of this router installed in positions 1 and 2.

Note: on IOLINK-520 routers, a second LAN interface module must be installed in link position number 1 (the leftmost position when viewed from the rear of the unit).

Note: if only a single interface module is installed, it must be installed in link position 1.

Compression Indicates whether data compression is enabled or disabled.

7 - TFTP Access

The TFTP Access option determines whether a remote LAN device will be allowed to make a TFTP connection to this router to dump (get) or restore (put) the configuration.

The TFTP application must be in "netascii" or "ascii" mode for configuration transfers.

Default: [disabled]

Procedures for performing a Configuration Dump using TFTP:

1) Start the TFTP application to be used for transfers to the router.
(The IP address of the router may be found in the Internet Set-Up menu.)

2) Get the file "config.txt" from the router.

3) Use a text editor to check the configuration file saved to the PC disk to confirm that the information is still in order. If minor errors occurred, they may be corrected with the text editor. If errors were major, get the configuration file again.

Procedures for performing a Configuration Load using TFTP:

1) Start the TFTP application to be used for transfers to the router.
(The IP address of the router may be found in the Internet Set-Up menu.)

2) Put the file "config.txt" to the router.

3) When the transfer is complete, the configuration will have been restored to the router.

.

Device Set-Up Menu

```
                          DEVICE SET-UP MENU

    Option              Value          Description
 1. Password                         - Change login password
 2. Device name       "DEV050607"    - Name this device
 3. Show time                        - Display current date and time
 4. Set time                         - Set date and time




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **DEVICE SET-UP MENU** allows the definition of the Device name, and a password to control local/remote access to the router management console. You can also set the real-time clock and date. Note that the clock is a 24-hour real-time clock.

1 - Password

The Password option allows you to change the router's login password. (The characters will **not** be echoed on the screen.) (If you have no need for a password, enter <NONE> in CAPS, and the entry of a password will be bypassed.) The password is case sensitive and must be entered precisely. An example is given below:

```
Enter:
 new password (1 to 8 characters)
> EURRNO\1

Enter:
 verification of new password (1 to 8 characters)
> EURRNO\1
New password installed
```

2 - Device Name

The Device Name option allows you to name (or re-name) this device for identification purposes. The router name will be displayed both in the Value column of this option and in the upper left-hand corner of all menu screens. If the router has not been named, the device name in the upper left-hand corner of the screen and the information in the Value column will show a prefix of DEV followed by the last six characters of the LAN port MAC address (e.g. DEV006045).

```
Enter:
 Device name string (up to 16 characters)
> Router5
```

3 - Show Time

The Show Time option displays the current day of the week, date and time.

```
Wednesday 1998-08-05 15:16:16
```

4 - Set Time

Use the Set Time option to set the date and 24-hour Time Clock. Note that if your network uses features of the IOLINK router which are controlled by activation times (such as Bandwidth-On-Demand or backup recovery) across different time zones, you must standardize on one time zone for all routers that use this feature.

```
Enter:
 Date in format yyyy-mm-dd, no_change
1998-09-27

Enter:
 Time in format hh:mm:ss
14: 25: 00
```

Telnet Set-Up Menu

```
                              TELNET SET-UP MENU

    Option          Value          Description
 1. Telnet access [enabled]     - Allow incoming Telnet connection
 2. Telnet                      - Connect to a remote device
 3. Telnet port   [default}     - Alternate remote device port
 4. Show names                  - Display known device names
 5. Add name                    - Add a remote device name
 6. Remove name                 - Delete remote device name




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **TELNET SET_UP MENU** allows telnet connections to be made to other routers in the network.

1 - Telnet Access

The Telnet Access option allows LAN/WAN network devices to make Telnet connections to this router for management. Once the connection is established, the network device will be presented with the menu interface for configuration management and statistics viewing.

Default: [enabled]

Considerations:

When a Telnet connection is made to a router, ensure that the Telnet session is in character mode, and carriage return padding (or translation) is set to NULL (or no translation). The extra character sent when carriage return padding is on will cause some displays to behave erratically.

Note: A Telnet connection from another IP address is allowed three attempts to login with the correct password. After three failures, that IP address will be rejected for the following ten minutes if any further attempts are made and the following alarm message is logged and displayed on the console:

```
Alarm: Possible intruder 192.168.89.65 exceeded password attempts limit
```

2 - Telnet

Choosing the Telnet option, and specifying the name or IP address of the router you wish to connect to, connects to the other router for configuration purposes and viewing of statistics.

The Device name at the top left of each Menu identifies the router being controlled.

If there is no data transmitted or received for a period of 5 minutes, the Telnet session will be disconnected. This time limit cannot be modified.

To disconnect from the router being controlled, enter Control-C (**^C**).

Considerations:

If the Internet Address of a remotely connected router is changed, immediately disconnect from the remote router by entering a Control-C (**^C**) and re-establish a new Telnet connection using the new Internet Address of the remote router.

3 - Telnet Port

The Telnet port option allows you to choose an alternate port number that a remote device can use for Telnet access to this router. This is necessary when Telnet is one of the exported services offered under Network Address Translation (NAT), as the well known port number will be used for the network Telnet server. An alternate port number must be supplied to Telnet to this router.

4 - Show Names

The Show Names option displays a listing of device names, their IP addresses and a user entered note of up to 75 characters.

```
Device Name            IP Address        Notes
----------------       ---------------   -----------------
Tokyo                  92.0.0.1          current device
Kyoto                  92.0.0.2          on link 1
Amsterdam              92.0.0.5          on link 2


Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the [s] to redraw is case sensitive; it must be lower case.

5 - Add Name

Use the Add Name option to add a device name, IP address and any desired notes. Note that when a note is added, if spaces are desired within the note, you must enclose the note in quotations (“). Ensure that the note is not more than 75 characters in length.

```
Enter:
 Device name (up to 16 characters)
>

Enter:
 IP address
>

Enter:
 Notes
>
```

6 - Remove Name

The Remove Name option allows you to remove a selected name. Note that the removal of a name also automatically removes the IP address and any notes associated with the name.

```
Enter:
 all, Device name
>
```

Upgrade Device Menu

```
                              UPGRADE DEVICE MENU

    Option                    Description
 1. High Security VPN       - Upgrade to High Security VPN




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **Upgrade Device Menu** may be used to enter a feature key code to enable 3DES (triple Data Encryption Standard) IP Security on this router. This feature is only available with an encryption security export permit. Please contact your equipment supplier for information about obtaining this upgrade.

Load FLASH Set-Up Menu

```
                          LOAD FLASH SET-UP MENU

   Option                   Description
 1. Console (ZMODEM)      - Load through serial port
 2. Network (TFTP)        - Load through IP network









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

From the **LOAD FLASH SET-UP MENU,** the software in the router may be updated to the latest version. The download file, referred to in this section as "###.all", will be found in the directory with the new software release number ### (e.g. 51P.04.03.02).

Considerations:

When installing a new version of operating software in a router, ensure that the current configuration is backed up before the installation process is started (see Access Setup Menu: Dump and Restore options).

Note: this operation cannot be performed from a secondary IP address.

1 - Console (ZMODEM)

Resets the router and places it in Console load mode. Once the router is in Console load mode, the "###.all" file may be sent using the ZMODEM transfer protocol. The Console load mode may only be used with a direct connection to the serial management port of the router.

The ZMODEM application **must** be in 32 bit CRC mode for software upgrade transfers.
This option must be confirmed before operation by typing "yes" when prompted.

Procedures for performing a Console ZMODEM Flash Load to upgrade the operating software of the router:

1) Save the current configuration of the router (Main menu: option 6).
2) Execute the Console (ZMODEM) command from the Load FLASH Set-Up menu.

   Confirmation is required. Enter "yes" to proceed.
3) After the router restarts, the router will be in receive ZMODEM mode. The router will display the following messages on the console port.

```
System startup
Receiving ZMODEM ...
**B0100000023be50
```

4) Start the ZMODEM transfer and send the file "###.all" from the Boot/Operational Code directory on the CD-ROM.
5) Once the ZMODEM transfer is complete, the router will verify the file "###.all" in memory, program and verify the FLASH, clear the configuration to default values (except the password), and then reset. After the reset, the router will operate normally using the newly upgraded software. A byte status message will be displayed on the console port during the programming of the FLASH.

   On the rare occasion that during the programming of the FLASH something happens to the router (power hit or hardware reset), causing the FLASH to become corrupted, the router will restart in ZMODEM receive mode only. If the router does not start in ZMODEM receive mode: power down the router, remove the screw(s) securing the WAN interface module(s), remove the WAN module(s), power up the router and wait for the power-up diagnostics to complete (Power LED goes green), disconnect power, reinstall WAN modules, power up the router. The router should now restart and be in ZMODEM receive mode. Once the file transfer is complete, the router will again come up in ZMODEM receive mode.

The ZMODEM Load Flash operation may be aborted (by aborting the ZMODEM transfer and then entering 5 control-X characters "^X" from the console keyboard. After the control-X characters are sent, the router will display a limited menu system. Choose the Abort Load option from the Load FLASH Set-Up menu. This will cause the router to reset and return to normal operations operating from the existing software.

If the ZMODEM transfer operation needs to be restarted after it has been canceled or after loading the first file, simply choose the Console (ZMODEM) option from the Load FLASH Set-Up menu once again.

Considerations:

When the router is placed in Console load BOOT mode, the LAN and WAN interfaces will be disabled. The router will only accept information from the console management port.

The BOOT code of the IOLINK-520 and IOLINK-PRO may be upgraded by performing a load of the "###.all" file from the Boot/Operational Code directory on the CD-ROM.

Maximum connection speed for ZMODEM transfer on an IOLINK-520 and IOLINK-PRO is 19200 Bps.

2 - Network (TFTP)

Resets the router and places it in Network Load mode. Once the router is in Network Load mode, a TFTP connection may be made to the router to upgrade to a new version of software. Make sure to disconnect any telnet sessions to the router before starting the TFTP transfer

The TFTP application must be in "octet" or "binary" mode for software upgrade transfers.

Procedures for performing a Flash Load to upgrade the operating software of the router:

1) Execute the Network (TFTP) command from the Load FLASH Set-Up menu.

2) Enter "none" to connect locally or enter the remote site ID number or alias to connect to a remote site. Login when connected.

3) Start the TFTP application to be used for transfers to the router.
(The IP address of the router may be found in the Internet Set-Up menu.).

4) Put the file "###.all" to the router from the Boot/Operational Code directory on the CD-ROM.
(Any router not in Network Load BOOT mode will respond with an access violation error.)

5) The router will verify the file "###.all" in memory, program and verify the FLASH, clear the configuration to default values (except: IP Address, IP Routing state, IP Forwarding state, WAN Environment, Link 1 & 2 State, the Switch Type, Directory Numbers, SPIDs, Password and connection data for the remote site, if applicable), and then reset. After the reset, the router will operate normally using the newly upgraded software. In some upgrade situations the Directory Numbers and SPIDs may be corrupted after the upgrade and will need to be re-entered.

   - The router may take up to two (2) minutes to program and verify the FLASH. The console will not respond during this time.

   To check on the router's current state during this process, get the file "status.txt" from the router. This file will report the router's state: both the mode and version if no errors have occurred, or an error message.

   On the rare occasion that during the programming of the FLASH something happens to the router (power hit or hardware reset), causing the FLASH to become corrupted, the router will restart in ZMODEM receive mode only. If the router does not start in ZMODEM receive mode: power down the router, remove the screw(s) securing the WAN interface module(s), remove the WAN module(s), power up the router and wait for the power-up diagnostics to complete (Power LED goes green), disconnect power, reinstall WAN modules, power up the router. The router should now restart and be in ZMODEM receive mode. Once the file transfer is complete, the router will again come up in ZMODEM receive mode.

The TFTP Load Flash operation may be aborted by re-connecting to the console of the router and choosing the Abort Load option from the Load FLASH Set-Up menu. This will cause the router to reset and return to normal operations operating from the existing software.

Considerations:

When the router is placed in Network (TFTP) load mode, the router will restart and then remain idle.

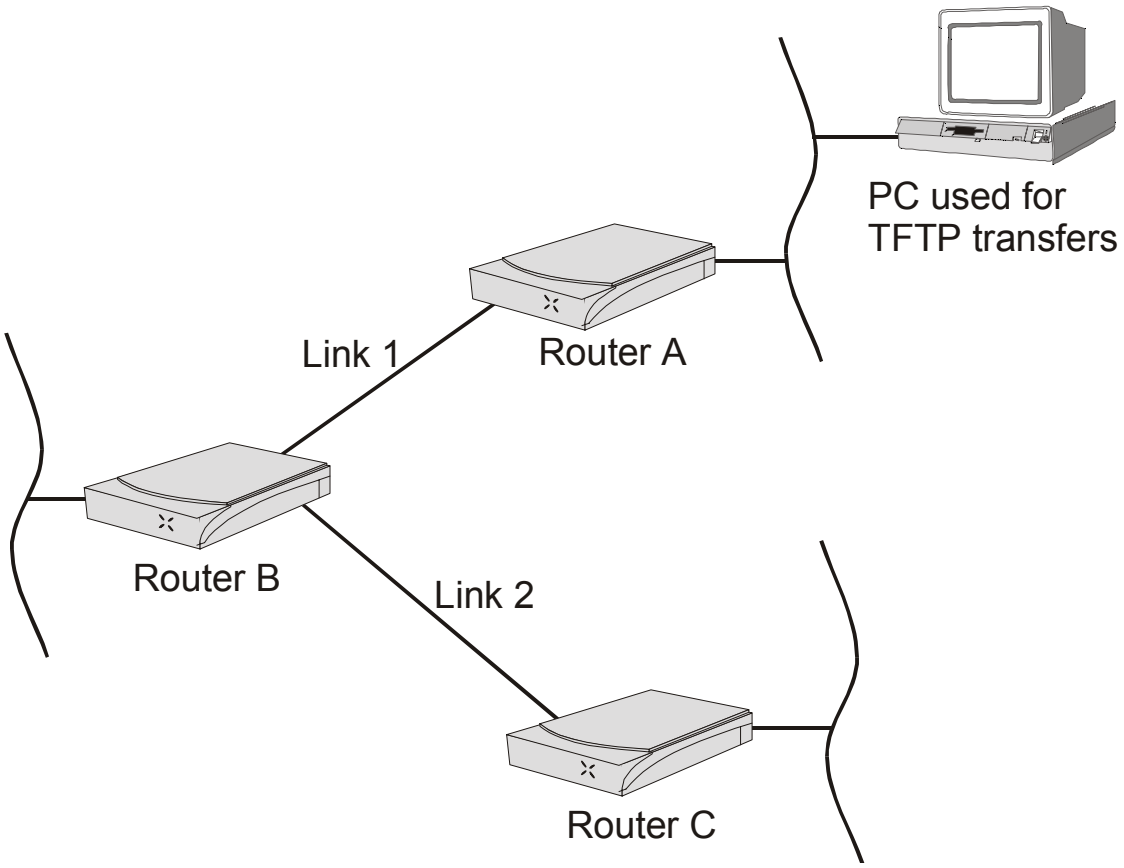
In the following diagram of a cluster of routers, when upgrading the three IOLINK routers in the diagram, the upgrade order should be Router C, then Router B, and finally Router A.

A TFTP software load to Router C would be performed as follows:

- Using TFTP, get config.txt from each router and save.
- Telnet to Router C. Enter the ID or alias of Router B in the Network (TFTP) option to put Router C in Network Load mode. When Router C restarts in Network Load mode, the connection to "Router B" will be re-established only if autocall is enabled on router B.
- The TFTP transfer of the upgrade code may now be performed from the PC to Router C. Once Router C has completed programming the flash and has restarted in operational mode, the connection to Router B will be re-established only if autocall is enabled on Router B.

Once router C is operating with the new software, the PC may be used to reload the config.txt file back to Router C.

Repeat for Router B, then again for Router A. Perform the Router B upgrade using the ID or alias of Router A. Router A upgrades would not require a remote site ID as the PC used for TFTP transfers is located on the same LAN as Router A.



Console Menu

```
                              CONSOLE MENU

    Option          Description
 1. Dump          - Back-up configuration from console
 2. Restore       - Load configuration from console









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The options in the **Console Menu** allow the current configuration settings of this router to be dumped to a backup device or for a saved configuration to be uploaded to restore the router to a previous configuration.

Note: Dump and Restore may not be performed over a telnet connection.

1 - Dump

Lists the configuration changes from the default settings to the console so it may be stored on a PC running a terminal-emulation package. It is recommended that after configuration of the bridge/router, the configuration changes be saved so that the device may be restored to these settings if required.

The Dump option should not be used during a connection to another bridge/router.

Note that only changes from the default settings are saved, not the entire configuration.

Two kinds of settings are not considered part of the configuration, and therefore are not included in the dump: trace settings and the password.

Procedures for performing a Configuration Dump:

1) Prepare the emulation package so that it is ready to accept the transfer of the configuration file.
2) Send the file (dump) to the PC disk using the Dump command.
3) Use a text editor to check the configuration file saved to the PC disk to confirm that information is still in order. If minor errors occurred, they may be corrected with the text editor. If errors were major, check the emulation package settings and dump the configuration again.

2 - Restore

Restores a configuration to the bridge/router that was previously saved to a disk file with the Dump command.

Note that the Restore will only restore those configuration settings that were changed from the default settings at the time the Dump was performed; Restore does not overwrite the entire configuration. Any changes made since the Dump was performed will not be overwritten and will thus remain in effect after the restore. It is strongly recommended that you do a full reset (under the Diagnostics menu) before performing a Restore to be certain that the system is restored to the state it was in at the time of the Dump. After a full reset, the IP address of the router must be re-entered.

Considerations:

The terminal-emulation package selected should have the capability to pace the loading of commands into the bridge/router. This may be done through the setting of a delay timer (character or line pacing) or a wait for the echo of the character before transmitting the next character.

The pacing function is commonly available, although pacing procedures will vary with each emulation package.

The Load option should not be used during a connection to another bridge/router.

Procedures for performing a Configuration Load:

1) Prepare the PC to transfer the configuration file.
2) Execute the Load command.
   Confirmation is required. Enter "yes" to proceed.
3) Send the file from the PC to the router.
4) When the transfer is complete, the configuration will have been restored to the bridge/router.

Interfaces Set Up Menu

```
                          INTERFACES SET-UP MENU

    Option              Value          Description
 1. LAN set-up          menu         - Define LAN environment
 2. WAN set-up          menu         - Configure WAN operation
 3. Terminal set-up     menu         - Define operator's console




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **INTERFACES SET-UP MENU** contains

1 - LAN Set-Up

The LAN Set-up option takes you to the LAN Set-Up Menu, where the parameters for the Local Area Network configuration are configured.

2 - WAN Set-Up

The WAN Set-up option takes you to the WAN Set-Up Menu, where the Wide Area Network links are configured and controlled.

3 - Terminal Set-Up

The Terminal Set-up option takes you to the Terminal Set-Up Menu, where the terminal parameters used for the router console are selected.

LAN Set-Up Menu

```
                          LAN SET-UP MENU

    Option                 Value          Description
 1. Bridge set-up          menu         - Define LAN port STP options
 2. IP set-up              menu         - Define IP parameters
 3. IPX set-up             menu         - Define IPX network numbers
 4. LAN interface type    [10BaseT]     - Set LAN interface type




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **LAN SET-UP MENU** contains options used to enable the router to be recognized as a device on the Local Area Network(s). This will enable it to bridge and route data, to connect to other routers across the LAN, and allow SNMP Network Management Stations to be able to access the router's SNMP agent.

If this is a model 5200 router that has a second LAN module installed, you will be requested to select for which LAN you wish to set the parameters, 1 or 2.

```
Enter :
    Set Reference LAN interface (1 or 2)
```

Once this is done, the options below are enabled.

1. Bridge Set-Up

The Bridge set-up option directs you to the LAN Bridge-STP Menu where STP Port parameters are set.

2. IP Set-Up

The IP set-up option takes you to the LAN IP Set-Up Menu where LAN IP routing parameters may be set for this LAN.

3. LAN IPX Set-Up

The IPX set-up option directs you to the LAN IPX Set-Up Menu, where network numbers may be assigned for the four IPX frame types supported by this LAN.

4. LAN Interface Type

The LAN Interface Type option defines which variety of Ethernet LAN is connected to this router.

Default: 10BaseT

Choices: 10BaseT, 10Base2, 10Base5

Note: This option is not displayed for an IOLINK-520 model.

LAN Bridge-STP Menu

```
                              LAN BRIDGE-STP MENU

    Option       Value          Description
 1. State        [enabled]    - Enable/disable port
 2. Path cost    [100]        - Define network cost for port
 3. Priority     [128]        - Set port priority









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **LAN Bridge-STP MENU** allows the management of the LAN bridging state, path cost, and priority.

1 - State

The State option toggles between Enabling and Disabling of the Spanning Tree Protocol for the LAN port.

Considerations:

When the port is [enabled] the states are reported as Listen(ing), Learn(ing), Forward(ing) or Block(ing). If the port is disconnected, "Disabled" is shown in the Show Ports display (even if the state is enabled).

When the port is [disabled], it does not participate in frame relay or the learning process. Also, when [disabled] the port is not included in the STP topology calculations and will not be activated by the STP should it be needed to take over from a failed bridge.

2 - Path Cost

The Path Cost option allows the setting of the contributing path cost to the Root for this port.

Contribution of Path Cost to Root Path Cost:

The path cost to the Root Bridge is added to those path costs of other bridges along the same stream to the Root Bridge. The result is the Root Path Cost.

Once the Root Bridge is selected, a determination of which bridge(s) will become blocked where necessary is made. This determination is made by comparing the sum of the path costs (i.e. the Root Path Cost) to the Root Bridge. Where redundant paths exist, the bridge with the lowest Root Path Cost to the Root Bridge will become the *Designated Bridge* for the LAN. If all contending bridges' ports have the same Root Path Costs, then first their Bridge IDs (Priority/MAC address) and second their Port IDs (Port Priority) will be used as tiebreakers.

Default: [100]

Range: 1 to 65535

Considerations:

Increasing this value increases the total cost of the path to the Root Bridge. This may (depending on the topology) cause a bridge along the path to the Root bridge to be taken out of service and a blocked bridge to come into service.

Decreasing the value may have the opposite effect.

3 - Priority

The Priority option allows the setting of the port priority. This value is entered in decimal format and appears in hex format in the Port ID/Designated Port identifier (as applicable) of the Port Status display.

Default: [128] (decimal)

Range: 0 - 255

Considerations:

Increasing this value lowers the probability of this port becoming the Root port to the Root bridge. Decreasing this value increases the probability.

LAN IP Set-Up Menu

```
                          LAN IP SET-UP MENU

    Option                 Value               Description
 1. Secondary IP set-up    menu              - Configure Secondary IP
 2. LAN - NAT set-up       menu              - LAN specific NAT setup
 3. IP address            "198.2.2.2" [24]   - Define IP address
 4. MTU size              [1500]             - MTU size at IP layer on LAN
 5. Routing protocol      [rip1_compatible]  - Define routing protocol
 6. RIP mode              [both]             - Define RIP send/receive mode
 7. Route cost            [0]                - Cost added to learned routes




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **LAN IP SET-UP MENU** contains options used to enable the router to be recognized as an Internet Protocol device on the network, to negotiate IP routes and to route IP data packets on the LAN.

1 – Secondary IP Set-Up

The Secondary IP Set-up option takes you to the Secondary IP set-up Menu, where this LAN may be configured to use secondary IP addresses on the local network for local routing.

2 – LAN – NAT Set-Up

The LAN-NAT set-up option takes you to the LAN-NAT set-up Menu, where Network Address Translation parameters for the primary LAN may be assigned. This option would be used when NAT is to be used between the primary LAN and the secondary LAN(s).

3 – IP Address

The IP Address option defines an Internet Protocol (IP) address and corresponding subnet size for the LAN. The LAN requires an IP address.

The IOLINK router supports SNMP that uses UDP for message transmission, and UDP runs on top of IP. An IP address is also required to connect to other routers across the LAN by using Telnet (for example, from a remote router to a local bridge).

The IP address consists of 4 octets and is represented by 4 fields separated by periods ("**.**"), where each field is specified by a decimal number (e.g. 92.3.1.10). Each decimal number must be less than or equal to 255, that is the maximum value of each 8-bit field.

The size of subnet mask variable defines the number of bits in an IP address to be used for network and subnetwork addressing (the remainder being used for host addressing). Subnetting allows multiple logical networks within a single standard IP network address.

Note: after changing the IP address of this LAN, a soft reset must be performed to bring the change into effect.

Default: [none]

```
Enter :
    none, internet address (up to 15 characters)
>
Enter :
    size of subnet mask (from 8 to 32)
>
```

4. MTU size

The Maximum Transmission Unit – the largest size, in bytes, of the data packet (including headers) transmitted. Data packets above this size will be fragmented. The standard MTU sizes for ethernet and PPP are 1500 bytes. As IPSec processing increases the size of the IP packet, there is an increased chance of fragmentation. If there is a path segment that has a smaller MTU, it is generally better to fragment packets at the origin (this router) using this option than assuming they will be fragmented en route (if the path segment cannot do fragmentation, the packet will not be transmitted). Packet fragmentation can be tuned with the Ping option (8) in the Applications menu.

Default: [1500]

5 - Routing Protocol

The Routing Protocol option defines the type of IP routing protocol to be used on this Local Area Network. The IOLINK router may be set up to use different types of IP routing protocols on each of its LANs and WAN links.

When the routing protocol is defined as none, the IOLINK router will operate as an IP router but will NOT participate in the exchange of RIP messages between the other IP routers in the network. All IP routing is accomplished by using the static routes table. All routes within the network must be manually entered in the static routing table.

When the routing protocol is defined as rip1, the IOLINK router will operate as a RIP1 IP router. All routing information will be sent and received via broadcast RIP packets.

When the routing protocol is defined as rip1_compatible, the IOLINK router will operate as a RIP2 IP router in broadcast mode. All routing information will be sent via broadcast RIP2 packets. Routing information may be received as broadcast RIP1, broadcast RIP2, or multicast RIP2.

When the routing protocol is defined as rip2, the IOLINK router will operate as a RIP2 IP router. All routing information will be sent via multicast RIP2 packets. Routing information may be received as broadcast RIP2 or multicast RIP2.

Partner routers connected on the network do not need to have their IP routing protocols set to the same values. An IP router at a central site may have it's routing protocol set to RIP so that it may continue to listen to RIP messages and adapt to the changes of the local network, while the remote locations, with their default routes back to the main router, cannot propagate any incorrect routing information that might be present on the remote segments. Each of the routers at the remote sites would have their routing protocol set to none.

Default: [rip1_compatible]

Choices: none, rip1, rip1_compatible, rip2

5 - RIP Mode

The RIP Mode option defines how this IOLINK router will participate in RIP IP routing message exchange for this subnet.

When the RIP mode is set to both, the IOLINK router will send and receive RIP routing messages.
When the RIP mode is set to send_only, the IOLINK router will only send RIP routing messages.
When the RIP mode is set to receive_only, the IOLINK router will only receive RIP routing messages.

Default: [both]

Choices: both, send_only, receive_only

7 - Route Cost

The Route Cost option defines the amount of extra routing cost to add to routes that are learned from this LAN. This added cost may be useful in forcing learned routes to have a higher cost when they are across a slower LAN connection.

Default: [0]

Secondary IP Set-up Menu

```
                              SECONDARY SET-UP MENU

    Option                    Value         Description
 1. Edit secondary entry      menu        - Modify/add Secondary IP entry
 2. Show secondary entries                - Display secondary IP entries
 3. Remove secondary entry                - Delete secondary IP entry



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The Secondary IP Set-Up Menu contains options to configure secondary Local Area Networks or subnetworks on this network. This provides the ability to set up a number of independently addressed virtual networks or subnetworks on the same physical local area network (also known as Secondary IP Addressing). Up to 16 secondary IP networks may be defined on this router.

1 - Edit Secondary Entry

The Edit Secondary Entry option takes you to the Edit Secondary Entry Menu, where the parameters for the secondary IP networks are defined.

2 - Show Secondary Entries

The Show Secondary Entries option displays a listing of the entries in the Secondary local network table.

```
                 Secondary              Subnet              Secondary IP
 ID    Alias    IP Address         Size / Mask             Subnet/Network
 --   -------   ---------------   ---------------------   ----------------
  1   LAN.1     199.65.43.21       24   255.255.255.0      199.65.43.0
  2   LAN.2     198.123.45.67      28   255.255.225.240    198.123.45.64
 12   LAN.12    199.76.54.32       14   255.252.0.0        199.76.0.0
```

ID: the identification numbers between 1 and 16 entered for the secondary local networks

Alias: the alias names assigned (automatically) to the secondary local networks; set as LAN.id#

Secondary IP Address: the IP addresses of each of the secondary local networks

Subnet Mask Size: the number of bits set in the subnet mask for each of the secondary IP networks

Subnet mask: the four decimal number representation of the bits set for the subnet mask.

Secondary IP Subnet / Network: the network or subnet IP address of the secondary subnet or network as defined by the Secondary IP Address and subnet mask.

3 - Remove Secondary Entry

The Remove Secondary Entry option allows you to delete a selected entry from the secondary local network table, or to clear all entries.

Edit Secondary Entry Menu

```
                          EDIT SECONDARY ENTRY MENU

    Option              Value          Description
 1. Secondary IP      *[        ]    - Secondary IP address
 2. Mask size         *[        ]    - Secondary subnet mask size
 3. Subnet mask       *[        ]    - Secondary subnet mask
 4. Routing protocol   [        ]    - Define routing protocol
 5. RIP mode           [        ]    - Define RIP send/receive mode
 6. Private route      [        ]    - Do not advertise this route
 7. Route cost         [        ]    - Cost added to learned routes




Enter :
    Set the entry ID (from 1 to 16)


>
```

The Edit Secondary Entry Menu provides options for entering parameters for routing to secondary networks or subnetworks through this router.

When an ID number for a secondary network is entered for the first time, you will be prompted to enter the defining IP address and mask size for the network. Once the secondary network is defined, the IP address and mask cannot be edited with this menu; the entry must be removed and re-entered to change these parameters.

1 - Secondary IP

The Secondary IP Address for this router on the secondary network or subnet with the new ID number is entered here the first time the ID number for this secondary network is entered.

The secondary IP address is used to access the secondary subnet or network through this router.

The IP address consists of 4 eight-bit fields separated by periods ("**.**"), where each field is specified by a decimal number (e.g. 92.3.1.10). Each decimal number must be less than or equal to 255 (the maximum value of an 8-bit binary number).

* Display only. This address is set when the entry is defined for the first time and may not be changed here; to make a change, the entry must be removed from the secondary address table and re-entered.

2 - Mask Size

The Mask Size defines the number of contiguous bit locations from the start of the IP address to be used for the subnet mask for this secondary network. The Subnet Mask when applied to the secondary IP address defines this Secondary IP subnet or network.

* Display only. This number is set when the entry is defined for the first time and may not be changed here; to make a change, the entry must be removed from the secondary address table and re-entered.

3 - Subnet Mask

The Subnet Mask option displays the subnet mask defined by the subnet mask size in option 2.

* Display only. This mask is set when the mask size entry is defined for the first time and may not be changed here; to make a change, the entry must be removed from the secondary address table and re-entered.

4 - Routing Protocol

The Routing Protocol option defines the type of IP routing protocol to be used on this secondary network.

When the routing protocol is defined as none, the IOLINK router will NOT participate in the exchange of RIP messages for this secondary network with the other networks. Routing on this secondary network is accomplished by using static routes. All routes within this secondary network must be manually entered as the static routes. Host devices and other routers on this network must be statically configured (they will not receive RIP messages). Routes with next hops on this network must be statically configured on this router. In addition to the static routes entered, this router will use routing information learned from other interfaces and networks

When the routing protocol is defined as rip1, the IOLINK router will use RIP1 IP protocol for this secondary network. All routing information will be sent and received via broadcast RIP packets.

When the routing protocol is defined as rip1_compatible, the IOLINK router will use RIP2 IP protocol in broadcast mode for this secondary network. All routing information will be sent via broadcast RIP2 packets. Routing information may be received as broadcast RIP1, broadcast RIP2, or multicast RIP2.

When the routing protocol is defined as rip2, the IOLINK router will use RIP2 IP protocol for this secondary network. All routing information will be sent via multicast RIP2 packets. Routing information may be received as broadcast RIP2 or multicast RIP2.

Networks on this router do not need to use the same IP routing protocols. For example, one secondary network may be set as RIP_compatible to learn and advertise changes to the network, while another may be set to none and must use static routes.

Default: [rip1_compatible]

Choices: none, rip1, rip1_compatible, rip2

5 - RIP Mode

The RIP Mode option defines how this IOLINK router will participate in RIP IP routing message exchange for this subnet.

When the RIP mode is set to both, the IOLINK router will send and receive RIP routing messages.

When the RIP mode is set to send_only, the IOLINK router will only send RIP routing messages.

When the RIP mode is set to receive_only, the IOLINK router will only receive RIP routing messages.

Default: [both]

Choices: both, send_only, receive_only

6 - Private Route

Setting this secondary network IP address to be a private route causes the IP address and network to not be advertised in the RIP information.

Default: [disabled]

7 - Route Cost

The Route Cost option defines the amount of extra routing cost (in hops) to add to routes that are learned from this Secondary network. This can be used in the case of multiple routes to artificially increase the cost of a less preferred route so that it will be used only if the preferred route is not available. The cost will not be added (and thus not appear in the route statistics) until a connection is made.

Default: [0]

LAN – NAT Menu

```
                                LAN - NAT MENU

    Option                  Value          Description
 1. Translation type       [port]        - Define translation method
 2. Dynamic IP pool        [none]        - Dynamically assigned mappings
 3. Show address pool                    - Display IP mappings
 4. Add static entry                     - Specify IP-IP mapping
 5. Remove static entry                  - Remove static IP mapping
 6. NAT enabled            [disabled]    - Enable address translation



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The LAN - NAT Menu sets parameters for the NAT address pool for the primary LAN. Network Address Translation (NAT) is a technique that translates private IP addresses on a private network to valid global IP addresses for access to another network. Network Address Port Translation (NAPT) translates both the IP address and the port. The advantage of port translation is that more than one private IP address can be translated to the same single global IP address. NAPT allows data exchanges initiated from hosts with private IP addresses to be sent to other networks via the IOLINK router using a single global IP address. Port translation can also be used from one private network to another private network if the two networks have conflicting IP addresses.

1 - Translation Type

This option sets the address translation method to be used for NAT. The address may be translated as either a port or an internal IP address. With IP address translation, each internal IP address is mapped to one global IP address; with port translation, several internal IP addresses may be mapped to a single global IP address.

Default: [port]

2 - Dynamic IP Pool

The Dynamic IP Address Pool option defines the block of global IP addresses that may be used to map to internal addresses. The router will assign a global IP address from this pool to the internal address of a device on the network.

The first address in the range must be specified followed by the number of addresses in the pool. The pool size may be up to 253 addresses.

Note: The pool may not have a pool size assigned such that the pool would contain an address that is a broadcast address (all binary 1s in the host portion of the IP address) for standard A, B or C class networks. If a pool size is entered which causes this condition, the following warning will be displayed:

```
Pool can not have that many addresses with the start address specified, Enter:
```

Enter a smaller size for the pool or assign a different starting address.

3 - Show Address Pool

This option displays the IP address pool for this remote site.

```
                          NAT ADDRESS POOL

Pool Address        Type    Actual Address                Status
--------------      -----   --------------                ---------
12.34.5.6           Static  196.23.45.6                   In use
12.34.5.12          Static  196.23.45.24                  Reserved
23.45.6.10          Dynamic 123.45.67.8                   In use
23.45.6.11          Dynamic None assigned                 Available
23.45.6.12          Dynamic None assigned                 Available
23.45.6.13          Dynamic None assigned                 Available
```

The Pool Address is the internal address to be used on this network; the Actual Address is the global IP address to which the internal address is assigned.

When the last dynamically assigned address in the address pool is reached, the router will automatically use port translation with that address in order to allow as many connections as possible. If there are zero or one address specified for the pool, then port translation will be used for all connections. If zero, the address assigned by the remote router IPCP or the address specified in the "Peer IP address" option will be used. If one address is specified, that address will be used.

4 - Add Static Entry

The Add Static Address option assigns a specific internal IP address of a device to a specific global IP address. When this option is selected, first enter the internal IP address to be assigned then the global IP address.

5 - Remove Static Address

The Remove Static Address option removes the static address assignment from the address pool. Addresses may be removed individually by entering the global IP address to be taken off, or the entire list of static address assignments may be cleared by entering "all".

6 - NAT Enabled

The NAT enable option enables or disables Network Address Translation on the LAN.

When NAT is enabled this router will not send RIP messages out. The router will be able to receive RIP requests. IP pattern filters and Firewall use the non-translated IP address. (i.e. the private IP address that is used on the private network).

Default: [disabled]

LAN IPX Set-Up Menu

```
                              LAN IPX SET-UP MENU

    Option                Value          Description
 1. Ethernet-II frames   "0"           - IPX network number
 2. RAW 802.3 frames     "0"           - IPX network number
 3. IEEE 802.2 frames    "0"           - IPX network number
 4. 802.2 SNAP frames    "0"           - IPX network number
 5. Auto Learn           [enabled]     - Auto learn IPX network numbers
 6. Help                               - Description of IPX frame types



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **LAN IPX Set-Up MENU** allows the configuration of the IPX network numbers on this router for each IPX frame type on the LAN.

1 - Ethernet-II Frames
2 - RAW 802.3 Frames
3 - IEEE 802.2 Frames
4 - 802.2 SNAP Frames

A value of "0" indicates that the router will learn the network number associated with this frame type upon receiving the first IPX frame of this frame type.

Default: [0]

Range: 0 to FFFFFFFF hex

Considerations:

Once an IPX network number is defined or learned, all further IPX frames of that frame type will use the network number. If a different network number is found for that frame type, the first network number defined or learned will continue to be used.

5 - Auto Learn

Enables or disables the auto learning of IPX network numbers for this IPX router. All IPX network numbers will be taken from the user defined values within options 1 through 4 in this menu.

Default: [enabled]

6 - Help

The Help option offers a brief description of the IPX frame types and network numbers.

WAN Set-Up Menu

```
                              WAN SET-UP MENU

    Option                  Value          Description
 1. Switch type            [NI-1]        - Set switch type
 2. Group set-up            menu         - Configure group operation
 3. Link set-up             menu         - Configure link parameters




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **WAN SET-UP MENU** allows the definition of link operation for the router.

1 - Switch Type

Choosing the Switch Type option defines the ISDN switch (signaling) type that this router is connected to.

When the Switch Type is changed, a **Soft Reset** must be performed for this to take effect. This allows the router to initiate operation with the new switch type.

Default: If S/T module is installed: [NET3]
If U module is installed: [NI-1]

Choices: DMS-100, NI-1, NI-2, 5ESS-PP, 5ESS-MP, NET3, TPH1962, KDD, SWEDEN, and NTT

Considerations:

The 5ESS switch types are split into two versions: 5ESS-PP (point to point) and 5ESS-MP (multipoint). In ISDN, point to point means that both B channel links in an ISDN BRI are used for a connection between a pair of devices. Multipoint means that one link of the BRI may be used to connect to one device, the other link may be used to connect to a different device.

Note: this menu item appears only if an ISDN module is installed in this router.

2 - Group set-up

The group Set-up option takes you to the Group Set-up Menu, where ISDN hunt group parameters may be configured.

Note: this menu item appears only if a dual BRI ISDN module is installed in this router.

3 - Link Set-Up

The Link Set-up option takes you to the Link Set-Up Menu, where the link interfaces are configured. Directory numbers and Service Profile Identifiers are defined for the ISDN B-channels.

Group Set-Up Menu

```
                              GROUP SET-UP MENU

    Option                  Value         Description

 1. Force 56k          [disabled]    - Force 56k rate adaptation
 2. Hunt group #       [none]        - Set common telephone number
 3. Add link                         - Add a specific link to this group
 4. Show groups




Enter:
    group number (1 or 2)

> 1
```

The above display is the first level of the **GROUP SET-UP MENU**. Once the group number is entered, the group number specified is added to the menu title bar and the Options are as shown below:

```
                            GROUP SET-UP 1 MENU

    Option                  Value         Description

 1. Force 56k          [disabled]    - Force 56k rate adaptation
 2. Hunt group #       [none]        - Set common telephone number
 3. Add link                         - Add a specific link to this group
 4. Show groups



Enter:

>
```

The **GROUP SETUP MENU** provides for grouping sets of ISDN B-channels together. These sets may be hunt groups or callback groups.

A hunt group phone number is defined by the ISDN service provider. This method of grouping the B-channels allows one ISDN phone number to be used to establish connections from remote site devices to multiple B-channels on the central site device. A group of single link protocol remote site devices may all dial in to the same ISDN phone number at the central site and contend for a link connection. This greatly simplifies the configuration process.

By default, all B-channel links are initially configured to be in group 1. Group 1 is defined with multilink operation disabled.

Consideration for IOLINK-520s with two ISDN interface modules: If this configuration is set up with remote site callback enabled, (this router will place a return call when it receives a prompting call from a remote site), then a callback group should be set up. A callback group is a grouping of one (the primary ISDN call number) or two (primary and alternate) ISDN numbers that a remote site router may dial to trigger the callback from this IOLINK router. If a callback group is not set up, the callback would come from the first available ISDN link; this may not be the primary or alternate number used by the remote site router, causing the callback to be rejected by the remote site.

.

Note: this menu will only be displayed if this router has an ISDN BRI module installed and the Logical ISDN Type set to ISDN.

1 - Force 56K

This option forces the B-channels in this group to use V.110 rate adaptation for all incoming and outgoing calls.

If the path to a destination number passes through a 56 Kbps digital circuit or the destination itself is a 56 K switched digital service, V.110 rate adaptation must be performed to allow the data to be sent at 56 K on the 64 K ISDN lines. When an ISDN call is placed, the local ISDN service must be informed that V.110 rate adaptation is required to fully complete this connection. Adding a percent symbol "%" before the ISDN number will cause the IOLINK router to send a message to the local ISDN service requesting V.110 rate adaptation.

Note: The link must be disconnected for this operation to take effect.

Default: [disabled]

2 - Hunt Group #

Enter the Hunt Group ISDN phone number assigned to this group of B-channels by the ISDN circuit provider. This Hunt Group number is used by this IOLINK router to inform the remote site partner devices which ISDN number to call when performing a "suspend" or "resume" of a connection managed circuit. This means that the remote site device will call the Hunt Group number when attempting to re-establish the ISDN call.

Note: Hunt Groups are a service from ISDN service providers and must be requested from them. If you have not subscribed for Hunt Group service, select "none" as the entry for this option. If a Hunt Group number is not defined, the ISDN number of the B-channel used to establish the call will be used for connection management negotiations.

When adding entries to the Stored Number table on remote partner ISDN IOLINK routers, this Hunt Group Number should be entered in the ISDN Number section in the table on the remote IOLINK router.

Default: [none]

```
Enter :
    none, Directory number (up to 35 characters)

>
```

3 - Add Link

Use this option to add a B-channel link to this group. Each link must always belong to only one group, so adding a link to a group will remove it from the previous group.

```
Enter :
    link number (1 or 2)

> 1
```

Note: If one ISDN interface module is installed, 2 links will be available, if two ISDN modules are installed (IOLINK-520 only), then 4 links will be available.

4 - Show Groups

Choosing this option displays an overview of the group configurations.

```
                          Groups Configuration

 Group Force Directory                Links
   #    56K   number                 1   2
   1          9876543                *
   2     Y    12345678                   *
```

Link Set-Up Menu

```
                              LINK SET-UP MENU

    Option                  Value          Description
 1. Physical link type  *[        ]




Enter:
    link number (1 or 2)

> 1
```

The above display is the first level of the **LINK SET-UP MENU**. Once the WAN link number is entered, the link number specified is added to the menu title bar and one of the menus shown on the following pages will appear. The menu displayed will depend on whether an ISDN or a leased line interface module is installed for that link.

Link Set-Up Menu - ISDN

If the link has an **ISDN BRI** interface module and the logical ISDN type is **ISDN**, the menu will be:

```
                              LINK SET-UP 1 MENU

    Option                    Value          Description
 1. Physical link type     *"BRI"
 2. Link operation          [enabled]     - Enable/disable link
 3. Link IP MTU size        [1500]        - MTU size at IP layer on link
 4. Logical ISDN type       [ISDN]
 5. ISDN set-up              menu         - Configure ISDN operation
 5. Group                   [1]




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **LINK SET-UP MENU** allows the configuration the link connections on this IOLINK router. The options displayed for this menu will vary depending on what interface modules are installed on this router.

1 - Physical link type

The Physical Link Type option displays the type of interface module installed for this link. This is a display-only item and may not be changed.

Values: BRI

2 - Link Operation

The Link Operation option toggles between [enabled] and [disabled] to allow this link to be used for connections.

Default: [enabled]

3. Link IP MTU size

The Maximum Transmission Unit – the largest size, in bytes, of the data packet (including headers) transmitted. Data packets above this size will be fragmented. The standard MTU sizes for ethernet and PPP are 1500 bytes. As IPSec processing increases the size of the IP packet, there is an increased chance of fragmentation. If there is a path segment that has a smaller MTU, it is generally better to fragment packets at the origin (this router) using this option than assuming they will be fragmented en route (if the path segment cannot do fragmentation, the packet will not be transmitted). Packet fragmentation can be tested with the Ping option (8) in the Applications menu.

Default: [1500]

4 - Logical ISDN Type (if BRI module installed on this link)

The Logical ISDN Type option allows you to select between a switched (dial up) ISDN circuit or a digital leased circuit to configure the router to match the type of service connected to this interface module.

The ISDN option is used when a switched (dial up) ISDN service is connected to the BRI module.

The Digital_Leased option is used when a permanent leased ISDN circuit is available from your ISDN service provider and is connected to the BRI module; please see the Link Set-up menu on following pages for a description of this option.

When this link is set to use digital leased circuits instead of switching circuits, the ISDN call establishing functions are not displayed on the menu.

Default: [ISDN]

Values: ISDN, Digital_Leased

Considerations:

The state of the Logical ISDN type option is saved when performing a software upgrade. This means that when the IOLINK router restarts, it will return to the operation state that was enabled before the upgrade was performed.

5 - ISDN Set-Up

The ISDN Set-Up option takes you to the ISDN Set-up menu where ISDN switch types and other ISDN parameters may be set.

Note: this option appears only if the router has an ISDN BRI module installed on this link and Logical ISDN Type is set to ISDN.

5 - Group

The identifying number of the Group to which this link is to belong is set here.

Default: [1]

Choices: 1 or 2 if a single ISDN interface module is present
1 to 4 if two ISDN interfaces present (IOLINK-520 only)

Consideration for IOLINK-520s with two ISDN interface modules: If this configuration is set up with remote site callback enabled, (this router will place a return call when it receives a prompting call from a remote site), then a callback group should be set up. A callback group is a grouping of one (the primary ISDN call number) or two (primary and alternate) ISDN numbers that a remote site router may dial to trigger the callback from this IOLINK router. If a callback group is not set up, the callback would come from the first available ISDN link; this may not be the primary or alternate number used by the remote site router, causing the callback to be rejected by the remote site

Note: Groups may also be set under the Group Set-up Menu. Links set in that menu need not be set here.

Note: this option appears only if the router has an ISDN dual BRI module installed on this link and Logical ISDN Type is set to ISDN.

Link Set-Up Menu – Digital Leased

If the link has an **ISDN BRI** interface module and the logical ISDN type is **Digital_Leased**, the menu will be:

```
                              LINK SET-UP 1 MENU

    Option                    Value          Description
 1. Physical link type     *"BRI"
 2. Link operation          [enabled]           - Enable/disable link
 3. Link IP MTU size        [1500]              - MTU size at IP layer on link
 4. Logical ISDN type       [Digital_Leased]
 5. Frame Relay             [enabled]           - Enable/disable frame relay
 6. Frame relay set-up       menu               - Configure Frame relay
 7. Phantom power detect    [disabled]          - Detect phantom power
 8. Link B channel         *[B1]                - Assign B channel




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **LINK SET-UP MENU** configures the link connections on this IOLINK router. The options displayed for this menu will vary depending on what interface modules are installed on this router.

