Series 8000 Router
Reference Manual

(Release 2.1)

Unit 15, Riverside Business Centre, Victoria Street, High Wycombe, Bucks HP11 2LT
Web: www.casecomms.com Email: sales@casecomms.com
Tel (UK): 08700 263 740 Tel (International): +44 (0) 1494 833 740
Fax (UK): 08700 263 741 Fax (International): +44 (0) 1494 833 741

STATUTORY NOTICES

WARNINGS

The 8325/8425/8525 basic units have a removable dress panel fitted to the front of the unit and removable blanking plates fitted at the rear. These panels may only be removed by suitably qualified personnel for installation or maintenance purposes, and must be replaced afterwards. Removal under any other circumstance would invalidate the RFI (Radio Frequency Interference) and safety type approvals.

Published by Case Communications Technical Publications Department

Preface

This manual provides information for X.25 network supervisors to install and set up the Router module. It forms part of the Series 8000 Systems Documentation, and refers to other manuals in the series. It assumes that you will already have some knowledge of the Series 8000 system obtained either from the systems documentation or from a Cray training course.

Chapter 5 provides instructions for users of the Router module.

A glossary is provided at the end of this manual.

Contents

Appendices

Figures

Tables

1 Introduction

1.1 The Router Module

The Router module is a component of the Series 8000 range of X.25 switches.

It provides an IP Routing function which allows transparent routing of IP frames between the local Ethernet network and remote IP Ethernet networks via a Series 8000 network. The IP Routing function can support the routing of all the upper layers of the TCP/IP protocol suite.

The module also provides a gateway function allowing interconnection between Series 8000 and TCP/IP Ethernet networks.

Physically it comprises a plug-in card which fits into a Series 8000 PSE taking up a single slot. Connection to the Ethernet 10 Mbps LAN is through a direct "tap" into the LAN cable.

1.2 IP Routing

IP Routing deals with Internet Protocol (IP) packets, which are the most common type of LAN network layer packets. IP is part of the TCP/IP protocol suite. IP Routing in Router allows IP packets to be transparently passed across the X.25 network to remote Ethernet LAN networks, using Series 8000 X.25 PSEs to provide the transport medium.

Because the IP packets are routed transparently, any protocol supported by IP may be transported across the X.25 network.

Router will perform three basis tasks in order to successfully route IP packets through a given network. Firstly, routing tables will be maintained and distributed throughout the network, thus allowing all participating routers to keep track of changes in network topology (refer to Appendix C for an explanation of the Routing Information Protocol). Secondly, those tables will be used by Router to take routing decisions when receiving IP packets whose destination network address does not correspond to the directly-connected network. Router will then forward these packets to another router closer to the destination. Thirdly, X.25 calls will be set up and cleared down as required in order to allow IP packets (including routing information) to be passed to other Routers across the Wide Area Network, encapsulated in X.25 packets.

Automatic distribution of routing information by each Router can be achieved by broadcasting such information onto the directly-connected LAN network, and by sending the information to each of the participating Routers across the X.25 network.

When a Router is first installed in a network, it has no knowledge of the existence of the remote Routers in the X.25 network, so the X.121 addresses of these remote Routers will need to be configured manually.

The X.121 addresses will subsequently be used in X.25 call set-ups to the remote Routers.

Instructions on how to configure a Router to participate in IP Routing can be found in Section 4.7.

Figure 1-2 shows a typical application of IP Routing allowing data to be passed between remote IP Ethernet LANs.

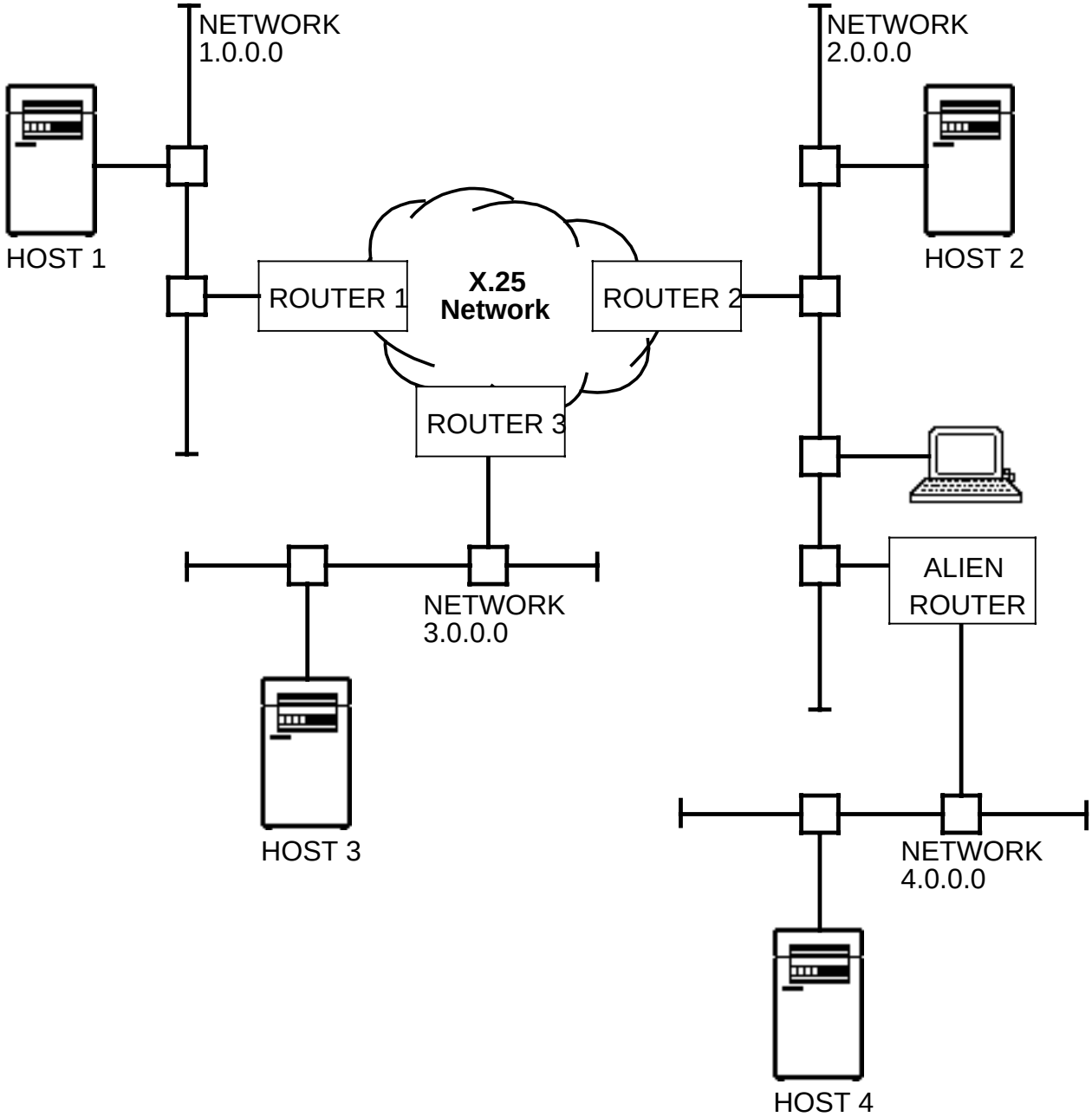


Figure 1-1 Typical IP Routing Application

In order to route IP packets originating on Ethernet network 1.0.0.0 to a destination on Ethernet network 4.0.0.0, Router 1 will on receipt of a packet from the LAN addressed to network 4.0.0.0 examine its routing tables. This should yield the information that Router 2 is the "next hop" router.

If an X.25 connection already exists to Router 2, the IP packet will simply be sent down the existing SVC encapsulated in X.25 packet(s); otherwise a

new call will be made to the X.121 address of Router 2 before the data can be sent.

On receipt of the IP packet, Router 2 will examine its routing tables, which should allow it to forward the packet to the "next hop" router on Ethernet network 2.0.0.0 *en route* to its final destination.

1.3 The Gateway Function of Router

A user on either X.25 or Ethernet can make a connection to a service on either network via a single call from a terminal; this is commonly known as a 'seamless connection'.

Figure 1-1 shows a typical application of the gateway function of Router, allowing X.25 terminals to access host computers connected to an Ethernet LAN.