1 - Physical link type

The Physical Link Type option displays the type of interface module installed for this link. This is a display-only item and may not be changed.

Values: BRI

2 - Link Operation

The Link Operation option toggles between [enabled] and [disabled] to allow this link to be used for connections.

Default: [enabled]

3. Link IP MTU size

The Maximum Transmission Unit – the largest size, in bytes, of the data packet (including headers) transmitted. Data packets above this size will be fragmented. The standard MTU sizes for ethernet and PPP are 1500 bytes. As IPSec processing increases the size of the IP packet, there is an increased chance of fragmentation. If there is a path segment that has a smaller MTU, it is generally better to fragment packets at the origin (this router) using this option than assuming they will be fragmented en route (if the path segment cannot do fragmentation, the packet will not be transmitted). Packet fragmentation can be tuned with the Ping option (8) in the Applications menu.

Default: [1500]

4 - Logical ISDN Type (if BRI module installed on this link)

The Logical ISDN Type option allows you to select between a switched (dial up) ISDN circuit or a digital leased circuit to configure the router to match the type of service connected to this interface module.

The ISDN option is used when a switched (dial up) ISDN service is connected to the BRI module; please see previous Link Set-up Menu for a description of this option.

The Digital_Leased option is used when a permanent leased ISDN circuit is available from your ISDN service provider and is connected to the BRI module. A digital leased circuit is permanently established by your service provider and does not require ISDN phone numbers or dialing functionality. When a digital leased circuit is established, the IOLINK router will treat it as if it were a normal 64 Kbps leased line connection for each assigned B-channel.

When this link is set to use digital leased circuits instead of switching circuits, the ISDN call establishing functions are not displayed on the menu.

Default: [ISDN]

Values: ISDN, Digital_Leased

Considerations:

The state of the Logical ISDN type option is saved when performing a software upgrade. This means that when the IOLINK router restarts, it will return to the operation state that was enabled before the upgrade was performed.

The following options appear if an ISDN module is present and Logical ISDN Type is set to Digital_Leased:

5 – Frame Relay

The Frame Relay option allows you to select between a frame relay circuit or a PPP leased circuit to configure the router to match the type of service connected to this interface module.

When this link is set to use Leased instead of Frame Relay, the Frame Relay options are not displayed on the menu.

Default: If International software loaded: [disabled] – router is in Leased Line mode.
If North American software loaded: [enabled] – router is in FrameRelay mode.

The router will request confirmation of the change when this menu item is selected, enter "yes"

Considerations:
The state of the Logical Leased type option is saved when performing a software upgrade. This means that when the IOLINK router restarts, it will return to the operation state that was enabled before the upgrade was performed.

6 – Frame Relay Set-Up

The Frame Relay Set-up option takes you to the Frame Relay Set-up menu where auto-learning may be disabled and LMI parameters set.

Note: this option appears only if the ISDN Type is set to Digital Leased and FrameRelay is enabled.

6/7 - Phantom Power Detect

Most NT-1s provide a signal to the connected ISDN device to indicate that the NT-1 is powered up and functioning correctly. This signal is generally called phantom power. Some NT-1s do not support phantom power. This option should be disabled if the NT-1 connected to the ISDN link module does not support phantom power.

If the IOLINK router is having difficulty obtaining a connection to the NT-1, this option should be disabled.

Default: [disabled]

Considerations: This option will not appear when the WAN module is an ISDN type U interface.

7/8 - Link B Channel

When the digital leased circuit option is configured on an ISDN BRI link, the ISDN B-channels must be assigned to link numbers for normal operation. When a B-channel on the BRI is assigned to a link number, the IOLINK router then treats the ISDN B-channel as a 64 Kbps leased line connection. If only one B channel is set to digital leased and the other is set to ISDN, then the B channel is automatically assigned and is not changeable (B1 for even link numbers, B2 for odd links). If both B channels on the BRI are set to digital leased, the B channels may be assigned as follows:

Link 1 may be assigned B-channel 1, B-channel 2 or both.

If link 1 is assigned B-channel 1, the other channel is available to service link 2 on the ISDN module; if link 1 is assigned B-channel 2, the other channel is not available.

This option is available only when the Digital Leased Circuit option is enabled.

```
Enter :
    B1, B2, B1-B2

>
```

If B-channel 2 has not previously been assigned to the odd numbered link on this ISDN module, the even numbered link may be assigned B-channel 2 or none.

If link 2 is assigned none, it is not available for user data connection.

This option is available only when the Digital Leased Circuit option is enabled.

```
Enter :
  B2, none

>
```

Considerations:

If B-channel 2 is already claimed by link 1 and you wish to reassign it to link 2, you must first reassign B1 to link 1 (select "B1"); otherwise, the following error display will appear:

```
Error: B2 is currently allocated to first link
```

Link Set-Up Menu – Leased Line

If the link has a **leased line** module installed, the menu will be:

```
                              LINK SET-UP 1 MENU

    Option                    Value          Description
 1. Physical link type    *"V.35"
 2. Link operation         [enabled]       - Enable/disable link
 3. Link IP MTU size       [1500]          - MTU size at IP layer on link
 4. Frame Relay            [enabled]       - Enable/disable frame relay
 5. Frame relay set-up      menu           - Configure Frame relay
 6. Link mode
 6. Link interface type
 6. Link speed             [64 kbps]       - Set speed for link
 7. Link CD wait time      [60 sec]        - Set CD wait time for link
 8. Loop compensation      [disabled]      - Enable/disable delay compensation


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **LINK SET-UP MENU** allows the configuration the link connections on this IOLINK router. The options displayed for this menu will vary depending on what interface modules are installed on this router.

1 - Physical link type

The Physical Link Type option displays the type of interface module installed for this link. This is a display-only item and may not be changed.

Values: V.35, RS232, RS530, V.11, G.703, LXT441-CSU, ATL-CSU

2 - Link Operation

The Link Operation option toggles between [enabled] and [disabled] to allow this link to be used for connections.

Default: [enabled]

3. Link IP MTU size

The Maximum Transmission Unit – the largest size, in bytes, of the data packet (including headers) transmitted. Data packets above this size will be fragmented. The standard MTU sizes for ethernet and PPP are 1500 bytes. As IPSec processing increases the size of the IP packet, there is an increased chance of fragmentation. If there is a path segment that has a smaller MTU, it is generally better to fragment packets at the origin (this router) using this option than assuming they will be fragmented en route (if the path segment cannot do fragmentation, the packet will not be transmitted). Packet fragmentation can be tuned with the Ping option (8) in the Applications menu.

Default: [1500]

4 – Frame Relay (if a V.35, RS232, RS530, V.11, G.703, LXT441-CSU or ATL-CSU module is installed on this link)

The Frame Relay option allows you to select between a frame relay circuit or a PPP leased circuit to configure the router to match the type of service connected to this interface module.

When this link is set to use Leased instead of Frame Relay, the Frame Relay options are not displayed on the menu.

Default: If International software loaded: [disabled] – router is in Leased Line mode.
If North American software loaded: [enabled] – router is in FrameRelay mode.

The router will request confirmation of the change when this menu item is selected, enter "yes"

Considerations:
The state of the Logical Leased type option is saved when performing a software upgrade. This means that when the IOLINK router restarts, it will return to the operation state that was enabled before the upgrade was performed.

5 – Frame Relay Set-Up

The Frame Relay Set-up option takes you to the Frame Relay Set-up menu where auto-learning may be disabled and LMI parameters set.

Note: this option appears only if the router has a leased line module installed on this link and Logical Leased Type is set to FrameRelay.

5/6 - Link Speed

The Link Speed option allows you to define the clock speed generated internally by the bridge/router for the link.

The link will clock both transmit and receive data from the clock it receives from the DCE device.

This internally generated clock may be used to clock this bridge/router and a partner bridge/router by using a custom back-to-back cable to connect the two bridge/routers together. This back-to-back connection is usually required only for testing purposes.

Choices: 9.6, 14.4, 19.2, 48, 50, 56, 64, 72, 76, 100, 128, 256, 384, 512, 768, 1024, 1544 and 2048 Kbps.

Default: [64 kbps]

Considerations:

The speed option is not available when an LXT441-CSU, ATL-CSU or G703 module is installed for this link or if running an ISDN module as a digital leased line.

6/7 - Link CD Wait Time

The Link 1 CD Wait Time option specifies the time the bridge/router will wait for Carrier Detect on the link. This is used primarily when modems must cycle through various speeds to find the one used for the link.

Default: [60 sec]

Range: 0 to 255 seconds

Considerations:

The CD wait time option is not available when an LXT441-CSU, ATL-CSU or G703 module is installed for this link or if running an ISDN module as a digital leased line.

The following option appears if a G703 interface module is installed on this link:

5/6- Link mode

The Link mode option sets the clock mode for a G703 interface on the link.

Default: [master]

Choices: master, slave

7/8. Loop compensation

The Loop Compensation option inverts the transmit clock signal generated by the interface module. This may be required to compensate for phase shifts between the clock signal and transmitted data signal; a problem that may show up as a large number of CRC errors when attempting to operate the connection at speeds greater than 64 Kbps.

Default: [disabled]

ISDN Set-Up Menu

```
                              ISDN SET-UP MENU

    Option                    Value          Description
 1. Dial prefix               [none]       - Set dial prefix
 2. Phantom power detect      [disabled]   - Detect phantom power
 3. Force 56k                 [disabled]   - Force 56k rate adaptation
 4. Directory number          [none]       - Set directory number
 5. SPID                      [none]       - Link service profile identifier


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **ISDN SET-UP MENU** provides for stored ISDN number set-up.

Note: this menu appears only if this router has an ISDN module installed and Logical ISDN type is set to ISDN (not Digital Leased).

1 - Dial Prefix

The Dial Prefix option is used when the ISDN IOLINK router is attached to an ISDN PBX. If a dialing prefix is required before an outside line is obtained, the dialing prefix must be entered here.

Default: [none]

2 - Phantom Power Detect

Most NT-1s provide a signal to the connected ISDN device to indicate that the NT-1 is powered up and functioning correctly. This signal is generally called phantom power. Some NT-1s do not support phantom power. This option should be disabled if the NT-1 connected to the ISDN link module does not support phantom power.

If the IOLINK router is having difficulty obtaining a connection to the NT-1, this option should be disabled.

Default: [disabled]

Considerations: This option is not available when the link module is an ISDN type U interface.

3 - Force 56K

This option forces both B-channels on this IOLINK router to use V.110 rate adaption for incoming and outgoing calls.

If the path to a destination number passes through a 56 Kbps digital circuit or the destination itself is a 56 K switched digital service, V.110 rate adaption must be performed to allow the data to be sent at 56 K on the 64 K ISDN lines. When an ISDN call is placed, the local ISDN service must be informed that V.110 rate adaption is required to fully complete this connection.

Note: Adding a percent symbol "%" in the ISDN number will cause the IOLINK router to send a message to the local ISDN service requesting V.110 rate adaption.

Default: [disabled]

4 - Directory Number

Enter the ISDN number of the B-channel (up to 15 characters). The ISDN number is available from the ISDN circuit provider. For a type NI-1 switch, enter only the local portion of the directory number, unless the area code is required for local calls.

When the Directory Number is changed, a **Soft Reset** must be performed for this to take effect. The router will be reset and begin operation with the new directory number.

Default: [none]

Note: in Net3 ISDN environments with BACP enabled, directory numbers must be configured for BACP to function.

The following option appears when an ISDN switch type is set to NI-1, NI-2, DMS-100 or 5ESS-MP:

5 - SPID

Enter the ISDN Service Profile Identifier (SPID) number assigned to this B-channel. The SPID number is available from the ISDN circuit provider.

When the SPID is changed, a **Soft Reset** must be performed for this to take effect. The router will be reset and begin operation with the new SPID.

Frame Relay Set-Up Menu

```
                    LINK SET-UP 1 FRAME RELAY SET-UP MENU

  Option               Value          Description

 1. Auto-learning      [disabled]   - Enable/disable LMI and DLCI learning
 2. LMI type           [ansi]       - Network interface
 3. Polling interval   [10 sec]     - Request network status
 4. Enquiry interval   [6]          - Full status enquiry
 5. Error threshold    [3]          - Enquiry failure tolerance
 6. Monitored events   [4]          - Error count interval



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **FRAME RELAY SET-UP MENU** allows the configuration of the frame relay parameters for the link. The options displayed in this menu will depend on the Auto-Learning setting selected

Note: this menu will be displayed if this link has Frame Relay enabled in the Link Set-UP Menu.

1 - Auto-Learning

The Auto-Learning option toggles between [enabled] and [disabled] to allow this frame relay router to try to auto-learn the LMI type as well as the configured DLCI values on the frame relay service.

When the frame relay router first starts up it will query the frame relay service to try to determine the LMI type. Once the LMI type is determined, the PVC configurations will be known from the full status inquiry messages. If the DLCI numbers of the PVC's on your service are determined during startup, the IOLINK router will automatically create a remote site profile for each PVC. The automatically created remote site profiles will be named "LinkxDLCIyyy" where x is the physical link number the PVC is on and yyy is the DLCI of the PVC. These automatically created remote site profiles may be renamed for easier usage by changing the Remote Site Alias within the Edit Remote Site menu.

Default: [enabled]

Considerations:

If during this learning process the maximum number of remote sites has been reached, the IOLINK router will prompt you that there are no remote sites available. A new remote site cannot be auto-created unless one of the existing remote sites is manually deleted. To remove a particular remote site, the PVC for that site must first be disabled (option 8 of the Main/Configuration/WAN set-up/Remote Site/Edit Remote Site/Connection set-up menu), then removed (option 4 of the Main/Configuration/WAN/Remote Site set-up menu). All remote sites on a link may be cleared by toggling the enable/disable function for the link, toggling the enable/disable function for auto-learning, or doing a soft reset.

Note: Auto-leaning with PPP Frame Relay is not compatible with some earlier model routers. In case of problems with auto-learning, try switching to raw 1490 frame relay operation (disable PPP for the remote site connection).

2 - LMI Type

The LMI Type option specifies the type of Link Management Interface in use by the Frame Relay service provider for the Frame Relay service.

When the LMI type is set to none, the IOLINK router simply creates frame relay packets and sends them on the defined PVCs. The links are not checked for errors. There is no congestion control checking. The link is only monitored for control signals.

Default: [none]

Choices: ansi, ccitt, lmi, none

Considerations:

The "ansi" LMI type operates as defined in the ANSI T1.617 Annex D specification and supports only permanent virtual circuits.

The "ccitt" LMI type operates as defined in the ITU-T Q.933 Annex A specification and supports only permanent virtual circuits.

The "lmi" LMI type operates as defined in the "Frame Relay Specification with Extensions Based on Proposed T1S1 Standards" specification and supports only permanent virtual circuits.

The following options are only displayed if the auto-learning option is set to "*disabled*" and the LMI type is set to a value other than "*none*":

3 - Polling Interval

The Polling Interval option specifies the time interval at which the IOLINK router will poll the Frame Relay switch for the management status.

Default: [10 sec]

Range: 5 to 30 seconds

4 - Enquiry Interval

The Enquiry Interval option specifies the frequency at which the IOLINK router will request a full status update from the Frame Relay service. The Enquiry Interval is expressed in numbers of Polling Intervals. By default, every 6th poll will be a full status update instead of just a management update.

Default: [6]

Range: 1 to 255

5 - Error Threshold

The Error Threshold option specifies how many unanswered status inquiries to send to the Frame Relay switch before determining that the link has failed.

Default: [3]

Range: 1 to 10

6 - Monitored Events

The Monitored Events option specifies the number of status inquiries that are to be monitored when determining the Error Threshold. By default, if the IOLINK router does not receive responses to 3 of the last 4 status inquiries, the link will be considered failed.

Default: [4]

Range: 1 to 10

Terminal Set-Up Menu

```
                              TERMINAL SET-UP MENU

    Option      Value          Description
 1. Terminal   [vt100]       - Define console terminal type
 2. Show                     - Display terminal definitions
 3. Add                      - Create a custom terminal definition
 4. Remove                   - Delete a terminal definition









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

From the **TERMINAL SET-UP MENU,** the terminal used for the router console is defined. A custom definition can be added if the terminal to be used is not presently supported by the router.

1 - Terminal

The Terminal option defines the terminal type to be used for the router console. The current terminal type is displayed in the Value column for this option. When this option is selected, the available terminal types are displayed.

Default: Terminal type chosen at first power-up

Choices: ansi, avt, ibm3101, qvt109, qvt102, qvt119, tvi925, tvi950, vt52, vt100, wyse-50, wyse-vp, teletype

Considerations:

If your terminal is not listed:

1) Choose another of the same make to try the features it provides; or,

2) Choose the terminal type **teletype**. This terminal type operates in scroll mode and does not offer the highlighting that may be provided with the pre-defined or custom terminal types. Operating in this mode does not prevent any of the operations of the router.

3) For a complete solution, create your own custom terminal type and add it to the types supported by the router using the Add option.

2 - Show

The Show option displays all terminal definitions. This listing may be of use if you need to create a custom terminal definition.

3 - Add

The Add option allows you to define a custom terminal type if you will be using a terminal that is not supported as one of the Terminal option choices. You must enclose the definition string for the custom terminal in quotations (“). Use the previous option (Show) to display definition strings for supported terminals.

4 - Remove

The Remove option deletes a terminal definition. This will delete a newly created definition. To delete a terminal definition, enter the name of the terminal as shown when the Add or Show option is selected

Connections Set-Up Menu

```
                          CONNECTIONS SET-UP MENU

    Option                Value          Description
 1. Remote site set-up    menu         - Configure remote site access
 2. Security set-up       menu         - Configure security
 3. PPP set-up            menu         - Configure PPP parameters
 4. IP address connect    menu         - Configure IP address connect
 5. Force disconnect                   - Disconnect a link
 6. Link status summary                - Status summary of all links




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **CONNECTIONS SET-UP MENU** allows

1 - Remote Site Set-Up

The Remote Site Set-up option takes you to the Remote Site Set-Up Menu, where configuration parameters required to establish PPP connections to remote devices are maintained.

2 - Security Set-Up

The Security Set-up option takes you to the Security Set-Up Menu, where PPP security options are maintained.

3 - PPP Set-Up

The PPP Set-up option takes you to the PPP Set-Up Menu, where general PPP options are maintained.

4 - IP Address Connect

The IP Address Connect Menu allows you to define PPP remote sites to be called depending upon the destination IP address of IP traffic on the local LAN.

5 - Force disconnect

Disconnects the link specified.

6 – Link status summary

Displays a summary of the links available on this device, their connections (if any) and the link speed.

```
                                Link StatusSummary

Link       Link      Remote Site                  ISDN                 Link
 ID     Type/State      Alias                    Number               Speed
----  ------------ ------------------------- ------------------------ ------
  1     ISDN/Up          REM1                   1-234-56789             64
  2     ISDN/Down        none                    none                    0
```

Link ID – the identification number associated with the link interface module; the same as the physical slot number in which the module is installed.

Link Type – the type of interface module for the link
Types: ISDN, Digital Leased, Frame Relay

Link State – whether the link is up or down

Remote Site Alias – the name assigned to the remote site associated with the link

ISDN Number – the ISDN number of the remote site connection (if applicable)

Link Speed – the nominal transmission speed of the link in Kilobits per second

Remote Site Set-Up Menu

```
                          REMOTE SITE SET-UP MENU

    Option                Value          Description
 1. Edit remote site       menu         - Modify/add a remote site entry
 2. Remote site summary                 - Summary of remote sites
 3. Learned summary                     - Summary of learned DLCI's
 4. Call summary                        - Call summary of remote sites
 5. Remove remote site                  - Delete remote site entry
 6. Manual call                         - Make a manual call to a remote site
 7. Force disconnect                    - Disconnect a call to a remote site


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **REMOTE SITE SET-UP MENU** allows the display, configuration, and creation of remote site profiles. Remote site profiles are used to establish PPP connections to other PPP routers. The appearance of this menu will vary depending on the interface modules installed and their configuration.

Important: When configuring this IOLINK router to be the originator of PPP ISDN calls or leased line connections, always define a remote site for each of the possible remote partner routers that this IOLINK router may connect to. For Frame Relay connections, remote site profiles are created automatically if auto-learning is enabled. If auto-learning is disabled, then frame relay remote sites must be manually configured as well. Each of the remote sites created stores all of the configuration information required to properly maintain the PPP connection to that remote PPP router. The remote site alias is used to match against the incoming user name during authentication. If an authenticated user name is the same as one of the configured remote site profiles, that connection will use the configuration defined within the remote site profile.

The configuration parameters for a remote site profile may be set by using another profile as a template. Three remote site table entries have been reserved for ISDN, leased line and Frame Relay remote site profile templates; these are:

ID number	remote site name
129	ISDN_TEMPLATE
130	FR_TEMPLATE
131	LEASED_TEMPLATE

Parameters for these profiles may be set under the "Edit Remote Site" menu option If a number of remote sites will have a similar profiles, copying the remote site profile from a template can save considerable time in setting them up.

If this router has an ISDN BRI interface and it is set for Digital Leased Circuit, the ISDN B-channel will be treated as a leased line connection.

When the IOLINK router receives an incoming ISDN call, the Multilink state is taken from the "ISDN_TEMPLATE" remote site profile. After the authentication process is finished, if the remote site is a valid remote site that has already been configured, the remaining call parameters are taken from the configured remote site profile. If the remote site does not match one of the configured remote site profiles, then the remaining call parameters will be taken from the "ISDN_TEMPLATE" remote site profile and a remote site profile for that link will be dynamically created at the next available remote site ID number. The newly created remote site profile will be named "INCOMING n" where "n" is the next unassigned Initial Profile number (n will be 1 or 2).

When CallerID security is enabled, an incoming call will not be accepted if the remote site does not match one of the configured remote site profiles.

When displaying status or statistic information on the connections to a remote site PPP router, most of the information is displayed according to a particular remote site. Within the Statistics section, a remote site is chosen and then the information for that connection may be displayed. The name of the remote site that the connection has been attached to may be viewed in the Event log file available within the Network Events menu.

There are 128 configurable remote sites available. Each of these remote sites will have a remote site alias associated with them. When a connection is made to a particular remote site, the call will be attached to that remote site profile after the connection has been established. Statistics for a connection are stored under the remote site profile alias or ID number.

Three remote site profiles, numbered 129 through 131, are reserved as templates that may be used for faster remote site configuration.

Remote Site ID	Remote Site Alias	Description
1 - 128	(user configurable)	Remote site used for outgoing connections to these specific remote sites. Configuration parameters for the outgoing connection are taken completely from the parameters defined in the remote site profile. Remote site profile used for incoming connections that have been authenticated and the incoming user name matches the name of one of the configured remote sites.
129	ISDN_TEMPLATE	Remote site profile used to set up a template that may be used to configure remote sites with ISDN connections. Multilink state is taken from this profile. If the incoming user name matches the name of one of the configured remote sites, the remaining call parameters will be negotiated from the values defined for that remote site. If the incoming user name does not match any of the remote sites defined, the connection is attached to the INCOMING profile for that link (132 through 145). The remaining negotiating parameters, such as BCP, IPCP, IPXCP, and CCP, will be taken from the ISDN_TEMPLATE settings.
130	FR_TEMPLATE	Remote site profile used to set up a template that may be used to configure remote sites with Frame Relay connections. If autolearning is enabled, this template will be used to auto-create each site learned. Site id numbers are assigned sequentially starting from the first available site number in the remote site table.
131	LEASED_TEMPLATE	Remote site profile used to set up a template that may be used to configure remote sites with Leased Line connections. For incoming connections, a remote site profile is auto-created at the first available location in the remote site table.

1 - Edit Remote Site

The Edit Remote Site option directs you to the Edit Remote Site Menu where the remote site profiles are maintained.

128 remote sites may be defined.

2 - Remote site summary

The Display Summary option displays an overview of the remote site profiles configured on this IOLINK router. Each of the options is shown as "E" for enabled, "D" for disabled or "NA" for not available.

```
* - Up   @ - Suspended                    Total Remote Site Entries: 7
 E - Enabled   D - Disabled   NA - Not Available

 Id  Alias             FR  AC MP    Pri/Sec    DLCI  BRG IP IPX CCP CMCP BACP
 --- ----------------  --- -- -- ------------ ----  --- -- --- --- ---- ----
   1 LEASED1           NA  D  E  Link01/none    NA   E   E  E   E   NA   D
   2 Toronto           NA  D  E    ISDN/none    NA   E   E  E   E   D    D
   3 LEASED4           RAW D  E  Link04/ISDN    16   E   E  E   E   NA   NA
   4 Dallas            NA  D  E    ISDN/ISDN    NA   E   E  E   E   D    D
 129 ISDN_TEMPLATE     NA  D  E    ISDN/ISDN    NA   E   E  E   E   D    D
 130 FR_TEMPLATE       PPP D  NA   none/none    16   E   E  E   D   NA   NA
 131 LEASED_TEMPLATE   NA  D  E    none/none    NA   E   E  E   E   NA   D
```

Id: Entry number in the Remote Site table. The Index number may be used to reference this entry in the IP Address Connect table or for viewing statistics.

Alias: Text name used to easily reference this entry in the table. The Alias may be used to reference this entry in the IP Address Connect table or for viewing statistics.

FR: Frame Relay – displays whether PPP encapsulation is enabled (PPP) or disabled (RAW) over Frame Relay. This column displays not applicable (NA) in a non-frame relay environment.

AC: The state of the Auto-call option for this remote site profile.

MP: The state of the Multilink option for this remote site profile.

Pri/Sec: The type of primary and secondary links configured for this remote site profile. ISDN/none indicates that the circuit will only use ISDN calls. Link1 or Link2 entries indicate that the circuit has been defined as a digital leased circuit.

DLCI: The Frame Relay DLCI number of this remote site. Not applicable (NA) in a non-frame relay environment.

BRG: The state of the BCP (bridging) option for this remote site profile.

IP: The state of the IPCP (IP routing) option for this remote site profile.

IPX: The state of the IPXCP (IPX routing) option for this remote site profile.

CCP: The state of the CCP (compression) option for this remote site profile.

CMCP: The state of the CMCP (connection management) option for this remote site profile. Not applicable (NA) if the remote site is not an ISDN site.

BACP: The state of the BACP option for this remote site profile. Not applicable (NA) if the remote site is a frame relay site.

3 - Learned summary

The Display Learned Summary option displays the current results of the latest full status update. This display will show the DLCI's reported from the frame relay service and their corresponding state. This status display will be updated after each enquiry interval.

```
                                        * - Up   E - Enabled   D - Disabled
 Link  DLCI  State     Link  DLCI  State     Link  DLCI  State
 ----  ----  -----     ----  ----  -----     ----  ----  -----
 1     902   *E        1     903    D        1     904    D
 1     909    D        1     910    D        1     911    D
 1     916    D        2     17     D        2     19     D
 2     21    *E
```

Link: The link interface used for this PVC in this remote site profile.

DLCI: The Data Link Connection Identifier (DLCI) value used for this PVC in this remote site profile.

State: The state of the PVC in this remote site profile. An asterisk (*) beside the state indicates that the PVC is currently up.

4 - Call Summary

The Display Call Summary option displays the ISDN call parameters for the Remote Site Table

```
* - Up   @ - Suspended                Total Call Site Entries: 0
                                                          Callback
  Id   Alias              ISDN Numbers     Wildcard        Enabled  Group
  ---  ----------------   ---------------  --------------  -------  -----
  1    NEW YORK           1-234-5678       543210          No        1
  2    LOS ANGELES        9-876-543-2100   none            No        2
                          9-876-543-2101
  3    test3              246-8101         none            No        1
```

Note: This option will only appear if an ISDN BRI interface module is installed which does not have the digital leased line option enabled.

4/5 - Remove Remote Site

The Remove Remote Site option deletes individual entries or all of the entries from the Remote Site table.

```
Enter:
   all, id or alias to delete
>
```

5/6 - Manual Call

The Manual Call option is used to establish a manual PPP call to a configured remote site.

```
Enter :
     remote site id or alias to dial (1 to 16 characters)
>
```

Note: This option will only appear if an ISDN BRI interface module is installed which does not have the digital leased line option enabled.

6/7 - Force Disconnect

The Force Disconnect option will cause the chosen remote site connection to be disconnected.

```
Enter :
     remote site id or alias to disconnect
>
```

Edit Remote Site Menu

```
                          EDIT REMOTE SITE MENU

    Option                  Value          Description
 1. Connection set-up      menu         - Configure connections
 2. Protocol set-up        menu         - Configure protocols
 3. Remote site alias    *[         ]   - Alias of remote site entry
 4. Connection           *[         ]   - Select connection configuration
 5. Primary connection   *[         ]   - Select connection type
 6. Remote site type     *[         ]   - Interoperable or spoofing




Enter:
    Remote site id or alias (1 to 16 characters)

>
```

The above display is the first level of the **EDIT REMOTE SITE MENU**. Enter the ID number or alias of the site you wish to edit.

Note: the options on this menu are not active until the Remote Site ID is entered.

When creating a new remote site profile, an alias must be entered for the new site. The first available identifier number will be assigned to this alias. The alias may be up to 16 characters long; blank spaces and the character "!" may not be used and the alias must start with a letter of the alphabet. You will then be prompted to enter a Template id number or profile; if this remote site will have a profile similar to an existing site, entering the alias or id number of that site will copy that remote site profile to this one. If you wish to start from the default settings, enter "none" (case sensitive).

After the remote site id or alias is supplied, the next level menu specific to that site appears

```
                          EDIT REMOTE SITE  MENU

   Option                 Value               Description
 1. Connection set-up      menu              - Configure connections
 2. Activation set-up      menu              - Configure remote site activation
 3. Protocol set-up        menu              - Configure protocols
 4. Security parameters    menu              - Configure security parameters
 5. Remote site alias     "LEASED1"          - Alias of remote site entry
 6. Connection            [dual_link]        - Select connection configuration
 7. Primary connection    [Leased]           - Select connection type
 8. Secondary connection  [Leased]           - Select connection type
 9. Remote site type      *[interoperable]   - Interoperable or spoofing









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

1 - Connection Set-Up

The Connection Set-up option takes you to the Connection Set-Up Menu for the chosen remote site. Here you define the connection parameters that will be used to establish the connection to the remote site device.

2 - Activation Set-Up

The Activation Set-up option takes you to the Activation Set-up menu for the chosen remote site, where activation conditions are defined for the main connection to this remote site. The activation conditions for the primary connection consist of the activation schedule, which determines when the connection may be operational, the usage limits and the load thresholds at which the link will be brought up or down.

The Activation conditions are not applicable when placing a manual call to this remote site.

Note: This option does not appear for site profiles with a Frame Relay, PPP disabled connection.

2/3 - Protocol Set-Up

The Protocol Set-up option takes you to the Protocol Set-up menu for the chosen remote site, where the BCP, IPCP, IPXCP, CCP, CMCP and BACP protocol parameters are configured.

3/4 - Security Parameters

The Security Parameters option allows you to set the password that this remote site will use for incoming security authorization and to set a user name and password for outgoing security authorization.

Note: This option will not appear if the remote site is configured for raw 1490 frame relay. Routers configured to have a leased line link operating in conjunction with an ISDN B-Channel (either as backup or bundled link) must have security enabled and with the proper usernames and passwords entered on both partner routers.

4/5- Remote Site Alias

The Remote Site Alias option defines the name used to represent this remote site. The remote site alias is used to match against the incoming user name during authentication. If an authenticated user name is the same as one of the configured remote site profiles, that call will use the configuration defined within the corresponding remote site profile.

The remote site alias is case sensitive and may consist of 1 to 16 alphanumeric characters. Use the underscore character instead of a space character.

5/6 – Connection

The Connections option defines the type of connection and its usage.

Options: single_link, dual_link, threshold, recovery, threshold_with_recovery.

Single link operation: only one link (the primary link) will be used for connection to this remote site.

Dual link operation: Two links will be available for connection to this remote site; both will be brought up any time a connection to this site is established.

Threshold: traffic levels on the primary link will be use to determine whether or not to bring up the secondary link. The conditions controlling the secondary link are set under the Activation menu. This option is not available with raw 1490 Frame Relay (PPP Encapsulation must be enabled).

Recovery: The secondary link will be used as a backup connection in case of failure of the primary link. The conditions controlling the secondary link are set under the Activation menu.

Threshold with recovery: the secondary link will be brought up if traffic on the primary link exceeds a threshold level or if the primary link fails. The conditions controlling the secondary link are set under the Activation menu.

Considerations: The "threshold with recovery" option is not compatible with partner routers that are configured to have only "threshold" or only "recovery" available on the link. If a connection of this type is attempted, the link will bob when the connection criteria are met for one router but not for the other. For example, if one is set for "threshold_with_recovery" and the other is set only for "recovery", when the threshold is exceeded the router with "threshold_with_recovery" will attempt to bring up the connection, but because the partner router is not set for threshold activation, the partner router will bring the connection down.

6/7 – Primary connection

The Primary connection option defines what type of service will be used on the primary connection. If the currently selected primary link is not configured for the chosen connection type, a warning is displayed: the connection will not be established if the link is not configured for the chosen connection type.

Options: Frame_relay, Leased, ISDN_call

7/8 – Secondary Connection

The Secondary connection option defines what type of service will be used on the secondary connection. If the currently selected secondary link is not configured correctly for the chosen connection type, a warning is displayed. The primary connection will still be established even if the secondary connection is not correctly configured.

Options: Frame_relay, Leased, ISDN_call

Note: this option is user configurable only if the connection is not single link. If the connection is single link, the option becomes display only with `*[none]` displayed.

8/9 - Remote Site Type

The Remote Site Type option defines whether spoofing is enabled or not with this remote site connection.

Options: interoperable, spoofing

Note: this option is user configurable only if the primary connection is ISDN_call type, otherwise this option is display only.

Considerations: If you are running spoofing with Triggered RIP, both routers must be set to Triggered RIP "link_up_only". The IOLINK-520 and IOLINK-PRO will automatically configure to this setting but the remote partner router should be checked to make certain that it is correctly configured.

Connection Set-Up Menu

The appearance of the Remote Site Connection Set-Up Menu will vary depending on the WAN modules installed in this router and the options selected. The Circuit Set up Menus on the following pages are all configurations with Frame Relay disabled on this router.

A – Link logical type set to ISDN, single or multiple links.

```
                    REMOTE SITE n CONNECTION SET-UP MENU

   Option              Value          Description
 1. ISDN call set-up    menu         - Configure ISDN calls
 2. Auto-call          [disabled]    - Activate auto-call




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **REMOTE SITE CONNECTION SET-UP MENU** allows the setting of parameters used for connection establishment to the remote site router.

1 - ISDN Call Set-Up

The ISDN Call Set-up option takes you to the ISDN Call Set-Up Menu for the chosen remote site. Here you set parameters such as the ISDN numbers of the remote partner ISDN routers and redial timers that pertain to ISDN circuit activation. This option is not available when the ISDN interface on this IOLINK router has been set as a Digital Leased Circuit.

2 - Auto-Call

The Auto-Call option is used to define this remote site as one that the IOLINK router will attempt to establish a connection to at all times. Each time the IOLINK router is powered up a connection will be attempted to this remote site.

Default: [disabled]

B - Link logical type set to Leased or Digital Leased, single link connection.

```
                    REMOTE SITE n CONNECTION SET-UP MENU

    Option          Value          Description
 1. Primary link    [none]       - Configure primary link number
 2. Auto-call       [disabled]   - Activate auto-call









Enter :
    none, link_number (1 or 2)

>
```

1 – Primary link

The Primary link option defines the link number that will be used to connect to this remote site.

Options: 1, 2, none

Default: [none]

2 - Auto-Call

The Auto-Call option is used to define this remote site as one that the IOLINK router will attempt to establish a connection to at all times. Each time the IOLINK router is powered up a connection will be attempted to this remote site.

Default: [disabled]

C - Link logical type set to Leased or Digital Leased, multiple link connection.

```
                    REMOTE SITE n CONNECTION SET-UP MENU

    Option            Value         Description
 1. Primary link     [4]          - Configure primary link number
 2. Secondary link   [3]          - Configure secondary link number
 3. Auto-call        [disabled]   - Activate auto-call









Enter :
    none, link_number (1 or 2)

>
```

1 – Primary link

The Primary link option defines the primary link number that will be used to connect to this remote site.

Options: 1, 2, none

Default: [none]

2 – Secondary link

The Secondary link option defines the secondary link number that will be used to connect to this remote site.

Options: 1, 2, none

Default: [none]

3 - Auto-Call

The Auto-Call option is used to define this remote site as one that the IOLINK router will attempt to establish a connection to at all times. Each time the IOLINK router is powered up a connection will be attempted to this remote site.

Default: [disabled]

D – Multiple link connection, primary link set to Leased, secondary link to ISDN.

```
                    REMOTE SITE n CONNECTION SET-UP MENU

   Option              Value          Description
 1. ISDN call set-up    menu         - Configure ISDN calls
 2. Primary link       [none]        - Configure primary link number
 3. Auto-call          [disabled]    - Activate auto-call




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

This version of the **REMOTE SITE CONNECTION SET-UP MENU** allows the configuration of a leased primary link (either PPP Leased or Digital Leased Line) and an ISDN secondary link.

1 - ISDN Call Set-Up

The ISDN Call Set-up option takes you to the ISDN Call Set-Up Menu for the chosen remote site. Here you set parameters such as the ISDN numbers of the remote partner ISDN routers and redial timers that pertain to ISDN circuit activation.

2 – Primary link

The Primary link option defines the primary link number that will be used to connect to this remote site.

Options: 1, 2, none

Default: [none]

3 - Auto-Call

The Auto-Call option is used to define this remote site as one that the IOLINK router will attempt to establish a connection to at all times. Each time the IOLINK router is powered up a connection will be attempted to this remote site.

Default: [disabled]

E – Single link connection, primary link set to Frame Relay.

```
                    REMOTE SITE n CONNECTION SET-UP MENU

   Option            Value              Description
 1. Primary link    [7]               - Configure primary link number
 2. DLCI            [16]              - Frame relay address
 3. CIR             [0 Kbps]          - Committed information rate
 4. EIR             [link_speed]      - Excess information rate
 5. Time interval   [10 (1/10th s)]   - Interval for monitoring bandwidth
 6. PPP             [disabled]        - Enable/disable PPP over Frame Relay
 7. State           [disabled]        - Enable/disable PVC


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

This version of the **REMOTE SITE CONNECTION SET-UP MENU** allows the setting of frame relay parameters used to configure the Permanent Virtual Circuit (PVC) that is used to connect to this remote site. Up to 128 remote site PVCs may be defined.

1 - Primary Link

The Primary link option defines the primary link number that will be used to connect to this remote site.

Options: 1, 2, none

Default: [none]

Considerations:

The PVC must be toggled (disable – enable option 7. State) before this option may be takes effect.

2 - DLCI

The Data Link Connection Identifier (DLCI) option specifies the Frame Relay LAPF address for the PVC. This value **must** be set to be the same as the value provided by the Frame Relay network provider.

When the frame relay router first starts up it will query the frame relay service to try to determine the LMI type. Once the LMI type is determined, the PVC configurations will be known from the full status enquiry messages. If the DLCI numbers of the PVC's on your service are determined during startup, the IOLINK router will automatically create a remote site profile for each PVC. The automatically created remote site profiles will be named "LinkxDLCIyyy" where x is the physical link number the PVC is on and yyy is the DLCI of the PVC.

Default: [16]

Range: 16 to 991

Considerations:

The PVC must be toggled (disable – enable option 7. State) before this option may be takes effect.

3 - CIR

The Committed Information Rate (CIR) option specifies the data rate that the Frame Relay service has guaranteed to provide.

This value **must** be set to the same as the value provided by the Frame Relay network provider. If the Frame Relay network provider supplies values for Bc and T only, simply calculate the CIR value by using the following formula: CIR = Bc/T.

Default: [0 k]

Range: 0 to 2048 Kbps

Considerations:

When changing the CIR option for this PVC, the PVC must be toggled (disable – enable option 7. State) before the new value will take effect.

The value of 0 indicates that there is no commitment on the data rate.

> The actual CIR may exceed the configured CIR because only complete frames are transmitted. Frames will not be broken to fit within CIR when the upper limit is met; the final frame will be transmitted in full. The only time this does not happen is when traffic exceeds CIR + EIR, in which case the frame which would cause CIR to be exceeded will not be transmitted.

The only restriction is that CIR + EIR > 0

4 - EIR

The Excess Information Rate (EIR) option specifies the data rate that the Frame Relay service indicates may be available for this PVC.

This value **must** be set to the same as the value provided by the Frame Relay network provider.

Default: ["link_speed"]

Range: 0 to 2048 Kb, "link_speed"

Considerations:

When changing the EIR option for this PVC, the PVC must be toggled (disable – enable option 7. State) before the new value will take effect.

When EIR = 0, no excess burst data is allowed to be transmitted. If EIR is non-zero, bursting is allowed.

The only restriction is that CIR + EIR > 0

5 - Time Interval

The Time Interval option specifies the time period (in 10ths of a second) that the IOLINK router uses for monitoring PVC bandwidth.

This value **must** be set to the same as the value provided by the Frame Relay network provider.

Default: [10 1/10th sec]

Range: 10 to 40 1/10th second

6 - PPP Encapsulation

The PPP Encapsulation option enables the IOLINK router to send data to this remote site using the Point to Point Protocol (PPP) over frame relay. When this option is disabled, the IOLINK router will send data to this remote site using standard RFC-1490 frame relay frames.

Default: [disabled]

Considerations:

When this IOLINK router is configured with PPP Encapsulation disabled and the remote site router has PPP enabled, this IOLINK router will bring the PVC up and there will be no indication that the connection negotiation is not proceeding. This local IOLINK router will indicate that the PVC is up, however there will be no traffic sent over the PVC. If the remote site router is an IOLINK router, the remote site router will continue to display the alarm "PPP connection attempt to remote site *n*" until the connection is established.

7 - State

The State option toggles between [enabled] and [disabled] to activate the PVC or take the PVC out of service.