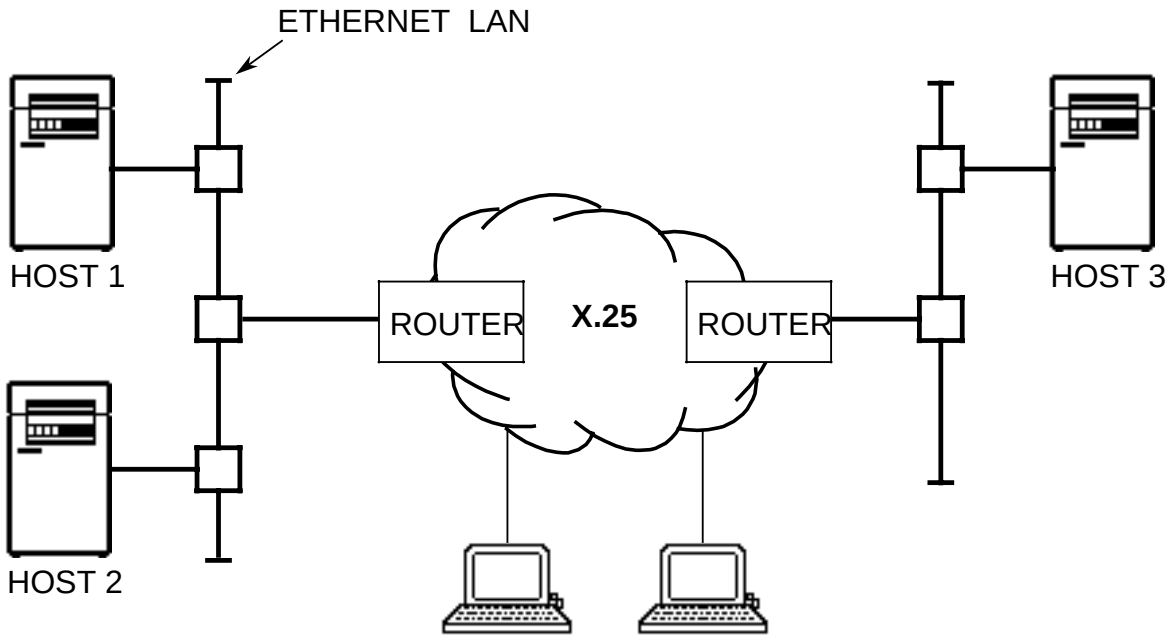


Figure 1-2 Typical Application

Router provides facilities to ensure that the boundary between the two networks (X.25 and LAN) is as invisible as possible. This allows the two different networks to appear to the users as one network.

Seamless connections are achieved by automatically translating LAN addresses to X.25 addresses, and vice versa. The translation process takes WAN service numbers (X.121 addresses), and maps them to specific TCP/IP addresses ('sockets', see Appendix C.2). Therefore any standard X.25 service can be converted to a standard LAN service address.

An example would be the use of Router as an additional access to a Host computer. The Router would, upon receipt of an X.25 call, automatically contact the Host over the Ethernet using an IP and TCP address. The users would be unaware of how they were actually connected.

1.4 Multiple Sessions

In some circumstances it would be advantageous to allow an operator at a terminal to change between two or more applications, or services, at the press of a key. For example, a sales desk may require quick access to Sales Order Processing, Stock Control, and Electronic Mail services.

Multiple sessions provide such a capability. Router allows users to make more than one outgoing connection. The user simply switches between the sessions by pressing appropriate keys. The keys are known as 'hot-keys', and are completely manager-definable.

1.5 Services

Router has two basic types of service: WAN Services and LAN Services. Router Services describe the address of the service, an optional password, and connection characteristics (via profiles). Each service has a name which can be employed by users to connect to their required destinations.

- A **WAN Service** contains an X.121 address. Users can connect to the service by two basic methods. The first allows the user to specify the name of the service; the second is automatic, or seamless selection. This occurs when an incoming LAN call is received with a TCP port that matches the TCP port specified in the service. For example, it is possible to configure a WAN service for access to a DEC system with a TCP port of 100; when an incoming LAN call for TCP port 100 arrives, the TGate automatically calls the configured X.121 address.
- A **LAN Service** contains a LAN socket address (IP address and TCP port). Again, like the WAN service, this can be selected either by name or automatically by an incoming X.25 call to Router's X.121 address. When a call from an X.25 device arrives, Router automatically calls the destination LAN address.

After a service is created, it must be enabled (a disabled service cannot have a connection made to it). When enabling a service it is first checked for any inconsistencies. If there are any, then the service will not be enabled and the manager is informed of the error.

Both the LAN and WAN have special services to allow users to enter dialogue. If the service is specified without a destination (e.g. LAN service without IP address and TCP port), but has a specified incoming address (i.e. X.121 sub-address for LAN services and TCP port for X.25 services), when an incoming call matches this incoming address, Router will enter a dialogue using the specified (or default) user profile. For example, if a WAN service called LAN-DIALOGUE is configured with a TCP port of 23 but without an X.121 sub-address, then when an incoming LAN call for TCP port 23 arrives, the user will enter a dialogue with Router. The service can also be configured with a password, in which case, the user will be requested to enter the password before entering the dialogue.

1.6 Profiles

Profiles are used within Router to define sets of characteristics that should be applied in given circumstances. There are three types of profile: a User Profile that describes the characteristics to be applied to a user, a Service Profile that describes the characteristics of a connection to a service, and a Terminal Profile that describes the characteristics of a manager's terminal. All profiles can be given a name to aid clarity.

- **User Profile** defines the hot-key sequences, the maximum number of simultaneous sessions the user can hold, whether or not the user is allowed to login to the manager facilities, and whether all services must be specified by name and not address. Additionally, an inactivity timer can be set so that users will be disconnected from Router if they are inactive for too long. This can help prevent users leaving terminals unattended but still using valuable resources. A User Profile is referenced by a service.
- **Service Profile** defines the service connection characteristics, including the initial sequence that is sent to the service upon connection (e.g. **LOGIN SALES**), and the refresh sequence that is sent whenever the service is selected (e.g. entered by hot-key). This refresh sequence requests that the service redisplay the image on the user's screen. An inactivity timer can be set so that the service will be disconnected if it is inactive for too long. This can help prevent users staying logged in to costly services and not using them. A Service Profile is referenced by a service.
- **Terminal Profiles** are provided to allow different types of terminal to manage Router successfully. There are four pre-defined profiles for the more popular terminals (VT100/ANSI, ADM3A, IBM 3101 and CIFER 2605), and four manager-definable profiles. Each profile describes both the input sequences for recognition of various functions (e.g. Submit Form), and output sequences for screen control. The Terminal Profile can be selected whenever the manager facilities are accessed, or can be specified within the general configuration form.

2 Installation

This chapter is provided as a supplement to the full installation guides for Series 8000, knowledge of and reference to which is assumed throughout.

2.1 Hardware Description

The Router software can be loaded onto one of two hardware variants: the TGate/Router card for use within the 8325 card frame, and the TGate/Router module for use in either the 8425 or 8525 card frame. Whichever variant is in use, TGate/Router provides a single IEEE 802.3 compliant interface. Various physical LAN interfaces are available as LPIMs (LAN Port Interface Modules). The interfaces available are standard AUI, 10Base2 (Cheapernet), and 10BaseT (twisted pair). Each TGate/Router carries a unique 48-bit Ethernet address which is stored in the Ethernet PROM.

The following subsections give a brief description of the two TGate/Router hardware variants.

2.1.1 The 8325 TGate/Router Card

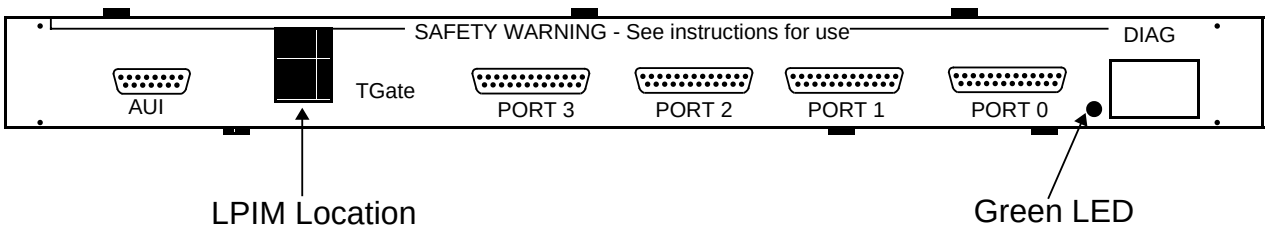


Figure 2-1 8325 TGate/Router Card Rear Panel

The rear panel carries four centrally-mounted 25-way D-type female connectors, all of which are reserved for future use. On the left is the AUI port 15-way D-type female connector. Next to the AUI is the LPIM site for an optional 10Base2 or 10BaseT interface to the same port. The card also contains an 8-pin diagnostic port for use by Cray engineers only.

The only indicator is a green LED, serving as a 'heartbeat', blinking at a rate dependent upon processor utilisation.

The TGate/Router card displays real-time status information via the 8325 display/control panel, in line with other 8325 cards (see Chapter 7 of the 8325 Installation Guide).

The front of the TGate/Router card carries three 96-way male DIN connectors to engage with the 8325 backplane.

2.1.2 The 8425/8525 TGate/Router Module

The TGate/Router module for the 8425/8525 systems comprises a three-board combination of UPM4 (X890-607011), TGate/Router (X890-606712) and Manager PAM (X890-606811). The UPM4 and TGate/Router fit in the front of the chassis, while the PAM fits into the rear, as shown in Figure 2-2.

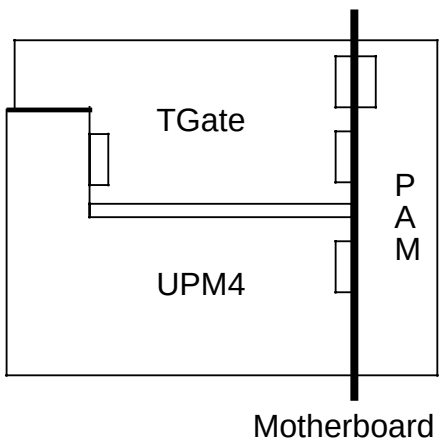


Figure 2-2 8425/8525 TGate Module Combination

There are no configuration links or switches on either the UPM4 or the TGate/Router.

The UPM4 has several activity indicator LEDs. A seven-segment LED display is used to display real time status information, along with a heartbeat indicator, in line with other 8425/8525 cards. A single green LED indicates processor activity, and a bar graph display indicates further status information.

The PAM rear panel carries four, centrally-mounted 25-way D-type female connectors, all of which are reserved for future use. At the top is a 15-way female D-type connector providing the AUI port. Below the AUI is a cutout for an optional LPIM providing either a 10Base2 (Cheapernet) or a

10BaseT (twisted pair) interface. The card also includes an alarm relay (reserved for future use). The PAM rear panel (=TGate/Router Module rear panel) is shown in Figure 2-3.

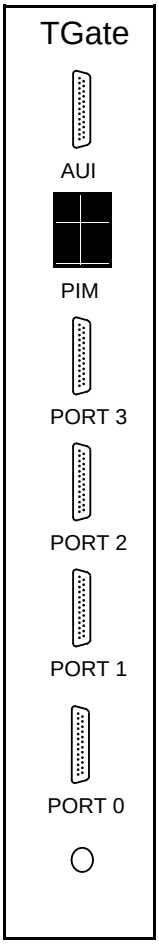


Figure 2-3 8425/8525 TGate/Router Module Rear Panel

2.2 LAN Port

The single LAN port on any TGate/Router variant can be set up for any of the configurations shown in Table 2-1.

INTERFACE	LPIM TYPE	CONNECTOR TYPE
AUI,IEEE 802.3	None	15-way D female
IEEE 10BASE2 CHEAPERNET, THIN E/NET	CPIM	BNC 50ohm Coaxial
IEEE 10BASET TWISTED PAIR	TPIM	RJ45 twisted pair (10-way)

Table 2-1 TGate/Router LPIM Types

To provide a single Cheapernet or twisted-pair port, the TGate/Router card is fitted with an LPIM . When an LPIM is fitted, the AUI interface is disconnected and must not have a drop cable attached.

Headers on the TGate/Router card (8325) or PAM (8425/8525) are used to select either the AUI interface or the LPIM interface, as described in Section 2.5.1.

2.3 Installation and Removal

A TGate/Router card (or combination of cards) may be inserted in any slot of the card frame, except slot 1 which is reserved for the Node Manager card. TGate/Router cards (or combinations) may be inserted or removed while the node is powered up, provided that the following procedures are carefully followed:

2.3.1 8325 Card

To insert a card into a live system:

1. Use an engineering wrist strap attached to the earthing stud provided on the rear panel of the chassis.
2. Remove the blanking panel, where fitted, from the slot into which the card is to be inserted, by carefully unscrewing the captive screws at either end. Ensure that the screws are fully undone.
3. Slide the card along the card guides until it is approximately 20 mm away from being fully home. Ensure that the card is straight and correctly aligned, and then push it smartly home to minimise bounce at the connector pins.
4. Secure the card with the captive screws at either end. **DO NOT OVERTIGHTEN.**
5. Allow the card to execute its power-up diagnostics and load its operational software from disk before inserting another card. (The node manager software cannot 'hot' load more than one card at a time.)

To remove a card from a live system:

1. Use an engineering wrist strap attached to the earthing stud provided on the rear panel of the chassis.
2. Unscrew the captive screws at either end of the card. Ensure that they are fully undone.
3. Reset the card using the display/control panel (see 8325 Installation Guide Chapter 7).
4. Using a small flat screwdriver or similar tool, gently release the card from the motherboard connectors by levering at the raised corners at each end of the card to be removed. Withdraw the card cleanly.
5. If it is not intended to replace the card, fit a blanking panel in its place (see Statutory Notices on page 0-2).

2.3.2 8425/8525 Module

The following subsections outline the procedure for inserting and removing modules from 8425/8525 systems.

2.3.2.1 UPM4 and TGate/Router (Main Modules)

The main modules are accessed by either opening the front door (8425) or by unscrewing the five captive screws on the front door in the centre section of the unit (8525).

Modules may be added and removed whilst the system is powered up, provided that the following procedures are carefully followed.

The recommended way to plug modules into a live system is as follows:

1. Separate the TGate/Router from the UPM4.
2. Slide the TGate/Router between the upper runners until the connectors are aligned, then push firmly home to minimise bounce at the connector pins.
3. Slide the UPM4 between the lower runners and push home similarly.
4. Allow each pair of modules (TGate/Router + UPM4) to fully load (i.e. display **r**) before inserting the next pair.

To remove the combination:

1. Reset the UPM4 module or the pair by shorting the **RST** link (marked on the board).
2. Carefully slide out the UPM4 taking great care to separate the connections cleanly.
3. Carefully slide out the TGate/Router similarly.

2.3.2.2 Port Access Modules (PAMs)

The PAMs are accessed by unscrewing the RFI screening bars on the rear of the unit. Each PAM can then be withdrawn by unscrewing the two knurled screws at either end and withdrawing the PAM from the unit.

Note: The RFI bars form part of the RFI seal: always replace and retighten the screws.

2.4 LPIM Installation and Removal

Live insertion of LPIM modules is not possible. Prior to installation, the TGate/Router card (8325) or PAM (8425/8525) must be removed (see Section 2.3).

2.4.1 LPIM Installation

Before installing the LPIM the port must be selected by moving the links to the positions shown in black in the relevant section of Figure 2-4.

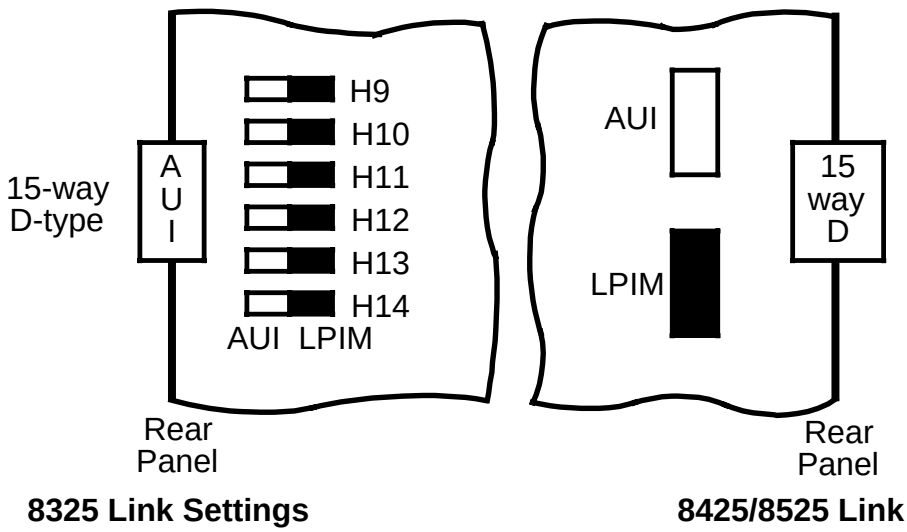


Figure 2-4 AUI/LPIM Select Links

The LPIM connector should be fed through the rear panel and the two rows of pins located with the sockets on the main card. Gently ease the LPIM home until the plastic standoff pillars secure it in place. The LPIM should then be secured to the rear panel with the screw provided. **Do not overtighten**.

2.4.2 LPIM Removal

Carefully remove the screw securing the LPIM to the rear panel. Using pliers or a similar tool, ease the LPIM over the plastic pillars. Once free, gently remove the LPIM from the socket.

If the LPIM is not to be replaced, the headers must be moved back to the AUI position to enable the AUI port (i.e. changed to the white positions shown in Figure 2-4).

2.5 Cabling

2.5.1 AUI Port

The AUI interface provides a standard 15-way D-type female connection. The pinout is defined in Appendix A.4.

The TGate/Router AUI port provides 15 VDC (8325) or 12 VDC (84/8525), current limited to 500 mA, on circuit VP.

The AUI port does not provide the normal slide locking for securing the cable; instead screw pillars are used. The pillars must not be removed as they also secure the rear panel.