Default: [enabled]

F – Multiple link connection, primary link set to Frame Relay, secondary to ISDN.

```
                    REMOTE SITE n CONNECTION SET-UP MENU

   Option              Value              Description
 1. ISDN call set-up    menu            - Configure ISDN calls
 2. Primary link       [7]              - Configure primary link number
 3. DLCI               [16]             - Frame relay address
 4. CIR                [0 Kbps]         - Committed information rate
 5. EIR                [link_speed]     - Excess information rate
 6. Time interval      [10 (1/10th s)]  - Interval for monitoring bandwidth
 7. PPP                [disabled]       - Enable/disable PPP over Frame Relay
 8. State              [disabled]       - Enable/disable PVC



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **REMOTE SITE CIRCUIT SET-UP MENU** allows the setting of frame relay parameters used to configure the Permanent Virtual Circuit (PVC) that is used to connect to this remote site. Up to 128 remote site PVCs may be defined.

1 - ISDN Call Set-Up

The ISDN Call Set-up option takes you to the ISDN Call Set-Up Menu for the chosen remote site. Here you set parameters such as the ISDN numbers of the remote partner ISDN routers and redial timers that pertain to ISDN circuit activation.

2 - Primary Link

The Primary link option defines the primary link number that will be used to connect to this remote site.

Options: 1, 2, none

Default: [none]

Considerations:

The PVC must be toggled (disable – enable option 8. State) before this option may be takes effect.

3 - DLCI

The Data Link Connection Identifier (DLCI) option specifies the Frame Relay LAPF address for the PVC. This value **must** be set to be the same as the value provided by the Frame Relay network provider.

When the frame relay router first starts up it will query the frame relay service to try to determine the LMI type. Once the LMI type is determined, the PVC configurations will be known from the full status enquiry messages. If the DLCI numbers of the PVC's on your service are determined during startup, the IOLINK router will automatically create a remote site profile for each PVC. The automatically created remote site profiles will be named "LinkxDLCIyyy" where x is the physical link number the PVC is on and yyy is the DLCI of the PVC.

Default: [16]

Range: 16 to 991

Considerations:

The PVC must be be toggled (disable – enable option 8. State) before this option takes effect.

4 - CIR

The Committed Information Rate (CIR) option specifies the data rate that the Frame Relay service has guaranteed to provide.

This value **must** be set to the same as the value provided by the Frame Relay network provider. If the Frame Relay network provider supplies values for Bc and T only, simply calculate the CIR value by using the following formula: CIR = Bc/T.

Default: [0 k]

Range: 0 to 2048 Kbps

Considerations:

When changing the CIR option for this PVC, the PVC must be be toggled (disable – enable option 8. State) before the new value will take effect.

The value of 0 indicates that there is no commitment on the data rate.

> The actual CIR may exceed the configured CIR because only complete frames are transmitted. Frames will not be broken to fit within CIR when the upper limit is met; the final frame will be transmitted in full. The only time this does not happen is when traffic exceeds CIR + EIR, in which case the frame which would cause CIR to be exceeded will not be transmitted.

The only restriction is that CIR + EIR > 0

5 - EIR

The Excess Information Rate (EIR) option specifies the data rate that the Frame Relay service indicates may be available for this PVC.

This value **must** be set to the same as the value provided by the Frame Relay network provider.

Default: ["link_speed"]

Range: 0 to 2048 Kb, "link_speed"

Considerations:

When changing the EIR option for this PVC, the PVC must be be toggled (disable – enable option 8. State) before the new value will take effect.

When EIR = 0, no excess burst data is allowed to be transmitted. If EIR is non-zero, bursting is allowed.

The only restriction is that CIR + EIR > 0

6 - Time Interval

The Time Interval option specifies the time period (in 10ths of a second) that the IOLINK router uses for monitoring PVC bandwidth.

This value **must** be set to the same as the value provided by the Frame Relay network provider.

Default: [10 1/10th sec]

Range: 10 to 40 1/10th second

7 - PPP Encapsulation

The PPP Encapsulation option enables the IOLINK router to send data to this remote site using the Point to Point Protocol (PPP) over frame relay. When this option is disabled, the IOLINK router will send data to this remote site using standard RFC-1490 frame relay frames.

Default: [disabled]

Considerations:

When this IOLINK router is configured with PPP Encapsulation disabled and the remote site router has PPP enabled, this IOLINK router will bring the PVC up and there will be no indication that the connection negotiation is not proceeding. This local IOLINK router will indicate that the PVC is up, however there will be no traffic sent over the PVC. If the remote site router is an IOLINK router, the remote site router will continue to display the alarm "PPP connection attempt to remote site *n*" until the connection is established.

8 - State

The State option toggles between [enabled] and [disabled] to activate the PVC or take the PVC out of service. You must confirm that this is the action you wish to take by typing "yes" at the prompt.

Default: [enabled]

ISDN Call Set-Up Menu

```
          EDIT REMOTE SITE 1 CONNECTION SET-UP ISDN CALL SET-UP MEN

    Option                    Value          Description
 1. Advanced settings         menu         - Advanced ISDN call settings
 2. ISDN number              [none]        - Set ISDN number
 3. Alternate ISDN number    [none]        - Set alternate ISDN number
 4. Group                    [1]           - Specify dial group
 5. Wildcard                 [none]        - Set wildcard ISDN number
 6. Call you                 [none]        - Set call you prefix
 7. Call me                  [none]        - Set call me prefix
 8. Callback                 [enabled]     - Enable/disable callback



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **REMOTE SITE ISDN CALL SET-UP MENU** allows the setting of parameters used for ISDN call establishment to the remote site PPP router. This menu is not displayed when the Digital Leased Circuit option is enabled for the ISDN interface.

1 – Advanced Settings

This option takes you to the Advanced Settings menu where callback delay and redial parameters may be set.

2 - ISDN Number

The ISDN Number option defines the ISDN number to be called to establish a connection to the remote partner PPP router.

Default: [none]

3 - Alternate ISDN Number

The alternate ISDN number is used for two different situations when Multilink operation is set to enabled for this remote site.

1. ISDN number called when Bandwidth on Demand settings require a second ISDN call to be made after an initial Auto-Call or IP Address Connect call has been placed to the remote site. When the secondary connection is enabled by selecting the ISDN_call option, the first ISDN Number will be used to place the first ISDN call according to the IP Address Connect table, and the Alternate ISDN Number will be used to place the second ISDN call according to the Bandwidth on Demand options defined within the Secondary Activation menu.
2. ISDN number called when both the primary and secondary connections are set to ISDN_call and an Auto-Call or IP Address Connect call is placed. This will cause this alternate ISDN call to be placed to the remote site PPP router once the main ISDN call has been established and Multilink operation has been successfully negotiated.

Default: [none]

4 - Group

The Group option specifies which group number will be used to make calls to this remote site connection. If hunt group numbers are not used, it is recommended that when using callback between this IOLINK-520 and IOLINK-PRO and a remote site router with only a single BRI, that the links on this IOLINK router be configured into groups of two links. If the links are grouped more than two to a group, a callback request may come in to one ISDN number in the group but be responded to by another link with an ISDN number that is not either the primary or alternate ISDN number that the remote site uses to call to this router. The callback will be rejected by the remote site router in this case. Groups are set up under the Link Set-up Menu.

Default: [1]

Options: 1 or 2

5 - Wildcard

The Wildcard option defines the ISDN number used when checking for a match on an incoming callerID identified call. The incoming call is checked for a match against the configured values for the ISDN number, the alternate ISDN number, and then the wildcard number.

This wildcard number may contain don't care values to allow for a broader matching possibility. Don't care values are defined with an "X" in the wildcard number. When the IOLINK router checks the incoming call's callerID against this wildcard value, the IOLINK router starts at the rightmost digit and checks each digit from there. The number of digits compared is determined by the ISDN number with the least amount of digits. This means that the checking will only be done to the maximum number of digits of either the incoming callerID or the wildcard value, whichever is less.

For example: The wildcard value is set to 931-1XXX. Refer to the following list for accept and reject examples.

Incoming callerID	Result
328	accepted
931-1328	accepted
2328	rejected
555-1212	rejected

Default: [none]

6 - Call You

Dialing prefix used to make the ISDN call to the remote site PPP router. The Call You dialing prefix is used to define the area codes, country codes, long distance dialing prefixes, or any other information required to establish an ISDN call to the remote site PPP router.

Default: [none]

7 - Call Me

Dialing prefix used by the remote partner router to make an ISDN call to this IOLINK router. When Connection Management is enabled, this ISDN IOLINK router will pass its directory numbers as well as the Call Me dialing prefix to the remote partner ISDN IOLINK router. This allows the remote partner ISDN IOLINK router to correctly dial this IOLINK router when the ISDN circuit needs to be resumed.

The Call Me dialing prefix is used to define the area codes, country codes, long distance dialing prefixes, or any other information required for the remote partner ISDN IOLINK router to establish an ISDN call to this ISDN IOLINK router.

Default: [none]

Note: When CMCP is enabled, the call me prefix to get back to the partner router must be entered so that the link can be re-established after suspension (only the directory number is passed when the call is set up, not the entire connection number). For the same reason, the partner router must also have its call me prefix entered.

8 - Callback

The Callback option when set to enabled causes this IOLINK router to refuse an incoming ISDN call for this remote site profile and then initiate an outgoing ISDN call to this remote site. Once a match of an incoming ISDN call is made to an existing remote site profile, the matching remote site profile is checked to determine whether the incoming call is answered or refused and a callback ISDN call initiated.

The Callback option may be used to provide a single point of ISDN billing. By allowing only one of the IOLINK routers to establish ISDN calls, the ISDN charges may be centralized in one location.

The CallerID option when enabled will take precedence on determining whether an incoming call is ignored or answered. When calling back this remote site, both the ISDN number and the alternate ISDN number will be tried.

Default: [disabled].

Considerations:

For this feature to operate, the ISDN service provider must supply the caller's number. Check with your ISDN service provider to see whether this service is available.

Advanced Settings Menu

```
EDIT REMOTE SITE 1 CONNECTION SET-UP ISDN CALL SET-UP ADVANCED SETTINGS MENU

    Option            Value         Description
 1. Callback delay    [2 s]        - Time to wait until callback
 2. Redial timer      [10 s]       - Time to wait until redial
 3. Redial count      [5]          - Number of redials to try
```

1 – Callback Delay

The Callback Delay option specifies the number of seconds that this router will wait before making a call in response to a callback request call from the remote site router. This allows sufficient time for the originating call to complete its disconnect before the response call arrives.

Default: [2 sec]

Range: 1 to 20 seconds

2 - Redial Timer

The Redial Timer option specifies the time the router will wait before attempting to redial an incomplete ISDN call.

Default: [10 sec]

Range: 4 to 255 seconds

Considerations:

When the ISDN switch type is set to KDD or NTT, the default, and minimum redial timer value is 90 seconds.

3 - Redial Count

The Redial Count option specifies the number of times the router will attempt to redial an incomplete ISDN call.

Default: [5] redials

Range: 0 to 255 redials

Auto-Call Considerations:

When two ISDN numbers are defined in the ISDN Call Set-Up menu of the remote site entry, the IOLINK router will alternate between the two numbers when re-dialing.

When the IOLINK router attempts to establish an Auto-Call ISDN call and the PPP router at the remote site does not respond, the IOLINK router will try up to the number of times defined in the Redial Count to establish the ISDN call. The interval between the successive attempts is defined by the Redial Timer. If after the defined number of redials the IOLINK router cannot establish a call to the remote partner, the IOLINK router will wait for one minute and then try to establish the ISDN call again using the Redial Count and the Redial Timer values. If the call is not established after these attempts, the IOLINK router will wait for 2 minutes and then try again. The IOLINK router will keep trying to establish the call (according to Redial Count & Redial Time) in blocks with the time intervals: 4 minutes, 8 minutes, 15 minutes, 15 minutes, etc.) until the remote partner answers the call.

When the ISDN switch type is set to KDD or NTT, the minimum time between re-dialing blocks is 3 minutes.

When the Redial Count is set to zero (0), the IOLINK router will redial the remote partner indefinitely at one minute intervals using the defined ISDN numbers for the remote site according to the redial blocks explained earlier. The IOLINK router will alternate between the two defined ISDN numbers for the partner in blocks of #1, #2 with a time between the two ISDN numbers of 4 seconds.

Address Connect Considerations:

When the IOLINK router attempts to establish an Address Connect ISDN call and the remote partner does not respond, the IOLINK router will not attempt to redial the remote partner until the next Address Connect connection is required.

If two ISDN numbers are defined in the ISDN Call Set-Up menu of the remote site entry, the IOLINK router will dial the alternate ISDN number after waiting 4 seconds if the first ISDN number does not respond.

Activation Set-Up Menu

```
                EDIT REMOTE SITE 1 ACTIVATION SET-UP MENU

    Option              Value          Description
 1. Schedule            menu         - Schedule remote site activation
 2. Usage set-up        menu         - Set up line usage parameters
 3. Threshold set-up    menu         - Set up traffic level thresholds
 4. Inactivity timer   [60 sec]      - Set traffic inactivity timer
 5. Recovery timer     [60 s]        - Define recovery steady state time




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **ACTIVATION MENU** allows the setting of the activation schedule and usage limits for the primary link used to connect to the remote site router. Traffic activation levels may also be set allowing the secondary link to be used when the throughput of the primary link exceeds the defined levels.

Note: the activation schedules of **both** partner routers on the link must be set up identically. If one is set to be active while the other is not, the active router will continuously try to bring up the link to the partner router, which will reject the connection because its activation table is set to have the connection to that remote site inactive. If the routers are in different time zones, you must decide on a standard time to be used by both.

1 - Schedule

The Schedule option takes you to the Schedule Menu where the times that the primary link will be activated or deactivated are set.

2 - Usage Set-Up

The Usage Set-up option takes you to the Usage Set-up Menu, where the circuit usage limits may be set.

3 - Threshold Set-Up

The Traffic Set-up option takes you to the menu where the traffic load conditions and stability timers for activating and deactivating the secondary link may be set.

4 - Inactivity Timer

The Inactivity Timer option defines the **Connection Management Idle Timer** that is used to determine when an ISDN call will be suspended or terminated. This timer monitors traffic on the link. If the link traffic is idle, this IOLINK router is set to use Connection Management, and there are LAN sessions using the link, the ISDN call will be suspended.

When the Inactivity Timer is set to off, this IOLINK router will not suspend or terminate the ISDN call. This may be used to allow only one of the IOLINK routers to monitor the link traffic to determine when to suspend or terminate the ISDN call.

The Inactivity Timer is also used for **IP Address Connect** configurations. If connection management is not used, the inactivity timer will monitor link traffic. If the traffic on the link is idle for a time longer than the inactivity timer, the link will be terminated and then be made available for the next IP address connect request.

Default: [60 sec]

Range: off, 20 to 3600 seconds

5 - Recovery Timer

The recovery timer sets the delay before the secondary link is activated or deactivated when the primary link goes down or is reestablished. This acts as a stability timer to give the primary link a period to recover before the backup is activated and to ensure that when the primary link is reestablished that it stays up for a significant time before the backup link is dropped.

Default: [15 sec] (note: if Frame Relay is enabled, this default changes to 60 sec.)

Range: 15 to 300 seconds

Note: This option will only be displayed if the Connection option in the Edit Remote Site menu is set to "recovery" or "recovery_with_threshold".

Schedule Menu

```
              EDIT REMOTE SITE 1 ACTIVATION SET-UP SCHEDULE MENU

    Option                          Description
 1. Activation intervals          - Set activation intervals
 2. Display schedule              - View activation timetable
 3. Display time                  - View current date and time




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **PRIMARY ACTIVATION MENU** allows the setting of the activation schedule for the primary link to be used to connect to the remote site PPP router. It controls outgoing calls from this router to the remote site router – incoming calls are not controlled by these options.

The Primary Activation conditions are not applicable when placing a manual call to this remote site.

1 - Activation Intervals

The Activation Intervals option defines the times that the primary link will be activated or deactivated.

Choose an action:

```
Enter:
 activate, deactivate, remove, clear

> activate
```

The Remove option will let you remove a specified activation time.

The Clear option will clear the entire table of all activation times.

The following example show the set-up for a connection to be active from 7:00 AM to 11:00 PM on weekdays and 10:00 AM to 5:00 PM on Saturdays:

Specify the day(s):

```
Enter:
 Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday,
 Weekends, Weekdays
> Weekdays
```

Specify the time:

```
Enter:
 Time (hour or hour: 00 or hour: 30)
> 07
```

The above Time can be specified in any one of three ways: 7, 07, or 7: 00. Valid hour values are 0 to 23 (24 hour clock). Settings on the half-hour are also permissible, e.g. 7: 30.

Set link disconnect time:

```
> deactivate
> Weekdays
> 23
```

For a deactivation time of midnight on a given day, you must specify hour 0 of the next day. Note that hour 0 starts a given day and hour 23: 30 is the last time specifiable for a given day.

Add Saturday:

```
> activate
> Saturday
> 10
```

```
> deactivate
> Saturday
> 17
```

2 - Display Schedule

```
                          Call 1 Activation Schedule

    0  1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16 17 18 19 20 21 22 23
Sun -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
Mon -- -- -- -- -- -- -- AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA --
Tue -- -- -- -- -- -- -- AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA --
Wed -- -- -- -- -- -- -- AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA --
Thu -- -- -- -- -- -- -- AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA --
Fri -- -- -- -- -- -- -- AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA --
Sat -- -- -- -- -- -- -- -- -- -- AA AA AA AA AA AA AA -- -- -- -- -- -- --

Activation Schedule Entries
 Weekdays -  7: 00 Act      Weekdays - 23: 00 Deact    Saturday - 10: 00 Act
 Saturday - 17: 00 Deact

Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

The display schedule shows the current schedule of when the primary connection to this remote site will be activated.

- A indicates that the connection will be active at this time
- \- indicates that the connection is inactive at this time

3 - Display Time

The Display Time option displays the current router time and date in the format::

Day of the week yyyy-mm-dd hh:mm:ss

Usage Set-Up Menu

```
          EDIT REMOTE SITE 1 ACTIVATION SET-UP USAGE SET-UP MENU

    Option          Value          Description
 1. Usage limit    [unlimited]   - Set line use limit per day
 2. Call limit     [unlimited]   - Set outgoing call limit per day
 3. Restart time   "07:00"       - Set time-of-day to restart limits




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

1 - Usage Limit

The Usage Limit option defines the maximum ISDN connection time for this remote site. The time limit is defined in minutes of connection time and is the maximum connection time per day. The Restart Time option determines when the IOLINK router will restart the usage limit timer.

Default: [240] minutes

Range: 1 to 2880 minutes or unlimited

2 - Call Limit

The Call Limit option defines the maximum number of ISDN connections allowed to this remote site per day.

Default: [120]

Range: 1 to 86400 calls or unlimited

3 - Restart Time

The Restart Time option defines the time of day that the call limit and usage limit timers will start recounting. Time is specified as a 24 hour clock and may be set in 30 minute increments. Time can be specified in any one of three ways: 7, 07, or 7: 00. Valid hour values are 0 to 23. Valid minute settings are :00 or :30, e.g. 7: 30.

Default: [07:00]

Range: 0 to 23:3

Note: Changing the Restart Time will reset all statistics counters; all current statistics will be erased.

Threshold Set-Up Menu

```
          EDIT REMOTE SITE 1 ACTIVATION SET-UP THRESHOLD SET-UP MENU

    Option                  Value          Description
 1. Up threshold           [80 %]       - Set activation traffic level
 2. Up stability timer     [2 min]      - Define up level steady state time
 3. Down threshold         [60 %]       - Set deactivation traffic level
 4. Down stability timer   [2 min]      - Define down level steady state time









Enter option number, "=" - main menu, <TAB> - previous menu
```

The **THRESHOLD SET-UP MENU** allows the traffic load conditions and stability timers for activating and deactivating the secondary link to be set.

1- Up Threshold

The Up Threshold value determines the percentage of primary link's capacity that will cause the secondary link to be activated. The primary link must sustain a throughput (either receive or transmit) of greater than the up threshold for a period greater than the up stability timer in order for the secondary link to be activated.

```
Enter:
 Percent of main link capacity (from 50 to 100)
> 80
```

Default: 80%

Note: In a frame relay environment, the link summary statistics used to determine the up threshold may not be accurate due to the overhead associated with frame relay. The overhead typically adds about 5% at an 80% line load, meaning setting the up threshold at 80% would cause the secondary link to come up when the actual transmission rate reaches about 85% of the maximum line rate. If a more accurate data transmission threshold is required, it may be calculated by using the Frame Relay Protocol Statistics. Go to the Main Menu/Statistics/WAN Statistics/Remote Site Statistics/Protocol Statistics and page down to the FR display. Take the greater of the Rcv or Xmt rate (in KB) and divide it by the stated link speed (in KB) *100 to get the recent percent of the link capacity being used for data. By comparing this to the load shown in the Link Summary Statistics, the amount of overhead may be determined and the threshold adjusted accordingly.

2 - Up Stability Timer

To prevent the unnecessary activation of the secondary link if the Up Threshold is only reached for a brief period, the Up Stability Timer is used. It defines how long the primary link's throughput must be at or above the Up Threshold before the secondary call is activated.

For example, using the default values, if a traffic level above the Up Threshold of 80% is maintained on the primary link for a period of 2-min. (length of time the secondary link is "held inactive"), then the secondary link will be activated.

```
Enter:
 time in minutes when link is down (from 1 to 60)
> 2
```

Default: 2 minutes

3 - Down Threshold

The Down Threshold determines when the secondary link is shut down again. It must be set lower than the Up Threshold.

After the secondary link comes on-line, it will begin to share the load that would have gone across the primary link. For example, if the primary link brings the secondary link on-line at a threshold of 80%, then both links will be carrying the load.

The Down Threshold looks at the total throughput (both links together) to determine if the second link will be brought down. The total throughput is compared to the throughput of a single link. When the total throughput drops below the Down Threshold, the second link will be dropped.

```
Enter:
 Percent of main link capacity (40 to 95)
> 60
```

Default: 60%

4 - Down Stability Timer

The Down Stability Timer is similar in operation to the Up Stability Timer. When the total link throughput drops below the value set by the Down Threshold for a period of time defined by the Down Stability Timer, the secondary link will be disconnected and placed back in the stand-by mode.

For example, if the total throughput (both links together) drops below 60% of the bandwidth of a single link (64 Kbps) for a period of 10 minutes, the secondary link will be disconnected.

```
Enter:
 time in minutes when link is up (from 1 to 60)
>10
```

Default: 2 minutes

Protocol Set-Up Menu

```
                    EDIT REMOTE SITE 2 PROTOCOL SET-UP MENU

    Option               Value          Description
 1. Bridge parameters    menu         - Configure bridge parameters
 2. IP parameters        menu         - Configure IP parameters
 3. IPX parameters       menu         - Configure IPX parameters
 4. CCP parameters       menu         - Configure CCP parameters
 5. CMCP parameters      menu         - Configure connection management
 6. BACP set-up          menu         - Configure BACP parameters
 7. Multilink protocol   [enabled]    - Allows multilink operation


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

1 - Bridge Parameters

The Bridge Parameters option takes you to the Bridge Parameters menu for the chosen remote site, where the bridge parameters are configured.

2 - IP Parameters

The IP Parameters option takes you to the IP Parameters menu for the chosen remote site, where the IP parameters are configured. The type of link is specified as numbered or unnumbered. The type of IP routing is set within this menu: none, RIP1, RIP2 or RIP1_compatible. Both local and peer IP addresses are defined here, NAT and NAPT may be enabled and configured and some connection management parameters are set.

3 - IPX Parameters

The IPX Parameters option takes you to the IPX Parameters menu for the chosen remote site, where the IPX parameters are configured. The type of link is specified as numbered or unnumbered. Both local and peer IPX addresses are defined here and some connection management parameters are set.

4 - CCP Parameters

The CCP Parameters option takes you to the CCP Parameters menu for the chosen remote site, where the CCP (Compression) parameters are configured.

5 - CMCP Parameters

The CMCP Parameters option takes you to the CMCP Parameters menu for the chosen remote site, where the CMCP (Connection Management) parameters are configured. The Connection Management parameters determine when the ISDN calls will be suspended and spoofed or when they will be terminated.

Note: this option will only be displayed if this remote site connection is configured as ISDN.

6 - BACP Set-Up

The BACP Parameters menu allows you to activate the BACP (Bandwidth Allocation Control Protocol) and set the call conditions used. BACP reduces network charges by adding or dropping the second link based on traffic demands. BACP mediates control of the link between the routers to prevent "link bobbing".

Note: this option will only be displayed if this remote site connection is configured as ISDN or PPP Leased and the dual-link option is enabled.

7 - Multilink Operation

This option determines whether the connection to this remote site will operate using single link protocol or PPP multilink protocol. Multilink protocol allows multiple links to be connected between two routers. The physical links may be of different types (e.g. Leased and ISDN)

Default: [disabled]

ISDN Considerations:

When multilink operation is changed for a group, all active ISDN calls will be disconnected.

When the IOLINK router receives an incoming call, the Multilink state is taken from the "ISDN_TEMPLATE" remote site profile. Note that if Multilink is disabled in the "ISDN_TEMPLATE" and an incoming call requests Multilink, the IOLINK router will negotiate to have Multilink enabled.

When a PPP IOLINK router with Multilink disabled attempts to establish an ISDN connection to an Ascend router with Multilink enabled, the Ascend router will shut down the ISDN call. Simply set the Multilink values on each of the routers to be the same value and then establish the ISDN connection.

Note: if the primary connection for this remote site is frame relay, PPP encapsulation must be enabled for this option to be displayed.

Bridge Parameters Menu

```
                EDIT REMOTE SITE 1 BRIDGE PARAMETERS MENU

    Option              Value          Description
 1. STP parameters      menu         - Define port specific options
 2. Bridge enabled     [enabled]     - Enable BCP negotiations
 3. Tinygram           [disabled]    - Enable tinygram compression
 4. FCS preservation   [enabled]     - Preserve FCS across WAN




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **BRIDGE PARAMETERS MENU** allows the setting of the type of Bridge link connection to the remote site PPP router. The parameters defined here are used by the BCP (Bridge Control Protocol) functions of the router for negotiating bridging during call establishment.

1 - STP Parameters

The STP Parameters option directs you to the STP Parameters Menu where STP Port parameters for this remote site are set.

2 - BCP Enabled

The BCP Enabled option enables or disables the Bridge Control Protocol negotiations for this remote site. When a connection to this remote site does not require bridging, this option may be disabled causing BCP not to be negotiated.

Default: [enabled]

3 - Tinygram

The Tinygram option enables or disables the compression of bridge frames that are smaller than the minimum frame size of 64 bytes. Tinygram compression simply suppresses the trailing zeroes of a small frame.

Default: [disabled]

4 - FCS Preservation

The FCS Preservation option enables or disables the transmission of the Frame Check Sequence (FCS) for bridge frames that are passed to the remote site PPP device.

When set to disabled, this IOLINK router will not send the FCS on bridge frames sent to the remote site PPP partner.

This option may need to be disabled when connecting to some Cisco routers.

Default: [enabled]

STP Parameters Menu

```
            EDIT REMOTE SITE 1 BRIDGE PARAMETERS STP PARAMETERS MENU

    Option       Value          Description
 1. State        [enabled]    - Enable/disable port
 2. Path cost    [100]        - Define network cost for port
 3. Priority     [128]        - Set port priority









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **STP PARAMETERS MENU** allows the setting of the STP port parameters used by the BCP (Bridge Control Protocol) functions of the router for negotiating bridging during call establishment. All of the settings in this menu will be ignored when STP is disabled within the Bridging Set-up menu.

1 - State

The State option toggles between enabling and disabling this WAN port when running Spanning Tree Protocol on the WAN connection to this remote site device.

2 - Path Cost

The Path Cost option allows the setting of the contributing path cost to the Root for this port.

Contribution of Path Cost to Root Path Cost:

The path cost to the Root Bridge is added to path costs of other bridges along the same stream to the Root Bridge. The result is the Root Path Cost.

Once the Root Bridge is selected, a determination of which bridge(s) will become blocked where necessary is made. This determination is made by comparing the sum of the path costs (i.e. the Root Path Cost) to the Root Bridge. Where redundant paths exist, the bridge with the lowest Root Path Cost to the Root Bridge will become the *Designated Bridge* for the LAN. If all contending bridges' ports have the same Root Path Costs, then first their Bridge IDs (Priority/MAC address) and second their Port IDs (Port Priority) will be used as tiebreakers.

Default: [100]

Range: 1 to 65535

Considerations:

Increasing this value increases the total cost of the path to the Root Bridge. This may (depending on the topology) cause a bridge along the path to the Root bridge to be taken out of service and a blocked bridge to come into service.

Decreasing the value may have the opposite effect.

3 - Priority

The Priority option allows the setting of the port priority. This value is entered in decimal format and appears in hex format in the Port ID/Designated Port identifier (as applicable) of the Port Status display.

Default: [128] (decimal)

Range: 0 - 255

Considerations:

Increasing this value lowers the probability of this port becoming the Root port to the Root Bridge. Decreasing this value increases the probability.

IP Parameters Menu

```
            EDIT REMOTE SITE 1 PROTOCOL SET-UP IP PARAMETERS MENU

    Option               Value                Description

 1. IP routing          menu               - Configure IP routing
 2. NAT advanced setup  menu               - Configure NAT address pool
 3. IP enabled         [enabled]           - Enable IP protocol
 4. NAT enabled        [disabled]          - Enable address translation
 5. Link IP type       [numbered]          - Define numbered link
 6. Local IP address   [none]              - Define local IP address
 7. Peer IP address    [none]              - Define peer IP address
 8. Private route      [disabled]          - Do not advertise this route
 9. VJ compression     [disabled]          - Enable VJ header compression


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **IP PARAMETERS MENU** allows the setting of the type of IP link connection to the remote site PPP router. The parameters defined here are used by the IPCP (Internet Protocol Control Protocol) functions of the router for negotiating IP routing during call establishment. The menu options are shown in the above screen for both the numbered and unnumbered link IP type settings. Some of the above menu options will not be displayed when unnumbered link IP type is enabled

Each side of the connection must have an IP address assigned to the router in order to properly route IP packets between the two routers.

The IP routing parameters defined here are for this connection to the remote site peer IP router only. The IP routing performed on the local LAN is defined within the IP Routing menu under the Configuration menu. This allows the IP routing to be set independently for each interface on this IOLINK router.

1 - IP Routing

The IP Routing option directs you to the IP Routing Parameters Menu where the IP routing parameters for this remote site are set. The parameters include the type of IP routing, the use of triggered RIP, and others.

2 – NAT Advanced Setup

The NAT Advanced Setup option takes you to NAT Advanced Setup menu where parameters for the Network Address Translation pool for this remote site may be assigned.

3 - IP Enabled

The IP Enabled option enables or disables the Internet Protocol negotiations for this remote site. When a connection to this remote site does not require IP routing, this option may be disabled causing IP not to be negotiated.

Default: [enabled]

4 - NAT Enabled

Network Address Translation (NAT) is a technique which translates private IP addresses on a private network to valid global IP addresses for access to the Internet. Network Address Port Translation (NAPT) translates both the IP address and the port. The advantage of port translation is that more than one private IP address can be translated to the same single global IP address. NAPT allows data exchanges initiated from hosts with private IP addresses to be sent to the Internet via the IOLINK router using a single global IP address. Port translation can also be used from one private network to another private network if the two networks have conflicting IP addresses.

A global IP address must be assigned to the WAN link upon which NAT is enabled for NAT to work. The global IP address may be configured locally or negotiated if numbered links are enabled. If unnumbered links are enabled, the router must accept an IP address for the WAN link from the remote site.

When NAT is enabled this router will not send RIP messages out. The router will be able to receive RIP requests. IP pattern filters and Firewall use the non-translated IP address (i.e. the private IP address that is used on the private network).

Remember: if NAT is enabled with IP addressing and Firewall is enabled, then the IP address for this remote site must be in the firewall table.

Default: [disabled]

Note: In a raw 1490 frame relay environment, if NAT is changed from enabled to disabled, any static IP addresses at the remote site will become invalid. In this case, clear the static routes entries with a "Remove Static routes – all" command from the NAT Advanced Menu.

5 - Link IP Type

The Link IP Type option defines the type of link connection that will be established with the remote site PPP router. The link may be numbered, in which both sides of the WAN connection have IP addresses assigned; or unnumbered, in which the peer (remote partner PPP router) and the calling router use their device IP address.

When operating in unnumbered mode, each of the two IP routers operates as half of a complete router. The WAN connection is considered a common internal data path with the IP routing actually taking place between the two remote LANs.

When the link IP type is set to unnumbered, the Local IP Address option is not available. For an unnumbered link, the local IP address is taken from the IP address assigned to this router in the Internet Set-Up menu.

Default: [unnumbered]

Choices: numbered, unnumbered

6 - Local IP Address

The Local IP Address option allows the definition of an Internet Protocol (IP) address and corresponding subnet size for the link of this router.

When the link IP type is set to unnumbered, the Local IP Address option is not available. For an unnumbered link, the local IP address is taken from the IP address assigned to this router in the Internet Set-Up menu.

The IP address consists of 4 octets and is represented by 4 fields separated by periods ("**.**"), where each field is specified by a decimal number (e.g. 92.3.1.10). Each decimal number must be less than or equal to 255, that is the maximum value of each 8-bit field.

The Subnet Mask Size variable partitions the host field of an IP address into two parts: a *subnet number* and a *host number*. The subnet mask is defined as a series of contiguous bit locations from the start of the IP address.

Default: [none]

```
Enter :
    IP address (up to 15 characters)
>

Enter :
    subnet mask size(from 8 to 32)
>
```

Caution: when using numbered links, both the local IP address AND the subnet mask size MUST be entered. If only the IP address is entered and no subnet mask size, the router has no way of determining the subnet location – the link will not operate.

6/7 - Peer IP Address

The Peer IP Address option allows the definition of an Internet Protocol (IP) address and corresponding subnet size for the link side of the PPP IP router at the remote site. If the link IP type is set to numbered, the peer IP address must be on the same network as the local IP address.

The IP address consists of 4 octets and is represented by 4 fields separated by periods ("**.**"), where each field is specified by a decimal number (e.g. 92.3.1.10). Each decimal number must be less than or equal to 255, that is the maximum value of each 8-bit field.

The subnet mask size is not specified when the link IP type is set to numbered. The subnet mask is defined as a series of contiguous bit locations from the start of the IP address.

Default: [none]

```
Enter :
    IP address (up to 15 characters)
>

Enter :
    subnet mask size(from 8 to 32)
>
```

7 - Negotiate Address

The Negotiate Address option is only available when the **Link IP Type is set to unnumbered**. Address negotiation causes this IOLINK router to negotiate with the peer IP router to determine the IP addresses of each device. This allows this IOLINK router to supply an IP address to the peer IP router if the Peer IP Address option is defined.

When address negotiation is enabled, this IOLINK router will accept an IPCP PPP connection from a peer IP router even if the global IP address of this IOLINK router is not configured. This IOLINK router will use the negotiated address that the peer has provided.

When address negotiation is disabled, this IOLINK router will not initiate address negotiations but will respond to address negotiations if requested by the peer IP router.

Default: [enabled]

8 - Private Route

The Private Route option is only available when the **Link IP Type is set to numbered**. Setting this numbered link connection to be a private link causes the IP connection to the peer IP router to not be advertised in the RIP information.

Default: [disabled]

8/9 - VJ Compression

The VJ Compression option enables or disables Van Jacobson header compression on packets send to this remote site.

Default: [disabled]

IP Routing Menu

```
        EDIT REMOTE SITE 1 PROTOCOL SET-UP IP PARAMETERS IP ROUTING MENU

    Option                Value                Description
 1. Routing protocol      [rip1_compatible]    - Define link routing protocol
 2. RIP mode              [both]               - Define RIP send/receive mode
 3. Triggered RIP         [disabled]           - Define triggered RIP
 4. Auto Default Route    [disabled]           - Add default route on connect
 5. Link cost             [0]                  - Define cost added to routes




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **IP PARAMETERS - IP ROUTING MENU** allows the setting of the IP routing parameters to use for this IPCP connection to the peer IP router. The parameters defined here are used by the IPCP (Internet Protocol Control Protocol) functions of the router for negotiating IP routing during call establishment.

1 - Routing Protocol

The Routing Protocol option defines the type of IP routing protocol to be used on this link interface. The IOLINK router may be set up to use different types of IP routing protocols on each of it's interfaces: LAN and links.

When the routing protocol is defined as none, the IOLINK router will operate as an IP router but will NOT participate in the exchange of RIP messages between the other IP routers in the network. All IP routing is accomplished by using the static routes table. All routes within the network must be manually entered in the static routing table.

When the routing protocol is defined as rip1, the IOLINK router will operate as a RIP1 IP router. All routing information will be sent and received via broadcast RIP packets.

When the routing protocol is defined as rip1_compatible, the IOLINK router will operate as a RIP2 IP router in broadcast mode. All routing information will be sent via broadcast RIP2 packets. Routing information may be received as broadcast RIP1, broadcast RIP2, or multicast RIP2.

When the routing protocol is defined as rip2, the IOLINK router will operate as a RIP2 IP router. All routing information will be sent via multicast RIP2 packets. Routing information may be received as broadcast RIP2 or multicast RIP2.

Partner routers connected on the WAN do not need to have their IP routing protocols set to the same values. An IP router at a central site may have it's routing protocol set to RIP so that it may continue to listen to RIP messages and adapt to the changes of the local network, while the remote locations, with their default routes back to the main router, cannot propagate any incorrect routing information that might be present on the remote segments. Each of the routers at the remote sites would have their routing protocol set to none.

Default: [rip1_compatible]

Choices: none, rip1, rip1_compatible, rip2

2 - RIP Mode

The RIP Mode option defines how this IOLINK router will participate in RIP IP routing messages over the link to this remote site.

When the RIP mode is set to both, the IOLINK router will send and receive RIP routing messages over the link to this remote site.

When the RIP mode is set to send_only, the IOLINK router will only send RIP routing messages over the link to this remote site.

When the RIP mode is set to receive_only, the IOLINK router will only receive RIP routing messages over the link to this remote site.

Default: [both]

Choices: both, send_only, receive_only

3 - Triggered RIP

The Triggered RIP option disables or defines the type of triggered RIP to use on the link to this remote site.

Disabling this option will cause the RIP routing tables to be transmitted every 60 seconds.

Entering "standard" enables triggered RIP; the IOLINK router will only send RIP messages over the link to this remote site when the routing information has actually changed.

Entering "link_up_only" enables triggered RIP; the IOLINK router will only send RIP messages over the link to this remote site when the routing information has actually changed **and** the link is currently up. If the link is down due to suspension, the routing information will be queued and then sent the next time the link is brought up for user data.

When triggered RIP is enabled, if the remote site router refuses to negotiate triggered RIP on the initial connection, this router will attempt to negotiate triggered RIP for 5 minutes. During the 5 minutes, this router will use normal RIP. If triggered RIP has not been negotiated after the 5 minutes, this router will fall back to using normal RIP.

Default: [disabled]

Choices: disabled, standard, link_up_only

Considerations: If you are running spoofing with Triggered RIP, both routers must be set to Triggered RIP "link_up_only". The IOLINK-520 and IOLINK-PRO will automatically configure to this setting but the remote partner router should be checked to make certain that it is correctly configured.

4 - Auto Default Route

The Auto Default Route option allows a default IP route to be added to the routing tables when a connection is established to this remote site. When the link to this remote site goes down, the auto default route will be removed from the routing table.

Default: [disabled]

5 - Link Cost

The Link Cost option defines the amount of extra routing cost to add to routes that are learned from this link connection. This added link cost may be useful in forcing learned routes to have a higher cost when they are across a slower link connection.

Default: [0]

NAT Advanced Set-Up Menu

```
    EDIT REMOTE SITE 1 PROTOCOL SET-UP IP PARAMETERS NAT ADVANCED SETUP MENU

    Option                Value                Description
 1. Translation type      [port]             - Define translation method
 2. Show address pool                        - Display IP mappings
 3. Dynamic IP pool       [none]             - Dynamically assigned mappings
 4. Add static entry                         - Specify IP-IP mappings
 5. Remove static entry                      - Remove static IP mapping




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The NAT Advanced Set-Up Menu allows you to set parameters for the NAT address pool for this remote site router.

1 - Translation Type

This option sets the address translation method to be used for NAT. The address may be translated as either a port or an internal IP address. With IP address translation, each internal IP address is mapped to one global IP address; with port translation, several internal IP addresses may be mapped to a single global IP address.

Default: [port]

2 - Show Address Pool

This option displays the IP address pool for this remote site.

```
                              NAT ADDRESS POOL

Pool Address         Type    Actual Address                Status
--------------       -----   ---------------               ---------
12.34.5.6            Static  196.23.45.6                   In use
12.34.5.12           Static  196.23.45.24                  Reserved
23.45.6.10           Dynamic 123.45.67.8                   In use
23.45.6.11           Dynamic None assigned                 Available
23.45.6.12           Dynamic None assigned                 Available
23.45.6.13           Dynamic None assigned                 Available
```

The Pool Address is the internal address to be used on this network, the Actual Address is the global IP address to which the internal address is assigned.

When the last dynamically assigned address in the address pool is reached, the router will automatically use port translation with that address in order to allow as many connections as possible. If there are zero or one address specified for the pool, then NAPT will be used for all connections. If zero, the address assigned by the remote router IPCP or the address specified in the "Peer IP address" option will be used. If one address is specified, that address will be used.

3 - Dynamic IP Pool

The Dynamic IP Address Pool option defines the block of global IP addresses that may be used to map to internal addresses. The router will assign a global IP address from this pool to the internal address of a device on the network.

The first address in the range must be specified followed by the number of addresses in the pool.

4 - Add Static Entry

The Add Static Address option assigns a specific internal IP address of a device to a specific global IP address. When this option is selected, first enter the internal IP address to be assigned, then the global IP address.

5 - Remove Static Address

The Remove static address option removes the static address assignment from the address pool. Addresses may be removed individually by entering the global IP address to be taken off, or the entire list of static address assignments may be cleared by entering "all".

IPX Parameters Menu

```
                    EDIT REMOTE SITE 1 IPX PARAMETERS MENU

    Option              Value                Description
 1. IPX   enabled      [enabled]          - Enable IPX protocol
 2. Link IPX type      [numbered]         - Define numbered link
 3. IPX net            [none]             - Define IPX network number
 4. Local IPX node     [none]             - Define local IPX node number
 5. Peer IPX node      [none]             - Define peer IPX node number
 6. Static routes only [disabled]         - Only use static IPX routes
 7. IPX DMR enabled    [disabled]         - Enable Demand RIP
 8. Force RIP update   [disabled]         - Enable forced regular RIP updates

Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **IPX PARAMETERS MENU** allows the setting of the type of IPX link connection to the remote site PPP router. The parameters defined here are used by the IPX (Internet Packet Exchange) functions of the router for negotiating IPX routing during call establishment. The menu options are shown in the above screen for both the numbered and unnumbered link IP type settings. Some of the above menu options will not be displayed when unnumbered link IPX type is enabled.

1 - IPX Enabled

The IPX Enabled option enables or disables the Internet Packet Exchange negotiations for this remote site. When a connection to this remote site does not require IPX routing, this option may be disabled.

Default: [enabled]

2 - Link IPX Type

The Link IPX Type option defines the type of link connection that will be established with the remote site PPP router. The link may be:

1. Numbered - This is where both sides of the WAN connection have IPX node addresses assigned and the WAN connection has it's own IPX network number.
2. Unnumbered - This is where the local and peer (remote partner PPP router) routers use their internal LAN side IPX node numbers.

When operating in unnumbered mode, each of the two IPX routers operates as half of a complete router. The WAN connection is considered a common internal data path with the IPX routing actually taking place between the two remote LANs.

When the link IPX type is set to unnumbered, the IPX Net, Local IPX Node, and Peer IPX Node options are not available.

When the link IPX type is set to numbered, the IPX network and local and peer IPX node numbers should be defined to ensure proper IPXCP negotiations between the local and peer IPX PPP routers.

Default: [unnumbered]

Choices: numbered, unnumbered

The following three options appear only if the Link IPX Type option is set to numbered:

3 - IPX Net

The IPX Net option allows the definition of the IPX network number to use for the WAN connection when operating in numbered mode for this IPXCP link to the remote site PPP router.

Default: [none]

```
Enter :
    none, Network number (up to 8 characters)
>
```

4 - Local IPX Node

The Local IPX Node option allows the definition of an Internet Packet Exchange (IPX) node address for the link of this router.

When the link IPX type is set to unnumbered, the Local IPX Node option is not available.

The IPX Node address consists of 12 hexadecimal bytes. The address may be entered with or without the hyphens. An example of an IPX node address may be 00-00-d0-00-12-13, and would be entered as such or simply as 0000d0001213.

Default: [none]

```
Enter :
 none, IPX node number (up to 17 characters)
>
```

5 - Peer IPX Node

The Peer IPX Node option allows the definition of an Internet Packet Exchange (IPX) node address for the link side of the PPP IPX router at the remote site.

When the link IPX type is set to unnumbered, the Peer IPX Node option is not available.

Default: [none]

```
Enter :
 none, IPX node number (up to 17 characters)
>
```

3 / 6 - Static Routes Only

The Static Routes Only option determines the type of IPX routing to perform on the connection with the peer IPX router. By enabling this option, only the static IPX routes and services defined in the IPX Routing Set-up menu will be used to perform IPX routing with the peer IPX router.

Default: [disabled]

4 / 7 - IPX DMR Enabled

The IPX DMR Enabled option defines or disables demand RIP for IPX routing with the peer IPX router. Demand RIP allows the IPX routing tables to be updated only when there has been a change in the routing table.

Disabling this option will cause the IPX RIP routing tables to be transmitted every 60 seconds.

Entering "standard" enables demand RIP; the IOLINK router will only send RIP messages over the link to this remote site when the routing information has actually changed.

Entering "link_up_only" enables demand RIP; the IOLINK router will only send RIP messages over the link to this remote site when the routing information has actually changed **and** the link is currently up. If the link is down due to suspension, the routing information will be queued and then sent the next time the link is brought up for user data.

When demand RIP is enabled, if the remote site router refuses to negotiate demand RIP on the initial connection, this router will attempt to negotiate demand RIP for 5 minutes. During the 5 minutes, this router will use normal RIP and SAP. If demand RIP has not been negotiated after the 5 minutes, this router will fall back to using normal RIP and SAP.

Default: [disabled]

Choices: disabled, standard, link_up_only

5 / 8 - Force RIP Update

The Force RIP Update option determines if the IOLINK router will send a RIP update request to the WAN peer IPX router when a local LAN RIP update is sent. When operating under normal RIP update times, this forces the WAN partners to provide their RIP tables when requested to maintain proper routing information.

Default: [disabled]

Compression Parameters Menu

```
                    EDIT REMOTE SITE 1 CCP PARAMETERS MENU

    Option                Value          Description
 1. Compression          [enabled]     - Allows compression operation
 2. Extended sequence    [disabled]    - Two byte sequence field









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **COMPRESSION (CCP) PARAMETERS MENU** allows the setting of data compression on the link connection to the remote site PPP router. The parameters defined here are used by the CCP functions of the router for negotiating data compression during call establishment.

1 - Compression

The Compression option enables or disables the negotiation of compression for data packets sent from the remote site PPP router and received by this router. The IOLINK router performs data compression at the bundle level and not at the link level. Link based compression will be rejected. The IOLINK router supports CCP option 17 - PPP Stac LZS Compression Protocol.

When the Compression option is enabled, data compression will be negotiated with the remote site router for data that is sent from this router to the remote site router.

When compression is disabled, this router will not allow data compression to be negotiated for the connection.

Default: [enabled]

2 - Extended Sequence

The Extended Sequence option enables or disables the use of a two-byte sequence number for inter-router communications. When disabled, the sequence number is one byte.

This option should be enabled when connecting to a PPP router that uses a two-byte sequence number instead of a one-byte sequence number. Some Cisco routers with software versions IOS 11.0 and IOS 11.1 use a two-byte sequence number.

Default: [disabled]

Considerations:

If compression has been negotiated for the connection but many data errors are received and very little data, the Extended Sequence number may need to be enabled.