The following AUI drop cables are recommended:

A001-000005	4 metre drop cable
A001-000006	20 metre drop cable

2.5.2 Cheapernet Port

The CPIM provides a single 50 ohm coaxial connector for connection to a thin Ethernet/Cheapernet system. The TGate/Router is connected to the network via a coaxial T-piece fitted to the CPIM. If the TGate is located centrally within the network, two 50 ohm coaxial cables (e.g. M151-400211, 1 metre) should be used. However, if the TGate/Router is sited at the end of the network, a 50 ohm terminator must be fitted to the unused side of the T-piece. To conform to EMC approvals, both supplied ferrites must be clipped onto the cables, one at either side of the T-piece, as close as physically possible: see Figures 2-5 and 2-6.

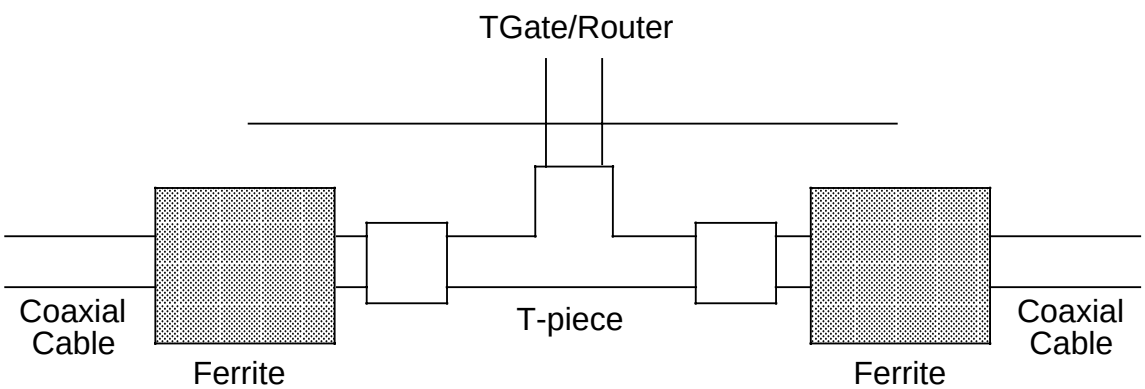


Figure 2-5 In-Line Cheapernet

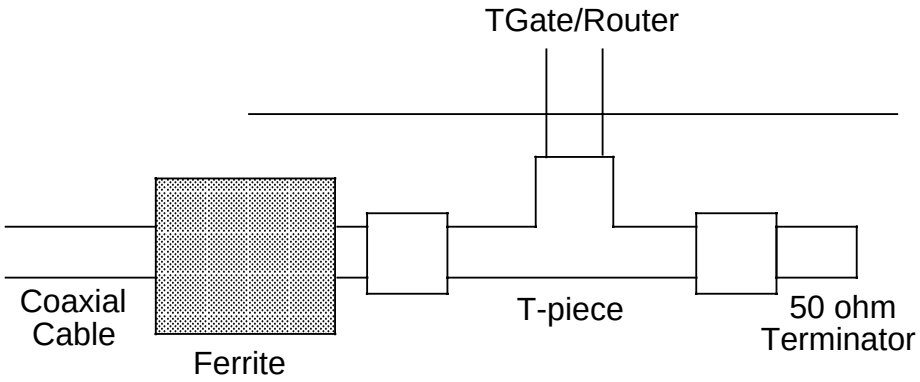


Figure 2-6 Network Termination

2.5.3 Twisted Pair Port

The TPIM provides a 10BaseT interface for TGate/Router. The interface is provided on a 10-way RJ45. The pin-out is described in Appendix A.5.

The two possible cabling schemes available for 10BaseT are:

Station to Station. A crossover cable is required.

Station to Repeater. A straight-through cable is required.

3 Initial Configuration

This chapter summarises the tasks that need to be carried out when initially configuring Router. Tasks that are not fully described here, are described in Chapter 4. An example configuration is given in Appendix E.

3.1 Control Panel Displays

On the 8325 control panel, the TGate/Router has a board ID of **T** and only uses the first character in its 'Display Status' field. The character displayed here corresponds to the operational state of the card. On the 8425 and 8525, the characters are displayed on the TGate/Router card's LED. Under normal running conditions an **r** is displayed. However, various other characters or sequences of characters may be displayed as summarised below.

CHARACTER	MEANING
b	booting
c	running congested
d	dumping
o	operational
r	running
t	test diags running
(v)	vector fault
(F)	fault
I	initialising
L	loading
P	poll received from XRMC
(0-9)	failure code
blank	awaiting poll from XRMC
(others)	part of failure code

3.2 Installing the Application

Using the Series 8000 Node Manager, select the Utilities menu and then the Install Application menu.

When you first enter the screen it lists all the applications. An asterisk (*) in the In Use column indicates that an application has been selected for loading onto one or more slots.

The Install command allows you to install a new application onto the PSE from the Router distribution disk. When you select this command, you will be prompted to insert the distribution disk into drive B and press **RETURN**. You then install the application by selecting **PF1**. The application is installed, and the list of installed applications is updated on the screen.

The Node Manager copies all the files needed to support the application, from the Router distribution disk to the system disk. The files copied will be the application's load and database files.

An application may also be installed remotely (if the Series 8000 Node Manager software is version 8 or above). To do this the distribution disk should first be inserted into drive B at the local node and using the Series 8000 Node Manager all files from the disk should be copied from the local drive B to disk drive B at the remote node. It will then be necessary to logon as Node Manager at the remote node and install the application as detailed above. (Full instructions on how to perform a remote file copy are given in the 8500/8400/8325 User Guides.)

3.3 Creating the Router Port

Next, a logical port (with a number 7000-7999 inclusive) must be created for Router to use (for example this could be 7050 to indicate that Router is running in slot 5). Configure the X.25 network level and user facilities as required, and bring the port online.

3.4 Initial Configuration Commands

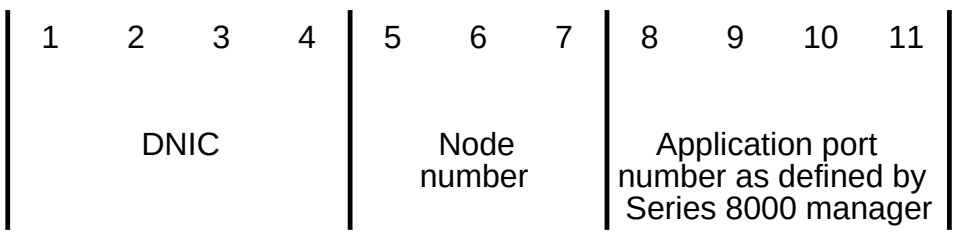
After cold start, Router is placed in an initial state ready for configuring, with the default configuration defined in Appendix B.

Cold start normally only takes place when the card is first installed. However, if at any time it is found necessary to go back to the default configuration, then a cold start can be performed by deleting the configuration files **Tgateconfig<n>** and **IPrtrconfig<n>** from disk B (see Series 8000 Xpress PSE (V.7) User Guide, Section 5.3.5), where **n** is the slot number in which the Router resides. Then a card reset may be executed; see the Series 8000 installation guide.

From the Manage Application screen of the Series 8000 Node Manager, set up an entry for the Router port, and use this to call the Router manager.

Alternatively, from a Triple-X PAD or the Series 8000 manager 'mini pad', make an X.25 call using sub-address 99, which calls the Router manager direct.

The X.121 address is:



The default X.121 is shown in Appendix B.

In both of the above cases a password is requested. Initially, this is simply carriage return. The Router then requests that a terminal type is specified. If the terminal type you are using is not listed, or is not compatible with one of the types listed, select the **Define** option to define your terminal (see Section 3.5).

The actual configuration depends upon the application that Router is being used for. Detailed below is a suggested order of configuration. Commands shown in bold are the manager commands that gain access to the relevant configuration screens; commands in brackets are their shortened form.

conf gen	General configuration. Manager password, manager terminal type and slot number.
conf prot	Protocol configuration. IP address. Other fields can be left as defaults, unless you are familiar with TCP/IP and wish to optimise these parameters to match your network.
rtr gen	Subnet mask and IP Broadcast Address.
conf mess	Welcome banner and general messages. Configure the welcome message that you desire. This will only be presented to users who enter dialogue with the gateway. Configure general messages and the user prompt.
conf prof user (**conf up**)	User profile configuration. Configure each of the user profiles that you require. This generally divides into 'seamless' users and 'dialogue' users.
conf prof serv (**conf sp**)	Service profiles. Configure each of the service profiles.
conf serv wan (**conf wan**)	WAN services. Configure and enable each of the WAN services that you require.
conf serv lan (**conf lan**)	LAN services. Configure and enable each of the LAN services that you require.
conf gen	The default user and service profiles may need to be changed.
conf prof term (**conf tp**)	The manager-defined terminal configuration may require completion and/or personalising.
rtr rc	In order to utilise the IP Routing function, the addresses of all other Routers which may be accessed by the Router across the X.25 network will need to be configured.
rtr rt	Static Routes and a Default route may be configured.

The above gives a quick guide to configuring Router. It is strongly advised that this manual be fully studied and the configuration planned, before attempting to actually configure Router; thus ensuring that the user's networking needs are fulfilled as effectively as possible.

3.5 Manager-Defined Terminal Configuration

When a user logs on after a cold start, Router requests selection of a Terminal Type. Option 5 of the menu allows the terminal characteristics to be defined to match the terminal in use. This is only necessary if you are not using one of the predefined terminal types.

The process used to define the terminal type is carried out in a TTY 'question and answer' mode as follows. The information highlighted in bold shows an example for a VT100 type terminal.

```
Define Terminal Profile 5 - MgrDefined
Input Parameters
Enter Cursor Left Sequence          : ^[[D
Enter Cursor Right Sequence         : ^[[C
Enter Cursor Up Sequence            : ^[[A
Enter Cursor Down Sequence          : ^[[B
Output Parameters
Enter Initialise Device sequence    : ^[C
Enter Clear Screen & Home sequence  : ^[[2J^[[1;1H
Enter Clear Line Sequence           : ^[[2K
Enter Cursor Position Type          : ASCII
Enter Cursor Position Offset        : 1
Enter Cursor Position String        : ^[[%r;%cH
Is the above correct?               : (Y,N,Q)
```

Control characters are symbolised by a preceding carat (^), for example **^[** is equivalent to an ESC character (see Appendix D). Entering two carats (**^^**) represents one actual carat character and not a control sequence. **%r** indicates the row address, and **%c** the column address.

When the complete definition is entered, type **Yes** to confirm the configuration. Router stores these parameters in Terminal Profile 5 with the name **MgrDefined**. The manager then uses these characteristics from the newly-configured Terminal Profile 5. If **Yes** is not entered, then the whole process is repeated.

Once Terminal Profile 5 is configured and entered, the **Define** option will no longer be presented, and future logons are given the option of **MgrDefined**, i.e. the name of Terminal Profile 5.

4 Manager Procedures

4.1 Overview

System management is carried out by a supervisor or network manager. The Router software manager facilities (referred to briefly as the 'manager') provide the dialogue between the supervisory/managerial user and Router. It is an intelligent, command-driven, menu/form based system, and provides the ability to configure, monitor, and control Router.

The manager environment provides you with access to all the configuration, control, and status functions with a minimum of input. This is performed by using a system of menus to display choices, and forms to enter configuration data. All commands within the system may be accessed from any menu, and any menu can be reached directly from any other. The manager combines the menus, forms and commands in a context-sensitive way to give a fully-featured control point for Router.

You can control the Router manager by using one of a number of terminal types (e.g. VT100), whose characteristics are already pre-configured in Router.

An example application and its configuration is given in Appendix E.

4.2 How the Manager Works

4.2.1 Input

Input to the manager is simple. You enter the command or information as an ASCII string, then terminate and submit it for evaluation by entering carriage return or line feed.

The editing functions available are:

Deleting a Character
When a delete (**DEL**) or backspace (**BS**) character is entered, the character to the left of the current cursor position is removed and all characters to the right of the deleted character are moved left one position.

Cancelling a Line
When a control-U (**^U**) or a control-X (**^X**) character is entered, the entire input line is cancelled.

Left-Right Cursor Keys
When a cursor key is entered, the current cursor position is moved in that direction. If, however, the cursor is at the left-most or right-most position within the text on the current line, then no action is taken. If a character is entered, it is inserted at the cursor position, and if there are characters to the right of the cursor, those characters are moved right one position.

Repeating a Line
When **^R** is entered, the previously submitted command line is recalled and replaces the current line, ready for re-submission or editing.

4.2.2 General Rules

Each input line can contain more than one command, with commands being separated by a semicolon (;).

All commands are accepted in any mix of upper and lower case and can be terminated by a space, comma, or semicolon.

If the Router finds an error within an input line, any further commands on that line are abandoned and the user is informed of the failure.

When a command is processed, any additional information required is prompted for, and if the prompt has an associated menu then the new menu will be displayed with the prompt.

Menus are only changed when it is necessary to assist and prompt the user in the selection of commands, actions, or items. The user can specify and carry out a complete command without affecting the currently-selected menu.

4.2.3 Using Menus

Menus are available as a general prompting aid. The information displayed in a menu can be either static or dynamic. Dynamic information refers to information calculated or derived at the time of display (e.g. status), and may be automatically updated.

Within each menu there are special functions that can be accessed by entering their associated key sequences. Their functions are:

Help (**^W**)	–	Provides a simple guide to the current menu and the selections it contains.
Main Menu (**^G**)	–	Causes the Main Menu to be displayed.
Prev Menu (**^L**)	–	Causes the previous menu to be displayed. (This is chronological and not necessarily hierarchical.)
NextPage (**^N** or **^F**)	–	If the current menu has more than one page, then this sequence causes the next page to be displayed.
PrevPage (**^B**)	–	If the current menu has more than one page, then this sequence causes the previous page to be displayed.

Both NextPage and PrevPage are cyclic, e.g. if there are two pages and page 2 is currently displayed, when NextPage is entered, page 1 is displayed.

4.2.4 Using Forms

Generally the configuration is entered via forms. Forms are an easy way of presenting and entering information.

Router uses standard form handling throughout. There are several types of field found in a form: Constrained List, Free Format Text, Free Format Blind Text, and Information Only fields. The Constrained List is a list of valid entries for the field, e.g. a directory banner field may only contain ENABLE or DISABLE. It is possible to sequence backward and forward through these lists, or if desired you can enter the value directly. The Free Format Text field is exactly that; you just enter text, e.g. a name. The Free Format Blind Text is similar to a free format field, except that the text is not visible to you (as in a password). The Information Only field presents configuration information that cannot be changed using this form.

When in a form, several special keys sequences may be used. They are:

Help (**^W**)	–	Provides a simple guide to this form and the selections it contains.
CursorUp ( )	–	Moves geographically upwards one field.
CursorDown ( )	–	Moves geographically downwards one field.
CursorLeft ( )	–	Moves geographically left one space, or when at the left edge of a field or when on a constrained list field, moves left one field.
CursorRight ( )	–	Moves geographically right one space, or when at the right edge of a field or when on a constrained list field, moves right one field.
TAB or **CR**	–	Moves to the next sequential field (not geographic).
Submit (**^E**)	–	Submits the form for validation and entry into the system.
Abort (**^C**)	–	Exits the form without validating or updating the system.
NextPage (**^N** or **^F**)	–	If this form has more than one page, this sequence causes the next page to be displayed.
PrevPage (**^B**)	–	If this form has more than one page, this sequence causes the previous page to be displayed.
Main Menu (**^G**)	–	Causes the Main Menu to be displayed and the form to be aborted.
Prev Menu (**^L**)	–	Causes the previous menu to be displayed and the form to be aborted.

Restore (**^R**) – Restores the field to its current configuration state (or initial state).

Space – When the cursor is at a Constrained List, the list is sequenced forward one item.

Backslash (\) – When the cursor is at a Constrained List, the list is sequenced backward one item.

<Text> – When in a Free Format Text field, the character is entered into the field with the standard line editing features.

When in a Constrained List field, the field is cleared and the text entered. The field then behaves like a Free Format Text field.

Clear (**^X** or **^U**) – Clears the field of any text. (Restores a constrained list.)

DEL or **BS** – When in a Free Format Text field, the character to the left of the cursor is deleted and any characters to the right of this character are moved left one position.