CMCP (Connection Management) Parameters Menu

```
            EDIT REMOTE SITE 1 PROTOCOL SET-UP CMCP PARAMETERS MENU

    Option                 Value          Description
 1. IP spoofing            menu         - Configure IP spoofing
 2. IPX spoofing           menu         - Configure IPX spoofing
 3. CMCP enabled          [disabled]    - Enable CMCP negotiations
 4. Bridge traffic        [enabled]     - Spoof bridge traffic
 5. Disc after last       [off]         - Disconnect after last session
 6. Suspension timeout    [off]         - Set maximum suspension interval




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **CONNECTION MANAGEMENT (CMCP) PARAMETERS MENU** allows the configuration of the Connection Management options for this remote site.

Note: this menu will only appear if this router has an ISDN BRI module installed.

1 - IP Spoofing

The IP Spoofing option directs you to the IP Spoofing Parameters Menu where the IP spoofing parameters for this remote site are set. The parameters define how to interact and keep track of the TCP sessions while connection management is enabled on the link to this remote site.

2 - IPX Spoofing

The IPX Spoofing option directs you to the IPX Spoofing Parameters Menu where the IPX spoofing parameters for this remote site are set. The parameters define how to interact and keep track of the IPX sessions while connection management is enabled on the link to this remote site.

3 - CMCP Enabled

The CMCP Enabled option enables or disables the Connection Management Control Protocol negotiations for this remote site. When a connection to this remote site does not require connection management, this option may be disabled causing CMCP not to be negotiated.

Connection Management is used to minimize the amount of connection time used when connected to partner IOLINK routers.

When Connection Management is enabled, the active ISDN calls are monitored for "Interesting Traffic", suspended, and resumed when required to transfer user data between IOLINK routers.

Default: [disabled]

Considerations: if this remote site is set as spoofing, CMCP will be set to enabled.

Note: When CMCP is enabled, the call me prefix to get back to the partner router must be entered so that the link can be re-established after suspension (only the directory number is passed when the call is set up, not the entire connection number). For the same reason, the partner router must also have its call me prefix entered.

4 - Bridge Traffic

The Bridge Traffic option enables or disables spoofing of bridge frame traffic while Connection Management is enabled.

When the IOLINK router is spoofing bridge traffic (this option enabled), the bridge traffic received from the LAN will not be used to resume a suspended ISDN call or to keep an existing ISDN call up. While the ISDN call is up for other reasons, the bridge traffic received from the local LAN will be passed.

When this option is disabled, the IOLINK router will pass all bridge traffic received from the local LAN. This will cause ISDN calls to be resumed if suspended.

Default: [enabled]

5 - Disconnect After Last

The Disconnect After Last option sets the time delay for disconnecting the link connection to this remote site after all of the connection management monitored sessions have been terminated. If set to off, the link connection will be disconnected when the Inactivity Timer expires.

Default: [off]

```
Enter :
    off, immediately, delay in seconds (from 5 to 300)
>
```

6 - Suspension Timeout

The Suspension Timeout option allows the definition of a maximum time that the link connection may be in the suspended state. If the link connection has been suspended for the time period defined by the suspension timeout, the link connection will be silently dropped and the sessions logged on that connection will be removed from the table. Silently dropping the link connection means that the peer remote site router will not be notified that the connection has been dropped.

Default: [off]

```
Enter :
    Time in minutes (from 1 to 10080), off
>
```

IP Spoofing Menu

```
      EDIT REMOTE SITE 1 PROTOCOL SET-UP CMCP PARAMETERS IP SPOOFING MENU

    Option          Value          Description
 1. TCP idle       [3600 sec]    - Set interval till first TCP keepalive
 2. TCP interval   [60 sec]      - Set interval between TCP keepalives
 3. TCP retries    [5]           - Set maximum TCP keepalive retries
 4. TCP aging      [7200 sec]    - Set TCP connection aging interval



Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **IP SPOOFING PARAMETERS MENU** allows the setting of connection management parameters that control the IP spoofing portion of the link connection. The timers and values defined within this menu will be used for each of the TCP sessions monitored by this IOLINK router.

1 - TCP Idle

The TCP Idle option defines the idle time in seconds that the IOLINK router will wait before sending the first fake (spoofed) keepalive to the TCP session endpoint. Idle time is the time when the IOLINK router does not receive TCP keepalive messages for that TCP session.

When the TCP Idle option is set to off, the IOLINK router will never send out fake keepalive messages.

The TCP keepalive messages are used to determine if the station at the end of the TCP session is still alive.

Default: [3600 sec]

```
Enter :
    time in seconds (from 60 to 7200), off
>
```

2 - TCP Interval

The TCP Interval option defines the internal interval time in seconds that the IOLINK router will wait before sending the next TCP keepalive. These additional keepalive messages will be sent when there has not been a response to the initial keepalive messages sent from the IOLINK router.

The TCP keepalive messages are used to determine if the station at the end of the TCP session is still alive.

Default: [60 sec]

```
Enter :
    time in seconds (from 5 to 120)
>
```

3 - TCP Retries

The TCP Retries option defines the number of unacknowledged fake TCP keepalive messages that this IOLINK router will send before the TCP session is considered dead.

The TCP keepalive messages are used to determine if the station at the end of the TCP session is still alive.

Default: [5]

```
Enter :
    Number of retries (from 1 to 20)
>
```

4 - TCP Aging

The TCP Aging option defines the amount of idle time in seconds that the IOLINK router will wait before the TCP session is aged out and considered dead. The aging timer starts counting when there is no session traffic.

The TCP aging timer can be used in conjunction with the IP address connect feature. When the TCP session traffic is idle for a time longer than the inactivity timer, the link will be suspended. If the TCP session continues to be idle, the aging timer will age out the session. Once all of the sessions are aged out, the link will be quietly taken from suspended to down. This process allows the link to be available for use with another IP address connect request.

When a TCP session has been aged out and the IOLINK router then receives a TCP keepalive for that session, the link will be re-established to send the keepalive. The link is re-established because the TCP keepalive messages are not easily discernable from normal TCP session traffic. The TCP aging timer should be set to a value larger than the frequency of TCP keepalive messages on the network. TCP keepalive messages can have intervals as long as 60 minutes.

The TCP keepalive messages are used to determine if the station at the end of the TCP session is still alive.

Default: [7200 sec]

```
Enter :
    time in seconds (from 60 to 604800), off
>
```

IPX Spoofing Menu

```
      EDIT REMOTE SITE 1 PROTOCOL SET-UP CMCP PARAMETERS IPX SPOOFING MENU

    Option           Value           Description
 1. IPX type20      [enabled]      - Spoof IPX type20 frames
 2. IPX broadcast   [enabled]      - Spoof IPX broadcast frames
 3. IPX idle        [300 s]        - Set interval till first IPX watchdog
 4. IPX interval    [60 s]         - Set interval between IPX watchdogs
 5. IPX retries     [10]           - Set maximum IPX watchdog retries
 6. IPX aging       [86400 s]      - Set IPX connection aging interval



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **IPX SPOOFING PARAMETERS MENU** allows the setting of connection management parameters that control the IPX spoofing portion of the link connection. The timers and values defined within this menu will be used for each of the IPX sessions monitored by this IOLINK router.

1 - IPX Type20

When the IPX Type20 option is enabled, this IPX router will ignore IPX type 20 packets and not re-transmit them to partner routers on the WAN. When the IOLINK router is spoofing IPX type 20 packets, the type 20 packets received from the LAN will not be used to resume a suspended ISDN call or to keep an existing ISDN call up.

Default: [enabled]

2 - IPX Broadcast

When the IPX Broadcast option is enabled, this IPX router will ignore IPX broadcast packets and not re-transmit them to partner routers on the WAN. When the IOLINK router is spoofing IPX broadcast packets, the broadcast packets received from the LAN will not be used to resume a suspended ISDN call or to keep an existing ISDN call up.

Default: [enabled]

3 - IPX Idle

The IPX Idle option defines the idle time in seconds that the IOLINK router will wait before sending the first fake (spoofed) watchdog to the client for the IPX session. Idle time is the time when the IOLINK router does not receive IPX watchdog messages for that IPX session.

When the IPX Idle option is set to off, the IOLINK router will never send out fake watchdog messages.

The IPX watchdog messages are used by servers to determine if the client at the end of the IPX session is still alive.

Default: [300 sec]

```
Enter :
    time in seconds (from 60 to 1260), off
>
```

4 - IPX Interval

The IPX Interval option defines the internal interval time in seconds that the IOLINK router will wait before sending the next IPX watchdog. These additional watchdog messages will be sent when there has not been a response to the initial watchdog messages sent from the IOLINK router.

The IPX watchdog messages are used by servers to determine if the client at the end of the IPX session is still alive.

Default: [60 sec]

```
Enter :
    time in seconds (from 10 to 600)
>
```

5 - IPX Retries

The IPX Retries option defines the number of unacknowledged fake IPX watchdog messages that this IOLINK router will send before the IPX session is considered dead.

The IPX watchdog messages are used by servers to determine if the client at the end of the IPX session is still alive.

Default: [10]

```
Enter :
    Number of retries (from 5 to 100)
>
```

6 - IPX Aging

The IPX Aging option defines the amount of idle time in seconds that the IOLINK router will wait before the IPX session is aged out and considered dead. The aging timer starts counting when there is no session traffic.

When an IPX session has been aged out and the IOLINK router then receives a watchdog for that session, the IOLINK router will simply ignore the watchdog.

The IPX watchdog messages are used by servers to determine if the client at the end of the IPX session is still alive.

Default: [86400 sec]

```
Enter :
    time in seconds (from 60 to 604800), off
>
```

BACP Set-Up Menu

```
            EDIT REMOTE SITE PROTOCOL SET-UP BACP SET-UP MENU

   Option            Value  Description
1. BACP             [enable]     - Enable/disable BACP operation
2. Call mode        [local]      - Device to initiate second call
3. Request number   [disabled]   - Partner provides second call number



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **BACP PARAMETERS MENU** allows you to activate the BACP (Bandwidth Allocation Control Protocol) and set the call conditions used.

Note: in Net3 ISDN environments with BACP enabled, directory numbers must be configured for BACP to function.

1 - BACP

The BACP option enables or disables the BACP for the secondary link. The parameters to add or drop the secondary link are set at the Main/Configuration/WAN Set-up/Remote Site Set-up/Edit Remote Site/Secondary Link Activation Menu.

Default: [enabled]

2 - Call Mode

The Call Mode option toggles between local and partner modes. Call mode allows you to set where the call to bring up the secondary link will originate from, so that all connections may be made from one router for centralized billing.

In local mode, this IOLINK router will initiate an outgoing call back to the remote site to re-establish the link.

In partner mode, this IOLINK router will send a request to the other router (via the primary link) to bring up the link from that end.

Default: [local]

3 - Request Number

The Request Number option is functional when BACP is in local mode. If enabled, the partner remote site ISDN number is requested. When disabled, the acknowledge message from this IOLINK router tells the partner remote site router that its ISDN number does not need to be sent (it is in the lookup table already).

Default: [disabled]

Note: this option is only displayed if Call Mode is [local].

Security Parameters Menu

```
              EDIT REMOTE SITE SECURITY PARAMETERS MENU

    Option                   Value            Description
 1. Incoming PAP password  [none]           - Set incoming PAP password
 2. Incoming CHAP secret   [none]           - Set incoming CHAP secret
 3. Outgoing user name     "DEV050607"      - Set outgoing user name
 4. Outgoing PAP password  [none]           - Set outgoing PAP password
 5. Outgoing CHAP secret   [none]           - Set outgoing CHAP secret


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **EDIT REMOTE SITE SECURITY PARAMETERS MENU** allows you to set outgoing and incoming password data and an outgoing user name for PPP security on the connection to this remote site router.

Note: routers configured to have a leased line link operating in conjunction with an ISDN B-Channel (either as backup or bundled link) must have security enabled and with the proper usernames and passwords entered on both partner routers.

1 - Incoming PAP password

The Incoming PAP Password option defines the PAP password that this IOLINK router PPP router expects to receive from the remote site PPP router in response to authentication requests from this router.

Default: [none]

2 - Incoming CHAP secret

The Incoming CHAP Secret option defines the CHAP secret that this IOLINK router PPP router expects to receive from the remote site PPP router in response to authentication requests from this router.

Default: [none]

3 - Outgoing user name

The Outgoing User Name option defines the user name that this IOLINK router PPP router will be sending to the remote site PPP router when responding to authentication requests from the remote site PPP router. The outgoing user name defaults to the device name. If the device name is changed, all remote sites are searched and any remote site whose outgoing user name matches the old device name will be updated to use the new device name.

The outgoing user name must be defined the same as the user name defined in the PPP security settings for the remote site router.

The outgoing user name is case sensitive and may consist of 1 to 32 alphanumeric characters. Use the underscore character instead of a space character.

Default: [*] Default device name

4 - Outgoing PAP password

The Outgoing PAP Password option defines the PAP password that this IOLINK router will use when responding to authentication requests from the remote site PPP router.

Default: [none]

5 - Outgoing CHAP secret

The Outgoing CHAP Secret option defines the CHAP secret that this IOLINK router will use when responding to authentication requests from the remote site PPP router.

Default: [none]

Security Set-Up Menu

```
                          SECURITY SET-UP MENU

    Option                  Value            Description
 1. Default parameters      menu           - Set default outgoing security
 2. Security level         [none]          - Set security protocol
 3. Request security       [incoming-only] - Set security operation
 4. CHAP challenges        [once]          - CHAP Authentication
 5. CallerID security      [disabled]      - Enable/disable CallerID security


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **SECURITY SET-UP MENU** allows the configuration of the PPP security options used between this router and the remote site for which a profile is currently being configured.

Note: routers configured to have a leased line link operating in conjunction with an ISDN B-Channel (either as backup or bundled link) must have security enabled (security level set to either [PAP] or [CHAP]) and with the proper usernames and passwords entered on both partner routers.

1 - Default parameters

The Default Parameters option takes you to the Default Parameters menu where the outgoing PPP security options to be used by this router when calling the remote site are configured.

2 - Security Level

The Security Level option defines the type of PPP security to use for incoming connections. When a security level is set, the IOLINK router will always require authentication on incoming connections. The IOLINK router will ask for authentication on outgoing calls when a security request is set to always (see below).

Default: [none]

Choices: none, PAP, CHAP

3 - Request security

This specifies when the remote site router should be requested to authenticate:

- always (when this router makes an outgoing call OR receives an incoming call)
- incoming_only (ONLY when this router receives an incoming call)

Default: If an ISDN module is installed: [incoming only]
If only leased line module(s) installed: [always]

Choices: always, incoming only

4 - CHAP Challenges

The CHAP Challenges option defines the frequency of CHAP challenges that this IOLINK router PPP router will require when authenticating a remote site PPP router.

Default: [once]

Choices: once, continuous

5 - CallerID Security

The CallerID Security option enables or disables the use of incoming callerID information to do a security check for valid devices. This option may be used to refuse incoming ISDN calls from routers located at an unknown site. Incoming callerID information received is matched against the ISDN number, alternate ISDN number, and wildcard values of each remote site profile. If a match is not found after checking each of the three numbers in each of the remote site profiles, the incoming ISDN call will be ignored.

The CallerID Security option must only be enabled on an IOLINK router that is connected to an ISDN service that provides callerID functions. Check with your ISDN service provider about the availability of this service. This option is only applicable to incoming data calls.

When this option is set to enabled, this IOLINK router will ignore any incoming ISDN call that does not provide callerID information or the callerID information does not match one of the configured values.

This option is only available when an ISDN BRI module is installed with the digital leased line option is disabled.

Default: [disabled]

Default Parameters Menu

```
                          DEFAULT PARAMETERS MENU

   Option                  Value              Description
1. Outgoing user name      "DEV050607"       - Set outgoing user name
2. Outgoing PAP password   "*"               - Set outgoing PAP password
3. Outgoing CHAP secret    [none]            - Set outgoing CHAP secret
```

The **DEFAULT PARAMETERS MENU** allows you to set default outgoing PPP security options for this router. The values set in this menu will be used for any calls originating from this router rather than from a remote site (calls originating from a remote site will use the security parameters set for that site).

1 - Outgoing user name

The Outgoing User Name option defines the user name that this IOLINK router PPP router will send to the called remote site PPP router when responding to authentication requests from the remote site PPP router. The outgoing user name defaults to the device name. If the device name is changed, all remote sites are searched and any remote site whose outgoing user name matches the old device name will be updated to use the new device name.

The outgoing user name must be defined the same as the user name defined in the PPP security settings for the remote site router.

The outgoing user name is case sensitive and may consist of 1 to 32 alphanumeric characters. Use the underscore character instead of a space character.

Default: [*] Default device name

2 - Outgoing PAP password

The Outgoing PAP Password option defines the PAP password that this IOLINK router PPP will use when responding to authentication requests from the remote site PPP router.

Default: [none]

3 - Outgoing CHAP secret

The Outgoing CHAP Secret option defines the CHAP secret that this IOLINK router PPP will use when responding to authentication requests from the remote site PPP router.

Default: [none]

PPP Set-Up Menu

```
                                PPP SET-UP MENU

    Option                  Value          Description
 1. Advanced PPP set-up     menu         - Configure advanced PPP parameters
 2. Restart timer          [3000 msec]   - Set restart timer
 3. Configure count        [10]          - Set configure count
 4. Failure count          [5]           - Set failure count
 5. Terminate count        [2]           - Set terminate count









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **PPP SET-UP MENU** configures PPP circuit parameters used during LCP (Link Control Protocol) negotiations with a remote site PPP router.

This IOLINK router PPP router will request the configuration parameters defined here when initiating a PPP connection to a remote site PPP router.

When negotiating the LCP parameters for incoming PPP connections initiated by the remote site PPP router, this IOLINK router will use these values as defaults but will accept a request for different values from the remote site PPP router.

If any of these LCP configuration parameters are required to be of a known value for a particular PPP connection, the parameters should be set to the same values on the routers on each end of the PPP link.

1 - Advanced PPP Set-Up

The Advanced PPP Set-up option takes you to the Advanced PPP Set-Up Menu. Here you set the advanced LCP parameters such as field compression, Quality protocol, and the type of multilink sequencing.

2 - Restart Timer

The Restart Timer option specifies the time between retransmissions of Configure Request or Terminate Request packets. When attempting to establish a PPP link connection, if the Restart Timer expires before a response is received for a Configure Request, another Configure Request will be sent.

Default: [3000 msec]

Range: 50 to 20000 msec

3 - Configure Count

The Configure Count option specifies the number of Configure Request packets that will be sent without receiving a valid Configure Ack, Configure Nak, or Configure Reject packet. If a valid response packet is not received within the count specified, it is assumed that the peer PPP router is unable to respond.

Default: [10]

Range: 1 to 100

4 - Failure Count

The Failure Count option specifies the number of Configure Nak packets that will be sent without sending a Configure Ack before assuming that the configurations requested are not converging. A Configure Nak packet is sent when one of the PPP routers wishes to negotiate the particular LCP parameter to be a different value than the one proposed by the initiating PPP router.

Default: [5]

Range: 1 to 100

5 - Terminate Count

The Terminate Count option specifies the number of Terminate Request packets that will be sent without receiving a Terminate Ack before assuming that the peer PPP router is unable to respond.

Default: [2]

Range: 1 to 10

Advanced PPP Set-Up Menu

```
                          ADVANCED PPP SET-UP MENU

    Option              Value             Description
 1. ACFC                [enabled]       - Address/control field compression
 2. PFC                 [disabled]      - Protocol field compression
 3. Echo monitoring     [enabled]       - Allow echo monitoring of link
 4. Quality protocol    [disabled]      - Set quality protocol
 5. Quality interval    [10 sec]        - Set quality interval
 6. MP encapsulation    [enabled]       - Use MP headers for NCP negotiation
 7. MP sequencing       [normal]        - Set multilink sequence numbers
 8. MP discriminator    [MAC_address]   - Set multilink endpoint discriminator
 9. MP minimum          [50]            - Set minimum fragmentation size


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **ADVANCED PPP SET-UP MENU** provides for more advanced PPP circuit parameter set-up. The parameters configurable from this menu are used during LCP (Link Control Protocol) negotiations with a remote site PPP router. This IOLINK router PPP router will request the configuration parameters defined here when initiating a PPP connection to a remote site PPP router.

When negotiating the LCP parameters for incoming PPP connections initiated by the remote site PPP router, this IOLINK router will use these values as defaults but will accept a request for different values from the remote site PPP router.

If any of these LCP configuration parameters are required to be of a known value for a particular PPP connection, the parameters should be set to the same values on the routers on each end of the PPP link.

1 - ACFC

The ACFC (Address/Control Field Compression) option determines if this IOLINK router PPP router will request Address and Control Field Compression on the PPP link.

Default: [enabled]

2 - PFC

The PFC (Protocol Field Compression) option determines if this IOLINK router PPP router will request Protocol Field Compression on the PPP link.

Default: [disabled]

3 - Echo Monitoring

The Echo Monitoring option determines if this IOLINK router PPP router will generate Echo-Request messages on the PPP link.. Echo monitoring is used to help debug a link and verify data transmission. A change to the Echo Monitoring state will take effect the next time the link starts.

Default: [enabled]

4 - Quality Protocol

The Quality Protocol option determines if this IOLINK router PPP router will request Link Quality Protocol monitoring on the PPP link.

Default: [disabled]

5 - Quality Interval

The Quality Interval option specifies the time interval between Link Quality Report packets that are generated and sent to the peer PPP router.

Default: [10 sec]

Range: 1 to 60 seconds

6 - MP Encapsulation

The MP Encapsulation option when set to enabled, specifies that the NCP negotiation messages are encapsulated within a Multilink header.

Default: [enabled]

7 - MP Sequencing

The MP Sequencing option specifies the size of the Multilink sequencing number used in the Multilink header during frame transmission. A setting of normal will use a 4 byte sequencing number and a setting of short will use a 2 byte sequencing number.

Default: [normal]

Choices: normal, short

Considerations:

When connecting to a Combinet PPP device, the MP Sequencing should always be set to short.

8 - MP Discriminator

The MP Discriminator option specifies the type of identification used to identify this IOLINK router PPP router during a Multilink connection. The MP Discriminator allows the remote site PPP router to uniquely identify this Multilink link when it requests establishment.

Default: [MAC_address]

Choices: MAC_address, IP_address, directory_number

9 - MP Minimum

The MP Minimum option specifies the minimum size of PPP frame that will not be fragmented when sent to the remote site PPP router. PPP frames equal to or larger than this value will be fragmented across the links in a Multilink connection. A value of zero causes all inter-router frames to be fragmented.

Default: [50]

Range: 0 to 1600

IP Address Connect Menu

```
                          IP ADDRESS CONNECT MENU

    Option                    Value          Description
 1. Edit IP address entry                   - Modify/add IP address entry
 2. IP address connect        [disabled]    - Activate IP address connect
 3. Show IP address entries                 - Display IP address entries
 4. Remove IP address entry                 - Delete IP address entry
 5. Remote site summary                     - Summary of remote sites




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **IP ADDRESS CONNECT MENU** allows the display and configuration of the IP Address Connect table entries. IP Address Connect is used to establish ISDN calls to specific remote sites based on specific destination IP addresses.

1 - Edit IP Address Entry

The Edit IP Address Entry option allows the definition of an entry in the IP Address Connect table. The IP Address connect table allows this IOLINK router to establish a PPP ISDN call to a specific remote site PPP router when IP traffic destined for a specific IP network is received from the local LAN. The IP addresses in the table are searched sequentially according to entry id number.

An entry of the IP address 0.0.0.0 causes any IP traffic to initiate a call to the specified remote site. Adding one of these default entries to the end of the table, e.g. id number 128, causes all IP traffic for destinations not listed in the address connect table to be sent to this default entry. Having this default entry at the end of the table causes all other entries to be checked first and then the remaining IP traffic will cause a connection to this default remote site.

To change any of the values of an entry that already exists, simply re-enter the values and substitute the new values where appropriate.

```
Enter :
    Set the IP address connect entry id (from 1 to 128)

>

Enter :
    Set the IP Address (up to 15 characters)

>

Enter :
    Size of subnet mask (from 1 to 32)

>

Enter :
    Remote site alias or id (up to 16 characters), none
```

2 - IP Address Connect

The IP Address Connect option enables or disables the IP Address connect operation of the router. When IP Address Connect is enabled, all IP traffic on the local LAN is checked against the IP routing table. If the IP address is not present in the IP routing table, the address is checked in the IP Address Connect table.

Default: [disabled]

3 - Show IP Address Entries

The Show IP Address Entries option displays all of the IP addresses and their corresponding remote site profile alias currently in the IP Address connect table. There may be up to 128 IP network addresses defined in the table.

```
  ID   IP Address        Subnet Mask Size   Subnet Mask       Remote Site
  --   ---------------   ----------------   ---------------   ----------------
   1   12.12.12.12               1          128.0.0.0         Vancouver

Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

ID:	Entry number in the IP Address Connect table.
IP Address:	Network IP address of the remote network or device.
Subnet Mask Size:	IP address mask size defined
Subnet Mask:	IP address mask created from the mask size defined. The mask is used to allow all IP addresses of a destination IP network to apply to the Address connect function.
Remote Site:	Remote site profile entry to be used to call a remote partner IOLINK router when IP traffic destined for the IP address is seen on the local LAN.

4 - Remove IP Address Entry

The Remove IP Address Entry option allows you to remove a selected IP Address Connect entry from the database. The entries may be removed individually by using the index number or all at once.

```
Enter :
    all, id

>
```

5 - Remote site summary

The Display Summary option displays an overview of the remote site profiles configured on this IOLINK router. Each of the options is shown as "E" for enabled, "D" for disabled or "NA" for not available.

```
* - Up   @ - Suspended                    Total Remote Site Entries: 7
 E - Enabled   D - Disabled   NA - Not Available

 Id  Alias             FR  AC MP    Pri/Sec    DLCI  BRG IP IPX CCP CMCP BACP
 --- ----------------  --- -- -- ------------- ----  --- -- --- --- ---- ----
   1 LEASED1           NA  D  E  Link01/none    NA   E   E  E   E   NA   D
   2 Toronto           NA  D  E    ISDN/none    NA   E   E  E   E   D    D
   3 LEASED4           RAW D  E  Link04/ISDN    16   E   E  E   E   NA   NA
   4 Dallas            NA  D  E    ISDN/ISDN    NA   E   E  E   E   D    D
 129 ISDN_TEMPLATE     NA  D  E    ISDN/ISDN    NA   E   E  E   E   D    D
 130 FR_TEMPLATE       PPP D  E    none/none    16   E   E  E   D   NA   NA
 131 LEASED_TEMPLATE   NA  D  E    none/none    NA   E   E  E   E   NA   D
```

Id: Entry number in the Remote Site table. The Index number may be used to reference this entry in the IP Address Connect table or for viewing statistics.

Alias: Text name used to easily reference this entry in the table. The Alias may be used to reference this entry in the IP Address Connect table or for viewing statistics.

FR: Frame Relay – displays whether PPP encapsulation is enabled (PPP) or disabled (RAW) over Frame Relay. This column displays not applicable (NA) in a non-frame relay environment.

AC: The state of the Auto-call option for this remote site profile.

MP: The state of the Multilink option for this remote site profile.

Pri/Sec: The type of primary and secondary links configured for this remote site profile. ISDN/none indicates that the circuit will only use ISDN calls. Link1 or Link2 entries indicates that the circuit has been defined as a digital leased circuit.

DLCI: The Frame Relay DLCI number of this remote site. Not applicable (NA) in a non-frame relay environment.

BRG: The state of the BCP (bridging) option for this remote site profile.

IP: The state of the IPCP (IP routing) option for this remote site profile.

IPX: The state of the IPXCP (IPX routing) option for this remote site profile.

CCP: The state of the CCP (compression) option for this remote site profile.

CMCP: The state of the CMCP (connection management) option for this remote site profile. Not applicable (NA) if the remote site is not an ISDN site.

BACP: The state of the BACP option for this remote site profile. Not applicable (NA) if the remote site is a frame relay site.

Packet Services Set-Up Menu

```
                        PACKET SERVICES SET-UP MENU

    Option                Value          Description
 1. Bridging set-up       menu         - Define bridging environment
 2. IP routing set-up     menu         - Define IP routing environment
 3. IP security set-up    menu         - Define IPsec services
 4. IPX routing set-up    menu         - Define IPX environment
 5. Filter set-up         menu         - Filter operations




Enter option number, "=" - main menu, <TAB> - previous menu
>
```

The **PACKET SERVICES SET-UP MENU** provides

1 - Bridging Set-Up

The Bridging Set-up option takes you to the Bridging Set-Up Menu, where the parameters for bridging are configured.

2 - IP Routing Set-Up

The IP Routing Set-up option takes you to the IP Routing Set-Up Menu, where the parameters for IP routing are configured. IP routing may be enabled or disabled in this menu.

3 - IP Security Set-Up

The IP Security Set-up option takes you to the IP Security Set-up Menu, where parameters for IPSec may be configured.

4 - IPX Routing Set-Up

The IPX Routing Set-up option takes you to the IPX Routing Set-Up Menu, where the parameters for IPX routing are configured. IPX routing may be enabled or disabled in this menu.

5 - Filter Set-Up

The Filter Set-up option takes you to the Filter Set-Up Menu, where you can create filters based on protocol types and custom specifications.

Bridging Set-Up Menu

```
                          BRIDGING SET-UP MENU

    Option                  Value         Description
 1. Spanning tree           menu        - Configure STP communications
 2. Bridge forwarding      [enabled]    - Enable/disable bridge forwarding
 3. Bridge aging timer     [300 sec]    - Set MAC address aging interval
 4. Show bridging table                 - View MAC address table
 5. Show permanent table                - View permanent addresses only
 6. Clear bridging table                - Delete all non-permanent entries


Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **BRIDGING SET-UP MENU** provides access to management of the bridge/router frame-routing functions. These include Spanning Tree settings, management of the address tables, and adjustment of the aging timer.

1 - Spanning Tree

The Spanning Tree option directs you to the Spanning Tree Menu, where parameters of the Spanning Tree Protocol for this bridge are set and viewed.

2 - Bridge Forwarding

The Bridge Forwarding option enables or disables the frame forwarding operation of the bridge.

Default: [enabled]

3 - Bridge Aging Timer

The Bridge Aging Timer option sets the interval after which unused, non-permanent entries are removed from the address table.

Default: [300 sec]

Range: off (disabled), 10 to 1,000,000 seconds.

Considerations:

Increasing the value of the bridge aging timer will remove unused entries less frequently. This will offer an increase in bridge performance, as the table will not be rebuilt as often when stations come on and off the LAN.

Decreasing the bridge aging timer will remove unused entries more frequently. This will cause the table to be rebuilt more often, which may, depending on the size of the network, consequently decrease bridge performance.

Balancing the bridge aging timer according to the size of the local LAN and the frequency of station usage and moves can assist in optimizing bridge performance. If a closely managed topology remains stable with high usage and few station additions or moves, it could be advantageous to initially let the bridge learn all station addresses and then increase or disable the aging timer. When a station deletion or move occurs, the timer value can be temporarily reduced to clear the entry from the table more quickly. In any case, learning never stops, and the new/moved station will be learned and added to the address table when encountered.

4 - Show Bridging Table

The Show Bridging Table option displays all addresses in the Bridge Filter Table, identifies the active/inactive and permanent/non-permanent addresses, identifies addresses to be filtered if they are a source and/or destination, describes their location, and gives the total number of address table entries.

```
                          ALL Known MAC Addresses
Total entries : 20
                              Filter If  WAN
Address            Active Perm Src  Dest Access Location
Start of table
01-80-c2-00-00-01                                Internal
01-80-c2-00-00-02                                Internal
01-80-c2-00-00-03                                Internal
01-80-c2-00-00-04                                Internal
01-80-c2-00-00-05                                Internal
01-80-c2-00-00-06                                Internal
01-80-c2-00-00-07                                Internal
01-80-c2-00-00-08                                Internal
01-80-c2-00-00-09                                Internal
01-80-c2-00-00-0a                                Internal
01-80-c2-00-00-0b                                Internal
01-80-c2-00-00-0c                                Internal
01-80-c2-00-00-0d                                Internal
01-80-c2-00-00-0e                                Internal
01-80-c2-00-00-0f                                Internal
02-44-00-c8-9a-ff     *      *                 *   LAN050607
02-44-00-c8-9a-ee     *                        *   LAN050607
12-34-56-78-99-99     *      *    *      *         LAN050607(fixed)
11-11-11-11-11-11                     *          unknown
ff-ff-ff-ff-ff-ff                                Internal
end of table
```

Address

The sixteen addresses **01-80-c2-00-00-01** to **01-80-c2-00-00-0f** are reserved for future use in the 802.1d standard.

The address (**ff-ff-ff-ff-ff-ff**) is a permanent address that, in its default state (unknown), will not filter any frames. Only one choice—Filter if Destination is available for this broadcast address. If applied, this will prevent broadcast frames from being put onto the LAN the bridge is connected to.

The address (**12-34-56-78-99-99**) is an active, permanent address that resides on LAN050607 (in this example, this is the LAN the bridge is attached to). Frames to and from this address will not cross the bridge, since they are identified as both filter-if-destination and filter-if-source. The "(fixed)" descriptor is added when the location of the address has been identified by management action.

The address (**11-11-11-11-11-11**) is an inactive, permanent address with a currently unknown location. Frames to this address will not cross the bridge, since they are identified as filter-if-destination. Note that this address should be made permanent, because if it is not encountered within the aging-timer interval it will be removed from the table.

The address (**02-44-00-c8-9a-ff**) is an active, permanent address that resides on LAN050607 and is allowed to transmit data on the WAN connection. This address is marked permanent because the operator enabled the permanent option within the Edit MAC Address menu of the MAC Address Filters menu.

The address (**02-44-00-c8-9a-ee**) is an active address that resides on LAN050607 and is allowed to transmit data on the WAN connection. Since this address is marked as having WAN access but not marked as permanent, this indicates that this address has been learned from the local LAN and assigned to have WAN access because it was one of the first 10 addresses encountered.

Active

A * in the Active column indicates the address is active. An address is considered active if it has been encountered within the aging-timer interval. Permanent addresses are not subject to the aging timer, but will be reported as active if they are encountered.

Perm

A * in the Perm column indicates the address is permanent. An address is considered permanent if it has been identified as such by the bridge manager. Permanent addresses are not subject to the aging timer, but will be reported as active if they are encountered.

Filter if Src

This indicates that a bridge/router manager has specified that frames having this source address will be filtered.

Filter if Dest

This indicates that a bridge/router manager has specified that frames having this destination address will be filtered.

Filter if Src / Dest

This indicates that a bridge/router manager has specified that frames having this source or destination address will be filtered. (This station can neither send data across the bridge/router, nor receive data from across the bridge/router.)

WAN Access

This indicates that the LAN device with this MAC address is allowed to pass data over the WAN connection to the remote site.

Location

Internal

These are the STP Multicast and LAN port MAC addresses that are internal to the bridge/router itself. Note that the bridge/router's MAC address is used for the default bridge/router and LAN names. Partner bridge/router's MAC addresses will also be listed as internal. Internal addresses are not subject to the aging timer, but will be reported as active if they are encountered.

LANxxxxxx (unknown)

These addresses are identified as to their location on a specific LAN, or as an (unknown) location. Their LAN location is identified either by manual entry or through the Learning Process when encountered.

5 - Show Permanent Table

The Show Permanent Table option displays all of the permanent filter-table addresses entered by the bridge/router manager for which the locations were identified (Internal addresses are not displayed.) The "(fixed)" Location descriptor indicates that a manager made the entry and specified the LAN location.

```
                          Operator Defined MAC Addresses
                                    Filter if  WAN
Address             Active Perm Src  Dest Access Location
Start of table
02-44-00-c8-9a-ff     *     *              *    LAN050607
12-34-56-78-99-99     *     *   *     *         LAN050607(fixed)
End of table
```

6 - Clear Bridging Table

The Clear Bridging Table option removes all non-permanent filter table addresses.

Considerations:

To prevent accidental removal of all non-permanent addresses, this option must be confirmed by entering "yes" at the prompt. (Refuse by entering "no" or use the TAB key to back out).

Spanning Tree Menu

```
                              SPANNING TREE MENU

    Option                Value          Description
 1. STP state             [enabled]    - Enable/disable Spanning Tree Protocol
 2. Bridge priority       [32768]      - Define root bridge selection priority
 3. Forwarding delay      [15 sec]     - Set delay before forwarding begins
 4. Message age timer     [20 sec]     - Receive hello message interval
 5. Hello time            [2 sec]      - Set hello message transmission interval
 6. Show bridge                        - View bridge STP status
 7. Show ports                         - View STP port status



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **SPANNING TREE MENU** allows the management and display of the 802.1D Spanning Tree Protocol (STP) parameters.

Note: For remote bridge/routers in a WAN, the following values set on one bridge/router will be automatically set the same on all other remote bridge/routers in the WAN. (This is because all remote bridge/routers function together as one unified bridge).

STP state	Option 2
Bridge Priority	Option 3
Forwarding delay	Option 4
Message age timer	Option 5
Hello time	Option 6

If these values are set differently upon start-up, the values set on the bridge/router with the lowest MAC address will prevail.

1 - STP State

The STP State option toggles between the [enabled] / [disabled] states of the Spanning Tree Protocol for the bridge.

Considerations:

STP needs to be [enabled] only if a known or potential loop is probable in the network.

If the Spanning Tree Protocol is to be [disabled], Options 1, 3, and 5 - 8 have no relevance. Note that Option 4 (Forwarding Delay) is used as the Learning timer in a non-STP configuration.

The default state for STP is **disabled**.

2 - Bridge Priority

The Bridge Priority option specifies the bridge's priority for becoming the *Root Bridge*. The bridge with the lowest bridge priority is elected to be the Root Bridge.

Default: [32768] * (IEEE 802.1D recommendation)

Range: 0 to 65535

Considerations:

*** This value is the first part of the Bridge ID For example: 32768-0000d0111111**

If you want the bridges to decide among themselves which is to be the Root bridge, then set all bridges' bridge priorities to the IEEE 802.1D default 32768. In this instance, with all bridge priorities being the same, the bridge with the lowest MAC address will be chosen as the Root Bridge.

Lower Value

If you want this bridge to become the Root Bridge, then set this number to be lower than the other bridges in the network.

Higher Value

If you want this bridge to become blocked (become the standby bridge where a redundant path exists), then set this number higher than the other bridge(s) competing to be the *designated bridge* for a LAN.

3 - Forwarding Delay

During a change in topology, the Forwarding Delay value specifies the time the bridge will wait in each of the *Listening* and *Learning States* before forwarding of frames begins.

In the *Listening State,* the bridge "listens" for the other bridges' topology and configuration information. (Non-permanent addresses are aged-out and cleared from the address table before the *Learning State* is entered.)

In the *Learning State,* the bridge learns the addresses of as many stations as possible, so when entering the *Forwarding State* it avoids flooding the network with packets destined for unknown addresses.

During the Listening and Learning State intervals, forwarding is blocked although during the Learning State, learned station information is included in the address table.

Default: [15 sec] (IEEE 802.1D recommendation)

Range: 4 to 30 seconds

Considerations:

The Forwarding Delay time of the bridge is applicable only if the bridge is, or becomes, the Root bridge, since the Root values override a non-root's Forwarding delay time value. The Root value is known as the Network Forward(ing) Delay.

Lower Value

If this bridge is the Root, or becomes the Root, setting the Forwarding Delay to a lower value might cause the network to flood with packets destined for addresses not yet learned. During the *Listening State*, the Root Bridge might also miss another bridge's information about a *Topology Change* if the Forwarding Delay is set too low.

Higher Value
Setting the value higher will increase the time spent in each of the *Listening and Learning States* when a reconfiguration is under way. A higher value will increase the time the network is unavailable for use during reconfiguration.

Recommendations:
The default value of 15 seconds is recommended by the IEEE 802.1D standard as a reasonable balance of performance. If a change is deemed necessary, increasing the value in consideration with Message (Max) Age is the recommended course of action.

The following relationship to Message (Max) Age must be maintained:
2 x (fwd_delay - 1.0) > max_age

4 - Message Age Timer

The Message Age Timer option specifies the length of time stored protocol information is considered valid. If a non-root bridge hasn't received protocol confirmation from the Root within this interval, it will broadcast to the other bridges that the topology has changed, and a reconfiguration calculation will be performed.

Default: [20 sec] (IEEE 802.1D recommendation)

Range: 6 to 40 seconds

Considerations:

The Maximum Age of the bridged network is set by the Root Bridge. If a reconfiguration of the bridged network occurs and this bridge becomes the Root, the value set at this bridge becomes the Network's value.

Lower Value

A much lowered Maximum Age value may cause more frequent reconfigurations of the bridged network (even if not necessary) if configuration information is delayed. A slightly lower value may trigger a reconfiguration more quickly should a bridge fail or a management action requests a change.

Higher Value

A higher Maximum Age value will allow more time for confirmation of the network configuration. This could be beneficial if delays are introduced and the network is frequently "going down" for unnecessary reconfigurations.

Recommendations:

The default value of 20 seconds is recommended by the IEEE 802.1D standard as a reasonable balance of performance. If a change is deemed necessary, increasing the value in consideration with Forwarding Delay and Hello Time is the recommended course of action.

The following relationship to Forwarding Delay must be maintained:
2 x (fwd_delay - 1.0) > max_age

The following relationship to Hello Time must be maintained:
Max Age > 2x (Hello Time + 1.0)

5 - Hello Time

The Hello Time option specifies the interval between the transmission of protocol configuration information by a bridge that is, or is attempting to become, the Root. In the Spanning Tree Protocol, only one bridge can be the Root Bridge. The Root Bridge generates a Configuration message after an interval set by this timer. (The Root is saying, "Hello, I'm still here".) All other bridges in the network wait for this Configuration message within the Network Hello Time to confirm that the topology is stable. If any bridge does not receive the Configuration message within the expected time, it will send out Topology Change messages to the other bridges in order to calculate a new configuration.

Default: [2 sec] (IEEE 802.1D recommendation)

Range: 1 to 10 seconds

Considerations:

This value is not directly used in configuration calculations but the bridged network uses the value set at the Root Bridge. (I.e. Network Hello Time).

Lower Value

Reducing this value increases the frequency of Configuration messages on the network, potentially creating excessive network traffic.

Higher Value

A higher value results in a slower response to a change in the topology of the network (e.g. addition/deletion/failure of bridges or communications paths).

Recommendations:

The default value of 2 seconds is recommended by the IEEE 802.1D standard as a reasonable balance of performance. If a change is deemed necessary, increasing the value in small steps is the recommended action.

The following relationship to Max Age must be maintained:
Max Age > 2 x (Hello Time + 1.0)

6 - Show Bridge

The Show Bridge option displays the Spanning Tree Protocol status of the bridge. The display of a Root bridge is shown below:

```
Bridge Status

Spanning Tree Protocol : Enabled
Bridge ID              : 32768-0000d0010101
Topology change        : 0
Designated Root        : 32768-0000d0010101
Root path cost         : 0
Root port              : None
Network Forward delay  : 15 seconds
Network Max age        : 20 seconds
Network Hello time     : 2 seconds
Bridge Forward delay   : 15 seconds
Bridge Max age         : 20 seconds
Bridge Hello time      : 2 seconds
```

Spanning Tree Protocol : Enabled

Indicates whether the Spanning Tree Protocol is Enabled or Disabled.

Bridge ID : 32768-0000d0010101
Designated Root : 32768-0000d0010101

The first part of each string indicates the (default) decimal Bridge Priority (32768). Refer to Option 4.

The remaining part of the string is the MAC address of the bridge and of the Root Bridge respectively.

If the Bridge ID string is identical to the Designated Root (bridge) string, then this bridge is the Root Bridge.

The Designated Root is the bridge sending/receiving frames to/from the attached LAN towards the Root Bridge.

Topology change : 0

If the topology is stable, this value is 0.
If the topology is changing, this value is 1.

Root path cost : 0
Root port : None

If this bridge is the Root Bridge, the Root path cost is 0 and the Root port value is None, as shown in the above display.

If this bridge is a non-root bridge, the cost is determined by the sum of this bridge's path costs leading to the Root Bridge.

The Root port of a non-root bridge is the port closest to the Root Bridge. It sends and receives protocol messages to/from the bridge and the Root Bridge. If this bridge is not the Root Bridge, the Root Port value will be in the format 0x8001. The "0x" is an indicator that the values to follow are in hex. Following the "0x" is the hex value of the decimal Port Priority. (The default Port priority of decimal 128 yields a hex value of 80.) Following the hex value is the port number (01). Default port priority values therefore yield a Root port value of 0x8001.

Network Forward delay : 15 seconds *
Network Max age : 20 seconds *
Network Hello time : 2 seconds *

Bridge Forward delay : 15 seconds **
Bridge Max age : 20 seconds **
Bridge Hello time : 2 seconds **

* These parameters are defined by the Root bridge.

** These parameters are defined at each bridge with Options 4, 5, and 6.

If this bridge is the Root bridge, corresponding parameters will be the same. If it is not the Root Bridge, these values may differ. (It is very possible that these values can be the same if this is not the Root Bridge, since these are the values recommended by the IEEE 802.1D standard. Check and compare the Bridge ID to the Root ID for confirmation of the Root.)

7 - Show Ports

The Show Ports option displays the status of this bridge's STP ports.

```
Port Status Summary


                                          Designated       Designated
                                            Bridge           Port
Name             State     Id Pri  Cost    Address    Pri   Id Pri  Cost
---------------- -------- --- --- ----- ------------ ----- --- --- -----
LAN              Forward    1 128 100           Self          Self
SITE2            Forward   44 128 100   020304050607 32768  44 128     0
```

Name

The **Name** column shows either the name of the STP port. LAN for the local LAN, or the remote site profile alias name for a properly connected remote site device.

State

The **State** column indicates the current port states that may be Disabled (by management action); or either Listen(ing), Learn(ing), Forward(ing) or Block(ing) (by STP action).

ID

In the above display, there are two indicators of the LAN port identifying numbers. They are found under the **ID** columns. They may not fall in order, as the listing is based on the MAC address of each bridge.

Cost

The **Cost** columns indicate the contributing cost of each port's path to the Root Path Cost.