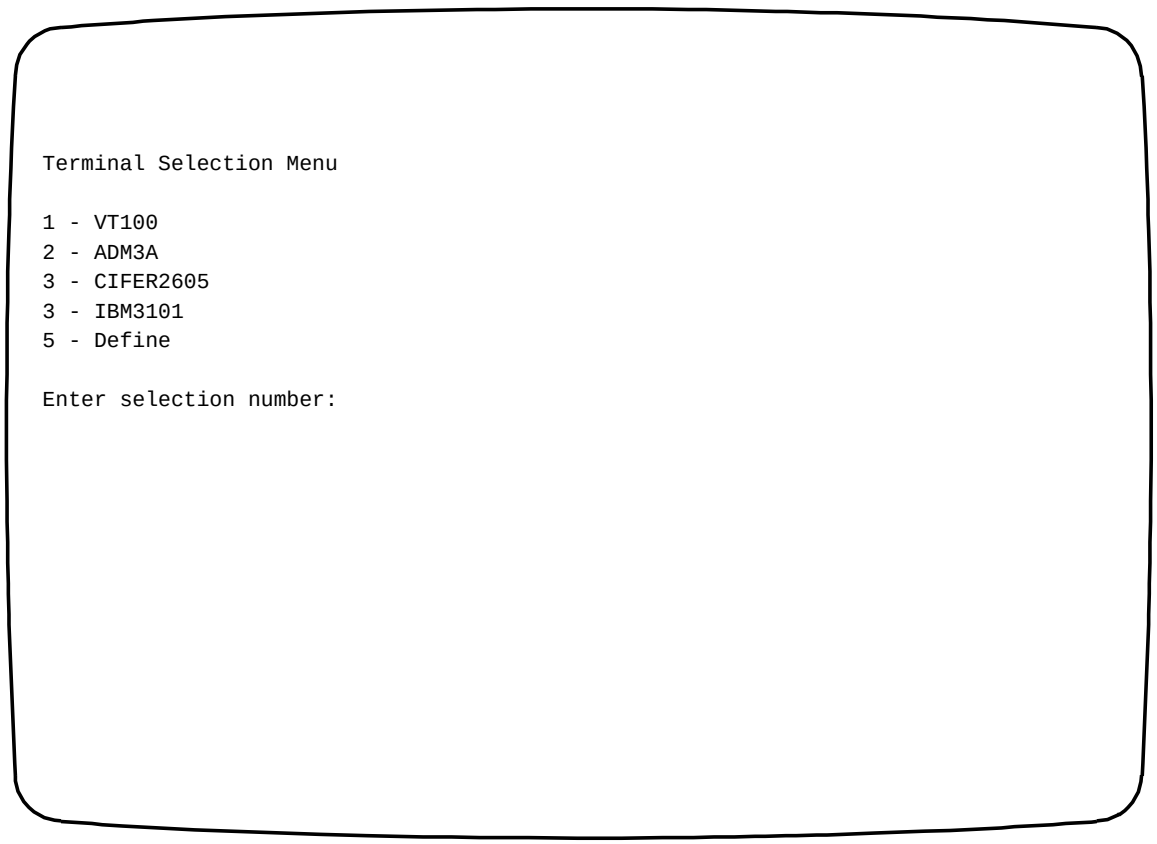
There are a few points to be observed. These are:

- When you attempt to leave a field, the field is validated on its own (i.e. not against other dependent fields). If this validation is unsuccessful, the system will restore the field, bleep at you and place the cursor at the start of the field. (If the field was a Constrained List in free format mode, then it is returned to list mode.)
- When a field is full and you attempt to enter more characters, the characters are ignored, and the system responds with a bleep.
- Control characters, where applicable, may be embedded into a free format field in the standard way, i.e. with a preceding carat (**^**). A carat character is achieved by entering two carats (**^^**).

In the following text, form fields are described with the type and size of field specified in brackets, e.g. (Free Format Text, 20) indicates a Free Format text field with a width of 20 characters. Fields indicated as Optional may optionally be completed. In many cases the field defaults to a specified value.

4.2.5 Initial Entry to the Manager

After connecting to Router, you can gain entry to the manager by using the **logon** command. Once you are logged on, the manager assumes it is communicating with a terminal of the type configured as the 'manager terminal type'. If one has not already been configured (e.g. after cold start), you are presented with the following terminal selection menu (in TTY mode):



If you enter **5** (**Define**), a minimum set of the terminal parameters are prompted for in teletype mode (see Section 2.8).

Router then uses the selected terminal characteristics and displays the Main Menu.

4.2.6 Menu Hierarchy

Figure 4-1 shows the hierarchy of the five menus and the forms accessible from each.

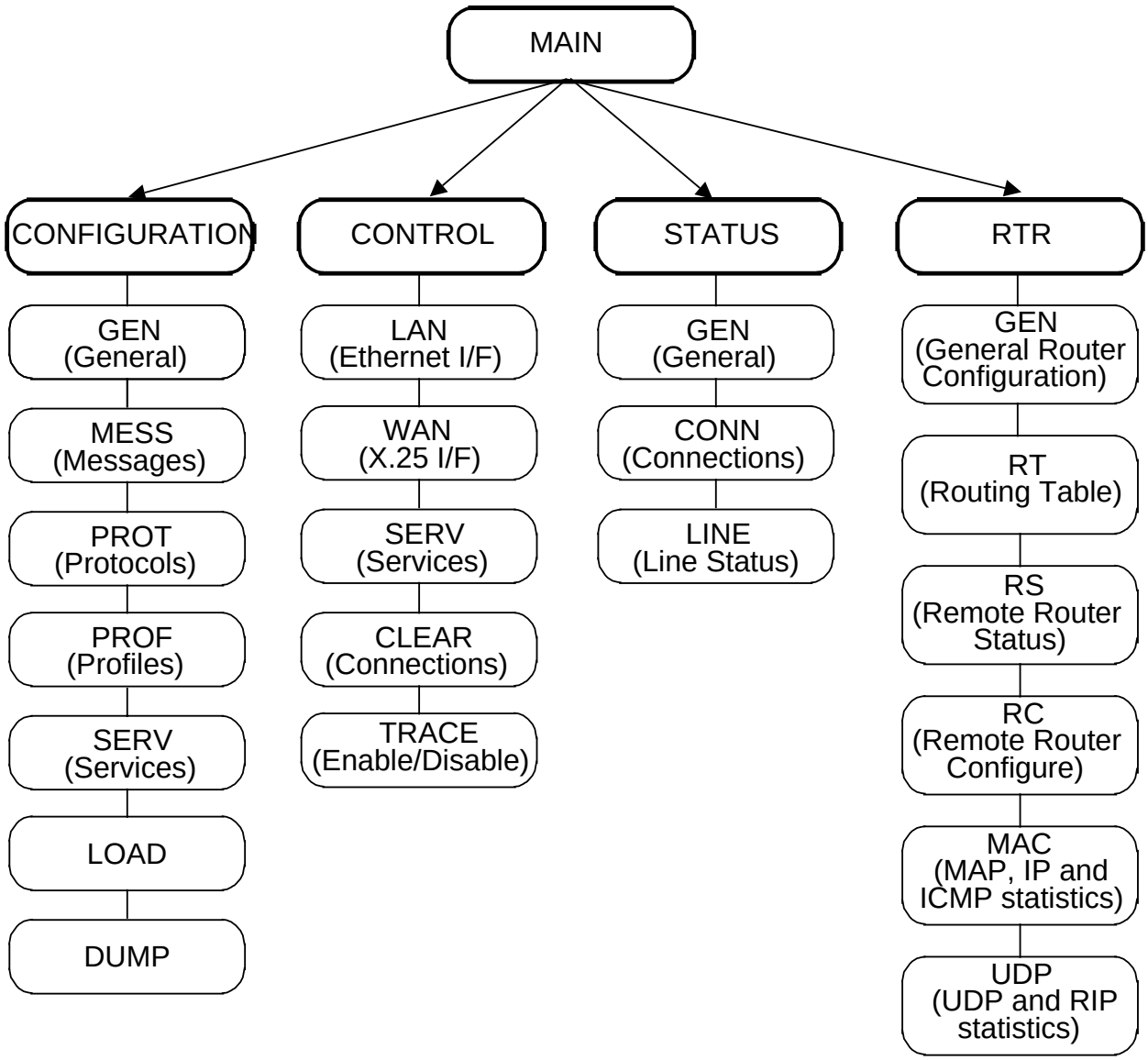
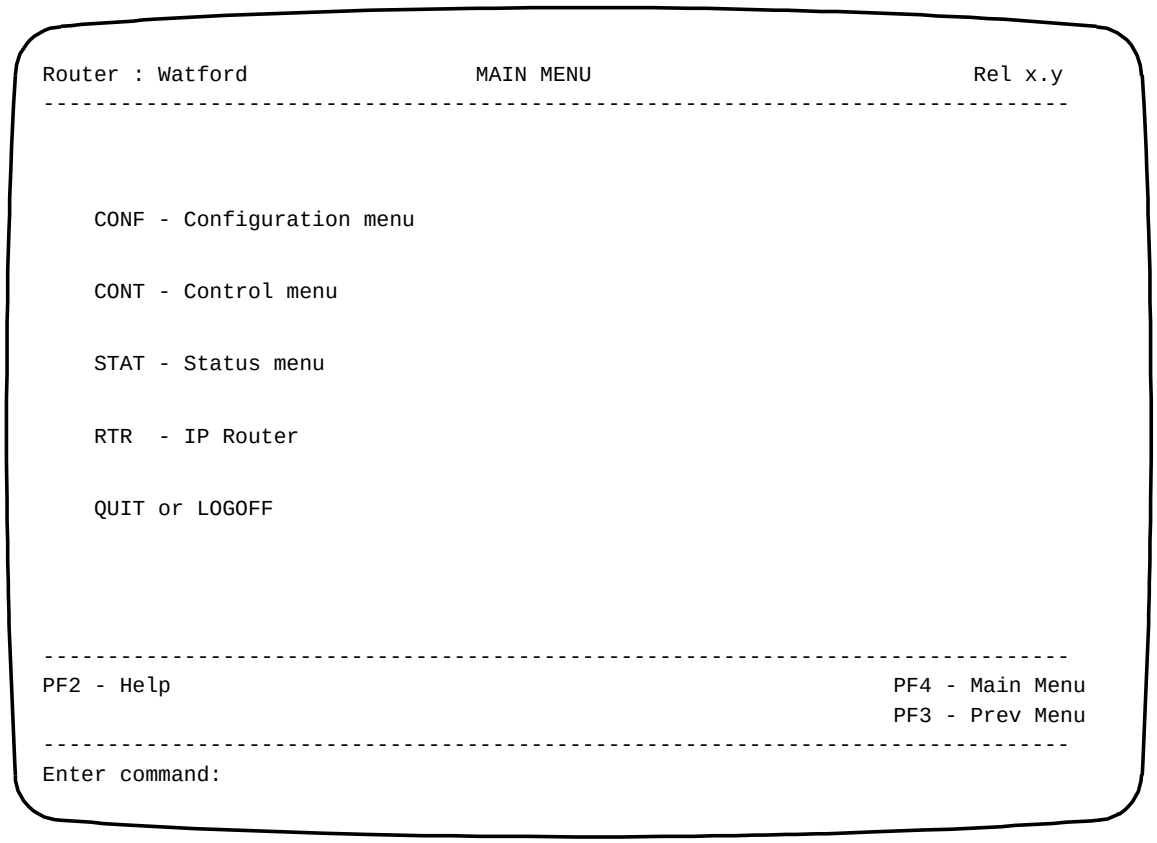