Designated Bridge

If "self" is listed, then the bridge is the designated bridge for the LAN it is attached to.

Address

This is the MAC address for the designated bridge attached to the specified LAN.

Priority

This is the port priority given to the designated bridge.

Designated Port

ID

This is the Port ID number.

Priority

This is the priority of the Designated Port.

Cost

If this is the Root Port, the priority is 0.

IP Routing Set-Up Menu

```
                          IP ROUTING SET-UP MENU

    Option                Value          Description
 1. IP routes             menu         - Modify/view routes
 2. ARP set-up            menu         - Configure ARP operation
 3. IP routing           [enabled]     - Enable/disable IP router
 4. IP forwarding        [enabled]     - Enable/disable IP routing
 5. ARP proxy            [disabled]    - Support proxy-ARP




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **IP ROUTING SET-UP MENU** allows the display and configuration of the IP Routing parameters for the router.

1 - IP Routes

The IP Routes option directs you to the IP Routes Menu, where the routing tables are displayed and changed.

2 - ARP Set-Up

The ARP Set-up option directs you to the ARP Set-Up Menu, where the ARP timers may be set and the ARP table may be viewed.

3 - IP Routing

The IP Routing option enables or disables the IP routing functions of the router.

Default: [enabled]

Considerations:

When IP Routing is disabled, all learned RIP routes will be cleared from the routing table.

4 - IP Forwarding

The IP Forwarding option enables or disables the forwarding of IP traffic when IP routing is enabled. When the IP forwarding option is disabled, IP traffic across the WAN links will be blocked

Default: [enabled]

5 - ARP Proxy

When this option is enabled, the IOLINK router will respond to local network ARP requests destined for other networks. The IOLINK router will reply to any matching route in the routing table. The IOLINK router will also reply for a station that is supposed to be on the local LAN but is connected through a remote route in the routing table.

Default: [disabled]

IP Routes Menu

```
                              IP ROUTES MENU

    Option                  Value          Description
 1. Edit route              menu         - Modify a route in the table
 2. Default gateway        [none]        - Define default gateway
 3. Show all routes                      - Display the route table
 4. Show static routes                   - Display only static routes
 5. Clear static routes                  - Remove all permanent entries









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **IP ROUTES MENU** allows the display and configuration of the routing tables.

1 - Edit Route

The Edit Route option directs you to the Edit Route Menu where the routing tables are modified.

2 - Default Gateway

The Default Gateway option allows the identification of a default gateway (i.e. *router*). Messages destined for hosts not on this (sub-)network are forwarded to the default gateway. The default gateway may be located on the local LAN or may be one of the remote site peer IP routers.

Note: If using raw 1490 Frame Relay, either enable "Auto Default Route" or configure the Default Gateway remote site peer address to access the Default Gateway.

If PPP is used and the IP address of the remote site peer IP router is not known, the default gateway may be defined as the remote site ID. This will cause the default gateway to become whatever device is currently connected at that remote site.

When an SNMP message is to be sent to an NMS, first the routing table is checked for a known route. If a route to the NMS is unknown, the SNMP message will then be sent to the default gateway. If the default gateway cannot provide the best route, it will send the message to the gateway that can provide the best route. After the default gateway sends the message to the other gateway for delivery, the default gateway will send an ICMP Redirect message back to the router that points to the best route gateway. In this manner, the router is informed of the best route for future SNMP message delivery.

A configured Default Gateway will override a default route learned from RIP. If there is more than one default gateway defined within the routing table, the default gateway with the lowest cost will be used and displayed in this option.

Default: [none]

```
Enter :
    none, gateway IP address, remote site ID or alias (up to 18 characters)
>
```

3 - Show All Routes

The Show All Routes option displays all of the routes currently in use by the router. The table is sorted by destination IP address. The default gateway, either learned or defined, will be displayed as "default route."

There is a maximum of 512 route entries allowed in the table.

```
                              All IP Routes
Total entries : 0 R: al 0, fr 512, tot 512  N: al 0, fr 1024, tot 1024

 Destination      Mask    Next Hop        Interface                    Route
 IP Address       Size   IP Address     Up / Identifier  Cost  Age    Type
---------------  ---- ---------------  ---------------  ----  ----   ------
 --Start of table--
 5.5.5.0           24  5.5.5.1          * LAN.1            1     0    DIRECT
 5.5.5.1           32  5.5.5.1          * LAN.1            1     0    DIRECT
 192.168.12.0      24  192.168.12.1     * LAN              1     0    DIRECT
 192.168.12.1      32  192.168.12.1     * INTERNAL         1     0    DIRECT
 192.168.15.1      32  192.168.15.1     * RS2              2     0    CONNECT
 192.168.84.0      24  192.168.84.1       RS4              2     0    CONNECT
 192.168.84.1      32  192.168.84.1       RS4              2     0    CONNECT
 198.169.1.150     32  198.169.1.150      RS5              2     0    CONNECT
--End of table--
```

Destination IP Address:	Network IP address of the remote network. Routes listed with a "+" indicate that these are secondary routes to the same destination network. If the main route goes away, the secondary route will be used.
Mask Size:	Subnet mask size defined for the route.
Next Hop IP Address:	IP address of the next hop router to use to reach the Destination IP Address.
Interface Up	An asterisk will be displayed if this route is up.
Interface Identifier	RS followed by a number indicates the Remote site profile ID number that this route is currently using. LAN indicates that this route is on the local LAN. A decimal point and number following the LAN indicates that this is a secondary network. INTERNAL indicates that this is the IP address of a port on this device
Cost:	Number of hops to reach the Destination IP Address.
Age:	Actual cost to reach the Destination IP Address. Triggered RIP routes will be indicated as RIP routes with a constant age of 0.
Route Type:	Type of route used: RIP, LOCAL, CONNECT, DIRECT, or OTHER. LOCAL is used for static routes. CONNECT indicates the route is on a connected peer IP router on an unnumbered link. DIRECT indicates that the route is directly connected to one of the interfaces. This could also indicate the peer IP router of a numbered link.

4 - Show Static Routes

The Show Static Routes option displays all of the static routes currently in use by the router.

```
                        Static IP Routes
 Destination      Mask    Next Hop        Interface                    Route
 IP Address       Size   IP Address     Up / Identifier  Cost  Age     Type
----------------  ---- ---------------  ---------------  ----  ----   ------
 --Start of table--
 5.5.5.0           24  5.5.5.1          * LAN.1            1     0    DIRECT
 5.5.5.1           32  5.5.5.1          * LAN.1            1     0    DIRECT
 192.168.12.0      24  192.168.12.1     * LAN              1     0    DIRECT
 192.168.12.1      32  192.168.12.1     * INTERNAL         1     0    DIRECT
 192.168.15.1      32  192.168.15.1     * RS2              2     0    CONNECT
 192.168.84.0      24  192.168.84.1     * RS4              2     0    CONNECT
 192.168.84.1      32  192.168.84.1     * RS4              2     0    CONNECT
 198.169.1.150     32  198.169.1.150    * RS5              2     0    CONNECT
--End of table--
```

5 - Clear Static Routes

The Clear Static Routes option clears all of the static routes from the routing table.

Note: any Default Gateway static routes that were automatically created will be deleted by this operation. A warning will be displayed if there was a default gateway defined in the static routing table.

Edit Route Menu

```
                              EDIT ROUTE MENU

    Option           Value           Description
 1. Destination    "none" [0]     - Destination IP address
 2. Next hop       "none"         - Next hop address
 3. Network mask  *"none"         - The network mask for the route
 4. Status        *[undefined]    - Is the address in the table




Enter:
    destination IP address (up to 15 characters)


> 192.3.44.0
```

The above display is the first level of the **EDIT ROUTE MENU**. The destination network IP address must be entered as well as the subnet mask size associated with the destination IP address. Once the destination network IP address and mask size have been entered, the next hop IP address or remote site ID/alias must be entered.

The menu title will change to indicate the destination IP network address and the subnet size that are being edited.

```
                              EDIT ROUTE MENU

     Option          Value                   Description
 1. Destination    "199.45.67.00" [26]    - Destination IP address
 2. Next hop       "198.65.43.21"         - Next hop address
 3. Type          *"LOCAL"                - Type of route
 4. Cost           [1]                    - Cost to reach destination in hops
 5. Private        [disabled]             - Do not advertise route
 6. Add/Remove                            - Add/Remove information in table
 7. Network mask  *"255.255.255.192"      - The network mask for the route
 8. Status        *[absent]               - Is the address in the table


Enter option number, "=" - main menu, <TAB> - previous menu


>
```

NOTE: A Static Route will **NOT** be replaced with a RIP route, even if the cost is lower.

1 - Destination

The destination IP address to be entered into the static routes table. The IP address is entered as four decimal numbers between 1 and 255, separated by decimal points. After the IP address is entered, the mask size will be requested; enter a number between 1 and 32 to indicate the number of bits to be used for the subnet mask. A mask size of 32 will specify the exact destination address entered.

2 - Next Hop

The Next Hop option defines the IP address or remote site profile ID or alias of the next-hop router to be used to reach the destination IP address.

3 - Type

The Type option displays the type of route. The route type may be either RIP or LOCAL. RIP is a learned route from the RIP updates on the network. LOCAL is a static route entered by the operator of the router.

4 - Cost

The Cost option defines the number of hops required to reach the destination IP address.

Default: [1]

Range: 1 - 15

5 - Private

The Private option when set to enabled causes the IOLINK router to not advertise this route in the RIP messages.

Default: [disabled]

6 – Add/Remove

This option toggles between Add and Remove depending on whether the entry is present in the route table or not.
The Add option adds the IP address to the routing table.
The Remove option removes the IP address from the routing table. If the route is a RIP route, the route may be re-learned by the next RIP route update from partner routers.

7 - Network Mask

The subnet mask for the destination IP network is calculated from the entered destination IP network address and the subnet size value. The resulting subnet mask is displayed here. This is a display only value.

8 - Status

The Status option tells whether the address is "Present" or "Not Present" in the Routing Table. When the address is first entered, "Added" is the Status value. The * beside the value indicates that this value is changed automatically as an address is added or deleted and cannot be manually redefined.

Default: * [Not Present]

ARP Set-Up Menu

```
                              ARP SET-UP MENU

    Option              Value          Description
 1. ARP aging timer    [2 min]       - Interval to remove entries
 2. ARP retry timer    [2 sec]       - Interval to retry ARP
 3. Add ARP entry                    - Add static ARP entry
 4. Remove ARP entry                 - Delete static ARP entry
 5. Show ARP table                   - View ARP table









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **ARP SET-UP MENU** contains options used to view and maintain the ARP table for this device.

1 - ARP Aging Timer

The ARP Aging Timer option sets the ARP (Address Resolution Protocol) aging timer. Upon the expiration of the ARP aging timer, unused entries are removed from the ARP cache.

Default: [2 min]

Range: 1 to 1440 minutes (1 day)

2 - ARP Retry Timer

The ARP Retry Timer option sets the time-out value after which an ARP message will be resent.

Default: [2 sec]

Range: 1 - 20 seconds

3 – Add ARP Entry

The Add ARP Entry option allows the manual entry of static addresses into the ARP table. When this option is selected, you are requested to enter the IP address, then to enter the MAC address of the node to be added.

4 – Remove ARP Entry

The Remove ARP Entry option allows removal of node addresses from the ARP table. Entries may be removed individually by entering the IP address of the node to be removed. Groups of addresses may also be removed: all static addresses may be taken out by entering "static", all dynamically assigned addresses by entering "dynamic" or the entire table may be cleared by entering "all".

5 - Show ARP Table

The Show ARP Table option displays all of the devices that have responded to ARP requests from this router and the devices that this router has responded to with an ARP reply. IP address information learned (possibly via RIP) will also be added to the table to eliminate the need for generating an ARP request when data needs to be sent to that address in the future.

```
                          Arp Table

 Interface      IP Address            MAC Address        Type
 ------------------------------------------------------------
 LAN            164.44.25.142         00-00-d0-00-23-24  dynamic
 LAN            164.44.25.98          00-00-d0-00-24-24  dynamic
 LAN            164.44.25.37          00-00-d0-00-25-24  dynamic
 LAN            164.44.25.13          00-00-d0-00-26-24  dynamic
 LAN            164.44.25.33          00-00-d0-00-27-24  dynamic
 Link 1         164.44.26.53          00-00-d0-00-28-24  dynamic
 Link 2         164.44.27.76          00-00-d0-00-23-25  dynamic

Type: [s]tart, [n]ext, [=] main menu, any other key to end.
```

Interface:	Interface on which the ARP mapping applies.
IP Address:	IP address of the device in the ARP table.
MAC Address:	MAC address of the device in the ARP table.
Type:	Type of entry in the table, either dynamic (learned via ARP requests) or static (configured via SNMP or console).

IP Security Set-Up Menu

```
                          IP SECURITY SET-UP MENU

    Option            Value          Description
 1. IP security      [enabled]     - Enable/disable IP security
 2. Policy set-up     menu         - Define IPsec policy
 3. Interfaces        menu         - Define IPsec interfaces
 4. Statistics        menu         - IPsec statistics
 5. Diagnostics       menu         - IPsec diagnostic tools



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **IP SECURITY SET-UP MENU** allows IPSec to be enabled or disabled and provides menus for setting IPSec policies, for defining where the IPSec interface is to be, for IPSec statistics and to set up and send IPSec diagnostic packets.

1 – IP Security

The IP Security option toggles the IPSec protocol suite of IP extensions that provide network security through a suite of cryptography methods.

Default: [enabled]

2 – Policy Set-up

The Policy set-up option takes you to the IP Policy Set-up Menu where IPSec policy items may be reviewed and edited.

3 – Interfaces

The Interfaces option takes you to the Interfaces Menu where the interface at which IPSec is to operate is set.

4 – Statistics

The Statistics option takes you to the IPSec Statistics Menu where IPSec policy and item stats be reviewed.

5 – Diagnostics

The Diagnostics option takes you to the IPSec Diagnostics Menu where an IPSec test packet may be set up and tested against the policy table to see which item (if any) matches the test packet.

Policy Set-Up Menu

```
                          POLICY SET-UP MENU

    Option                Value              Description
 1. Edit item             menu             - Modify/create policy item
 2. Show item                              - Display policy item
 3. Show summary                           - Display policy item summary
 4. Show active items                      - Display active item summary
 5. Show SA summary                        - Display SA summary
 6. Remove item                            - Remove policy item
 7. Local IP address    [none]             - Define local IP address
 8. Default action      [bypass-IPsec]     - Define default frame processing




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **POLICY SET-UP MENU** displays IPSec policy items, lets you set up policy items, defines a local IP address and sets the action to be taken with packets that fail to match an IPSec policy item.

An IPSec Policy consists of the table of items that define IPSec processing for any packet that passes through the IPSec interface(s).

A policy item consists of the set of rules that packets will be tested against, the Security Association that defines the connection parameters between the two end points of the link, and the processing actions that are performed on the packets.

A Security Association defines a dedicated secure virtual connection between two nodes. The nodes are typically IPSec enabled routers (also known as security gateways) with a LAN as one connection and an unsecure network (such as the Internet) on another. The SA is identified by of the IP Address of the destination, identification codes for the SA, and the protocol to be used (always Encapsulating Security Payload protocol for this software release). Included within th SA are the algorithms used for authentication and encryption of the packets, and the keys for encodeing and decoding packets with those algorithms.

An SA is defined from an originating node to a destination node; it is, therefor a one way connection. To allow secure two way traffic across the unsecured network, two corresponding SAs will be defined on the peer routers that will be mirror images of each other, that is, all outbound parameters on one node will be set as inbound parameters on the peer and vice versa.

An essential part of the security provided by IPSec is the encapsulating of the original packet for transmission across the unsecured portion of the network. Both the data and header information, including original source and destination address, protocol, and packet size, are encrypted and wrapped in a packet with only the addresses of the end points on the unsecured network and the SA idendifier code visible during transmission across the SA. What this provides in effect is a secure tunnel between the two nodes through the unsecured network.

With this software release, only one IPSec policy may be set; Policy and Security Association (SA) parameters such as encryption and authentication keys must be set manually. An IPSec policy is made up of one or more (up to a maximum of 32) items.

1 – Edit Item

The Edit Item option takes you to the Edit Item Menu where IPSec Policy Items may be configured.

2 – Show Item

```
                          Policy Item 1 - [ IPSec_1 ]

Policy Item Parameters
Status:                    Active             Priority:              10
Action:               Apply-IPsec          SA Creation:          Manual

Manual SA Parameters
Local IP Addr:      198.169.1.109         Peer IP Addr:     192.168.2.1
SA Mode:                  Tunnel            Protocol:             ESP
Authentication:         HMAC-MD5          Encryption:             DES
Outbound SPI:         0xffffffff          Inbound SPI:      0x11111111

Selection Rules
Source IP:          198.169.1.109 / 255.255.255.0
Destination IP:       192.168.2.1 - 192.168.2.3
Protocol:                    ANY
Source Port:                 ANY
Destination Port:            ANY
```

The Show Item option displays a detailed listing of the settings for the requested item:

Policy Item Parameters

Status: policy item is active, inactive or modified

Action: processing that will be applied to packets that match this policy item: apply-IPsec, bypass-IPsec, discard

Priority: indicates the priority of this item in the policy list. Items are checked from lowest to highest priority

SA Creation: always Manual

Manual SA Parameters

Local IP Addr: IP address for the local end of IPSec Security Association (SA(s))

SA Mode: tunnel or transport

Authentication: MD5 or none

Outbound SPI: 32 bit (8 hex character) Security Parameter Index transmitted with the outbound packet as part of the identification of the outbound IPSec SA

Peer IP Addr: IP address for the remote end of IPSec SA(s)

Protocol: always ESP

Encryption: DES, 3-DES (if option enabled) or null

Inbound SPI: 32 bit (8 hex character) Security Parameter Index that is used to identify the IPSec SA for an inbound packet.

Selection Rules

Source IP: the source address against which packets will be tested for this item. The address may appear as:.

A single address listing indicates that the source must be this specific IP address

Two addresses seperated by a dash indicates that the source may be within a range of IP addresses; any address that falls on or between the addresses shown will match the rule.

An address followed by a slash and a number indicates that the destination may be on a subnet as specified by the address and the mask size shown. Any address on the subnet will match the rule.

Destination IP: the destination address against which packets will be tested for this item. The address may appear as:

A single address listing indicates that the destination must be this specific IP address

Two addresses seperated by a dash indicates that the destination may be within a range of IP addresses; any address that falls on or between the addresses shown will match the rule.

An address followed by a slash and a number indicates that the destination may be on a subnet as specified by the address and the mask size shown. Any address on the subnet will match the rule.

Protocol: Protocol number to compare against the protocol of a packet (any or a protocol number between 1 and 255)

Source Port: any port or a specific port number (between 1 and 65535)

Destination Port: any port or a specific port number (between 1 and 65535)

3 – Show Summary

```
                                                Total Entries: 1

[*] - Entry has been modified
Id Alias            Pri Action  Active  Mode  Peer            Prot Encr Auth
-- ---------------- --- ------- ------ ------ --------------- ---- ---- ----
 1 IPSec_1           10 IPsec   Yes    Tunnel 192.168.2.1      ESP DES  MD5









Type: [s] to redraw, [=] main menu, any other key to end.
```

The Show Summary option lists all the items in the policy table in order if their ID numbers, with the following parameters for each item:

Id: the identification number assigned to this item

Alias: the user defined name assigned to this item

Pri: the priority level of this item, packet matching is done from lowest to highest priority

Action: processing that will be applied to packets that match this policy item: apply-IPsec, bypass-IPsec, discard

Active: yes if this policy item is active, no if the item has been modified but not activated

Mode: tunnel or transport

Peer: IP address of the remote end of the IPSec SA(s)

Prot: Protocol used with this item – always ESP

Encr: type of encryption – DES, 3-DES (if option enabled), or null

Auth: authentication mode – MD5 or none

4 – Show Active Items

```
 Device: DEV050607                                Total Entries: 0

[*] - Entry has been modified
Pri Id Alias            Action  Active  Mode  Peer            Prot Encr Auth
--- -- ---------------- ------- ------ ------ --------------- ---- ---- ----
 10  1 IPSec_1          IPsec   Yes    Tunnel 192.168.2.1      ESP DES  MD5




Type: [s] to redraw, [=] main menu, any other key to end.
```

Active Items are shown in order of priority, lowest to highest, with the following parameters for each item:

Pri: the priority level of this item, packet matching is done from lowest to highest priority

Id: the identification number assigned to this item

Alias: the user defined name assigned to this item

Action: processing that will be applied to packets that match this policy item: apply-IPsec, bypass-IPsec, discard

Active: will always be yes as this is the active policy items display

Mode: tunnel or transport

Peer: IP address of the remote end of the IPSec SA(s)

Prot: Protocol used with this item – always ESP

Encr: type of encryption – DES, 3-DES (if option enabled), or null

Auth: authentication mode – MD5 or none

5 – Show SA Summary

```
SA Id Dir Source Address  Dest Address    SPI(hex) Mode   Prot Encr Auth
----- --- --------------- --------------- -------- ------ ---- ---- -----
    7 OUT 198.169.1.109   192.168.2.1     ffffffff Tunnel ESP  DES  HMAC_MD5
    8 IN  192.168.2.1     198.169.1.109   11111111 Tunnel ESP  DES  HMAC_MD5

    9 OUT 201.19.53.121   188.54.2.18     fafafafa Tunnel ESP  DES  HMAC_MD5
   10 IN  188.54.2.18     201.19.53.121   12345678 Tunnel ESP  DES  HMAC_MD5




Type: [s] to redraw, [=] main menu, any other key to end.
```

The Show SA Summary option displays a listing of current Security Associations, each related SA pair is shown grouped together.

SA Id: an arbitrary identification number assigned to this security association

Dir: the direction of the SA – inbound or outbound

Source Address: the IP address of the originating SA connection

Dest Address: the IP address of the receiving SA connection

SPI: Security parameter index – the 32 bit (8 hex characters) number assigned when this SA was created; used by each router to identify this SA.

Mode: tunnel or transport

Prot: Protocol used with this item – always ESP

Encr: type of encryption – DES, 3-DES (if option enabled) or null

Auth: authentication mode – MD5 or none

6 – Remove Item

The Remove Item option deletes and item from the policy table.

7 – Local IP Address

The Local IP Address to be used for Security Association negotiations. This must be a public address of this device known to the local network. This address should not be dynamically assigned.

Default: [none]

Options: none, LAN1, LAN2 (if option installed), IP address

8 – Default Action

The Default Action option defines the processing that will be applied to packets, which fail to match any of the items in the policy table.

Note: bypass-IPSec is intended for set-up purposes only as it allows packets from any source to any destination across the interface. This is useful for remote configuration of the router but is insecure and should be changed to discard for normal operation.

Default: [bypass-IPsec]

Options: apply-IPSec, bypass-IPSec, discard

Edit Item Menu

```
                          EDIT ITEM MENU

    Option              Value          Description
 1. Name               [         ]    - Define item name
 2. Status            *[         ]    - Item status
 3. Priority           [         ]    - Define item priority
 4. Action             [         ]    - Define IPsec frame processing
 5. Selection rules     menu          - Define selection rules




Enter :
    policy item ID or alias (1 to 16 characters)


>
```

The **EDIT ITEM MENU** will appear as above until the ID number or alias for the policy item is entered. If the policy item is being created, enter an alias name for the item (up to 16 alphanumeric characters, no spaces); the next sequential ID number will be automatically assigned. Once the identity of the item has been established, the will change to reflect the characteristics of that item, as shown on the following page.

Edit Policy 1 Item x Menu

```
                          EDIT POLICY 1 ITEM 1 MENU

    Option              Value             Description
 1. Name              "IPSec_1"        - Define item name
 2. Status           *[inactive]       - Item status
 3. Activate                           - Activate this item
 4. Priority          [10]             - Define item priority
 5. Action            [apply-IPsec]    - Define IPsec frame processing
 6. SA creation      *[manual]         - Define SA creation method
 7. Manual ESP SA     menu             - Define manual ESP SA
 8. Selection rules   menu             - Define selection rules




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **EDIT POLICY 1 ITEM x MENU** defines the parameters of a policy item. A policy may have up to 32 items.

A policy item consists of the set of rules that packets will be tested against, the Security Association that defines the connection parameters between the two end points of the link, and the processing actions that are performed on the packets. Packet matching tests are performed in the order of priority of the items in the policy table, lowest to highest.

When a policy item is configured, the reference direction will be OUTBOUND from this interface; parameters for both outbound and inbound Security Associations are to be set according to this reference. Remember that for two-way communication, the peer router (security gateway) must be set up with a coresponding policy item that mirrors the parameters of this item.

1 – Name

The Name option shows the current alias for this policy item and allows you to change it if desired. The alias may be up to 16 alpha-numeric characters long, no spaces, use underscore.

2 – Status

The Status option shows whether this item is active or inactive. Only active policy items are used in IPSec processing. An item is initially inactive when it is created. When an item has been modified, the status field will change to reflect this, but the item will remain active with the original settings until the modification is updated with option 4 below.

3 – Activate/Dectivate

The Activate option enables an inactive policy item; Deactivate disables an active item.

4 – Update

Update enables a modified policy item. When an item is modified, the changes made by editing have no effect until the item is updated.

Note: this option appears only when the item has been modified and not yet updated.

4/5 – Priority

The Prority option sets where this item test will occur compared to other items in the policy table. Packets are processed and applied against Active Policy Items in order of item priority from lowest to highest priority.

When an item is created, it is automatically assigned a priority of 10 more than the current largest priority. This number may be changed to put the item in the desired order of processing. Leaving a gap between item priority numbers allows room for insertion of future items into a desired spot in list.

Default: [10 + current highest priority]

Range: 1 - 999

5/6 – Action

The Action option defines the processing that will be applied to packets matching this policy item.

Default: [apply-IPSec]

Options: apply-IPSec, bypass-IPSec, discard

6/7 – SA Creation

The SA Creation option is a read-only display that shows how this Security Association has been created; currently only manual SA creation is available.

7/8 – Manual ESP SA

The Manual ESP SA option takes you to the Manual ESP SA menu where Encapsulating Security Payload Security Association parameters may be set.

8/9 – Selection Rules

The Selection Rules option takes you to the Selection Rules menu where the source and destination packet selection rules for this policy item may be set.

Edit Policy 1 Item x Manual ESP SA Menu

```
                EDIT POLICY 1 ITEM 1 MANUAL ESP SA MENU

    Option              Value          Description
 1. Peer IP address    [none]        - Define peer IP address
 2. SA mode            [tunnel]      - Define IPsec SA mode
 3. Authentication     [none]        - Define ESP athentication
 4. Encryption         [DES]         - Define ESP encryption
 5. Outbound SPI       [0]           - Define outbound SPI
 6. Inbound SPI        [0]           - Define inbound SPI
 7. Keys                menu         - Define manual ESP keys



Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **EDIT POLICY 1 ITEM x MANUAL ESP MENU** allows you to manually set the Encapsulating Security Payload Security Association parameters for this policy item. The SA of a policy item is identified by

1 – Peer IP Address

The Peer IP Address option defines the address of remote end of this SA connection. This address will be checked on incoming packets, along with the Inbound SPI and the portocol of the packet.

Default: [none]

Options: none, IP address

2 – SA Mode

The SA mode option defines whether the IPSec Security Association is to operate in tunnel or transport mode. In tunnel mode, the originating and destination IP addresses are encapsulated in the packet transmitted over the network, only the addresses of the gateways at either end of the connection are not encrypted. This option should be set to tunnel mode for regular IPSec communication over the network. In transport mode, the data packet is encrypted, but the origin and destination addresses will be those of the security gateway routers. Transport mode is intended to bu used for router management communication, such as setting IPSec parameters.

Default: [tunnel]

Options: tunnel, transport

3 – Authentication

The Authentication option defines whether or not this policy item is to use HMAC MD5 authentication. The "none" option is available only if encryption (option 4) has been set to a value other than "null"; ie. you can't turn off both authentication and encryption at the same time.

Default: [MD5]

Options: none, MD5

4 – Encryption

The Encryption option defines the type of encryption, if any, to be used for this policy item. 3-DES encryption is available as an upgrade option, please see page 17 for upgrade information. The "null" option is available only if authentication (option 3) has been set to a value other than "none"; ie. you can't turn off both authentication and encryption at the same time.

Default: [DES]

Options: DES, 3-DES (if option enabled), null

5 – Outbound SPI

The Outbound SPI option defines the 8 hexadecimal character (32 bit) Security Parameter Index to be sent with outbound packets to identify this IPSec Security Association. This SA will be identified by the receiving gateway by matching this SPI, plus the destination address (Peer IP address in option 1), plus the protocol (ESP).

Default: [0]

Options: up to 8 hex characters

6 – Inbound SPI

The Inbound SPI option defines the 8 hexadecimal character (32 bit) Security Parameter Index to be checked for on inbound packets to identify if they were sent using this Security Association. Packets will be tested against this SPI, plus the destination address (Local IP address of this router) and the protocol (ESP). Packets that match will use this SA for decryption.

Default: [0]

Options: up to 8 hex characters

Note: when setting up an SA connection between two routers, the SPI entries in this menu on each router will be mirror images; for example, the Outbound SPI on one router will be the Inbound SPI on the peer router at the other end of the connection.

7 – Keys

The Keys option takes you to the Keys menu where the Encryption and Authentication keys may be set.

Edit Policy 1 Item x Manual ESP SA Keys Menu

```
                EDIT POLICY 1 ITEM 1 MANUAL ESP SA KEYS MENU

   Option                  Value
 1. Outbound encrypt key   [none]
 2. Inbound encrypt key    [use_outbound]
 3. Outbound auth key      [none]
 4. Inbound auth key       [use_outbound]




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **EDIT POLICY 1 ITEM x MANUAL ESP SA KEYS MENU** allows you to manually set the values for the Encapsulating Security Payload Security Association keys to be used with this policy item.

Note: when setting up an SA connection between two routers, the key entries in this menu on each router will be mirror images; for example, the Outbound encryption key on one router will be the Inbound encryption key on the peer router at the other end of the connection.

1 – Outbound Encrypt Key

The Outbound Encrypt Key option defines the 16 or 48 hex character key to be used for encrypting the Encapsulating Security Payload (ESP) portion of outbound data packets.

Note: the DES keys must be exactly 16 hex characters, 3-DES keys must be exactly 48 hex characters.

Default: [none]

Options: none, 16 hex characters (DES), 48 hex characterd (3-DES)

2 – Inbound Encrypt Key

The Inbound Encrypt Key option defines the 16 or 48 hex character key to be used for decrypting the Encapsulating Security Payload (ESP) portion of inbound data packets.

Note: DES keys must be exactly 16 hex characters, 3-DES keys must be exactly 48 hex characters.

Default: [none]

Options: none, use_outbound, 16 hex characters (DES), 48 hex characterd (3-DES)
use_outbound copies the outbound encryption key entered for option 1 into the inbound encryption key

3 – Outbound Auth Key

The Outbound Auth Key option defines the 32 hex character key to be used for the authentication algoritm (MD5) applied to outbound data packets.

Note: the entry must be exactly 32 hex characters.

Default: [none]

Options: none, 32 hex characters

4 – Inbound Auth Key

The Inbound Auth Key option defines the 32 hex character key to be used for the authentication algoritm (MD5) applied to inbound data packets.

Note: the entry must be exactly 32 hex characters.

Default: [none]

Options: none, use_outbound, 32 hex characters
use_outbound copies the outbound authentication key entered for option 1 into the inbound authentication key

Edit Policy 1 Item x Selection Rules Menu

```
                EDIT POLICY 1 ITEM 1 SELECTION RULES MENU

   Option       Value         Description
 1. Src IP      [any]       - Define Source IP address
 2. Dest IP     [any]       - Define Destination IP address
 3. Protocol    [any]       - Define protocol
 4. Src port    [any]       - Define source port
 5. Dest port   [any]       - Define dest port









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **EDIT POLICY 1 ITEM x SELECTION RULES MENU** defines the policy item rules against which a packet will be tested.

When a policy item is configured, parameters for both outbound and inbound cases must be set. For this menu the reference direction will be OUTBOUND; the source and destination parameters will automatically be swapped to configure the inbound case.

Note that the policy item rules for inbound IPSec packets will not be tested until the packet has passed SA identification, authorization and decryption

1 – Src IP

The Src IP option defines the source IP address (specific or range) to match against packets.

Default: [any]

Options: any address, or a specific IP address, (press enter when prompted for a second address) or a range of addresses specified by first and last addresses, or a range of addresses specified by starting address and a mask size

2 – Dest IP

The Dest IP option defines destination the IP address (specific or range) to match against packets.

Default: [any]

Options: any address, or a specific IP address (press enter when prompted for a second address), or a range of addresses specified by first and last addresses, or a range of addresses specified by starting address and a mask size

3 – Protocol

The Protocol option defines the protocol number (between 1 and 255 inclusive) to match against packets for this policy item. The most common protocol numbers are: 6 (TCP), 17 (UDP) and 1 (ICMP – e.g. Ping).

Default: [any]

Options: any, protocol number (from 1 to 255)

4 – Src Port

The Src Port option defines the port number to match against packets for this policy item.

Default: [any]

Options: any, port number (from 1 to 65535)

5 – Dest Port

The Dest Port option defines the to match against packets for this policy item.

Default: [any]

Options: any, port number (from 1 to 65535)

Interfaces Menu

```
                          INTERFACES MENU

    Option              Value          Description
 1. IPsec Interface    [LAN]         - Define IPsec Interface









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

1 – IPSec Interface

The IPSec Interface option defines the interface at which IPSec protocols are to be applied. Selecting the "none" option will effectively turn IPSec off.

Note that selecting WAN enables IPSec processing on all WAN interfaces. This means that if the router has two WAN interfaces with one configured to communicate over the Internet and the other with a private link, a policy item must be created to allow the private link traffic to pass through.

Default: [LAN] (IOLINK-PRO)
[LAN1] (IOLINK-520)

Options: none, LAN, WAN (IOLINK-PRO, single LAN IOLINK-520)
none, LAN1, LAN2, WAN (dual LAN IOLINK-520)

Statistics Menu

```
                          STATISTICS MENU

    Option              Description
 1. Show policy statistics       - Show policy statistics
 2. Show item statistics         - Show item statistics
 3. Clear Policy statistics      - Clear policy statistics
 4. Clear item statistics        - Clear item statistics









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **STATISTICS MENU**displays the statistics for an IPSec policy or a policy item and allows the statistics to be reset.

1 – Show Policy Statistics

```
                          IPsec Policy Statistics

Outbound            Packets/Bytes      Inbound             Packets/Bytes
------------------------------------ ------------------------------------
      Inspected:       7081/1153911          Inspected:       6381/1145276
        Discard:          0/0                  Discard:        641/38460
         Bypass:       3692/866075              Bypass:       5659/1092496
   Encapsulated:       3389/464104        Decapsulated:         81/9996
       Tunneled:       3389/464104            Tunneled:         81/9996
      Transport:          0/0                Transport:          0/0
      Encrypted:       3389/328616           Decrypted:         81/9996
  Authenticated:       3383/395844            Verified:         81/11728
Default discard:          0/0           Default discard:          0/0
 Default bypass:       3648/862475      Default bypass:       5615/1088896

Errors
  Error discard:          0              Error discard:          8
Internal errors:          0            Internal errors:          0
                                        Decrypt errors:           0
                                          Auth failure:           0
                                        Policy failure:           8


Type: [s] to redraw, [=] main menu, any other key to end.
```

The Show Policy Statistics displays IPSec traffic statistics for all items of this policy

Inspected: count of total packets / bytes tested against this policy

Discard: count of total packets / bytes discarded after matching an item under this policy or by the default action for this policy

Bypass: count of total packets / bytes bypassed around IPSec processing after matching an item under this policy

Encapsulated: count of total transmitted or default action packets / bytes encapsulated by IPSec processing after testing against this policy

Decapsulated: count of total received packets / bytes decapsulated by IPSec processing

Tunneled: count of total packets / bytes transmitted or received through IPSec tunneling after testing against this policy

Transport: count of total packets / bytes transmitted or received through IPSec transport after testing against this policy

Encrypted: count of total Outbound packets / bytes encrypted by IPSec processing after testing against this policy

Decrypted: count of total Inbound packets / bytes decrypted by IPSec processing after testing against this policy

Authenticated: count of total Outbound packets / bytes authenticated by IPSec processing after testing against this policy

Verified: count of total Inbound packets / bytes with authentication verified by IPSec processing after testing against this policy

Default discard: count of total packets / bytes discarded after failing to match an item under this policy

Default bypass: count of total packets / bytes bypassed around IPSec processing after failing to match an item under this policy

Error Discards: summation count of packets discarded due to one of the errors listed below

Internal Errors: count of packets discarded due to being received with an unknown authorization or encryption algorithm

Decrypt Errors: count of packets discarded due to detection of a corrupted packet by the decryption algorithm.

Auth Failure: count of packets discarded due to authentication failure

Policy Failures: count of packets which passed authentication but were discarded due to failure to match any item in the policy table after decapsulation, decryption and authentication (post processing for incoming tunnel packets)

2 – Show Item Statistics

```
                          IPsec Policy Item 1 Statistics          V 51V4.6.2.3
MH

Outbound             Packets/Bytes      Inbound              Packets/Bytes
------------------------------------ ------------------------------------
      Inspected:       3373/282732           Inspected:         64/5840
        Discard:          0/0                 Discard:         12/720
         Bypass:         44/3600               Bypass:         44/3600
   Encapsulated:       3329/452168        Decapsulated:         20/1200
       Tunneled:       3329/452168            Tunneled:         20/1200
      Transport:          0/0                Transport:          0/0
      Encrypted:       3329/319080           Decrypted:         20/1200
  Authenticated:       3323/385108            Verified:         20/1600

Errors
  Error discard:          0              Error discard:          0
Internal errors:          0            Internal errors:          0
                                        Decrypt errors:          0
                                          Auth failure:          0



Type: [s] to redraw, [=] main menu, any other key to end.
```

The Show Policy Statistics displays IPSec traffic statistics for a selected item of this policy. After selecting this option, you will be requested to enter the ID number or alias of the policy item you wish to view statistics for.

The display descriptions are the same as for the previous statistics display.

3 – Clear Policy Statistics

The Clear Policy option resets the statistics counters in the Show Policy display to zero.

Options: totals – resets only the totals summed from the policy list but leaves the stats for individual items
all – resets both overall totals and individual item ststs

4 – Clear Item Statistics

The Clear Item option resets the statistics counters for the item ID number or alias entered to zero.

Diagnostics Menu

```
                              DIAGNOSTICS MENU

    Option         Value          Description
 1. Test IPsec     menu         - Send test packet through system




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **DIAGNOSTICS MENU** contains one option, which takes you to the Test IPSec menu on the following page.

Test IPSec Menu

```
                              TEST IPSEC MENU

    Option          Value          Description
 1. Src IP          ""           - Define source IP address
 2. Dest IP         ""           - Define destination IP address
 3. Protocol        [50]         - Define protocol
 4. Src port        [100]        - Define source port
 5. Dest port       [100]        - Define dest port
 6. Direction       [inbound]    - Incoming or outgoing
 7. Perform test                 - Test packet



Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **TEST IPSec MENU** allows formatting of an IPSec test packet and internal testing of that pacet against the IPSec table of policy items.

1 – Src IP

The Src IP option defines the source IP address to set for the test packet.

2 – Dest IP

The Dest IP option defines destination the IP address to set for the test packet.

3 – Protocol

The Protocol option defines the protocol number (between 1 and 255 inclusive) to set for the test packet packets. The most common protocol numbers are: 6 (TCP), 17 (UDP) and 1 (ICMP – e.g. Ping).

Default: [any]

Options: any, protocol number (from 1 to 255)

4 – Src Port

The Src Port option defines the source port number to set for the test packet.

Default: [any]

Options: any, port number (from 1 to 65535)

5 – Dest Port

The Dest Port option defines the destination port number to set for the test packet

Default: [any]

Options: any, port number (from 1 to 65535)

6 – Direction

The Direction option defines the direction to set for the test packet to cross the IPSec interface

Default: [Inbound]

Options: Inbound, Outbound

7 – Perform Test

The Perform Test option matches the test packet configured above against the items in the policy table until a match is found or the end of the table is reached and displays the results of the test. As shown below:

```
                        POLICY TEST

* - Match   ! - No Match   NA - Not Applicable   <-- - Selected Policy

Id  Pri   SrcIP  DstIP  Prot  SrcPort  DstPort    Action     Match?
--  ---   -----  -----  ----  -------  -------  -----------  ------
 1   10     !      !      *       *        !      Apply IPsec   NO
 4   40     *      *      *       *        *      Apply IPsec   YES  <--

-- End of Active Policy list  --

-- Press <Tab> or <Esc> to return to menu  --
```

IPX Routing Set-Up Menu

```
                          IPX ROUTING SET-UP MENU

    Option                    Value        Description
 1. Static routes             menu       - Edit/display static routes
 2. Static services           menu       - Edit/display static services
 3. IPX routing              [enabled]   - Enable/disable IPX router
 4. IPX forwarding           [enabled]   - Enable/disable IPX routing
 5. Local networks                       - Display local network connections.
 6. Show routes                          - Display the route table
 7. Show services                        - Display the service table
 8. Help                                 - Description of IPX routing



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **IPX ROUTING SET-UP MENU** allows the display and configuration of the IPX Routing parameters for the router.

1 - Static Routes

The Static Routes option directs you to the Static Routes Menu, where user defined IPX static routes are maintained.

2 - Static Services

The Static Services option directs you to the Static Services Menu, where user defined IPX static services are maintained.

3 - IPX Routing

The IPX Routing option enables or disables the IPX routing.

Default: [enabled]

Considerations:

Routing information (RIP) will only be transmitted across the WAN to the partner router according to the state of the IPX DMR Enabled option within the IPX Parameters menu of the remote site profile used to establish a PPP connection. If demand RIP is enabled, RIP messages will only be transmitted when there is a change.

When IPX Routing is disabled, all learned RIP routes will be cleared from the routing table.

4 - IPX Forwarding

The IPX Forwarding option enables or disables the forwarding of IPX traffic. When the IPX forwarding option is disabled, IPX traffic across the WAN links will be blocked

Default: [enabled]

Considerations:

When IPX Forwarding is disabled all learned RIP routes will be cleared from the routing table.

5 - Local Networks

The Local Networks option displays all of the IPX network numbers currently in use by the router on each of its interfaces.

```
                  LOCAL IPX NETWORKS

LAN Interface:
    Ethernet II          51524
    Raw 802.3            0
    IEEE 802.2           0
    802.2 Snap           0

WAN Interface:
    SITE2                14526
```

6 - Show Routes

The Show Routes option displays all of the learned IPX routes currently in use by the router.

There is a maximum of 512 route entries allowed in the table.

```
                        IPX Routes
Total entries : 7

 Network   Interface          Next Hop      Hops    Ticks
-------------------------------------------------------
 51524     local                local         0        1
 126       lan              205204239749     2       50
 14526     SITE2            992400423941     2       50
```

Network: IPX Network Address of the remote network.

Interface: Interface that the IPX network is located on; either local, LAN or remote site router.

Next Hop: IPX address of the next-hop router to use to reach the Destination IPX Network.

Hops: Number of hops to reach the Destination IPX Network.

Ticks: Number of ticks to reach the Destination IPX Network.

Considerations:

A 9600-bps link on this router has a tick value of 5.

7 - Show Services

The Show Services option displays all of the Servers currently seen by the router. The Services table is created from information received by this router in SAP (Server Advertising Protocol) packets generated by Novell Servers.

There is a maximum of 512 server entries allowed in the table.

```
                        IPX Services
Total entries : 3
 Type      Server Address         Hops  Server Name
-------------------------------------------------
 0004  00000311:0000ff3a4001:0451   2  SQA_SERVER_311
 0004  00000312:00004ac38445:0451   6  NOVELL312
 0004  00000401:000e03448a32:0451   2  NOVELL_401
```

Type:	Novell Server types. Some possible Server types are:	
	Unknown	0
	Print Queue	3
	File Server	4
	Job Server	5
	Print Server	7
	Archive Server	9
	Remote Bridge Server	24
	Advertising Print Server	47
Server Address:	IPX address of the Server.	
Hops:	Number of hops to reach the Server from this router.	
Server Name:	Name of the Server.	

8 - Help

The Help option offers a brief description of the IPX routing options.

Static IPX Routes Menu

```
                              STATIC ROUTES MENU

    Option                  Value          Description
 1. Edit route              menu         - Modify a route in the table
 2. Convert route                        - Make a learned route static
 3. Show static routes                   - Display static routes
 4. Clear static routes                  - Remove groups of static routes









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **STATIC IPX ROUTES MENU** allows the display and configuration of the static IPX routing tables.

1 - Edit Route

The Edit Route option directs you to the Edit Route Menu where the static IPX routing table entries are modified. A maximum of 50 static IPX routes may be defined.

2 - Convert Route

The Convert Route option is used to convert one of the currently learned IPX routes into an IPX static route. Enter the IPX network number of the learned route when prompted and then enter a static route id number. The learned IPX route will become a static IPX route.

```
Enter:
 network number

>


Enter:
 static route entry id
>
```

3 - Show Static Routes

The Show Static Routes option displays all of the static IPX routes currently in use by the router.

```
                              IPX Static Routes
 Total entries : 2

 ID   Network   Interface         Next Hop      Hops  Ticks
-------------------------------------------------------------
 1    00000012  lan               000000012345   1        1
 2    00004143  SITE2             n/a            1        1
```

ID:	Entry number in the static IPX routes table.
Network:	IPX Network Address of the remote network.
Interface:	Interface that the IPX network is located on, either LAN or remote site router.
Next Hop:	IPX address of the next-hop router to use to reach the Destination IPX Network.
Hops:	Number of hops to reach the Destination IPX Network.
Ticks:	Number of ticks to reach the Destination IPX Network.

4 - Clear Static Routes

The Clear Static Routes option clears the specified static IPX routes from the routing table.