Figure 4-1 Menu Hierarchy

The Main, Configuration, Control, Status and RTR Menus are described in Sections 4.3, 4.4, 4.5, 4.6 and 4.7 respectively.

4.3 Main Menu



From this menu it is possible to execute commands directly, or to enter other menus (the Configuration, Control, Status and IP Router Menus are described in Sections 4.4, 4.5, 4.6 and 4.7 respectively). The Router identity is displayed in the top left-hand side of the screen. The top right-hand side of the screen displays **Rel x.y** where **x** is the version number and **y** is the software issue.

4.3.1 Quit Manager (quit command)

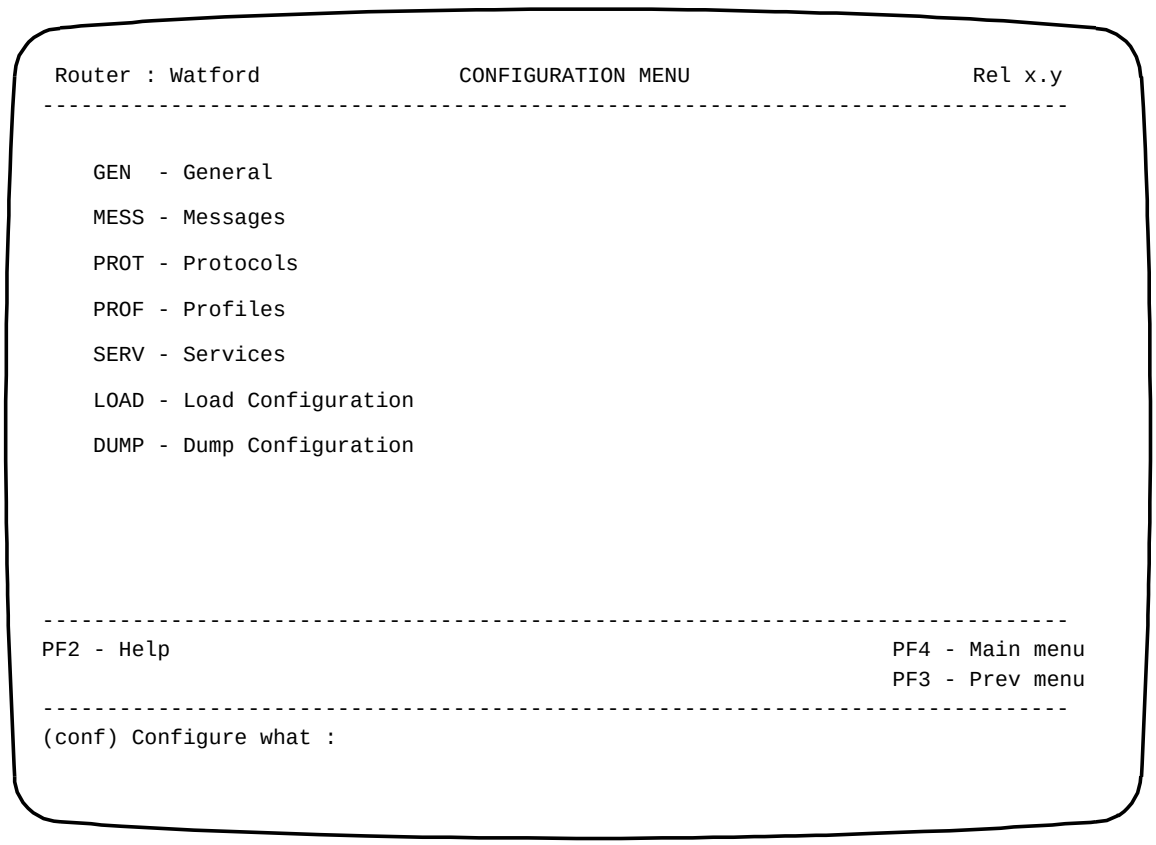
The **quit** command causes Router to leave manager mode and return to user mode.

4.3.2 Logoff from Router (logoff command)

The **logoff** command logs you out of the manager and disconnects you from Router (**logout** is also accepted).

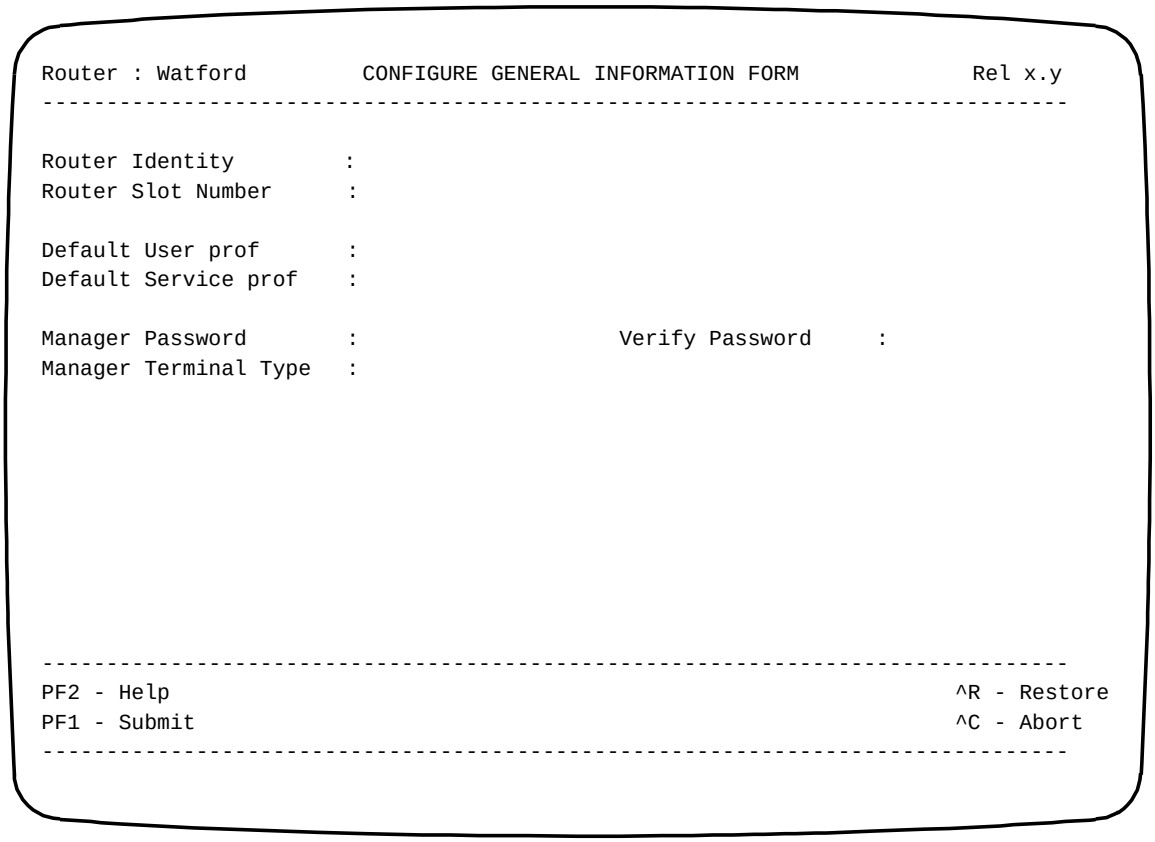
4.4 Configuration Menu (**conf** command)

The Configuration Menu displays the options that are available for configuring Router.



To the left-hand side of the **Configure what:** prompt the display in brackets shows that the **conf** command has been partially completed. Therefore commands that are entered here become part of the **conf** command, e.g. entering **mess** here is the same as entering **conf mess** from anywhere else in the system.

4.4.1 Configure General Information Form (**conf gen** command)



This form allows you to configure items that do not directly associate with other parts of the configuration, or warrant a form of their own.