```
Enter:
 all, lan, remote site id or alias (up to 16 characters)
>
```

Edit Static IPX Route Menu

```
                              EDIT ROUTE MENU

    Option       Value          Description
 1. Status     *[        ]    - Is entry in static route table
 2. Network     [        ]    - Destination network number
 3. Interface   [        ]    - Interface to destination network
 4. Hops        [        ]    - Hops to destination network
 5. Ticks       [        ]    - Ticks to destination network









Enter:
    entry id (from 1 to 50)


> 1
```

The above display is the first level of the **EDIT ROUTE MENU**. The table id number must be entered to proceed to the next level.

The menu title will change to indicate the table id number that is being edited.

```
                          EDIT ROUTE 1 MENU

    Option       Value            Description
 1. Status     *"Not Present"   - Is entry in static route table
 2. Network     "1"             - Destination network number
 3. Interface   ""              - Interface to destination network
 4. Hops        [1]             - Hops to destination network
 5. Ticks       [1]             - Ticks to destination network









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

NOTE: A Static Route will **NOT** be replaced with a RIP route, even if the hop and tick count is lower.

1 - Status

The Status option tells whether the static route is "Present" or "Not Present" in the Routing Table. When the route entry is first entered, "Not Present" is the Status value. The * beside the value indicates that this value is changed automatically as an entry is added or deleted and cannot be manually redefined.

Default: * [Not Present]

2 - Network

The Network option defines the destination IPX network address of the static route.

3 - Interface

The Interface option defines the interface, either LAN or remote site device, which the destination IPX network is located on. A value of LAN indicates that another IPX router located on the locally connected LAN is to be used to access the destination IPX network. When the interface is set to LAN, the option Next Hop will be available to define the MAC address of the router located on the locally connected LAN.

A value of a remote site profile name or id indicates that the destination IPX network is located on the remote site IPX router. The Next Hop option is not required and therefore not available when a remote site profile is defined for the interface.

4 - Next Hop

The Next Hop option defines the MAC address of the next-hop IPX router on the locally connected LAN to be used to reach the destination IPX network. The next-hop router must be on the local IPX network.

5 - Hops

The Hops option defines the number of hops to reach the destination IPX network.

Default: [1]

Range: 1 - 15

6 - Ticks

The Ticks option defines the number of ticks to reach the destination IPX network.

Default: [1]

Range: 1 - 64000

7 - Remove

The Remove option removes the IPX static route from the routing table.

Static IPX Services Menu

```
                          STATIC SERVICES MENU

    Option                  Value         Description
 1. Edit service            menu        - Edit a static service
 2. Convert service                     - Make a learned service static
 3. Show static services                - Display the service table
 4. Clear static services               - Remove groups of static services









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **STATIC IPX SERVICES MENU** allows the display and configuration of the static IPX services.

1 - Edit Service

The Edit Service option directs you to the Edit Service Menu where the static IPX service entries are modified. A maximum of 50 static IPX services may be defined.

2 - Convert Service

The Convert Service option is used to convert one of the currently learned IPX services into an IPX static service. Enter the server name and service type of the learned service when prompted and then enter a static service id number. The learned IPX service will become a static IPX service.

```
Enter:
 server name

>


Enter:
 hex service type
>


Enter:
 static service entry id
>
```

3 - Show Static Services

The Show Static Services option displays all of the static IPX services currently in use by the router.

```
                              IPX Static Services
 Total entries : 2

 ID Interface        Type Server Address             Hops Server Name
-------------------------------------------------------------------------
  1 lan              0017 00000002:000000015223:0000  0   Mars
```

ID:	Entry number in the static IPX services table.
Interface:	Interface that the IPX service is located on, either LAN or remote site router.
Type:	Hex value of the type of IPX service.
Server Address:	IPX Address of the server.
Hops:	Number of hops to reach the server.
Server Name:	Name of the server.

4 - Clear Static Services

The Clear Static Services option clears the specified static IPX services from the table.

```
Enter:
 all, lan, remote site id or alias (up to 16 characters)
>
```

Edit Static IPX Service Menu

```
                          EDIT SERVICE MENU

    Option          Value          Description
 1. Status        *[        ]    - Is entry in static route table
 2. Server name    [        ]    - Novell server name
 3. Service type   [        ]    - Novell service type
 4. Interface      [        ]    - Interface to service
 5. Network        [        ]    - Server's network number
 6. Node           [        ]    - Server's node number
 7. Socket         [        ]    - Service's socket number
 8. Hops           [        ]    - Hops to server



Enter:
    entry id (from 1 to 50)


> 1
```

The above display is the first level of the **EDIT SERVICE MENU**. The table id number must be entered to proceed to the next level.

The menu title will change to indicate the table id number that is being edited.

```
                       EDIT SERVICE 1 MENU

    Option          Value                  Description
 1. Status        *"Not Present"         - Is entry in static route table
 2. Server name    ""                    - Novell server name
 3. Service type   [1]                   - Novell service type
 4. Interface      ""                    - Interface to service
 5. Network        "1"                   - Server's network number
 6. Node           "00-00-00-00-00-01"   - Server's node number
 7. Socket         [0]                   - Service's socket number
 8. Hops           [1]                   - Hops to server



Enter option number, "=" - main menu, <TAB> - previous menu


>
```

NOTE: A Static Service will **NOT** be replaced with a SAP learned service, even if the hop count is lower.

1 - Status

The Status option tells whether the static service is "Present" or "Not Present" in the Table. When the service entry is first entered, "Not Present" is the Status value. The * beside the value indicates that this value is changed automatically as an entry is added or deleted and cannot be manually redefined.

Default: * [Not Present]

2 - Server Name

The Server Name option defines the IPX server name of the static service.

3 - Service Type

The Service Type option defines the type of IPX service as a hex value.

Default: [1]

Range: 1 - ffff

4 - Interface

The Interface option defines the interface, either LAN or remote site device, which the IPX service is located on. A value of LAN indicates that the service is located on the locally connected LAN.

A value of a remote site profile name or id indicates that the service is located on the remote site IPX router's network.

5 - Network

The Network option defines the IPX network address of the static service.

6 - Node

The Node option defines the IPX node address of the static service.

7 - Socket

The Socket option defines the socket number of the static service if applicable.

8 - Hops

The Hops option defines the number of hops to reach the IPX service.

Default: [1]

Range: 0 - 15

Filter Set-Up Menu

```
                          FILTER SET-UP MENU

    Option                      Value         Description
 1. MAC address filters         menu        - Define MAC address filters
 2. Bridge pattern filters      menu        - Define bridge pattern filters
 3. IP router pattern filters   menu        - Define IP pattern filters
 4. IPX router pattern filters  menu        - Define IPX pattern filters









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **FILTER SET-UP MENU** provides paths to Menus for complete filter configuration.

1 - MAC Address Filters

The MAC Address Filters option takes you to the MAC Address Filters Menu, where you can define parameters for Source MAC Filters.

2 - Bridge Pattern Filter

The Bridge Pattern Filter option takes you to the Bridge Pattern Filter Menu, where you can create bridge filters based on custom specifications.

3 - IP Router Pattern Filter

The IP Router Pattern Filter option takes you to the IP Router Pattern Filter Menu, where you can create IP filters based on custom specifications.

4 - IPX Router Pattern Filter

The IPX Router Pattern Filter takes you to the IPX Router Pattern Filter Menu, where you can create IPX filters based on custom specifications.

MAC Address Filters Menu

```
                          MAC ADDRESS FILTERS MENU

    Option                      Value        Description
 1. Edit MAC address filter     menu       - Configure MAC address filter
 2. Filter operation           [positive]  - Set operation of filters
 3. Broadcast address          [forward]   - Filter MAC broadcast frames
 4. Show bridging table                    - View MAC address table
 5. Show permanent table                   - View permanent addresses only
 6. Clear bridging table                   - Delete all non-permanent entries









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **MAC ADDRESS FILTERS MENU** allows the display and configuration of the MAC Address Filters for the router.

1 - Edit MAC Address Filter

The Edit MAC Address Filter option takes you to the Edit MAC Address Filter Menu, where the MAC Address Filters are modified.

2 - Filter Operation

The Filter Operation option changes the operation of the MAC address filters defined in the bridging table from positive to negative.

When Filter Operation is positive, all frames with MAC addresses as defined in the bridging table will be filtered.

When Filter Operation is negative, all frames with MAC addresses as defined in the bridging table will be forwarded.

Internal addresses will not be affected by the current state of the Filter Operation. All internal addresses will automatically be corrected for proper operation regardless of the current setting of Filter Operation.

Default: [Positive]

3 - Broadcast Address

The Broadcast Address option allows the choice of filtering or forwarding of MAC broadcast frames for bridged data.

When set to forward, all MAC broadcast frames will be forwarded.

When set to filter, all MAC broadcast frames will be filtered.

Default: [forward]

4 - Show Bridging Table

The Show Bridging Table option displays all addresses in the Bridge Filter Table, identifies the active/inactive and permanent/non-permanent addresses, identifies addresses to be filtered if they are a source and/or destination, describes their location, and gives the total number of address table entries.

```
                          ALL Known MAC Addresses
Total entries : 20
                               Filter If
Address            Active Perm Src  Dest         Location
Start of table
01-80-c2-00-00-01                                Internal
01-80-c2-00-00-02                                Internal
01-80-c2-00-00-03                                Internal
01-80-c2-00-00-04                                Internal
01-80-c2-00-00-05                                Internal
01-80-c2-00-00-06                                Internal
01-80-c2-00-00-07                                Internal
01-80-c2-00-00-08                                Internal
01-80-c2-00-00-09                                Internal
01-80-c2-00-00-0a                                Internal
01-80-c2-00-00-0b                                Internal
01-80-c2-00-00-0c                                Internal
01-80-c2-00-00-0d                                Internal
01-80-c2-00-00-0e                                Internal
01-80-c2-00-00-0f                                Internal
02-44-00-c8-9a-ff     *     *                *   LAN050607
02-44-00-c8-9a-ee     *                      *   LAN050607
12-34-56-78-99-99     *     *   *      *         LAN050607(fixed)
11-11-11-11-11-11                      *         unknown
ff-ff-ff-ff-ff-ff                                Internal
end of table
```

Refer to the Show Bridging Table option of the Bridging Set-up menu for more details.

5 - Show Permanent Table

The Show Permanent Table option displays all of the permanent filter table addresses entered by the router manager for which the locations were identified (Internal addresses are not displayed.) The "(fixed)" Location descriptor indicates that a manager made the entry and specified the LAN location.

```
                          Operator Defined MAC Addresses
                                Filter if  WAN
Address            Active Perm Src  Dest Access Location
Start of table
02-44-00-c8-9a-ff     *     *              *    LAN050607
12-34-56-78-99-99     *     *   *     *         LAN050607(fixed)
End of table
```

6 - Clear Bridging Table

The Clear Bridging Table option removes all non-permanent filter table addresses.

Considerations:

To prevent accidental removal of all non-permanent addresses, this option must be confirmed by entering "yes" at the prompt. (Refuse by entering "no" or use the TAB key to back out).

Edit MAC Address Filter Menu

```
                        EDIT MAC ADDRESS FILTER MENU

    Option              Value          Description
 1. Status             *[        ]    - Is the address in the table?
 2. Location           *[        ]    - Location of MAC address
 3. Filter if source    [        ]    - Filter all frames from this address
 4. Filter if dest      [        ]    - Filter all frames to this address
 5. Permanent           [        ]    - Address is not subject to aging
 6. Remove                            - Delete address









Enter:
    MAC address in hexadecimal (up to 17 characters)

> d0456789
```

The above display is the first level of the **Edit MAC Address Filter Menu**. Once the MAC address is entered (leading 0s are padded), the address specified is added to the menu title bar, the values are shown for the address, and the options become available, as shown below:

```
                EDIT MAC ADDRESS 00-00-d0-45-67-89 FILTER MENU

    Option              Value            Description
 1. Status             *"Not Present"   - Is the address in the table?
 2. Location           *"unknown"       - Location of MAC address
 3. Filter if source    [disabled]      - Filter all frames from this address
 4. Filter if dest      [disabled]      - Filter all frames to this address
 5. Permanent           [disabled]      - Address is not subject to aging
 6. Remove                              - Delete address


>
```

1 - Status

The Status option tells whether the address is "Present" or "Not Present" in the Address Table. When the address is first entered, "Not Present" is the Status value, and a Location value of [unknown] is shown. The * beside the value indicates that this value is changed automatically as an address is added or deleted and cannot be manually redefined.

Default: * [Not Present]

2 - Location

The Location option identifies the location of the MAC address. The locations will either be "unknown" or the LAN name of one of the partner connected IOLINK routers. The * beside the value indicates that this value is changed automatically as the location is learned and cannot be manually redefined.

Default: ***** [unknown]

3 - Filter *(Forward)* If Source

The Filter If Source option toggles between Enabling and Disabling of the Source Filtering (Forwarding) feature for the specified address.

Default: [disabled]

Considerations:

When the Filter Operation is set to positive, enabling this option will prevent frames from this address from crossing the bridge/router to the associated LAN. Once Filter if Source is chosen, the Permanent value is set to [enabled]. This may be toggled back to [disabled] if a non-permanent entry is desired.

When the Filter Operation is set to negative, enabling this option will allow frames from this address to cross the bridge/router to the associated LAN. Once Forward if Source is chosen, the Permanent value is set to [enabled]. This may be toggled back to [disabled] if a non-permanent entry is desired.

4 - Filter *(Forward)* If Destination

The Filter If Destination option toggles between Enabling and Disabling of the Destination Filtering feature for the specified address.

Default: [disabled]

Considerations:

When the Filter Operation is set to positive, enabling this option will prevent access to this address from another LAN station located across the bridge/router. Once Filter if Destination is chosen, the Permanent value is set to [enabled]. This may be toggled back to [disabled] if a non-permanent entry is desired.

When the Filter Operation is set to negative, enabling this option will allow access to this address from another LAN station located across the bridge/router. Once Forward if Destination is chosen, the Permanent value is set to [enabled]. This may be toggled back to [disabled] if a non-permanent entry is desired.

5 - Permanent

The Permanent option toggles between Enabling and Disabling of the Permanent Address Value.

Default: [disabled]

Considerations:

This Value must be [enabled] if you want to make the Address Permanent. If [enabled] the Address will not be subject to removal by the expiration of the Aging Timer or the Clear Filter Table option (found in the Bridging Set-Up Menu or the MAC Address Filters Menu).

If a station is not expected to move, making the address Permanent will offer a slight increase in bridge/router performance.

6 - Remove

Select the Remove option to remove the specified address (permanent or non-permanent). Internal and system-supplied addresses cannot be removed.

Bridge Pattern Filter Menu

```
                          BRIDGE PATTERN FILTERS MENU

    Option                  Description
 1. Show alias            - View pattern filter aliases
 2. Add alias             - Create an alias for a pattern filter
 3. Remove alias          - Delete a pattern filter alias
 4. Show pattern          - View current pattern filters
 5. Add pattern           - Create a pattern filter
 6. Remove pattern        - Delete a pattern filter
 7. Help                  - Read pattern filter and alias description









Enter option number, "=" - main menu, <TAB> - previous menu



>
```

The **BRIDGE PATTERN FILTER MENU** allows for the inclusion of custom-programmable filters in the filter table to provide increased security and maximum local LAN usage.

The bridge/router supports up to 64 patterns and 32 aliases (including the defaults). Each pattern may be up to 80 characters in length. The total number of characters in all defined patterns must not exceed 500.

EXAMPLES:	Refer to the Programmable Filtering section of the Reference Manual file, for detailed filter construction information with examples.

1 - Show Alias

The Show Alias option displays existing default Aliases and those created with the Add Alias option.

```
                          Bridge Pattern Filter Aliases

 1. IP          - 12-0800
 2. TCP         - IP & 23-06
 3. UDP         - IP & 23-11
 4. ARP         - 12-0806
 5. NETWARE     - 12-8137 | 12-8138
 6. APPLE       - 12-809B
 7. DECNET      - 12-6003
 8. LAT         - 12-6004
 9. XNS         - 12-0807


Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

2 - Add Alias

The Add Alias option allows the creation of an easily identifiable string of characters to identify a complex Filter Mask:

```
Enter:
 alias name (up to 8 characters)

> bmCast


Enter:
 filter pattern for alias (up to 80 characters)
> 0-fffffffffff


Enter:
 alias ID number (from 1 to 32)

> 3
```

Once an alias is created, you must use Add Pattern to add the alias to the filter table and make it operational:

```
Enter:
 filter pattern (up to 80 characters)
> bmCast


Enter:
 pattern ID number (from 1 to 64)
>5
```

Check the alias filter assignment with the Show Pattern option:

```
                          Bridge Filter Patterns

ID    Pattern
--    ----------------------------
1     12-600x
2     0-010203040506&12-809B
...
5     bmCast
```

3 - Remove Alias

The Remove Alias option deletes an Alias from the Alias Table. (Confirm with Show Alias.)

```
Enter:
 alias ID number, alias name

> bmCast
```

"bmCast" is used on LAN 1	**(Prevents blanket removal when an alias is in use:** carefully **check usage** of the alias with **Show Pattern** and then, **if removal of the alias is still desired**, use the **Remove Pattern** option first to remove all occurrences of the alias in the Filter Pattern table, **then use** the **Remove Alias** option).

4 - Show Pattern

The Show Pattern option displays the filter masks that have been defined with the Add Pattern option:

```
Enter:
 all, global, lan, Remote site id or alias
>
```

global

```
                          Global Bridge Filter Patterns
Id    Pattern
--    ----------------------------
1     12-600x
3     LAT
```

MARKETING - (Remote Site Alias)

```
                       Bridge Filter Patterns to MARKETING
Id    Pattern
--    ----------------------------
2     0-010203040506&12-809B
```

all

```
                      Summary of all Bridge filter patterns
Type      Id    Pattern
--------  --    ----------------------------
Global     1     12-600x
           3     LAT
MARKETING  2     0-010203040506&12-809B
```

5 - Add Pattern

The Add Pattern option allows the definition of a filter mask and adds it to the filter table. *Filter masks are checked against the frame in the order of their index numbers, so those that are most likely to be encountered should have the lowest index numbers.*

```
Enter:
 global, lan, Remote site id or alias
>

Enter:
 filter pattern (up to 80 characters)
> 12-600x

Enter:
 pattern ID number (from 1 to 64)
> 1
```

A **global** filter pattern will be applied to all bridge data.

A **LAN** filter pattern will be applied to all bridge data being sent to the local LAN.

A **Remote Site Id or Alias** filter pattern will be applied to all bridge data being sent to the specified remote site only. The Remote Site Alias specified must be defined on this device.

6 - Remove Pattern

The Remove Pattern option deletes a previously created filter mask (in this case, a filter mask with the pattern ID of "2"). (Confirm the removal with Show Pattern).

```
Enter:
 all, pattern ID number
>2
```

7 - Help

The Help option provides Help screens describing the creation of Filter Masks.

To move between the Help screens, type: [s]tart, [n]ext, or [p]rev. (You must use lower-case letters)

IP Router Pattern Filter Menu

```
                        IP ROUTER PATTERN FILTER MENU

    Option                Description
 1. Show alias          - View pattern filter aliases
 2. Add alias           - Create an alias for a pattern filter
 3. Remove alias        - Delete a pattern filter alias
 4. Show pattern        - View current pattern filters
 5. Add pattern         - Create a pattern filter
 6. Remove pattern      - Delete a pattern filter
 7. Help                - Read pattern filter and alias description









Enter option number, "=" - main menu, <TAB> - previous menu



>
```

The **IP ROUTER PATTERN FILTER MENU** allows for the inclusion of custom programmable filters in the filter table to provide increased security and maximum local LAN usage.

The router supports up to 64 patterns and 32 aliases (including the defaults). Each pattern may be up to 80 characters in length. The total number of characters in all defined patterns must not exceed 500.

EXAMPLES:	Refer to the Programmable Filtering section of the Reference Manual file, for detailed filter construction information with examples.

1 - Show Alias

The Show Alias option displays existing default Aliases and those created with the Add Alias option.

```
                        IP Router Pattern Filter Aliases

 1. TCP       - 09-06
 2. UDP       - 09-11
 3. MSBROWSE  - 20-0089003


Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

2 - Add Alias

The Add Alias option allows the creation of an easily identifiable string of characters to identify a complex Filter Mask:

```
Enter:
 alias name (up to 8 characters)

> bmCast

Enter:
 filter pattern for alias (up to 80 characters)
> 0-fffffffffff

Enter:
 alias ID number (from 1 to 32)

> 3
```

3 - Remove Alias

The Remove Alias option deletes an Alias from the Alias Table. (Confirm with Show Alias.)

```
Enter:
 alias ID number, alias name

> bmCast
```

"bmCast" is used on LAN 1	**(Prevents blanket removal when an alias is in use:** carefully **check usage** of the alias with **Show Pattern** and then, **if removal of the alias is still desired**, use the **Remove Pattern** option first to remove all occurrences of the alias in the Filter Pattern table, **then use** the **Remove Alias** option).

4 - Show Pattern

The Show Pattern option displays the filter masks that have been defined with the Add Pattern option:

```
Enter:
 all, global, lan, remote site id or alias
>
```

global

```
                          Global IP Pattern Filters
Id    Pattern
--    ---------------------------
1     12-600x
3     LAT
```

Vancouver (Remote Site alias)

```
                          IP Pattern Filters to Vancouver
Id    Pattern
--    ----------------------------
2     0-010203040506&12-809B
```

all

```
                          Summary of all IP Pattern Filters
Type      Id    Pattern
--------  --    ----------------------------
Global     1     12-600x
           3     LAT
Vancouver  2     0-010203040506&12-809B
```

5 - Add Pattern

The Add Pattern option allows the definition of a filter mask and adds it to the filter table. *Filter masks are checked against the frame in the order of their index numbers, so those that are most likely to be encountered should have the lowest index numbers.*

```
Enter:
 global, lan, Remote site id or alias
> Vancouver

Enter:
 filter pattern (up to 80 characters)
> 12-600x

Enter:
 pattern ID number (from 1 to 64)
> 2
```

A **global** filter pattern will be applied to all IP routed data.

A **LAN** filter pattern will be applied to all IP routed data being sent to the local LAN.

A **Remote Site Id or Alias** filter pattern will be applied to all IP routed data being sent to the specified remote site only. The Remote Site Alias specified must be defined on this device.

6 - Remove Pattern

The Remove Pattern option deletes a previously created filter mask (in this case, a filter mask with the pattern ID of "2"). (Confirm the removal with Show Pattern.)

```
Enter:
 all, pattern ID number
> 2
```

7 - Help

The Help option provides Help screens describing the creation of Filter Masks.

To move between the Help screens, type: [s]tart, [n]ext, or [p]rev. (You must use lower-case letters)

IPX Router Pattern Filter Menu

```
                      IPX ROUTER PATTERN FILTER MENU

    Option                  Description
 1. Show alias            - View pattern filter aliases
 2. Add alias             - Create an alias for a pattern filter
 3. Remove alias          - Delete a pattern filter alias
 4. Show pattern          - View current pattern filters
 5. Add pattern           - Create a pattern filter
 6. Remove pattern        - Delete a pattern filter
 7. Help                  - Read pattern filter and alias description




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **IPX ROUTER PATTERN FILTER MENU** allows for the inclusion of custom programmable filters in the filter table to provide increased security and maximum local LAN usage.

The bridge/router supports up to 64 patterns and 32 aliases (including the defaults). Each pattern may be up to 80 characters in length. The total number of characters in all defined patterns must not exceed 500.

EXAMPLES:	Refer to the Programmable Filtering section of the Reference Manual file, for detailed filter construction information with examples.

1 - Show Alias

The Show Alias option displays existing default Aliases and those created with the Add Alias option.

```
                        IPX Router Filter Pattern Aliases
 1. NETBIOS    - 5-14
```

2 - Add Alias

The Add Alias option allows the creation of an easily identifiable string of characters to identify a complex Filter Mask:

```
Enter:
 alias name (up to 8 characters)
> bmCast

Enter:
 filter pattern for alias (up to 80 characters)
> 0-fffffffffff

Enter:
 alias ID number (from 1 to 32)
> 3
```

3 - Remove Alias

The Remove Alias option deletes an Alias from the Alias Table. (Confirm with Show Alias.)

```
Enter:
 alias ID number, alias name

> bmCast
```

"bmCast" is used on LAN 1	**(Prevents blanket removal when an alias is in use:** carefully **check usage** of the alias with **Show Pattern** and then, **if removal of the alias is still desired**, use the **Remove Pattern** option first to remove all occurrences of the alias in the Filter Pattern table, **then use** the **Remove Alias** option).

4 - Show Pattern

The Show Pattern option displays the filter masks that have been defined with the Add Pattern option:

```
Enter:
 all, global, lan, remote site id or alias
>
```

global

```
                          Global IPX Pattern Filters
Id    Pattern
--    ----------------------------
1     12-600x
3     LAT
```

Vancouver (Remote Site alias)

```
                       IPX Pattern Filters to Vancouver
Id    Pattern
--    ----------------------------
2     0-010203040506&12-809B
```

all

```
                        Summary of all IPX Pattern Filters
Type       Id    Pattern
--------   --    ----------------------------
Global      1     12-600x
            3     LAT
Vancouver   2     0-010203040506&12-809B
```

5 - Add Pattern

The Add Pattern option allows the definition of a filter mask and adds it to the filter table. *Filter masks are checked against the frame in the order of their index numbers, so those that are most likely to be encountered should have the lowest index numbers.*

```
Enter:
 global, lan, Remote site id or alias
> Vancouver

Enter:
 filter pattern (up to 80 characters)
> 9-600x

Enter:
 pattern ID number (from 1 to 64)
> 2
```

A **global** filter pattern will be applied to all IPX routed data.

A **LAN** filter pattern will be applied to all IPX routed data being sent to the local LAN.

A **Remote Site Id or Alias** filter pattern will be applied to all IPX routed data being sent to the specified remote site only. The Remote Site Alias specified must be defined on this device.

6 - Remove Pattern

The Remove Pattern option deletes a previously created filter mask (in this case, a filter mask with the pattern ID of "2"). (Confirm the removal with Show Pattern.)

```
Enter:
 all, pattern ID number
>2
```

7 - Help

The Help option provides Help screens describing the creation of Filter Masks.

To move between the Help screens, type: [s]tart, [n]ext, or [p]rev. (You must use lower-case letters)

Applications Set-Up Menu

```
                          APPLICATIONS SET-UP MENU

   Option              Value           Description

 1. SNMP set-up         menu         - Define SNMP communications
 2. DHCP set-up         menu         - Define DHCP configuration
 3. Firewall set-up     menu         - Define firewall parameters
 4. NAT exports         menu         - Define exported services for NAT
 5. Syslog set-up       menu         - Define Syslog configuration
 6. Time to live       [32]          - Router hops allowed
 7. Traceroute                       - Trace a route
 8. Ping                             - ICMP echo requests




Enter option number, "=" - main menu, <TAB> - previous menu
>
```

The **APPLICATIONS SET-UP MENU** provides paths to menus for Internet communication management applications.

1 - SNMP Set-Up

The SNMP Set-up option takes you to the SNMP Set-Up Menu, where you to define the parameters necessary to allow the router's SNMP agent and corresponding MIB information to be accessed by an SNMP Network Management Station. Traps (Alarms) will also be sent by the router to the NMS to inform it of a significant event (cold start, warm start, link up, link down, and authentication failure).

2 - DHCP Set-Up

The DHCP Set-up option directs you to the DHCP Set-Up Menu, where the DHCP (Dynamic Host Configuration Protocol) parameters may be set and the IP address pool may be viewed.

3 - Firewall Set-Up

The Firewall Set-up option directs you to the Firewall Set-Up Menu, where the IP Firewall parameters may be set.

4 - NAT Exports

The NAT Exports option directs you to the NAT Exports Menu, where Internet services available for export on this network may be set up, checked, or removed.

5. Syslog Set-Up

The Syslog Set-up option directs you to the Syslog Set-up Menu, where a system message logging service to forward event messages to servers using the Syslog utility may be set up.

6 - Time To Live

The Time To Live option sets the maximum number of router hops that an IP packet generated by the router is allowed before being discarded.

IP packets that are being routed through the IOLINK router will have their time-to-live value decremented by two.

Default: [32]

Range: 1 - 255

7 – Traceroute

Sends a UDP packet to the destination you specify and lists the IP addresses of the devices that the packet passes through along the route to that destination.

8 - Ping

The Ping option generates ICMP Ping messages to the specified destination IP address. The size and number of packets transmitted is entered within the command options. If you enter a broadcast address, you will be additionally prompted for LAN or Remote Site ID information. The ping broadcast will then be sent out the LAN port or to the remote site router.

```
Enter :
    Destination (up to 15 characters)
> 25.25.25.25


Enter :
    Length of data in bytes (1472 or lower)
> 15


Enter :
    Number of packets to send (from 1 to 32767)
> 1
```

The results of the Ping messages received will be displayed on the screen. The example below shows the results of an unsuccessful Ping command.

```
Ping to 25.25.25.25, 15 bytes, count 1

Enter <Tab> or <Esc> to stop

No Reply from 25.25.25.25 sequence 0 for 2.0 seconds
Ping results for 25.25.25.25, packets transmitted 1, received 0


Press any key to return to menu.
```

SNMP Set-Up Menu

```
                              SNMP SET-UP MENU

    Option               Value           Description
 1. Edit community       menu          - Modify SNMP community
 2. Message size        [1472 bytes]   - Define maximum message size
 3. Show communities                   - View SNMP communities
 4. Remove community                   - Delete SNMP community









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **SNMP SET-UP MENU** allows the display and configuration of the Simple Network Management Protocol (SNMP) parameters for the router. For information on the IOLINK routers compliance with the SNMP Management Information Bases (MIBs) and details of the proprietary MIB, please refer to the MIB files on the CD-ROM included with the unit.

The SNMP Set Up Menu contains two default communities:
- "public" which is a read-only community accessible by all Network Management Station (NMS) addresses
- "GUI_Config" which is a read-write community accessible by all NMS addresses

1 - Edit Community

The Edit Community option takes you to the Define Community Menu, where the router's agent and NMS are brought under a management community.

2 - Message Size

The Message Size option allows the setting of the maximum message size sent by the router's SNMP agent.

Default: [1472 bytes]

Range: 484 to 1472 bytes

Considerations:

The message size sent by the router is determined by what the NMS can accept. The default size of 1472 bytes, combined with the "overhead," totals the maximum Ethernet frame size.

3 - Show Communities

The Show Communities option displays the defined SNMP communities.

```
SNMP Communities

Number of defined communities  :  3

Community Name   Write Access      Addresses          Trap Format
GUI_Config       enabled           all                    -

Public           disabled          all                    -

NMS_1            enabled           92.0.0.1           SNMPv1
                                   111.1.1.1          SNMPv2









Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

4 - Remove Community

The Remove Community option deletes the specified SNMP community from the list of available communities. Enter either the community name for a single deletion or "all" if the entire SNMP community list is to be deleted. Note that removing all communities will prevent access from any NMS until replacements are added.

Edit Community Menu

```
                          EDIT COMMUNITY MENU

    Option                 Value          Description
 1. Write access          [        ]    - Allow write access
 2. Show addresses                      - View address lists
 3. Add address                         - Add address and trap format
 4. Remove address                      - Delete address from list




Enter:
    community name string (up to 32 characters)

>
```

Note: only alphanumeric characters and the underscore ("_") character may be used in the community name. In addition, the characters are **case-sensitive**. Once the community name is defined, it is added to the Menu title (as shown below), and the options become available.

```
                      EDIT COMMUNITY Marketing MENU

    Option                 Value          Description
 1. Write access          [disabled]    - Allow write access
 2. Show addresses                      - View address lists
 3. Add address                         - Add address and trap format
 4. Remove address                      - Delete address from list




Enter:

>
```

1 - Write Access

The Write Access option defaults to [disabled] when a SNMP Community name string is entered. This allows an NMS to have read-only access to this SNMP Community. Write access [enabled] allows a NMS to have read/write access to the SNMP community.

Considerations:

If several NMSs are available at one site, a community might be named "Public" with read-only access. This allows all NMS managers to view SNMP information for the router, although only the community(ies) with read/write access [enabled] will be able to modify parameters. (Note that the community name "all" should not be used, since, if it were ever removed, other defined communities would be removed along with it).

2 - Show Addresses

The Show Addresses option provides a display of existing NMS and trap addresses for this Community name (e.g. Marketing).

```
Address Lists for Community Marketing
Total NMS addresses      :  3

Addresses                Trap Format
192.24.56.1              SNMPv1
111.1.1.1                SNMPv2
all                      -
```

3 - Add Address

Up to 10 addresses may be added to the address list. If the address list is empty, the router's SNMP agent will not accept requests from a NMS, even if it correctly provides this community name. If the list contains the single entry "all," the router's SNMP agent will accept requests from any NMS providing this community name. Addresses must be entered in standard IP format (four fields separated by a periods, with each field specifying a decimal number).

When a trap is generated by the router's SNMP agent, it will be sent (along with the Community name) to each of the destination addresses specified.

Considerations:

If "all" is initially chosen for the address list, and (one or more) specific addresses are desired as a replacement, remove "all" with *Option 4, Remove address,* to allow the addition of the new address(es).

4 - Remove Address

The Remove Address option deletes the specified address associated with the SNMP Community. Other addresses remain unaffected. (If "all" is specified, all addresses are deleted.)

DHCP Set-Up Menu

```
                              DHCP SET-UP MENU

    Option                    Value          Description
 1. Server IP address pool    menu         - Range of allowable addresses
 2. DNS set-up                menu         - Define DNS address(es)
 3. NetBIOS setup             menu         - NetBIOS parameters
 4. DHCP services            [none]        - Set DHCP operational mode
 5. Relay destination        [none]        - BOOTP/DHCP server IP address
 6. ICMP echo verification   [enabled]     - Ping allocated IP address
 7. Lease period             [60 min]      - Length of lease
 8. Default gateway          [automatic]   - Gateway for client



Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **DHCP SET-UP MENU** contains options used to dynamically configure and maintain the DHCP parameters for remote devices on a network via a central DHCP server. Dynamic Host Configuration Protocol (DHCP) allows configuration of devices (DHCP clients) to be handled from a central DHCP server. This allows devices to be added and removed from a network with all of the network information (i.e. IP address, DNS, subnet mask, etc.) being configured automatically. It is designed to allocate network addresses to a number of hosts on the IOLINK router's LAN(s) or on remote site networks connected over the WAN links. It will supply minimal configuration needed to allow hosts to operate in an IP network.

1 - Server IP Address Pool

The Server IP address pool option directs you to the Server IP address pool Menu, where the range of allowable IP addresses may be set.

2 - DNS Set-Up

The DNS Set-up option directs you to the DNS Set-Up Menu, where the Primary and Secondary DNS (Domain Name Server) addresses may be set.

3 - NetBIOS Set-Up

The NetBIOS set-up option directs you to the NetBIOS set-up Menu, where the NetBIOS parameters may be set.

4 - DHCP Services

The DHCP services option sets the DHCP operational mode as none, server or relay. Selecting "none" disables the option. Selecting "server" enables this IOLINK router to act as a simple DHCP server for its LAN. Selecting "relay" enables the IOLINK router to relay DHCP service data to a remote DHCP server.

Default: none

Choices: none, server, relay

5 - Relay Destination

The Relay destination option allows you to enter the IP address of the remote DHCP server to which DHCP client data will be routed. **Note:** BootP Relay should only be used with leased line connections, it is not recommended when using any form of connection management (spoofing, IP address connect) on a dial-up line.

Default: none

6 - ICMP Echo Verification

The ICMP echo verification option enables or disables the ping allocated IP address. If enabled, ICMP Ping messages may be sent to the specified IP address when a Ping command is issued.

Default: enabled

7 - Lease Period

The Lease period option sets the length of time (in minutes) that an assigned IP address will be allocated to a DHCP client.

Default: 60

Range: 10 to 65535 minutes

8 - Default gateway

The Default Gateway option allows the identification of a default gateway (i.e. *router*). Messages destined for hosts not on this (sub-)network are forwarded to the default gateway. The default gateway may be located on the local LAN or may be one of the remote site peer IP routers.

Note: If using raw 1490 Frame Relay, either enable "Auto Default Route" or configure the Default Gateway remote site peer address to access the Default Gateway.

If PPP is used and the IP address of the remote site peer IP router is not known, the default gateway may be defined as the remote site ID. This will cause the default gateway to become whatever device is currently connected at that remote site.

When an SNMP message is to be sent to an NMS, first the routing table is checked for a known route. If a route to the NMS is unknown, the SNMP message will then be sent to the default gateway. If the default gateway cannot provide the best route, it will send the message to the gateway that can provide the best route. After the default gateway sends the message to the other gateway for delivery, the default gateway will send an ICMP Redirect message back to the router that points to the best route gateway. In this manner, the router is informed of the best route for future SNMP message delivery.

A configured Default Gateway will override a default route learned from RIP. If more than one default gateways are defined within the routing table, the default gateway with the lowest cost will be used and displayed in this option.

Default: [automatic]

```
Enter :
       automatic, none, ip_address (up to 15 characters)
>
```

Server IP Address Pool Menu

```
                          SERVER IP ADDRESS POOL MENU

    Option                Value          Description
 1. IP address pool      [none]        - Specify IP address pool
 2. Show address pool                  - Display allocated addresses
 3. Add static Address                 - Specify clients IP/MAC address
 4. Remove static address              - Remove static IP address









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **SERVER IP ADDRESS POOL MENU** contains options used to view and maintain the Server IP address pool for the DHCP server of this device.

1 - IP Address Pool

The IP address pool option sets the IP address pool. A block of IP addresses may be configured from which the server will hand out IP addresses. The first address in the range must be specified followed by the number of addresses desired.

Default: none

Range: 1 to 253 addresses

Considerations:

IP address assigned to the pool must be on the same IP network or the LAN of which this IOLINK router is a part.

The IP address pool is not allowed to contain a network broadcast address (all binary 1s in the host portion of the address) for the network or subnetwork in which the pool resides or for a standard Class A, B or C network.

If a pool assignment will contain a disallowed address, the following message will appear:

```
Size will create addresses outside network's valid range,
```

Use a smaller pool size or a different starting address.

2 - Show Address Pool

```
                          DHCP Server IP Address Pool
Pool Address         Type     Hardware Address      Lease Remaining
---------------      ----     -----------------     ---------------
129.0.0.25           Dynamic  00-00-D0-00-12-34           45
129.0.0.26           Dynamic  00-00-D0-00-12-35        Reserved
129.0.0.27           Static   00-00-D0-00-12-36           55
129.0.0.28           Static   00-00-D0-00-12-3         Reserved
129.0.0.29           Dynamic     Available

Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

3 - Add Static Address

The Add static address option assigns a specific IP address to a specific device, such as a network server, from the central DHCP server. When this option is selected, first enter the IP address to be assigned to the device, then the MAC of the device.

4 - Remove Static Address

The Remove static address option removes the static address assignment from a device. Devices may be removed individually by entering the MAC address of the device to be taken off, or the entire list of static address assignments may be cleared by entering "all".

DNS Set-up Menu

```
                                DNS SET-UP MENU

    Option            Value          Description
 1. Primary DNS      [none]        - Address of Primary DNS
 2. Secondary DNS    [none]        - Address of Secondary DNS
 3. Domain name      [none]        - Network name









Enter option number, "=" - main menu, <TAB> - previous menu
>
```

The **DNS SET-UP MENU** contains options used to configure and maintain the DNS parameters for this device. The DHCP server will supply the IP address of the primary and secondary Domain Name Servers when this router is configured as a DHCP server. The DHCP server will not return an IP address if the DNS entries in this menu are set to none.

1 - Primary DNS

The Primary DNS option defines the IP address of the primary network Domain Name Server (DNS).

Default: [none]

2 - Secondary DNS

The Secondary DNS option defines the IP address of the secondary network Domain Name Server (DNS)

Default: [none]

3 - Domain Name

The Domain Name option allows the specification of a domain name of up to 254 characters.

Default: [none]

Considerations:

When setting up a router using IP addressing that will have a DNS server on the local network as well as a connection to an external DNS server (such as in Internet Service Provider), the local DNS server should be set as the Primary DNS and the external DNS server as the Secondary DNS.

NetBIOS Set-Up Menu

```
                              NETBIOS SETUP MENU

    Option                     Value              Description
 1. Send NetBIOS node type   [enabled]          - Send node type to client
 2. Send NetBIOS scope       [enabled]          - Send scope identifier
 3. Send NetBIOS name srv    [enabled]          - Send name server address
 4. NetBIOS node type        [B]                - Type of name resolution
 5. NetBIOS scope Id         "DEV050607_scope"  - Scope identifier
 6. NetBIOS name server      [none]             - IP address of name server









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **NETBIOS SET-UP MENU** contains options used to configure and maintain the NetBIOS parameters for this device. NetBIOS is used by Windows NT or Windows 95 clients to advertise themselves and to locate resources. When a netBIOS client initializes, it must advertise its machine name; the Windows NT server then finds the IP address associated with that name.

1 - Send NetBIOS Node Type

The Send NetBIOS node type option sends the node type to the client when enabled. If disabled, broadcasts will be used to advertise and locate resources.

Default: disabled

2 - Send NetBIOS Scope

The Send NetBIOS scope option sends the scope identifier to the client when enabled. The scope identifier is a name for the group of computers to which the NetBIOS name of this router is known

Default: disabled

3 - Send NetBIOS Name Srv

The Send NetBIOS name srv option sends the name server address to the client when enabled.

Default: disabled

4 - NetBIOS Node Type

The NetBIOS node type option allows you to set the type name resolution. The Send NetBIOS node type option must be enabled before this option will be displayed.

Default: disabled

Choices: B - broadcasts node names and queries
P - point-to-point communication with the NetBIOS name server to resolve and register NetBIOS names.
M - mixed; a combination of B and P communication. Traffic is first broadcast on the local segment and attached segments configured to propogate NetBIOS broadcasts. Once a NetBIOS name server is located, point-to-point communication across routers is allowed.
H -hybrid; a mixture of B and P communications. P is used if a NetBIOS name server is available, otherwise B is used.

5 - NetBIOS Scope Id

The NetBIOS scope Id option allows you to set the scope identifier. The default scope identifier will be the device name followed be "_scope" (i.e. DEVXXX_scope). The Send NetBIOS scope option must be enabled before this option will be displayed.

Default: DEVXXX_scope

6 - NetBIOS Name Server

The NetBIOS name server option allows you to set the IP address of the NetBIOS name server. The Send NetBIOS name srv option must be enabled before this option will be displayed.

Default: none

Firewall Set-Up Menu

```
                          FIREWALL SET-UP MENU

   Option                  Value        Description
 1. LAN firewall setup     menu        - LAN specific firewall setup
 2. WAN firewall setup     menu        - Remote site firewall setup
 3. Block src IP spoofing  [enabled]   - Discard ext pkts with local src IP









Enter option number, "=" - main menu, <TAB> - previous menu
>
```

The **FIREWALL SET-UP MENU** contains options used to view and maintain the IP firewall settings for this device. The IOLINK router firewalls are set on a per interface basis, so the set up of the LAN and WAN firewalls is identical. The direction of traffic is specified from the perspective of the IOLINK router, so incoming traffic is from the specified interface to the IOLINK router, outgoing traffic is from the IOLINK router to the specified interface.

1 – LAN Firewall Set-up

The LAN Firewall Set-up option directs you to the LAN Firewall Set-Up Menu, where the IP Firewall parameters for IP traffic to and/or from Local Area Network(s) may be set.

2 - WAN Firewall Set-up

The WAN Firewall Set-up option directs you to the WAN Firewall Set-Up Menu, where the IP Firewall parameters for IP traffic to and/or from individual remotes site on Wide Area Networks may be set.

3 - Block Source IP Spoofing

When the Block Source IP Spoofing option is enabled, all of the traffic external to this LAN that uses a source IP address the same as the local network IP address will be filtered. This prevents devices located on an external network from attempting to gain access to the local network by using a local IP address as their source address. The IOLINK router will discard any IP traffic that is received with a source IP address the same as an IP address located on the LAN.

Default: [disabled]

LAN Firewall Set-Up Menu

```
                          FIREWALL - LAN MENU

   Option                  Value        Description
 1. Designated servers      menu       - Edit entry for a specific server
 2. Edit firewall entry     menu       - Edit/Add firewall entries
 3. Firewall               [both]      - Block inbound/outbound/both
 4. Firewall statistics                - View firewall statistics
 5. Clear statistics                   - Clear firewall statistics
 6. Show firewall entries              - Display firewall entries
 7. Remove entry                       - Remove a firewall entry




Enter option number, "=" - main menu, <TAB> - previous menu
>
```

The **LAN FIREWALL SET-UP MENU** contains menu options to control the IP firewall settings for LAN connections to this device. The **LAN FIREWALL SET-UP MENU** and **WAN FIREWALL SET-UP MENU** contains identical menu options. They control the IP firewall settings for LAN and WAN connections to this device.

If this is an IOLINK-520 with an optional second LAN interface installed, you will be requested to select which LAN interface is to be configured before proceeding.

Remember that when the firewall function is set to *both*, **all incoming and outgoing IP traffic to and/or from the LAN** interface (including secondary LANs) will be **filtered**. All IP traffic (TCP, UDP (ping), TFTP and PPP) received from or sent to the LAN(s) will be filtered out and not allowed through the firewall.

To allow specific IP traffic to be passed between another network connection and this LAN, either a firewall entry must be specified or a designated server must be specified or a combination of the two. The direction in which the firewall is to filter traffic (inbound, outbound or both) is specified under the *Firewall* option (3) or may be set on an individual firewall table entry basis via the *Edit firewall entry* option (2).

1 - Designated Servers

The Designated Servers option directs you to the Designated Servers Menu, where the IP addresses may be defined for the designated servers on the LAN. A designated server is a device that is legally accessible from another network connection. An example, designated servers may be the HTTP server and the FTP server on the LAN that may be accessed by devices located at remote sites.

2 - Edit Firewall Entry

This option directs you to the Edit Firewall Entry Menu, where a table of entries that are to be allowed to pass IP traffic through the firewall is defined. The Firewall table may have up to 128 entries.

3 - Firewall

The Firewall option controls the direction in which Firewall filtering is to be applied by this IOLINK router to all traffic through the LAN interface.

By default, the direction in which filtering will be applied for all entries in the firewall table is initially set to the direction specified by this option. This direction may be changed for individual entries using the *Edit firewall entry* option (2). Once the direction of filtering for some entries has been altered, changing the overall direction applied to the firewall table will not affect those entries that have been changed; if a change to these entries is required, each entry that needs to be changed must be edited individually.

If *Block incoming* is selected, a**ll incoming IP traffic** from the LAN(s) to the IOLINK router will be **filtered out, EXCEPT what is specified in the Designated Server or Firewall Entry table**. This means that only the specified traffic will be allowed through the firewall for forwarding through the IOLINK router to another network. All outbound traffic from the IOLINK router to the LAN will be forwarded.

If *Block outgoing* is selected, a**ll outgoing IP traffic** through the IOLINK router to the LAN(s) will be **filtered out, EXCEPT what is specified in the Designated Server or Firewall Entry table**. This means that only the specified traffic will be allowed through the IOLINK router out onto the LAN(s). All inbound traffic from the LAN to the IOLINK router will be forwarded.

If *Block both* is selected a**ll outgoing AND incoming IP traffic** through the IOLINK router will be **filtered out, EXCEPT what is specified in the Designated Server or Firewall Entry table**. This means that only the specified traffic will be allowed through the IOLINK router in either direction.

If *disabled* is selected, all traffic is allowed to pass without being filtered.

Default: [disabled]

Choices: Block inbound/outbound/both/disabled

4 - Firewall Statistics

The Firewall Statistics option displays a summary of the number of frames discarded by the firewall function.

```
                          LAN 1 FIREWALL STATISTICS

Frames discarded                      Totals
-------------------------------------------------------------------------
Source IP spoofed                    0

Source IP address                    0
Destination IP address               0
Protocol number                      0
Port number                          0

Total frames discarded               0
```

Source IP Spoofed:	Frames outbound to the LAN discarded due to source IP address being the same as an IP address already on the local network.
Source IP Address:	Frames outbound to the LAN discarded because the source IP address is not allowed to access this local network.
Destination IP Address:	Frames outbound to the LAN discarded because the destination IP address on the local network is not allowed to be accessed from another network.
Protocol Number:	Outgoing frames to the LAN discarded because the protocol type is not allowed.
Port Number:	Outgoing frames to the LAN discarded because the port number is not allowed..
Total Number:	Total number of Outgoing frames to the LAN discarded due to firewall filtering.

5 - Clear Statistics

The Clear Statistics option clears all of the firewall statistics.

Note: The firewall statistics may also be cleared with the Clear All Statistics option in the Statistics Set-up menu.

6 - Show Firewall Entries

The Show Firewall Entries option displays all of the entries in the Firewall table. Entries marked with a "**" indicate an entry from the Designated Servers menu.

```
                              Firewall Entries
       Source /          Source /              Source / Dest
 #   Dest address    Destination mask  Type  Port 1  Port n  Alias
--  ---------------  ----------------  ----  ------  ------  --------------
**  All addresses         None         TCP   20      21      FTP server
    199.167.3.145         None
**  All addresses         None         TCP   80      80      WWW server
    199.167.3.139         None
 1  199.167.4.0      255.255.255.0     TCP   1       65535   Manual entry
    199.167.3.0      255.255.255.0
```

#:	Entry number in the Firewall table.
Source/Destination Address:	IP addresses to be checked for in IP traffic.
Source/Destination Mask:	IP address masks to be used for checking the source and destination addresses.
Type:	Type of IP packet. TCP, UDP, or another user defined value.
Port 1:	Starting port of the range of ports to allow through the firewall.
Port n:	Ending port of the range of ports to allow through the firewall.
Alias:	Name used to indicate the type of entry in the port, either a manual entry or a name from the Designated Servers menu.

7 - Remove Entry

The Remove Entry option deletes individual entries or all of the entries from the Firewall table.

```
Enter :
    all, index number (from 1 to 128)

>
```

WAN Firewall Set-Up Menu

```
                          FIREWALL - REMOTE SITE MENU

    Option                    Value        Description
 1. Designated servers        menu        - Edit entry for a specific server
 2. Edit firewall entry       menu        - Edit/Add firewall entries
 3. Firewall                 [both]       - Block inbound/outbound/both
 4. Firewall statistics                   - View firewall statistics
 5. Clear statistics                      - Clear firewall statistics
 6. Show firewall entries                 - Display firewall entries
 7. Remove entry                          - Remove a firewall entry




Enter option number, "=" - main menu, <TAB> - previous menu
>
```

A remote site name or ID number designating a remote site that has been configured under the WAN Set-up Menu must be entered before the options on this menu are made operational.

The **WAN FIREWALL SET-UP MENU** and **LAN FIREWALL SET-UP MENU** contains identical menu options. They control the IP firewall settings for LAN and WAN connections to this device.

Remember that when the firewall function is set to *both*, **all incoming and outgoing IP traffic to and/or from the specified WAN remote site** will be **filtered**. All. IP traffic (TCP, UDP (ping), PPP and TFTP) received from or sent to the specified remote site will be filtered out and not allowed through the firewall. To allow specific IP traffic to be passed between another network connection and this remote site, either a firewall entry must be specified or a designated server must be specified or a combination of the two. The direction in which the firewall is to filter traffic (inbound, outbound or both) is specified under the *Firewall* option (3) or may be set on and individual firewall table entry basis via the *Edit firewall entry* option (2).

1 - Designated Servers

The Designated Servers option directs you to the Designated Servers Menu, where the IP addresses may be defined for the designated servers on this remote site network. A designated server is a device that is legally accessible from other networks.

2 - Edit Firewall Entry

This option directs you to the Edit Firewall Entry Menu, where a table of entries that are to be allowed through the firewall is defined. A firewall entry allows passage of IP traffic to and/or from this remote site and another IP network. The Firewall table may have up to 128 entries per remote site.

3 - Firewall support

The Firewall option controls the direction in which Firewall filtering is to be applied by this IOLINK router to all traffic to and/or from this remote site.

By default, the direction in which filtering will be applied for all entries in the firewall table is initially set to the direction specified by this option. This direction may be changed for individual entries using the *Edit firewall entry* option (2). Once the direction of filtering for some entries has been altered, changing the overall direction applied to the firewall table will not affect those entries that have been changed; if a change is required, each entry that needs to be changed must be edited individually.

If *Block incoming* is selected, a**ll incoming IP traffic** from the remote site network to the IOLINK router will be **filtered out, EXCEPT what is specified in the Designated Server or Firewall Entry table**. This means that only the specified traffic will be allowed through the firewall for forwarding through the IOLINK router to another network. All outbound traffic from the IOLINK router to the remote site will be forwarded.

If *Block outgoing* is selected, a**ll outgoing IP traffic** through the IOLINK router to the remote site network will be **filtered out, EXCEPT what is specified in the Designated Server or Firewall Entry table**. This means that only the specified traffic will be allowed through the IOLINK router out onto the remote site. All inbound traffic from the remote site to the IOLINK router will be forwarded.

If *Block both* is selected a**ll outgoing AND incoming IP traffic** through the IOLINK router for this remote site network will be **filtered out, EXCEPT what is specified in the Designated Server or Firewall Entry table**. This means that only the specified traffic will be allowed through the IOLINK router in either direction.

If *disabled* is selected, all traffic is allowed to pass to and from the remote site without being filtered.

Default: [disabled]

Choices: Block inbound/outbound/both/disabled

4 - Firewall Statistics

The Firewall Statistics option displays a summary of the number of frames destined to the specified WAN remote site discarded by the firewall function.

The firewall statistics may be cleared with the Clear All Statistics option in the Statistics Set-up menu.

```
                          Firewall Statistics

Frames discarded                    Totals
-------------------------------------------------------------------------
Source IP spoofed                   0

Source IP address                   0
Destination IP address              0
Protocol number                     0
Port number                         0

Total frames discarded              0
```

Source IP Spoofed:	Frames outbound to this WAN remote site discarded due to source IP address being the same as an IP address already on the remote site network.
Source IP Address:	Frames outbound to this WAN remote site discarded because the source IP address is not allowed to access this remote site network.
Destination IP Address:	Frames outbound to this WAN remote site discarded because the destination IP address on the remote site network is not allowed to be accessed from another network.
Protocol Number:	Outgoing frames to this WAN remote site discarded because the protocol type is not allowed.
Port Number:	Outgoing frames to this WAN remote site discarded because the port number is not allowed.
Total Number:	Total number of Outgoing frames to this WAN remote site discarded due to firewall filtering.

Additional information on events in Firewall operation is available under the **Syslog** menu.

5 - Clear Statistics

The Clear Statistics option clears all of the firewall statistics.

6 - Show Firewall Entries

The Show Firewall Entries option displays all of the entries in the Firewall table. Entries marked with a "**" indicate an entry from the Designated Servers menu.

```
                              Firewall Entries
       Source / Dest    Source /              Source / Dest
  #  Dir Network Address Destination mask Type Port 1 Port n Alias
--- --- --------------- ---------------- ---- ------ ------ --------------
**    in All addresses        None         TCP   20      21      FTP server
      in 199.167.3.145        None
**    in All addresses        None         TCP   80      80      WWW server
      in 199.167.3.139        None
 1   out 199.167.4.0     255.255.255.0     TCP   1       65535   Manual entry
     out 199.167.3.0     255.255.255.0
```

#:	Entry number in the Firewall table.
Source/Destination Address:	IP addresses to be checked for in the IP traffic.
Source/Destination Mask:	IP address masks to be used for checking the source and destination addresses.
Type:	Type of IP packet. TCP, UDP, or another user defined value.
Port 1:	Starting port of the range of ports to allow through the firewall.
Port n:	Ending port of the range of ports to allow through the firewall.
Alias:	Name used to indicate the type of entry in the port, either a manual entry or a name from the Designated Servers menu.

7 - Remove Entry

The Remove Entry option deletes individual entries or all of the entries from the Firewall table.

```
Enter :
    all, index number (from 1 to 128)

>
```

Designated Servers Menu

```
                          DESIGNATED SERVERS MENU

    Option                    Value          Description
 1. E-mail (SMTP) server     [none]        - Specify E-Mail server IP address
 2. POP 2/3 server           [none]        - Specify E-Mail POP server address
 3. FTP server               [none]        - Specify FTP server IP address
 4. WWW (HTTP) server        [none]        - Specify WWW server IP address
 5. Telnet server            [none]        - Specify Telnet IP address
 6. Local DNS                [none]        - Specify local DNS IP address
 7. Remote DNS               [none]        - Specify remote DNS IP address
 8. Secondary local DNS      [none]        - Specify local DNS IP address
 9. Secondary remote DNS     [none]        - Specify remote DNS IP address

 Enter option number, "=" - main menu, <TAB> - previous menu

>
```

The **DESIGNATED SERVERS MENU** contains options used to define the IP address of specific services on this local or remote site network that may be accessed by devices on other networks. Defining a Designated Server allows for simpler set up when configuring what traffic is to be allowed through the firewall.

1 - E-mail (SMTP) Server

The E-mail Server option defines the IP address of the E-mail (SMTP) Server on this network that may be accessed by devices on other networks.

Default: [none]

2 - POP 2/3 Server

The POP Server option defines the IP address of the POP 2/3 Server on this network that may be accessed by devices on other networks.

Default: [none]

3 - FTP Server

The FTP Server option defines the IP address of the FTP Server on this network that may be accessed by devices on other networks.

Note: depending on the FTP software used, a client may not be able to reach an FTP server through a router using NAPT with firewall security enabled unless a port is opened for user authentication communications. This port may be set up in the Edit Firewall Entry Menu.

Default: [none]

4 - WWW (HTTP) Server

The WWW Server option defines the IP address of the WWW (HTTP) Server on this network that may be accessed by devices on other networks.

Default: [none]

5 - Telnet Server

The Telnet Server option defines the IP address of the Telnet Server on this network that may be accessed by devices on other networks.

Default: [none]

6 - Local DNS

The Local DNS option defines the IP address of the Domain Name Server (DNS) on this network that may be accessed by devices on other networks. This entry allows access to the designated IP address only on port 53.

Default: [none]

7 - Remote DNS

The Remote DNS option defines the IP address of the Domain Name Server (DNS) on another network that may be accessed by devices on this network. This setting would be used when connecting to an ISP for example and the DNS is located external to your network within the ISP. This entry allows access to the designated IP address on port 53 as well as on ports 1024 to 65535.

Default: [none]

8 - Secondary local DNS

The Secondary local DNS option defines the IP address of the secondary DNS Server on this network that may be accessed by devices on other network connections. This entry allows access to the designated IP address only on port 53.

Default: [none]

9 – Secondary remote DNS

The Secondary remote DNS option defines the IP address of the secondary Domain Name Server (DNS) on another network that may be accessed by devices on this network. This entry allows access to the designated IP address on port 53 as well as on ports 1024 to 65535.

Default: [none]

Edit Firewall Entry Menu

```
                              FIREWALL ENTRY MENU

    Option                Value          Description
 1. Destination addr   [         ]   - Destination IP address of frame
 2. Destination mask   [         ]   - Network mask for dest address
 3. Source address     [         ]   - Source IP address of frame
 4. Source mask        [         ]   - Network mask for source address
 5. Protocol type      [         ]   - Allow specific protocol types
 6. Source port        [         ]   - Source port range to allow
 7. Destination port   [         ]   - Destination port range to allow.
 8. Description        [         ]   - Describe the entry
 9. Entry direction    [         ]   - Direction this entry applies to









Enter :
    Firewall filter id (from 1 to 128)

> 1
```

The above display is the first level of the **EDIT FIREWALL ENTRY MENU**. Once the firewall entry index number is entered, the number specified is added to the menu title bar and the Options are as shown below:

```
                            FIREWALL ENTRY 1 MENU

    Option                Value          Description
 1. Destination addr   [none]            - Destination IP address of frame
 2. Destination mask   [none]            - Network mask for dest address
 3. Source address     [all]             - Source IP address of frame
 4. Source mask        [none]            - Network mask for source address
 5. Protocol type      [all]             - Allow specific protocol types
 6. Source port        [0] [65535]       - Source port range to allow
 7. Destination port   [0] [65535]       - Destination port range to allow.
 8. Description        "Manual entry"    - Describe the entry
 9. Entry direction    [outbound]        - Direction this entry applies t









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

A Firewall entry allows the creation of a specific IP connection type of communication path to be allowed through the firewall. The Source IP address of a known network may be defined to be allowed to access either a specific device or network.

1 - Destination Addr

The Destination IP Address option defines a hole in the firewall for the IP address (or range of addresses) for frames outbound from this IOLINK router to a destination on the network in question.

The IP address consists of 4 eight-bit fields, each field is specified by a decimal number and the fields are separated by a decimal point (e.g. 92.3.1.10). Each decimal number must be less than or equal to 255 (the maximum decimal value of an 8-bit binary number).

Default: [none]

2 - Destination Mask

The Destination Mask option defines the address mask to be used on the Destination IP Address defined in option 1 for this entry. To have the firewall entry apply to an individual IP address a mask of none should be used.

The address mask consists of 4 eight-bit fields, each field is specified by a decimal number and the fields are separated by a decimal point (e.g. 92.3.1.10). Each decimal number must be less than or equal to 255 (the maximum decimal value of an 8-bit binary number).

Default: [none]

3 - Source Address

The Source IP Address option defines a hole in the firewall for the IP address (or range of addresses) for frames inbound to this IOLINK router from the network in question. The default setting of this option allows all IP addresses on this network to send frames out through the IOLINK router. Setting specific source IP addresses allows for greater restrictions on who can access external networks.

The IP address consists of 4 eight-bit fields, each field is specified by a decimal number and the fields are separated by a decimal point (e.g. 92.3.1.10). Each decimal number must be less than or equal to 255 (the maximum decimal value of an 8-bit binary number).

Default: [all]

4 - Source Mask

The Source Mask option defines the address mask to be used on the Source IP Address defined in option 3 for this entry. To have the firewall entry apply to an individual IP address a mask of none should be used.

The address mask consists of 4 octets and is represented by 4 fields separated by periods ("**.**"), where each field is specified by a decimal number (e.g. 255.255.255.0). Each decimal number must be less than or equal to 255, that is the maximum value of each 8-bit field.

Default: [none]

5 - Protocol Type

The Protocol Type option defines the protocol type to allow through the firewall for this entry. The protocol type may be defined as TCP, UDP, or any other protocol type. Other protocols are defined as a valid IP protocol type in hex.

Default: [TCP]

Choices: TCP, UDP, (any protocol type number in hex)

6 - Source Port

The Source Port option defines the starting and ending port numbers from the Source IP address(es) defined above from which inbound frames are to be allowed through the firewall. The default setting of this option allows all ports from a defined source to send inbound frames through the IOLINK router to other networks. Setting a specific source port or range of ports allows for greater restrictions on who can access external networks.

Default: [0] to [65535]

Range: 0 to 65535

7 - Destination Port

The Destination Port option defines the starting and ending port numbers from the Destination IP address(es) defined above to which outbound frames are to be allowed through the firewall. The default setting of this option allows the IOLINK router to send outbound frames to all ports on a defined IP Destination. Setting specific destination port or range of ports allows for greater restrictions on who can access this network from outside.

Default: [0] to [65535]

Range: 1 to 65535

8 - Description

This option allows a text description of up to 19 characters of this entry in the firewall table. If blank spaces are used in the description, it must be enclosed in double quotation marks.

9 - Entry direction

The Entry Direction option determines which direction the filtering operation for this entry will take place. Filtering direction is determined from the point of view of the IOLINK router; that is outbound is traffic from the IOLINK router to the network, inbound is from the network to the IOLINK router.

None will allow the direction selected in the LAN or WAN Firewall setup menu to operate without restriction by this option.

.

Outbound will perform filtering of traffic from the IOLINK router to the selected network, i.e. traffic from other networks.

Inbound will perform filtering on traffic from the network to the IOLINK router; i.e. traffic destined for other networks.

Both will filter all traffic.

Note: The direction specified in this option will operate in conjunction with the general direction specified in the LAN or WAN Firewall Set-up menu. For example: a general firewall direction of *Both* would filter all traffic to and from the network to the IOLINK router. Setting a specific address entry to have a direction of *Inbound* would then allow the device with that address to communicate through the firewall. Please see the *Installation and Applications Manual* for some specific examples of firewall operation.

By default, the direction in which filtering will be applied for all entries in the firewall table is initially set to the direction specified by the *Firewall support* option (3). This direction may be changed for individual entries using the *Edit firewall entry* option (2). Once an the direction of filtering for some entries has been altered, changing the overall direction applied to the firewall table will not affect those entries that have been changed; if a change is required, each entry that needs to be changed must be edited individually.

NAT Exports Menu

```
                              NAT EXPORTS MENU

    Option                  Value          Description
 1. Edit Services           menu         - Add/remove exported services
 2. Router port             menu         - Change router server ports for export
 3. Show services                        - Display exported services
 4. Clear services                       - Clear all exported services









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **NAT Exports Menu** has options for setting, clearing and reviewing exported Internet services available on this network. Using Network Address Translation (NAT). NAT maps arbitrary internal network IP addresses to valid global IP addresses used on the Internet. Network Address Port Translation (NAPT) allows a number of internal hosts to map to the same global IP address via port assignment to that address. NAT exported services are only available through port translation.

NOTE: Exported services from a remote site are only available if NAPT is enabled for that site (under the Configuration/WAN Set-up/Remote Site Set-up/Edit Remote Site/Protocol Set-up/IP Parameters menu).

1 - EDIT Services

The Edit Services option takes you to the Edit Services Menu, where the host devices for the various Internet services that will be offered on this network may be added to or removed from the export services table.

2 - Router Port

The Router Port option takes you to the Router Port Menu where the port number for services provided by this router may be assigned.

3 - Show Services

Displays a list if the Internet services available for export on this network.

4 - Clear Services

Clears the NAPT table of IP addresses of services available for export on this network.

Edit Services Menu

```
                              EDIT SERVICES MENU

    Option                  Value          Description
 1. Other Services          menu         - Add/remove other exported services
 2. E-mail                 [none]        - E-mail server's IP address
 3. POP2/POP3              [none]        - POP2/POP3 server's IP address
 4. FTP                    [none]        - FTP server's IP address
 5. WWW (HTTP)             [none]        - WWW (HTTP) server's IP address
 6. Telnet                 [none]        - Telnet server's IP address
 7. DNS                    [none]        - DNS server's IP address



Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **EDIT SERVICES MENU** allows you to set the internal IP address of the device where each Internet service that will be available for export on this network can be accessed. The NAT port used for Network Address Port Translation for the services in options 2 through 8 will be the well-known port number for that service.

When a service is added using this menu, it will also be automatically added to the firewall designated servers list, even if firewall is not enabled.

1 - Other Services

The Other Services option takes you to a menu where the internal IP address of an Internet service not offered in the list below may be set up.

2 - E-mail

The IP address of the E-mail server on this network may be set. (port 25)

3 - POP2/POP3

The IP address of the POP2/POP3 server on this network may be set. (POP2 - port 109, POP3 – port 110)

4 - FTP

The IP address of the FTP server on this network may be set. (port 21, FTP data – port 20)

Note: depending on the FTP software used, a client may not be able to reach an FTP server through a router using NAPT with firewall security enabled unless a port is opened for user authentication communications. See Main/Configuration/Applications/Firewall/ Edit Firewall Entry Menu.

5 - WWW (HTTP)

The IP address of the WWW (HTTP) server on this network may be set. (port 80)

6 - Telnet

The IP address of the Telnet server on this network may be set. (port 23)

7 - DNS

The IP address of the DNS server on this network may be set. (port 53)

Other Services Menu

```
                              OTHER SERVICES MENU

    Option                 Value          Description
 1. NAT port             *[      ]       - Port number exported by NAT
 2. Status               *[      ]       - Is service in export's table?
 3. Host IP address       [      ]       - Enter location of service
 4. Host port             [      ]       - Enter port number of service on host
 5. Description           [      ]       - Describe the service
 6. Remove                               - Remove the service


Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **OTHER SERVICES MENU** allows the set up of an Internet service not listed in the Edit Services menu.

1 - NAT Port

This option displays the port number that NAT will use to export this service

Range: 1 to 65535

2 - Status

This option displays whether or not this port has an IP address present in the export table and is being used by another service. If the port is already present in the table, the host address and port will be displayed and may be changed; the NAT Port and Status for this entry may not be changed if already present – you must return to the previous menu, re-enter this one and use another port number.

Default: [not present]

3 - Host IP Address

Enter the internal IP address of the host for this service.

Default: [0.0.0.0]

4 - Host Port

Enter the internal port number of the host for this service.

Default: [port number entered for NAT Port]

Range: 1 to 65535

5 - Description

Enter a description of the service. If blank spaces are used in the description, it must be enclosed in double quotation marks.

Range: up to 20 characters

6 - Remove

Remove this service from the export table. The service must be present in the export table before this option will be displayed.

Router Port Menu

```
                              ROUTER PORT MENU

    Option             Value          Description
 1. Telnet            [default]       - Change telnet server ports for export
 2. TFTP              [default]       - Change TFTP server ports for export
 3. SNMP              [default]       - Change SNMP server ports for export




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **EDIT ROUTER SERVICES MENU** contains options to set alternate port numbers to export the Telnet, TFTP and SNMP services of this router. If one of these services is offered on another server through NAT, then that server will use the well-known port number for that service; this router must use a different port number for its service.

1 - Telnet

The Telnet option defines a port number to use for Telnet services on this router.

2 - TFTP

The TFTP option defines a port number to use for TFTP services on this router.

3 - SNMP

The SNMP option defines a port number to use for SNMP services on this router.

SYSLOG Set-Up Menu

```
                              SYSLOG SET-UP MENU

    Option                 Value          Description
 1. Syslog                 [enabled]    - Enable/disable syslog logging
 2. Syslog IP address      [none]       - Define host IP address
 3. Events facility        [none]       - Define network events facility
 4. Security facility      [none]       - Define security facility
 5. Activation facility    [local2]     - Define activation facility
 6. Firewall facility      [none]       - Define firewall facility



Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **SYSLOG Set-Up Menu** configures this IOLINK router to send messages to a standard Syslog service running on a specified host. Syslog is a utility, typically on a UNIX type system but also available for other systems, that forwards system messages to a user selected destination, known as a facility. A facility may be a file, another device, such as a printer, or another utility, such as an e-mail service. A listing of available facilities is given at the end of this section. It is recommended that you choose the "local*n*" facilities for logging messages from this router unless you are certain that a specified facility is not used by any other part of the system.

For a listing of system messages and their descriptions, please see Appendix A of the IOLINK-520 and IOLINK-PRO Reference Manual file on the accompanying disk. For information on Syslog, please see your UNIX (or equivalent) operating system reference manual.

This router will generate one of four classes of message: events, security, activation or firewall. Each type may be sent to a separate facility. All messages are sent at severity level 6 (information level).

Note: if Syslog is set up to send messages to a host across a WAN link and spoofing or traffic initiated connection is enabled, the link will be brought up every time a system event occurs, i.e. very frequently. Depending on how link service charges are accrued, this may not be desirable. It is recommended that the Syslog host be on the same LAN as this router.

Note: Time of day should be synchronized between this IOLINK router and the Syslog daemon host; if this is not done, interpreting a sequence of logged events becomes more difficult.

1 – Syslog

The Syslog option toggles the Syslog operation between enabled and disabled.

Default: [disabled]

2 – Syslog IP address

Enter the IP address of the Syslog host to which the system messages are to be forwarded for logging.

3 – Events Facility

A network event message generated by this router will be forwarded to the selected facility for logging on the Syslog host.

Default: [none]

Choices: (see below for details)
none, local0, local1, local2, local3, local4, local5, local6, local7,
auth, cron, daemon, kern, lpr, mail, news, syslog, user, uucp

4 – Security Facility

A security message generated by this router will be forwarded to the selected facility for logging on the Syslog host.

Default: [none]

Choices: (see below for details)
none, local0, local1, local2, local3, local4, local5, local6, local7,
auth, cron, daemon, kern, lpr, mail, news, syslog, user, uucp

5 – Activation Facility

An activation message generated by this router will be forwarded to the selected facility for logging on the Syslog host.

Default: [none]

Choices:
none, local0, local1, local2, local3, local4, local5, local6, local7,
auth, cron, daemon, kern, lpr, mail, news, syslog, user, uucp

6 – Firewall Facility

A firewall message generated by this router will be forwarded to the selected facility for logging on the Syslog host.

Default: [none]

Choices:
none, local0, local1, local2, local3, local4, local5, local6, local7,
auth, cron, daemon, kern, lpr, mail, news, syslog, user, uucp

Facilities available on Syslog:

none	Message will not be sent
local0-7	Reserved for user defined service – recommended choice.
user	Messages generated by user processes.
kern	Messages generated by the kernel.
mail	The mail system.
daemon	System daemons, such as ftpd(1M), routed(1M), etc.
auth	The authorization system: login(1), su(1M), getty(1M), etc.
syslog	Syslog daemon
lpr	The line printer spooling system: lpr(1), lpc(1M), lpd(1M), etc.
news	Reserved for the USENET network news system.
uucp	Reserved for the UUCP system.
cron	The cron/at facility; crontab(1), at(1), cron(1M), etc.

Statistics Menu

```
                              STATISTICS MENU

    Option                          Value         Description
 1. Statistics set-up               menu        - Define statistics operation
 2. Remote site information         menu        - Remote site stats/status
 3. LAN statistics                  menu        - Access LAN statistics
 4. Link stats                                  - Detailed link statistics
 5. Link summary                                - Summary stats of all links
 6. Interface stats                             - Statistics of all interfaces
 7. Interface status                            - Status of all interfaces
 8. Clear statistics                            - Reset link & interface stats




Enter option number, "=" - main menu, <TAB> - previous menu



>
```

The **STATISTICS MENU** provides access to complete router statistics and status displays.

1 - Statistics Set-Up

The Statistics Set-up option takes you to the Statistics Set-Up Menu, where the interval and the range of reported statistics may be set. All statistics counts may also be reset from this menu.

2 – Remote Site Information

The Remote Site Information option takes you to the Remote Site Information Menu, where remote site statistics, status and usage information can be examined.

3 - LAN Statistics

The LAN Statistics option takes you to the LAN Statistics Menu, where statistics can be examined to evaluate LAN performance.

4 - Link Stats Display

```
Enter:
   Link to display (1 or 2)
```

The link Stats display will vary to reflect the WAN module installed for that link. The display screen below shows the statistic elements common to all types of module. The XX'd areas under Interface State indicate where the variable statistics will go. Displays particular to each module type are listed on following pages.

```
                                  Link  1 Status
State: Enabled, Up, Network, Opened
Remote Site: Atlanta

Interface State        Frame Counts  (Rcv/Xmt)       Frame Errors
Speed   : 64000 bps    Bytes :      47648/47639      Cgt disc   : 0
Type    : XXX          Frames:       3536/3536       CRC        : 0
XXXXXXX                                             Rcv abort  : 0
XXXXXXX                                             Overrun    : 0
XXXXXXX                                             Rcv miss   : 0
XXXXXXX                                             Too large  : 0
XXXXXXX                                             Misaligned : 0
                                                    Underrun   : 0
                              Throughput
Rcv   0%       0.0 KB |
Xmt   0%       0.0 KB |
                      |----|----|----|----|----|----|----|----|----|----|
                     0   10   20   30   40   50   60   70   80   90  100%
```

State :

This displays the current state of the link: Enabled/Disabled, Idle / Opening / Up/ Down / Establish / Authenticate / Network / Terminate, Initial / Starting / Closed / Stopped / Closing / Stopping / Req Sent / Ack Rcvd / Ack Sent / Opened.

Remote Site :

This displays the name of the current remote site to which this link is connected.

Speed :

This displays the speed at which the link is operating. The speed will be as set by the connection. If the link is disconnected, no speed (0) will be shown.

Type :

The interface type is identified in this display.

Frame Counts

Bytes :

This indicates the total number of bytes received/transmitted across the link.

Frames :

This indicates the total number of frames received/transmitted across the link.

Frame Errors

These frames are considered invalid because they do not conform to valid frame checking parameters. These frames usually result from a hardware error on either the LAN or the router.

Cgt Disc Congestion Discards — This is generated when a frame is discarded due to congestion.

CRC Cyclic Redundancy Check — This often indicates a problem with the transmitting hardware and/or communications line (a modem, noisy line, router link problem) that has been detected by the receiver.

Rcv abort Receiver Abort — This reports that an incoming frame has been aborted. This results when the transmitter doesn't receive all of a frame to be sent, and it sets an abort flag at the point this is discovered in the transmission. The receiver notes this as a statistic and discards the frame.

Overrun The link controller could not empty the link FIFO into common memory before the next frame from the link is written to the FIFO. This indicates a problem with the memory inside the router.

Rcv miss Receiver Miss — This reports that an incoming frame has been aborted. This results when the frame is missed because of a lack of receive buffers. The remote router will retransmit the frame.

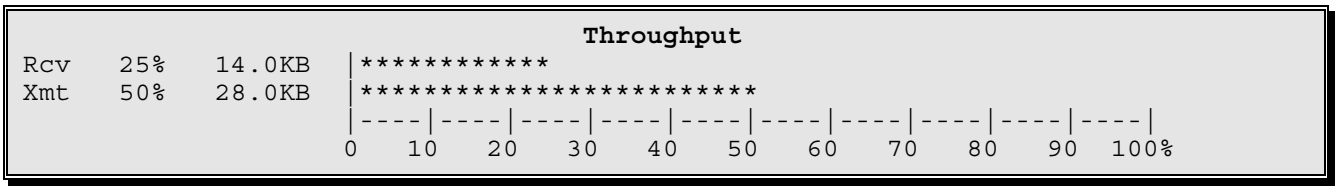
Too large This reports that an incoming frame has been discarded because the frame exceeded the maximum length. This may be caused by a frame being overrun by another frame on the link, so that the router thinks both frames are one frame.

Misaligned This reports that frames detected on this link have a number of bits not exactly divisible by eight.

Underrun The link controller could not read the rest of the frame from common memory before the link FIFO emptied. This indicates a problem with the memory inside the router.

Throughput

Both receive and transmit call utilization are displayed by the two bar graphs. Utilization describes the total bits received or sent (including protocol overhead) divided by the total bits possible based on the call speed. For each statistic, the numerical percentage is printed along with its equivalent baud rate and the bar graph.



ISDN BRI module interface display:

```
                                Link  Statistics
                                     Link  1
State: Enabled, Up, Network, Opened
Remote Site: Atlanta

Interface State          Frame Counts  (Rcv/Xmt)        Frame Errors
Speed   : 64000 bps      Bytes :      47648/47639       Cgt disc   : 0
Type    : BRI            Frames:       3536/3536        CRC        : 0
Circuit : Outgoing                                      Rcv abort  : 0
State   : IDLE                                          Overrun    : 0
                                                        Rcv miss   : 0
Partner Number:                                         Too large  : 0
5551212                                                 Misaligned : 0
                                                        Underrun   : 0
                                   Throughput
Rcv   0%        0.0 KB |
Xmt   0%        0.0 KB |
                       |----|----|----|----|----|----|----|----|----|----|
                     0   10   20   30   40   50   60   70   80   90  100%
```

Circuit :

This identifies the type of ISDN call. The call may be "Incoming, Outgoing, or Cleared".

State :

This identifies the current state of the ISDN call. The state may be one of "Idle, Proceeding, Disconnecting, or Connected".

Partner Number :

This identifies the ISDN number of the remotely connected PPP ISDN router.

V.35 leased line interface module display:

```
                                Link  Statistics
                                     Link  2
State: Enabled, Idle
Remote Site: London

 Interface State         Frame Counts  (Rcv/Xmt)        Frame Errors
Speed : 0 bps            Bytes :          0/0           Cgt disc   : 0
Type  : V.35             Frames:          0/0           CRC        : 0
DTR   : down                                           Rcv abort  : 0
CD    : up                                             Overrun    : 0
RTS   : down                                           Rcv miss   : 0
DSR   : up                                             Too large  : 0
CTS   : up                                             Misaligned : 0
RI    : up                                             Underrun   : 0

                                  Throughput
Rcv   0%        0.0 KB |
Xmt   0%        0.0 KB |
                       |----|----|----|----|----|----|----|----|----|----|
                     0   10   20   30   40   50   60   70   80   90  100%
```

RS232 leased line interface module display:

```
                                Link  Statistics
                                     Link  2
State: Enabled, Idle
Remote Site: London

 Interface State        Frame Counts  (Rcv/Xmt)        Frame Errors
Speed : 0 bps           Bytes :          0/0           Cgt disc   : 0
Type  : RS232           Frames:          0/0           CRC        : 0
DTR   : down                                           Rcv abort  : 0
CD    : up                                             Overrun    : 0
RTS   : down                                           Rcv miss   : 0
DSR   : up                                             Too large  : 0
CTS   : up                                             Misaligned : 0
RI    : up                                             Underrun   : 0

                                Throughput
Rcv   0%        0.0 KB |
Xmt   0%        0.0 KB |
                       |----|----|----|----|----|----|----|----|----|----|
                      0   10   20   30   40   50   60   70   80   90  100%
```

DTR

The state of the Data Terminal Ready signal.

CD

The state of the Carrier Detect signal.

RTS

The state of the Request to Send signal.

DSR

The state of the Data Set Ready signal.

CTS

The state of the Clear to Send signal.

RI

The state of the Ring Indicator signal.

V.11 leased line interface module display:

```
                                Link  Statistics
                                     Link  2
State: Enabled, Idle
Remote Site: London

 Interface State        Frame Counts  (Rcv/Xmt)        Frame Errors
Speed : 63000 bps       Bytes :          0/0          Cgt disc   : 0
Type  : V.11            Frames:          0/0          CRC        : 0
C     : down                                          Rcv abort  : 0
I     : up                                            Overrun    : 0
                                                      Rcv miss   : 0
                                                      Too large  : 0
                                                      Misaligned : 0
                                                      Underrun   : 0

                                Throughput
Rcv   0%        0.0 KB |
Xmt   0%        0.0 KB |
                       |----|----|----|----|----|----|----|----|----|----|
                      0   10   20   30   40   50   60   70   80   90  100%
```

C

The state of the Control (terminal ready out) signal.

I

The state of the Indicator (carrier detect in) signal.

RS530 leased line interface module display:

```
                                Link  Statistics
                                     Link  1
State: Enabled, Idle
Remote Site: London

 Interface State        Frame Counts  (Rcv/Xmt)        Frame Errors
Speed : 63000 bps       Bytes :          0/0          Cgt disc   : 0
Type  : RS530           Frames:          0/0          CRC        : 0
TR    : down                                         Rcv abort  : 0
RR    : up                                           Overrun    : 0
RS    : down                                         Rcv miss   : 0
DM    : up                                           Too large  : 0
CS    : up                                           Misaligned : 0
                                                     Underrun   : 0

                                Throughput
Rcv   0%        0.0 KB |
Xmt   0%        0.0 KB |
                       |----|----|----|----|----|----|----|----|----|----|
                      0   10   20   30   40   50   60   70   80   90  100%
```

TR

The state of the Terminal Ready signal.

RR

The state of the Receiver Ready signal.

RS

The state of the Ready to Send signal.

DM

The state of the Data Mode signal.

CS

The state of the Clear to Send signal.

G703 leased line interface module display:

```
                              Link  Statistics
                                   Link  1
State: Enabled, Up, FR Up
LMI State: Up

 Interface State       Frame Counts  (Rcv/Xmt)       Frame Errors
Speed : 2044000 bps    Bytes :        684/526        Cgt disc   : 0
Type  : G.703          Frames:         12/9          CRC        : 0
Mode  : Master                                       Rcv abort  : 0
CD    : up                                           Overrun    : 0
                                                     Rcv miss   : 0
                                                     Too large  : 0
                                                     Misaligned : 0
                                                     Underrun   : 0

                                 Throughput
Rcv   0%       0.0 KB |
Xmt   0%       0.0 KB |
                      |----|----|----|----|----|----|----|----|----|----|
                     0   10   20   30   40   50   60   70   80   90  100%
```

Mode

The state of the Mode signal (Master/Slave).

CD

The state of the Carrier Detect signal.

ATL CSU/DSU - leased line interface module display:

```
                                Link  Statistics
                                     Link  2
State: Enabled, Opening, FR Down
LMI State: Opening

 Interface State       Frame Counts  (Rcv/Xmt)       Frame Errors
Speed : 0 bps          Bytes :          0/0          Cgt disc   : 0
Type  : ATL-CSU        Frames:          0/0          CRC        : 0
Line  : Unknown                                      Rcv abort  : 0
Loopbk: None                                         Overrun    : 0
                                                     Rcv miss   : 0
                                                     Too large  : 0
                                                     Misaligned : 0
                                                     Underrun   : 0

                                Throughput
Rcv   0%       0.0 KB |
Xmt   0%       0.0 KB |
                      |----|----|----|----|----|----|----|----|----|----|
                     0   10   20   30   40   50   60   70   80   90  100%
```

LXT411 CSU/DSU - leased line interface module display:

```
                                Link  Statistics
                                     Link  1
State: Enabled, Up, FR Up
LMI State: Up
Speed : 56000 bps      Bytes :        274/332        Cgt disc   : 0
Type  : LXT-CSU        Frames:          5/6          CRC        : 0
Mode  : 56K-OCU                                      Rcv abort  : 1
Line  : Connected                                    Overrun    : 0
Loopbk: None                                         Rcv miss   : 0
                                                     Too large  : 0
                                                     Misaligned : 0
                                                     Underrun   : 0

                                Throughput
Rcv   0%       0.0 KB |
Xmt   0%       0.0 KB |
                      |----|----|----|----|----|----|----|----|----|----|
                     0   10   20   30   40   50   60   70   80   90  100%
```

Mode

The state of the Mode signal.

Line

The state of the Line signal.

Loopbk

The state of the Loopback signal.

5 – Link Summary

```
                                  Link Summary

Link       Link      Remote Site        Throughput         %       Frame
 ID     Type/State      Alias         Kbps (Rcv/Xmt)   (Rcv/Xmt)   Errors
----  ------------ ---------------- ---------------------------- ----------
  1     ISDN/Up       DEV012345           0.0/0.0         0/0             0
  2     ISDN/Down        none             0.0/0.0         0/0             0
```

Link ID :

The link numbers (1 or 2).

Link Type/State :

The link module types and states of each link.

Remte Site Alias :

The names assigned to the remote sites currently associated with each link.

Throughput :

The received and transmitted throughput rates for each link in kilobits per second.

% :

The received and transmitted throughput as a percentage of the available link speed.

Frame Errors :

The number of invalid frames received on each link since the last "Clear link statistics" command.

6 – Interface Statistics

```
                          Interface Statistics

Interface#          Total Frames (Rcv/Tx)          Total Bytes (Rcv/Tx)
----------          ---------------------          --------------------
  0                          2/106                        128/0
  1                         36/158                       2304/0
  2                          0/0                            0/0
```

Interface # :

The interface module number. Interface 0 is the primary LAN interface. A BRI interface pair will display only as interface 1, as in the example above. All other interface types will show as interface 1 and interface 2.

Total Frames :

The count of frames received and transmitted through this interface since the stats were last cleared.

Total Bytes :

The count of bytes received and transmitted through this interface since the stats were last cleared.

7 – Interface Status

```
                              Interface Status

 Interface    Interface           Link#    Logical              Interface
 number        Type                        Type                 Speed(Kbps)
---------   -------------------   -----   -------------------   -----------
   0          10/100 Module        NA     LAN                   100000
   1          BRI ST               1,2    ISDN                      64
```

Interface number :

The interface number.

Interface Type :

The physical type of interface module installed on this interface.

Link # :

The link number associated with this interface.

Logical Type :

The logical type assigned to this interface.

Interface speed :

The nominal data transfer rate for this interface in kilobytes per second.

8 - Clear Statistics

The Clear Statistics option clears all fields in the Link statistics to zero.

Statistics Set-Up Menu

```
                          STATISTICS SET-UP MENU

    Option                  Value         Description
 1. Extended statistics    [disabled]    - Enable/disable extended statistics
 2. Interval               [60 sec]      - Set display interval
 3. Clear all statistics                 - Reset all statistics




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

1 - Extended Statistics

Choosing the Extended Statistics option enables extended statistics causing additional statistics to be calculated and reported.

When extended stats are [disabled], limited information is available from:
- **Link Status**, WAN Statistics Menu (throughput section is not available).
- **Bridged Traffic**, LAN Statistics Menu (only the total column is available).
- **IP Traffic**, LAN Statistics Menu (only the total column is available).
- **IPX Traffic**, LAN Statistics Menu (only the total column is available).
- **Total LAN Traffic**, LAN Statistics Menu (only the total column is available).

Default: [disabled]

Considerations:

Enabling this option will decrease router performance, as additional processing is required. You must confirm a change by entering "yes" at the prompt.

2 - Interval

The Interval option sets the timer that updates the statistics.

Default: [60 sec]

Range: 10 to 3,600 seconds.

Considerations:

Lowering the time interval will require more router processing power while increasing the time interval will require less.

3 - Clear All Statistics

The Clear All Statistics option clears ALL of the statistics and resets all fields to zero.

Remote Site Information Menu

```
                          REMOTE SITE INFORMATION MENU

    Option                          Description
 1. Common protocols stats       - Counts of IP/IPX/Brg Frames
 2. PPP statistics               - Total counts of PPP protocols
 3. Status                       - Status of a particular RMS
 4. Usage information            - Display usage information
 5. Clear remote site stats      - Reset remote site statistics




Enter :
    Remote site id or alias (up to 16 characters)

>
```

The above display is the first level of the **REMOTE SITE INFORMATION MENU**. Once the remote site identification number or alias is entered, the alias of the specified remote site is added to the menu title bar and the Options are as shown below:

```
                       REMOTE SITE INFORMATION test1 MENU

    Option                          Description
 1. Common protocols stats       - Counts of IP/IPX/Brg Frames
 2. PPP statistics               - Total counts of PPP protocols
 3. Frame Relay statistics       - Total counts of FR protocol
 4. Status                       - Status of a particular RMS
 5. Usage information            - Display usage information
 6. Clear remote site stats      - Reset remote site statistics









Enter option number, "=" - main menu, <TAB> - previous menu

>
```

1 – Common Protocol Stats

```
                          Common Protocols Stats

                      Remote Site Name: test1 (Id: 1)
Frame Type         Total Counts    Average Rate    Recent Rate    Highest Rate
----------         ------------    ------------    -----------    ------------
All Rcvd                      0
All Tx                       0

IP Rcvd                      0
IP Tx                        0
IP Rcv Discards              0
IP Tx Discards               0

IPX Rcvd                     0
IPX Tx                       0
IPX Rcv Discards             0
IPX Tx Discards              0

Brg Rcvd                     0
Brg Tx                       0
Brg Rcv Discards             0
Brg Tx Discards              0
```

The Common Protocol Stats display lists frame counts with number of frames received, transmitted and discarded for each of the various transmission protocols.

Frame Type The frame transmission protocol

Total Counts The total number of occurrences since the statistics were last reset.

Average Rate The average rate of occurrences per second since the statistics were last reset.

Recent Rate The averaged rate of occurrences per second of the last statistics interval.

Highest Rate The highest recent rate encountered since the statistics were last reset or a re-powering of the bridge/router occurred.

2 - PPP Stats

```
                                PPP Stats

                     Remote Site Name: test1 (Id: 1)
Frame Types          Total (Rcvd/Tx)     Frame Types          Total(Rcvd/Tx)
------------      --------------------  ------------      ------------------
IPXCP                      0/0           CMCP                      0/0

IPCP                       0/0           BCP                       0/0
VJ Compression             0/0           BPDU                      0/0
VJ Uncompression           0/0           BPDU Discards             0/0

LCP                        0/0           BACP                      0/0
LCP Discard                0/0           BAP                       0/0
LQR                        0/0           BAP Discard               0/0
PAP                        0/0
CHAP                       0/0
```

Screen 1 of PPP Stats display

```
                                PPP Stats

                     Remote Site Name: test1 (Id: 1)
Frame Types          Total (Rcvd/Tx)     Frame Types          Total(Rcvd/Tx)
------------      --------------------  ------------      ------------------
MP Frames                  0/0           CCP                       0/0
MP Fragments               0/0           Reset Req                 0/0
Frame Header Err           0/-           Reset Ack                 0/0
Frag Header Err            0/-           Restarts                  0/-
Frame Discards             0/-           Resynchs                  0/-
Frag Discards              0/-           Cmprs Discards            0/0
                                         Zero Pad                  0/-
                                         Decompress Err            9/-
                                         Recent Comp Ratio       -:-/-:-
                                         Avrg Comp Ratio         -:-/-:-
```

Screen 2 of PPP Stats display

The PPP Stats display shows frame counts received and transmitted for each of the frame types listed.

Note that the PPP Stats display does not do on screen updates; to update the screen display, switch screens with the "n" (next) or "p" (previous) key or tab out and key "2" to re-enter this display. Note: the "n" or "p" must be lower case.

3 – Frame Relay Statistics

```
                          Frame Relay Stats
                  Remote Site Name: test2_Leased (Id: 4)


Frame Types          Frame Counts
------------         ----------------
Frames Rcvd                   0
Frames Tx                     0
Frames Discards Rcv           0
Frames Discards Tx            0
FECN Frames Rcv               0
BECN Frames Rcv               0
```

This display shows counts of:

Frames Rcvd: Frames received since the statistics were last cleared.

Frames Tx: Frames transmitted since the statistics were last cleared.

Frames Discards Rcvd: Received Frames discarded since the statistics were last cleared.

Frames Discards Tx: Transmitted Frames discarded since the statistics were last cleared.

FECN: Forward Explicit Congestion Notification Frames received since the statistics were last cleared (high count indicates possible link congestion for received traffic).

BECN: Backward Explicit Congestion Notification received since the statistics were last cleared (high count indicates possible link congestion for transmitted traffic).

3/4 - Status

Status of a remote site connection is displayed on a series of screens. To navigate from one display to another, enter "n" to go to the next screen, "p" to go to the previous screen, "s" to go to the starting screen or any other key to return to the Remote Site Stats Menu. Note: the "n", "p" and "s" are case sensitive; they must be lower case. The display will vary depending on the type of connection to the selected remote site; the status of more than one protocol option may be displayed on a screen.

Status – ISDN Link

```
                          Protocols Configurations
                      Remote Site Name: test_ISDN (Id: 1)

    * - Up   E - Enabled   D - Disabled   NA - Not Available
FR   AC  MP      Pri/Sec    DLCI  BCP  IPCP  IPXCP  CCP  BACP  CMCP
---  --  --  -------------  ----  ---  ----  -----  ---  ----  ----
D    D   E   Link04/none    NA    E    E     E      E    E      E
```

Status – Leased Line

```
                          Protocols Configurations
                      Remote Site Name: test_LEASED (Id: 2)

    * - Up   E - Enabled   D - Disabled   NA - Not Available
FR   AC  MP      Pri/Sec    DLCI  BCP  IPCP  IPXCP  CCP  BACP  CMCP
---  --  --  -------------  ----  ---  ----  -----  ---  ----  ----
D    D   E   Link04/none    NA    E    E     E      E    NA    NA
```

Protocol Status – Frame Relay

```
                          Protocols Configurations
                      Remote Site Name: test_FRELAY (Id: 3)

    * - Up   E - Enabled   D - Disabled   NA - Not Available
FR   AC  MP      Pri/Sec    DLCI  BCP  IPCP  IPXCP  CCP  BACP  CMCP
---  --  --  -------------  ----  ---  ----  -----  ---  ----  ----
PPP  D   E     none/none    16    E    E     E      E    NA    NA
```

FR : Frame Relay PPP, Raw 1490 or disabled for this remote site.

AC : Auto-call enabled / disabled for this remote site.

MP : Multipoint enabled / disabled for this remote site.

Pri/Sec : The Primary and Secondary (if applicable) links for this remote site.

BCP : Bridge Control Protocol enabled / disabled status.

IPCP : IP Control Protocol enabled / disabled status.

IPXCP : IPX Control Protocol enabled / disabled status.

CCP : Compression Control Protocol enabled / disabled status.

BACP : Bandwidth Allocation Control Protocol enabled / disabled status (if this is an ISDN connection, otherwise Not Applicable).

CMCP : Connection Management Control Protocol enabled / disabled status (if this is an ISDN connection, otherwise Not Applicable).

Protocol Configurations – Frame Relay

```
                                        FR
PVC State     : Disabled, Idle
Link/DLCI     : 0/16
CIR/EIR       : 0/0 Kbps
```

PVC State:

The state of the permanent Virtual Circuit on this link: whether the link is Enabled or Disabled, and if enabled, whether it is Idle, Up, Opening or PPP Opening.

Link/DLCI:

The Link and Data Link Circuit Identifier numbers associated with this remote site

CIR/EIR:

The Committed Information Rate and Excessive (burst) Information Rate for this link.

Protocol Configurations – BCP

```
 Status                  Local                    Remote
                                 BCP
802.3/Ethernet       :  disabled                 disabled
Tinygram Compression :  disabled                 disabled
MAC Address          :  00-00-00-00-00-00        00-00-00-00-00-00
```

802.3/Ethernet:

This displays the resulting bridging state for this protocol after the advisory notices are sent by the local and remote bridges. The advisory notices indicate what frame types are supported by the device.

This may display disabled if the partner bridge sends a configure reject for the advisory notice for this frame type. When this happens, the device that originally sent the advisory notice will continue to send bridge frames in the frame formats originally reported in the advisory notice.

Tinygram Compression:

This displays the negotiated state of Tinygram Compression for the local and remote devices.

MAC Address:

This displays the MAC addresses of the local and remote devices which are used for bridging data between the devices.

Protocol Status – BACP

```
 Status                  Local                    Remote
                                 BACP
Magic Number         :  1850971031               1851377123
Call Mode            :  Partner
Request number Option:  disabled
```

Magic Number:

This displays the control code numbers passed between the two routers. The router with the lower magic number will have control of setting up and tearing down the connection.

Call Mode:

This displays the selected origination of the secondary call to this remote site.

Request number Option:

The status of the Request number option for obtaining the ISDN number of the partner router.

Protocol Status – CCP

```
Status                  Local                    Remote
                                CCP
Protocol             : Stac LZS (17)            Stac LZS (17)
Histories            :  1                        1
Check mode           :  Sequence Number         Sequence Number
```

Protocol :

This displays the current compression protocol for this end of the CCP link connection as well as the compression protocol for the remote end.

Histories :

This displays the current number of histories which have been negotiated for both the local end and the remote end of the connection.

Check Mode :

This displays the compression check modes, which have been negotiated for both the local end and the remote end of the connection.

Protocol Status – IPCP

```
 Status                  Local                    Remote
                                IPCP
IP Address           :  0.0.0.0                  0.0.0.0
Subnet Mask Size     :  0                        0
Link IP type         :  unNumbered
VJ Compression       :  none                     none
Max slot id          :  0                        0
Slot id Comp         :  disabled                 disabled
```

IP Address :

This displays the current IP addresses for this end of the IPCP link connection as well as the IP address for the remote end.

Subnet Mask Size :

This displays the current subnet mask size for this end of the IPCP link connection as well as the subnet mask size for the remote end.

Link IP Type :

This displays the type of IP link connection between this IOLINK router and the remote site router, either numbered or unnumbered.

VJ Compression :

This displays the negotiated type of compression protocol for this end of the IPCP link connection as well as the compression protocol for the remote end: none, VJ TCP.

Max Slot Id :

This displays the negotiated value for the Van Jacobson max slot identifier for this end of the IPCP link connection as well as the value for the Van Jacobson max slot identifier for the remote end.

Slot Id Comp :

This displays the negotiated state of the Van Jacobson slot identifier compression for this end of the IPCP link connection as well as the state of the Van Jacobson slot identifier compression for the remote end.

Protocol Status – IPXCP

```
Status                  Local                      Remote
                              IPXCP
IPX Routing Protocol  : RIP/SAP
Force RIP Updates     : disabled
IPX Network Number    : 0
IPX Node Number       : 00-00-00-00-00-00         00-00-00-00-00-00
```

IPX Routing Protocol:

This displays the IPX routing protocol negotiated over the link. The possible routing protocols are RIP/SAP, Static, Demand RIP/SAP.

Force RIP Updates:

This displays the state of the force RIP updates option on the link connection. This display is only applicable when the IPX Routing Protocol is RIP/SAP.

IPX Network Number:

This displays the IPX network number negotiated for the link. The network number will be 0 if the interface is unnumbered.

IPX Node Number:

Local :

This indicates the IPX node number negotiated for this end of the link. The node number will be 0 if the interface is unnumbered.

Remote :

This indicates the IPX node number negotiated for the remote site end of the link. The node number will be 0 if the interface is unnumbered.

Protocol Status – Multilink

```
 Status                  Local                    Remote
                              Multilink
MRRU                 :  1800                     1800
SSNHF                :  normal                   normal

Local  EPD           :  class MAC 00-00-d0-00-d1-1a
Remote EPD           :  class MAC 00-00-d0-00-af-1f
```

MRRU :

This displays the negotiated MRRU (Maximum Receive Reconstructed Unit) value for this end of the link connection as well as the MRRU value for the remote end.

SSNHF :

This displays the negotiated SSNHF (Short Sequence Number Header Format) value for this end of the link connection as well as the SSNHF value for the remote end: normal / short.

EPD :

This displays the negotiated EPD (End Point Discriminator) value for this end of the link connection and the EPD value for the remote end.

Protocol Status – CMCP

```
 Status                  Local                    Remote
                              CMCP
Callback number  1   :  6681048                  2447072
Callback number  2   :  9954321                  3435566
```

Callback number n:

This displays the callback ISDN numbers used by each interface and by the remote site connected to that interface.

4/5 – Usage information

```
                          Usage Summary
                  Remote Site Name: test1 (Id: 1)

Day of Week     Usage          Outgoing Calls
Sunday      : 0      min       0       calls
Monday      : 0      min       0       calls
Tuesday     : 0      min       0       calls
Wednesday   : 0      min       0       calls
Thursday    : 0      min       0       calls
Friday      : 0      min       0       calls
Saturday    : 0      min       0       calls

Current     : 0      min       0       calls
```

Note: The day-of-weeks are the 24-hour time intervals starting from 7:00 the same day.

Usage :

This displays the total number of minutes of line usage.

Outgoing Calls :

This displays the total number of outgoing calls to this remote site for the indicated day of the week.

5/6 Clear Remote Site Stats

The Clear Remote Site Statistics option clears all fields in all of the remote site statistics displays to zero.

LAN Statistics Menu

```
                          LAN STATISTICS MENU

   Option                      Description
 1. Bridged traffic        - Summary of Bridge traffic
 2. IP traffic             - Summary of IP Router traffic
 3. IPX traffic            - Summary of IPX Router traffic
 4. Total LAN traffic      - Summary of LAN traffic
 5. LAN error              - View LAN errors history
 6. Clear LAN statistics   - Reset LAN statistics
 7. Clear LAN errors       - Reset LAN errors




Enter option number, "=" - main menu, <TAB> - previous menu

>
```

1 - Bridged Traffic

The Bridged Traffic option displays a summary of Bridged LAN traffic since the statistics were last reset.

2 - IP Traffic

The IP Traffic option displays a summary of IP Router LAN traffic since the statistics were last reset.

Note: only statistics on the primary LAN are kept, none are available for secondary LANs.

3 - IPX Traffic

The IPX Traffic option displays a summary of IPX Router LAN traffic since the statistics were last reset.

4 - Total LAN Traffic

The Total LAN Traffic option displays a summary of Total LAN traffic since the statistics were last reset.

5 - LAN Error

The LAN Error option displays a summary of LAN and router errors since the statistics were last reset.

6 - Clear LAN Statistics

The Clear LAN Statistics option clears all statistic fields in the LAN statistics to zero.

7 - Clear LAN Errors

The Clear LAN Errors option clears all error fields in the LAN statistics to zero.

Bridged Traffic Summary Display (Option 1)

This screen displays Bridged LAN traffic statistics gathered since the statistics were last reset and reports statistics generated within the current statistics interval.

```
                        Bridged Traffic Summary for LAN
                                                 Average     Recent    Highest
Statistic                              Total      Rate       Rate       Rate
-------------------------------------------------------------------------------
Frames from LAN                            0
Bytes from LAN                             0
Frames filtered from LAN                   0
Frames to LAN                              0
Bytes to LAN                               0




Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

If a second LAN module is present, statistics for both LANs will be displayed.

Column Analysis

Total Indicates the total number of occurrences since the statistics were last reset. (Available with extended statistics disabled.)

Average Rate Indicates the average rate of occurrences per second since the statistics were last reset.

Recent Rate Indicates the averaged rate of occurrences per second of the last statistics interval.

Highest Rate Indicates the highest recent rate encountered since the statistics were last reset or a re-powering of the router occurred.

Bridged Traffic Summary Statistics Definitions

Frames from LAN	All bridge data frames successfully received from the LAN.
Bytes from LAN	All bridge data bytes successfully received from the LAN.
Frames filtered from LAN	All bridge data frames received from the LAN and filtered by the router. This includes frames filtered because the frame meets pattern filtering criteria or the frame was unsuccessfully received because of an error.
Frames to LAN	All bridge data frames successfully placed upon the LAN.
Bytes to LAN	All bridge data bytes successfully placed upon the LAN.

IP Traffic Summary Display (Option 2)

This screen displays IP Routed LAN traffic statistics gathered since the statistics were last reset and reports statistics generated within the current statistics interval.

```
                          IP Traffic Summary for LAN
                                          Average      Recent     Highest
Statistic                          Total     Rate        Rate        Rate
-------------------------------------------------------------------------
Frames from LAN                        0
Bytes from LAN                         0
Frames filtered from LAN               0
Frames to LAN                        780
Bytes to LAN                       59060
ARP Discards From LAN                  0
Redirect Sent From LAN                 0
Unreachable Sent From LAN              0


Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

If a second LAN module is present, statistics for both LANs will be displayed.

Column Analysis

Total Indicates the total number of occurrences since the statistics were last reset. (Available with extended statistics disabled.)

Average Rate Indicates the average rate of occurrences per second since the statistics were last reset.

Recent Rate Indicates the averaged rate of occurrences per second of the last statistics interval.

Highest Rate Indicates the highest recent rate encountered since the statistics were last reset or a re-powering of the router occurred.

IP Traffic Summary Statistics Definitions	
Frames from LAN	All IP frames successfully received from the LAN.
Bytes from LAN	All IP bytes successfully received from the LAN.
Frames filtered from LAN	All IP frames received from the LAN and filtered by the router. This includes IP frames filtered because the frame meets pattern filtering criteria or the frame was unsuccessfully received because of an error.
Frames to LAN	All IP frames successfully received from partner routers and placed upon the LAN.
Bytes to LAN	All IP bytes successfully received from partner routers and placed upon the LAN.
ARP Discards from LAN	Data frames discarded because local LAN stations not responding to an ARP request. This occurs when an IP frame destined for this LAN is received from a partner router, but there is no entry in the ARP table for that IP address, and the station does not respond to an ARP request.
Redirect Sent from LAN	The number of ICMP Redirect messages generated.
Unreachable Sent from LAN	The number of ICMP Destination Unreachable messages generated.

NOTE: The IP frames and bytes in the above table refer to frames properly routed to this router. A properly routed frame will be MAC addressed to the router and IP addressed for a station on another network or sub-network.

IPX Traffic Summary Display (Option 3)

This screen displays IPX Routed LAN traffic statistics gathered since the statistics were last reset and reports statistics generated within the current statistics interval.

```
                          IPX Traffic Summary for LAN


                                          Average      Recent     Highest
Statistic                      Total         Rate        Rate         Rate
-------------------------------------------------------------------------
Frames from LAN              4348699          228         416          840
Bytes from LAN             278317248        14616       26667        53785
Frames filtered from LAN      132982            6           0          840
Congestion discards from LAN       0            0           0            0
Frames to LAN              269806208        14171       26667        28236
Bytes to LAN                 4169752          219         416          441



Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

If a second LAN module is present, statistics for both LANs will be displayed.

Column Analysis

Total Indicates the total number of occurrences since the statistics were last reset. (Available with extended statistics disabled.)

Average Rate Indicates the average rate of occurrences per second since the statistics were last reset.

Recent Rate Indicates the averaged rate of occurrences per second of the last statistics interval.

Highest Rate Indicates the highest recent rate encountered since the statistics were last reset or a re-powering of the bridge/router occurred.

IPX Traffic Summary Statistics Definitions	
Frames from LAN	All IPX frames successfully received from the LAN.
Bytes from LAN	All IPX bytes successfully received from the LAN.
Frames filtered from LAN	All IPX frames received from the local LAN and filtered by the router. This includes IPX frames filtered because the frame meets pattern filtering criteria or the frame was unsuccessfully received because of an error.
Congestion Discards from LAN	IPX Data frames discarded because of internal congestion between the LAN and the IPX module
Frames to LAN	All IPX frames successfully placed upon the LAN.
Bytes to LAN	All IPX bytes successfully placed upon the LAN.

Total LAN Traffic Summary Display (Option 4)

This screen displays statistics gathered since the statistics were last reset and reports statistics generated within the current statistics interval.

```
                          Total LAN Traffic Summary


                                        Average      Recent     Highest
Statistic                      Total      Rate        Rate        Rate
-------------------------------------------------------------------------
Frames from LAN              4348699       228         416         840
Bytes from LAN             278317248     14616       26667       53785
Frames filtered from LAN      132982         6           0         840
Adapter discards                   0         0           0           0
Congestion discards from LAN       0         0           0           0

Frames forwarded             4215689       221         416         441
Bytes forwarded            269806208     14171       26667       28236
Frames to LAN                4169752       219         416         441
Bytes to LAN               268464916     14024       26667       28250
Congestion discards to LAN         0         0           0           0




Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

If a second LAN module is present, you will be asked to select which LAN statistics to display.

Column Analysis

Total Indicates the total number of occurrences since the statistics were last reset. (Available with extended statistics disabled.)

Average Rate Indicates the average rate of occurrences per second since the statistics were last reset.

Recent Rate Indicates the averaged rate of occurrences per second of the last statistics interval.

Highest Rate Indicates the highest recent rate encountered since the statistics were last reset or a re-powering of the router occurred.

Total LAN Traffic Summary Statistics Definitions	
Frames from LAN	All frames successfully received from the local LAN.
Bytes from LAN	All bytes successfully received from the local LAN.
Frames filtered from LAN	All frames received from the local LAN and filtered by the router. This includes frames filtered because the router is in Learn mode, the destination address resides on the same LAN, the source address is specified for filtering, or the frame meets pattern filtering criteria.
Adapter Discards	All incoming frames lost because of an overflow error, receive buffer congest, missed frame detection, CRC errors, or framing errors. This is a case where LAN traffic exceeds the processing capability of the router, primarily because the router is engaged in other functions such as filtering.
Congestion Discards from LAN	This occurs when the router has to discard frames from the LAN because too many frames are waiting for processing inside the router and buffer space is unavailable.
Frames Forwarded	All frames successfully forwarded to partner routers.
Bytes Forwarded	All bytes successfully forwarded to partner routers.
Frames To LAN	All frames successfully placed upon the local LAN.
Bytes To LAN	All bytes successfully placed upon the local LAN.
Congestion Discards to LAN	This occurs when the router has to discard frames destined for the local LAN because too many frames are waiting for processing inside the router and buffer space is unavailable.

LAN Error Display (Option 5)

```
                          LAN Calgary Error Summary

Device Errors                              LAN Errors
-------------------------------------------------------------------------------
Loss of Carrier           : 0              CRC Errors                 : 0
Transmit Babble Errors    : 0              Framing Errors             : 0
Underflow Errors          : 0              Single Collision           : 0
Overflow Errors           : 0              Multiple Collisions        : 0
Receive Buffer Congest    : 0              Transmit Retry Failures    : 0
Receiver Misses           : 0              Late Collisions            : 0
Transmit Buffer Errors    : 0              Heartbeat Failure          : 0
Memory Errors             : 0              Oversized frames received  : 0


Type: [s] to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

If a second LAN module is present, you will be asked to select which LAN statistics to display.

Device Errors	
Loss of Carrier	This usually indicates a problem with the LAN hardware either on the Router or in the transceiver.
Underflow Errors	This is a hardware error. The LAN hardware could not read the contents of a frame to be transmitted from memory.
Transmit Babble Errors	Currently unused
Overflow Errors	The software could not supply a receive buffer in time to receive frames because of congestion.
Receive Buffer Congest	The router missed a frame; because of congestion, the software did not supply sufficient receive buffers to the LAN hardware fast enough to receive all segments of a frame.
Receiver Misses	The router missed the frame because there were no receive buffers available for storing the frame. Note that this statistic counts only this specific case—whereas the Traffic Summary Receiver Misses statistic counts two additional receive buffer errors and combines them into one statistic.
Transmit Buffer Errors	This is a hardware or software error. The transmit buffers are corrupted or the memory could not be read by the LANCE chip.
Memory Errors	This reports errors occurring with the router's memory.

LAN Errors	
CRC Errors	A frame was received with a bad CRC and was discarded.
Framing Errors	A frame was received that did not contain an integral number of bytes (some bits were missing).
Single Collision	The number of times exactly one retry was needed to transmit a packet.
Multiple Collisions	The number of times more than one retry was needed to transmit a packet.
Transmit Retry Failures	The LAN transceiver has made 16 attempts to transmit a packet and has been blocked each time because of collisions. The transmission is aborted.
Late Collisions	A collision should only be seen when the transceiver transmits the first 64 bytes of a packet. The likely cause is a faulty transceiver that has started transmitting after this point.
Heartbeat Failure	This is also called an "SQE" error. As a check for LAN presence, the transceiver is supposed to test the collision presence circuit whenever a transmission is made. The LANCE is complaining that this did not happen. Ethernet Version 1 does not support Heartbeat, so Heartbeat should be disabled when the router is connected to Version 1.
Oversized frames received	A count of oversized (>1518 bytes) frames received

Diagnostics Menu

```
                              DIAGNOSTICS MENU

    Option              Value         Description

    Option           Value          Description
 1. Soft reset                    - Reset device (retain configuration)
 2. Full reset                    - Reset device (use factory defaults)
 3. Heartbeat       [enabled]     - Report transceiver heartbeat failures
 4. WAN trace        menu         - Trace link frames
 5. WAN loopback     menu         - Access WAN loopback diagnostics



Enter option number, "=" - main menu, <TAB> - previous menu

>
```

1 - Soft Reset

Selecting the Soft Reset option resets the router software and restarts the router. The current configuration is retained.

Note: a reset may also be performed by toggling the switch behind the hole on the lower right side of the faceplate.

2 - Full Reset

Selecting the Full Reset option resets the router configuration to factory default settings and restarts the router. The factory default settings include the terminal type and password.

CAUTION: Use this option with caution. All configuration settings will be lost.

3 - Heartbeat

The Heartbeat option enables or disables reporting of transceiver heartbeat failures. This failure is not a router fault but a transceiver fault. As a check for LAN presence, the transceiver should ensure that the collision-presence circuit is working whenever a transmission is made. When Heartbeat is enabled, the router will report these failures. Ethernet Version 1 does not support Heartbeat, so all transceivers should have Heartbeat Disabled on these Version 1 Ethernet networks.

Considerations:

Enabling this option can help in determining transmission line performance, although it will decrease router performance, since additional processing must be done by the router to report these errors. (Disable for Version 1 Ethernet.)

4 - WAN trace

The WAN diagnostics option takes you to the WAN Trace Menu, where trace operations can be [enabled] or [disabled] for each link in order to evaluate link operation.

5 – WAN Loopback

The WAN Loopback option takes you to the WAN Loopback Menu, where loopback tests can be performed on a specified link in order to evaluate link operation.

WAN Trace Menu

```
                                WAN TRACE MENU

    Option          Value                  Description
 1. Trace link      [1]                  - Enter the link to be traced
 2. Real time       [disabled]           - Display frames in real-time
 3. Capture         [enabled]            - Capture frames in buffer
 4. End             [disabled]           - End capture at link down
 5. Data display    [hex] [single_line]  - Set frame display format
 6. Time            [disabled]           - Add time to display
 7. Show                                 - View capture buffer




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **WAN TRACE MENU** can be used to monitor the link with features such as statistics capture, frame and packet level tracing, and link-utilization and efficiency histograms. Note that these features will hamper the performance of the bridge/router; therefore, the tracing functions should only be [enabled] when needed.

1 - Trace Link

Enable the trace for the specified link after the other options below are set. These options also determine which link is displayed with the Show option.

2 - Real Time

Enable this option when the display of frames in real-time is desired. When [enabled], the trace starts immediately and scrolls off the bottom of the screen. Return to the menu by entering "2" to disable real-time (You will have to wait 7-8 seconds or more for this to take effect).

3 - Capture

Enabling this option allows for frame capture and display after the buffer is allocated. Use Option 7, Show, to display the capture.

4 - End

With this option [enabled], if the link goes down while a trace is underway, the Capture function will end and the data from the trace can be examined up until the point of failure. If this option is [disabled], the Capture function will end when the allocated capture buffer is full.

If the link goes down and then comes back up, the recovery can be examined with End [disabled].

5 - Data display

Three possibilities are offered for the display of data. Data may be displayed in **hex** or **ASCII,** or, since in most cases the data being sent doesn't itself need to be examined, **off** may be chosen, which will display only the protocol frame information. Note that command completion may be used (i.e. only the first letter (or letters) need to be entered for recognition). After a data from a trace is captured, you may move from off to ASCII or hex, as this information resides in the background.

```
Enter:
 ascii, hex, off
>

Enter:
 all_lines, single_line
>
```

6 - Time

[Enable] this option to add time to the trace display in thousands of a second (h.mm.ss.xxx). Time is always available and does not need to be enabled to capture data during a trace (i.e. may be enabled after the data from the trace is captured). Time is relative to the time of power-up.

7 - Show

This option appears once the buffers are allocated

This option displays the frames captured by the Trace and stored in the capture buffer. (BOB = Beginning of Buffer; EOB = End of Buffer.) The trace shown below is with the data display in the "off" mode.

BOB	**This Bridge/Router**	**Partner Bridge/Router**
rRR 0		expects 0
xI 4,0 122	expects 4, sends 0	gets 0
rRR 1		expects 1
rI 1,4 68	gets 4	still expecting 1, sends 4
xRR 5	expects 5	
rI 1,5 68	gets 5	still expecting 1, sends 5
xI 5,1 122	still expecting 5, sends 1	gets 1
xRR 6	expects 6	
rRR 2		expects 2
xI 6,2 236	still expecting 6, sends 2	gets 2
rRR 3		expects 3
rI 3,6 68	gets 6	still expecting 3, sends 6
xRR 7	expects 7	
rI 3,7 68	gets 7	still expecting 3, sends 7
xI 7,3 144	still expecting 7, sends 3	gets 3
xRR 0	expects 0	
rRR 4		expects 4
xI 0,4 122	still expecting 0, sends 4	gets 4
rRR 5		expects 5
rI 5,0 68	gets 0	still expecting 5, sends 0
xRR 1	expects 1	
rI 5,1 68	gets 1	still expecting 5, sends 1
xI 1,5 122	still expecting 1, sends 5	gets 5
xRR 2	expects 2	
rRR 6		expects 6
xI 2,6 258	still expecting 2, sends 6	gets 6
rRR 7		expects 7
rI 7,2 68	gets 2	still expecting 7, sends 2
xRR 3	expects 3	
rI 7,3 68	gets 3	still expecting 7, sends 3
xI 3,7 68	still expecting 3, sends 7	gets 7
xRR 4	expects 4	
rRR 0		expects 0
EOB		

Format:

Receive frames (r) are indented.
Transmit frames (x) are not.

Valid frames are as follows:

I	-	Information
RR	-	Receiver Ready
RNR	-	Receiver Not Ready
REJ	-	Reject
SABM	-	Set Asynchronous Balance Mode
DM	-	Disconnect Mode
DISC	-	Disconnect
UA	-	Unnumbered Acknowledgment
FRMR	-	Frame Reject

Information (I) Frame traces will be displayed with the following:

Link (L1/L2) (x/r)I N(r), N(s) Data Field Length Data Field (hex)

As much of the Data Field as will fit on one line will be displayed if hex or ASCII format is specified. If **off** is specified, only the Data Field Length is given.

Supervisory (S) frame traces will be displayed with the following:

Link (L1/L2) (x/r)(RR / RNR / REJ) N(r)

Unnumbered (U) frame traces will be displayed with the following:

Link (0/1) (x/r) (SABM / DM / DISC / UA / FRMR)

Any illegal or unknown frame will be completely dumped in hex. Note that any frame with a CRC error will not be displayed and a Level 2 error will be output.

LAPB *control field* formats:

Three types of Link Access Procedures (Balanced) **LAPB** control field formats are used to perform:

1) numbered information transfer (**I** format),
2) numbered supervisory functions (**S** format) and
3) unnumbered control functions (**U** format).

The numbered **I** format is used to perform information transfer.

The numbered **S** format is used to perform data link supervisory control functions such as:
- acknowledge **I** frames,
- request transmission of **I** frames, and
- to request a temporary suspension of **I** frames.

The unnumbered **U** format is used to provide additional data link control functions.

INFORMATION FRAMES:

I **I**nformation

The (**I**) statistic indicates a transfer of a sequentially numbered frame containing an (**I**) information field.

To allow the sending of an **I**nformation frame a Receive Ready (**RR**) supervisory frame is sent by the remote bridge/router requesting the connection.

SUPERVISORY FRAMES:

RR **R**eceiver **R**eady

A Receive Ready (**RR**) supervisory frame is sent by the bridge/router in order to:

1) indicate that it is ready to receive an **I** frame;
2) acknowledge previously received **I** frames numbered up to and including N(R) - 1.

An **RR** frame may be used to indicate the clearance of a busy condition reported by the earlier transmission of an **RNR** frame by that same bridge/router.

RNR **R**eceiver **N**ot **R**eady

The **RNR** statistic is generated by either remote bridge/router to indicate a busy condition. A busy condition essentially indicates a temporary inability to accept incoming **I** frames. **I** frames numbered up to and including N(R) - 1 are acknowledged.

I frame N(R) and any subsequent **I** frames received, are not acknowledged; the acceptance state of these unacknowledged frames will be indicated in subsequent exchanges.

REJ **REJ**ect

The **REJ** supervisory frame is generated when a remote bridge/router requests transmission of **I** frames starting with the frame numbered N(R). **I** frames numbered N(R) - 1 and below are acknowledged. Additional **I** frames (pending initial transmission) may be transmitted following the retransmitted **I** frame(s).

Only one **REJ** exception condition for a given transfer direction may be established at any time. This **REJ** exception condition is reset (cleared) upon the receipt of an **I** frame with an N(S) equal to the N(R) of the **REJ** frame. A **REJ** frame may be used to indicate the clearance of a busy condition that was reported by the earlier transmission of an **RNR** frame by that same bridge/router.

UNNUMBERED FRAMES:

SABM **S**et **A**synchronous **B**alanced **M**ode

The **SABM** unnumbered command is generated to place the addressed bridge/router into an asynchronous balanced mode information-transfer phase, where all command/response control fields will be one octet in length.

The receiving bridge/router confirms acceptance of the **SABM** by the transmission, at the first opportunity, of a **UA** response.

Previously transmitted **I** frames that are unacknowledged when a **SABM** command is generated remain unacknowledged. It is the responsibility of a higher level (e.g. TCP, XNS, LAT) to recover from the loss of the contents (packets) of such **I** frames.

DISC **DISC**onnect

The **DISC** statistic is generated when the bridge/router sending the **DISC** informs the other bridge/router that it (the sending bridge/router) is suspending its own operation.

Before the **DISC** is acted upon, the bridge/router receiving the **DISC** confirms its acceptance of the **DISC** command by the transmission of a **UA** response. The bridge/router sending the **DISC** enters the disconnected phase when it receives the acknowledged **UA** response.

Previously transmitted **I** frames that are unacknowledged when **DISC** is generated remain unacknowledged. It is the responsibility of a higher-level protocol (e.g. TCP, XNS, LAT) to recover from the possible loss of the contents (packets) of such **I** frames.

UA **U**nnumbered **A**cknowledgment

A **UA** response and statistic is generated to acknowledge the receipt and acceptance of the mode-setting commands. Received mode-setting commands are not acted upon until the **UA** response is transmitted.

DM **D**isconnected **M**ode

The **DM** unnumbered response and statistic is generated to report a status where the bridge/router is logically disconnected from the link, and is in the disconnected phase.

1) The **DM** may be sent to indicate that the bridge/router has entered the disconnected phase without having received a **DISC** command.
2) If sent in response to the reception of a mode-setting command, the **DM** is sent to inform the other bridge/router(s) that this bridge/router is still in the disconnected phase and cannot execute the Set Mode command.

A bridge/router in the **DM** phase will monitor received commands and will react to a **SABM** command. It will send a **DM** response with the F bit set to 1 in response to another command received with the P bit set to 1.

FRMR **FR**a**M**e **R**eject

The **FRMR** statistic is generated by the bridge/router to report an error condition not recoverable by the re-transmission of an identical frame. This may result from at least one of the following conditions:

1) the receipt of a command or response control field that is undefined or not implemented;
2) the receipt of an I frame with an information field that exceeds the maximum established length;
3) the receipt of an invalid N(R); or
4) the receipt of a frame with an information field that is not permitted or the receipt of a supervisory or unnumbered frame with incorrect length.

An undefined or not implemented control field is any control field encoding not identified in Table 5, LAPB commands and responses.

A valid N(R) must be within the range from the lowest send sequence number N(S) of the still unacknowledged frame(s) to the current logical DCE send state variable, inclusive.

An information field that immediately follows the control field, and consists of 3 to 5 octets, is returned with the FRMR and provides the reason for the FRMR response.

WAN Loopback Menu

```
                          WAN LOOPBACK n MENU

   Option                      Value         Description
 1. Link operation            [enabled]    - Enable/disable link
 2. External loopback                      - Generate/verify loopback data

 3. ATL CSU/DSU self test                  - Perform internal self test
 4. ATL CSU/DSU local                      - Perform local digital loopback
 5. CSU/DSU remote loopback                - Perform loopback with partner

 2. Link operation mode       [56K]        - Set operation mode for link
 3. LXT CSU/DSU remote loopback master     - Set loopback master
 4. LXT CSU/DSU remote loopback slave      - Set loopback slave

 6. Help                                   - Description of link diagnostics









Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **LINK DIAGNOSTICS MENU** allows loopback testing to be performed for this link.

You must first specify which link you wish to perform the tests on by entering the link number; the options on the menu will then be available.

The ATL CSU/DSU options are only available when the link module is an ATL CSU/DSU module and the link state is disabled.

The LXT CSU/DSU options are only available when the link module is an LXT 411 CSU/DSU module and the link state is disabled.

1 - Link operation

Toggles between [enabled] and [disabled] to activate the link or take the link out of service. You must confirm that this is the action you wish to take by typing "yes" at the prompt.

Considerations:

Disabling the link will cause the control signals to be dropped and the link connection to be disconnected.

2 - External Loopback

This option is available for the following link types: V.35, RS232, RS530, V.11, and ATL CSU/DSU. This option is not shown if the link is an ISDN BRI or LXT 411 CSU/DSU.

Enabling this option causes a test pattern to be generated and transmitted by this link module. This external loopback test requires that somewhere along the WAN link connection, there is a loopback to send the test pattern back to the bridge/router. The loopback may be a hardware loopback or an internal loopback on a remote modem.

```
LINK 1 - EXTERNAL LOOPBACK

Link Interface Type:  RS530
Sample Description :  256 Byte Frame

Total Frames Xmt   :              513
Total Frames Rcv   :              513
Good  Frames Rcv   :              253
Error Frames Rcv   :                0
Xmt Failures       :                0









Type: [s] - redraw, [c]lear, [=] main menu, any other key to end.
```

Total Frames Xmt: The total number of frames transmitted by the link module.

Total Frames Rcv: The total number of frames received by the link module.

Good Frames Rcv: The total number of good frames received by the link module. A good frame is a frame with a correct CRC, is correctly aligned, etc.

Error Frames Rcv: The total number of error frames received by the link module. An error frame is a frame with a bad CRC, unaligned, contains an abort sequence, etc.

Xmt Failures: The number of times the bridge/router attempted to transmit a test frame and failed. This is due to the absence of a transmit link clock signal. This will indicate that the connection to the link module is faulty.

2 – Link Operation Mode

This option sets toggles an LXT 411 CSU/DSU link operation between 56 Kbps and 64 Kbps. This option is only available on an LXT 411 CSU/DSU link.

3 – ATL CSU/DSU Self Test

Enabling this option activates the ATL CSU/DSU link module's internal self test. The ATL CSU/DSU link module reports pass or fail messages for each 100 ms period.

```
                              LINK 1 - ATL CSU/DSU SELF TEST

Link Interface Type: ATL CSU/DSU 56 Kbps
Sample Description :  100 ms Period

Total Periods         :             10
Good  Periods         :             10
Error Periods         :              0









Type: [s] - redraw, [c]lear, [=] main menu, any other key to end.
```

Total Periods: The total number of 100 ms periods that the ATL CSU/DSU link module performed the self test.

Good Periods: The total number of 100 ms periods that the ATL CSU/DSU link module successfully performed the self test.

Error Periods: The total number of 100 ms periods that the ATL CSU/DSU link module unsuccessfully performed the self test.

3 – LXT441 Remote Loopback Master

This option sets the LXT411 CSU/DSU link module in this device to master mode for loopback testing and displays the results from traffic generated by the IOLINK router and looped back by the remote slave LXT CSU/DSU device.

Remote Loopback between two LXT CSU/DSU routers is only available in 56 K mode. The remote LXT CSU/DSU must be put in slave mode manually.

```
                LINK 1 - LXT411 CSU/DSU REMOTE LOOPBACK MASTER

Link Interface Type: LXT-CSU 56 Kbps
Sample Description :  256 Byte Frame

Total Frames Xmt   :              723
Total Frames Rcv   :              723
Good  Frames Rcv   :              431
Error Frames Rcv   :                0









Type: [s] - redraw, [c]lear, [=] main menu, any other key to end.
```

Total Frames Xmt: The total number of frames transmitted by the link module.

Total Frames Rcv: The total number of frames received by the link module.

Good Frames Rcv: The total number of good frames received by the link module. A good frame is a frame with a correct CRC, is correctly aligned, etc.

Error Frames Rcv: The total number of error frames received by the link module. An error frame is a frame with a bad CRC, unaligned, contains an abort sequence, etc.

4 – LXT441 Remote Loopback Slave

This option sets the LXT411 CSU/DSU link module in this device to slave mode for loopback testing and displays the status as slave LXT CSU/DSU device.

Remote Loopback between two LXT CSU/DSU routers is only available in 56 K mode.

```
                LINK 1 – LXT411 CSU/DSU REMOTE LOOPBACK SLAVE

Link Interface Type: LXT-CSU 56 Kbps
Sample Description :  256 Byte Frame

The slave LXT441 CSU/DSU
   Mode  :  56K
   State :  forced CSU_LP









Type: [s] - redraw, [c]lear, [=] main menu, any other key to end.
```

4 – ATL CSU/DSU Local Loopback

Enabling this activates the digital loopback function of the ATL CSU/DSU link module.

When in digital loopback, the ATL CSU/DSU link module will create an internal loopback on both the digital interface and the analog interface. The test results shown here indicate traffic that is generated by the IOLINK router and looped back by the digital interface of the ATL CSU/DSU link module.

```
                    LINK 1 - ATL CSU/DSU LOCAL LOOPBACK

Link Interface Type: ATL CSU/DSU 56 Kbps
Sample Description :  256 Byte Frame

Total Frames Xmt   :              513
Total Frames Rcv   :              513
Good  Frames Rcv   :              253
Error Frames Rcv   :                0









Type: [s] - redraw, [c]lear, [=] main menu, any other key to end.
```

Total Frames Xmt: The total number of frames transmitted by the link module.

Total Frames Rcv: The total number of frames received by the link module.

Good Frames Rcv: The total number of good frames received by the link module. A good frame is a frame with a correct CRC, is correctly aligned, etc.

Error Frames Rcv: The total number of error frames received by the link module. An error frame is a frame with a bad CRC, unaligned, contains an abort sequence, etc.

5 - CSU/DSU Remote Loopback

Enabling this option activates the remote loopback function of the ATL CSU/DSU link module. This option is only available on an ATL CSU/DSU link.

When the remote loopback function is initiated, the local ATL CSU/DSU link module will send a remote slave loopback command to the remote partner CSU/DSU attempting to put the remote partner CSU/DSU in loopback. Once the remote partner CSU/DSU is in loopback, the local ATL CSU/DSU will generate test data and send it to the remote partner. The local ATL CSU/DSU will error check the returning data and report pass or fail back to the local IOLINK router in 100 ms intervals.

Remote Loopback between an ATL CSU/DSU and an LXT CSU/DSU must be performed with the ATL CSU/DSU in the local router and the LXT CSU/DSU in the remote unit. The remote LXT CSU/DSU must be put in slave mode manually.

```
                          LINK 1 - CSU/DSU REMOTE LOOPBACK

Link Interface Type: ATL CSU/DSU 56 Kbps
Sample Description :  100 ms Period

Total Periods         :             17
Good  Periods         :              0
Error Periods         :              0
Not Connected Periods :              0









Type: [s] - redraw, [c]lear, [=] main menu, any other key to end.
```

Total Periods: The total number of 100 ms periods that the CSU/DSU link module exchanged the test pattern with the remote partner CSU/DSU.

Good Periods: The total number of 100 ms periods that the CSU/DSU link module exchanged the test pattern with no errors with the remote partner CSU/DSU.

Error Periods: The total number of 100 ms periods that the CSU/DSU link module exchanged the test pattern with errors with the remote partner CSU/DSU.

Not Connected Periods: The total number of 100 ms periods that the CSU/DSU link module could not establish a connection with the remote partner CSU/DSU.

Considerations:

The remote partner CSU/DSU must be an IOLINK router CSU/DSU link module in order to perform this remote loopback function.

Network Events Menu

```
                          NETWORK EVENTS MENU

    Option                   Description
 1. Acknowledge alarm       - Clear alarm status display
 2. Show events             - View event history
 3. Clear events            - Clear event history
 4. Show security log       - View security failure log
 5. Clear security log      - Clear security failure log
 6. Show activation log     - View resume event log
 7. Clear activation log    - Clear resume event log




Enter option number, "=" - main menu, <TAB> - previous menu


>
```

The **NETWORK EVENTS MENU** allows the display and management of alarm histograms.

Event, link Activation and Security Logs are listed and explained in the Reference Manual file on the accompanying disk.

1 - Acknowledge Alarm

The Acknowledge Alarm option clears the screen ALARM display for the current alarm.

2 - Show Events

The Show Events option displays the 199 most recent events and alarms since the router was last powered up or Cleared with option 3. A listing of events and alarms is available in Appendix A of the IOLINK-520 and IOLINK-PRO Reference Manual. Alarms are indicated by an asterisk (*).

```
#1 1999-01-26 13:39:05   SNMP is running
#2 1999-01-26 13:39:06 * IP Routing is enabled
#3 1999-01-26 13:39:07   Configuration restored
#4 1999-01-26 13:39:08   Running in OPERATIONAL mode
#5 1999-01-26 13:39:09 * LAN connection established
#6 1999-01-26 13:39:35 * LAN started forwarding
time is 1999-01-26 14:24:32, 8 items since last clear.



Type: [s]tart, [n]ext, [p]rev, [=] main menu, any other key to end.
```

The format of the time stamp for each event is: year-month-day hour:minute:second

These will be according to the date and time set in the Device Set-Up menu.

3 - Clear Events

The Clear Events option removes all events from the table.

4 - Show Security Log

The Show Security Log option displays the 99 most recent security logs since the router was last powered up or Cleared with option 5.

```
#1 1999-01-26 16:26:53   Link 1 PAP failed for one (5551313)
#2 1999-01-26 16:28:19   Link 1 CHAP failed for one (5551313)
time is 1999-01-26 16:28:19, 2 items since last clear.

Type: [s]-to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

The format of the time stamp for each security log entry is: year-month-day hour: minute: second

These will be according to the date and time set in the Device Set-Up menu.

5 - Clear Security Log

The Clear Security Log option removes all security logs from the table.

6 - Show Activation Log

The Show Activation Log option displays the 100 most recent connection management link activation logs since the router was last powered up or Cleared with option 7. The entries in the log indicate the device that was called, the protocol that caused the activation, the source and destination addresses within the frame that caused the activation, and a hex dump of the frame that caused the activation. The hex dump of the frame may be used for debugging purposes when the link is being resumed incorrectly.

```
#1 1999-01-26 14:53:27   Resume event to DEV000d05 (IPX)
#2 1999-01-26 14:53:27   Dst 0000411b:000000000001:0451 Src
                       + 00001515:00001b02446b:4003
#3 1999-01-26 14:53:27   Length = 46 - ff ff 00 29 01 11 00 00 41 1b 00 00 00
                       + 00 00 01 04 51 00 00 15 15 00 00 1b 02 44 6b 40 03 22
                       + 22 17 03 01 00 16 00 02 15 01 01 00 01 bf bf
#4 1999-01-26 15:06:10   Resume event to DEV000d05 (IP)
#5 1999-01-26 15:06:10   Dst 192.168.95.196 Src 198.169.1.149
#6 1999-01-26 15:06:10   Length = 335 - 45 00 01 4f 00 00 00 00 1f 29 b1 db c6
                       + a9 01 95 c0 a8 5f c4 02 54 48 45 20 51 55 49 43 4b 20
                       + 42 52 4f 57 4e 20 46 4f 58 20 4a 55 4d 50 53 20 4f 56
                       + 45 52 20 54 48 45 20 4c 41 5a 59 20 44 4f 47 20 31 32
time is 1999-01-26 15:06:16, 9 items since last clear.

Type: [s]-to redraw, [=] main menu, any other key to end.
```

note: the[s] to redraw is case sensitive; it must be lower case.

The format of the time stamp for each alarm is as follows: year-month-day hour: minute: second

These will be according to the date and time set in the Device Set-Up menu.

7 - Clear Activation Log

The Clear Activation Log option removes all connection management link activation logs from the table.