Router Identity (Free Format Text)
This is a mandatory field. A name to represent the Router card must be entered. This identity will appear at the top of each manager screen.

Slot Number (Information Only)

This is the slot number of the Router card.

Default User Profile (Free Format Text, 15)
This is a mandatory field. It contains a user profile number or name. This profile is used whenever a user establishes a connection to Router and no direct method of obtaining a profile has been established (e.g. no profile specified in service table).

Default Service Profile (Free Format Text, 15)
This a mandatory field. It must contain a service profile number or name. This profile is used whenever a user establishes a new session to a service, and no direct method of obtaining a profile is available (e.g. user specifying

the service address without using the service table; or in the service table, the service profile was not specified).

Manager Password/Verify Password (Free Format Blind Text, 12)
These are optional fields. The two fields must be identical and are provided as a protection from entering incorrect information.

Manager Terminal Type (Free Format Blind Text, 15)
This is an optional field. It contains a terminal profile number or name. If this field is empty then, after manager password verification, the user is given a simple teletype menu of terminals from which to select. If this field contains a valid terminal type, then no terminal selection menu will be given and the terminal profile specified will be adopted automatically.

4.4.2 Configure Messages Menu (**conf mess** command)

```
Router : Watford           CONFIGURE MESSAGES FORM                    Rel x.y
-------------------------------------------------------------------------------
WEL   - Welcome Banner



COM  - Connect Message


BUSY - Destination Busy


ICD  - Incompatible Destination


DISC - Disconnect Message


User Prompt:

-------------------------------------------------------------------------------
PF2 - Help

-------------------------------------------------------------------------------
(conf mess) Enter message type:
```

This menu allows you to edit the welcome banner, and to configure general messages.

The banner may contain embedded control characters in the standard way (e.g. **^G** = control-G).

By default the banner will be output with a terminating carriage return (**^M**) and line feed (**^J**). This can be suppressed by ending the text line with a backslash \. (A backslash is output if the line is terminated by two backslashes.)

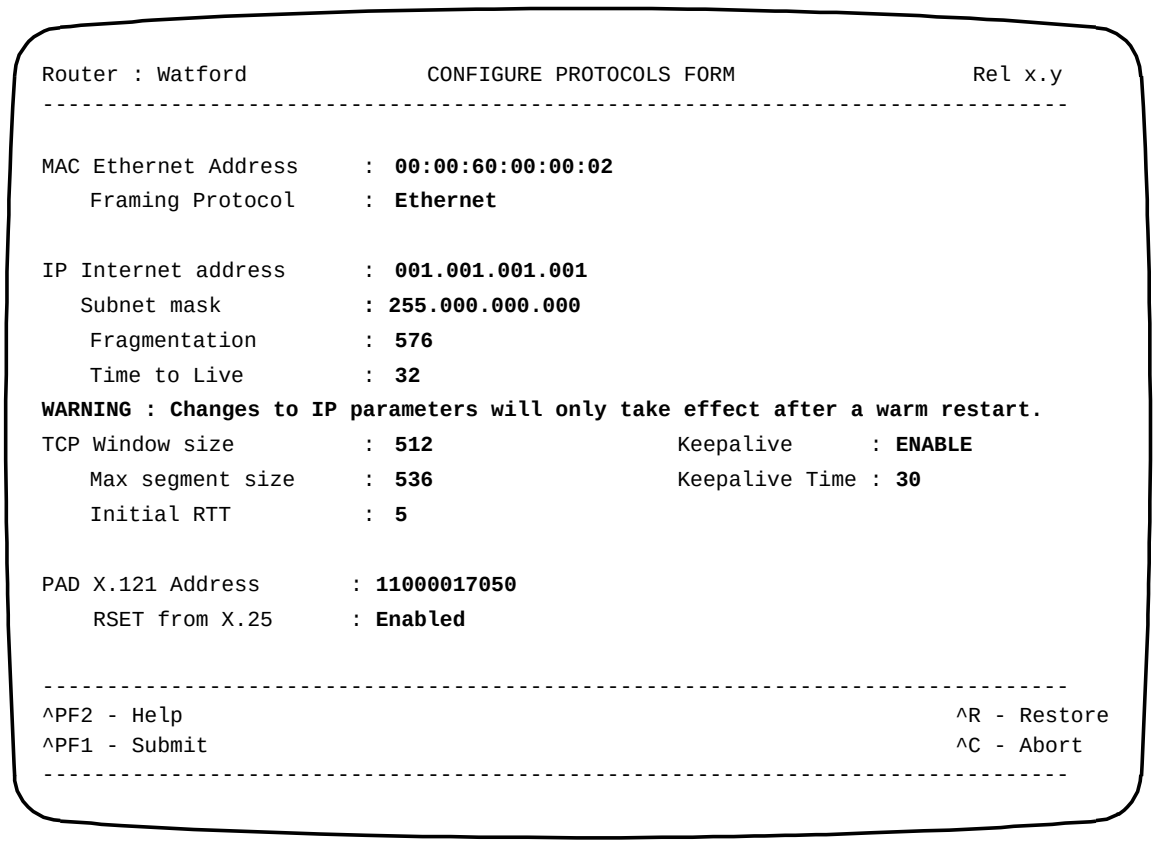
The banner can be a maximum of 78 characters.

COM/BUSY/ICD/DISC (Free Format Text, 59)
These fields are optional. They may contain embedded control characters. Entered text will be output in replacement for the standard text (COM, DISC etc.).

PROMPT (Free Format Text, 59)
This field is optional. It may contain embedded control characters. Entered text will be output in user dialogue as a prompt to enter the next command.

4.4.3 Configure Protocols Form (conf prot command)

This form allows each of the LAN protocols to be configured for correct operation.



```
Router : Watford              CONFIGURE PROTOCOLS FORM                  Rel x.y
-------------------------------------------------------------------------------

MAC Ethernet Address     :  00:00:60:00:00:02
    Framing Protocol     :  Ethernet

IP Internet address      :  001.001.001.001
   Subnet mask           : 255.000.000.000
    Fragmentation        :  576
    Time to Live         :  32
WARNING : Changes to IP parameters will only take effect after a warm restart.
TCP Window size          :  512                  Keepalive      : ENABLE
    Max segment size     :  536                  Keepalive Time : 30
    Initial RTT          :  5

PAD X.121 Address       : 11000017050
    RSET from X.25      : Enabled

-------------------------------------------------------------------------------
^PF2 - Help                                                        ^R - Restore
^PF1 - Submit                                                      ^C - Abort
-------------------------------------------------------------------------------
```

MAC Ethernet Address (Information)
This displays the fixed Ethernet address (hexadecimal).

MAC Framing Protocol (Information)
This displays the MAC framing method.

Ethernet – Ethernet (Xerox, DEC, Intel) framing standard

IP Internet Address (Free Format Text, 20)
This is a mandatory field. It contains an Internet Address. This address represents the Internet Address of this device; it is used in the generation of IP datagrams and handling ARP packets. See Appendix C.2.

IP Subnet Mask (Free Format Text, 20)
This field defines the 'network' or 'subnet' part of the IP address designed for Router. Bit positions in this mask identify which bits in the IP address are significant when determining if an address for a destination device is on the same network or subnet. This can be used to route according to the

Internet address classes (Class A=255.0.0.0; Class B=255.255.0.0; Class C=255.255.255.0 – see Appendix C.2); but more flexibility is provided by this mask, as other ranges may be defined.

IP Fragmentation (Free Format Text, 6)
This is a mandatory field, but defaults to 576. It contains a number between 128 and 1500, which specifies the maximum IP datagram size before fragmentation occurs.

IP Time to Live (Free Format Text, 6)
This is a mandatory field, but defaults to 32. It contains a number between 2 and 255. It is used to prevent IP datagrams drifting aimlessly through a network. Any datagram that lives longer than this period, or passes through this many IP routers, is discarded.

TCP Window Size (Free Format Text, 6)
This is a mandatory field, but defaults to 512. It contains a number between 128 and 4096 in bytes. It is used to determine the number of unacknowledged bytes that can be sent to Router, i.e. the maximum number of bytes in transit across the network between the remote device and Router.

TCP Max Segment Size (Free Format Text, 6)
This is a mandatory field, but defaults to 536. It contains a number between 128 and 4120 in bytes. It defines the maximum size of a TCP segment (packet). It is often set to ensure that TCP segments can be sent using single unfragmented IP datagrams.

TCP Initial RTT (Free Format Text, 6)
This is a mandatory field, but defaults to 50. It contains a number between 2 and 999 in 10ths of a second. This is the round trip of the TCP link. It is used in assessing whether to re-transmit packets.

Keepalive (Constrained List)
This feature allows Router to detect that a LAN user (or host) has disappeared from the LAN network when there is no user activity. Router will poll each LAN session every n seconds to check the host (and session) are still active. If Router gets no response from the session then it will go through the normal re-transmission sequence and then disconnect the session.

Enabled- Perform Keepalive
Disabled - Do not perform Keepalive

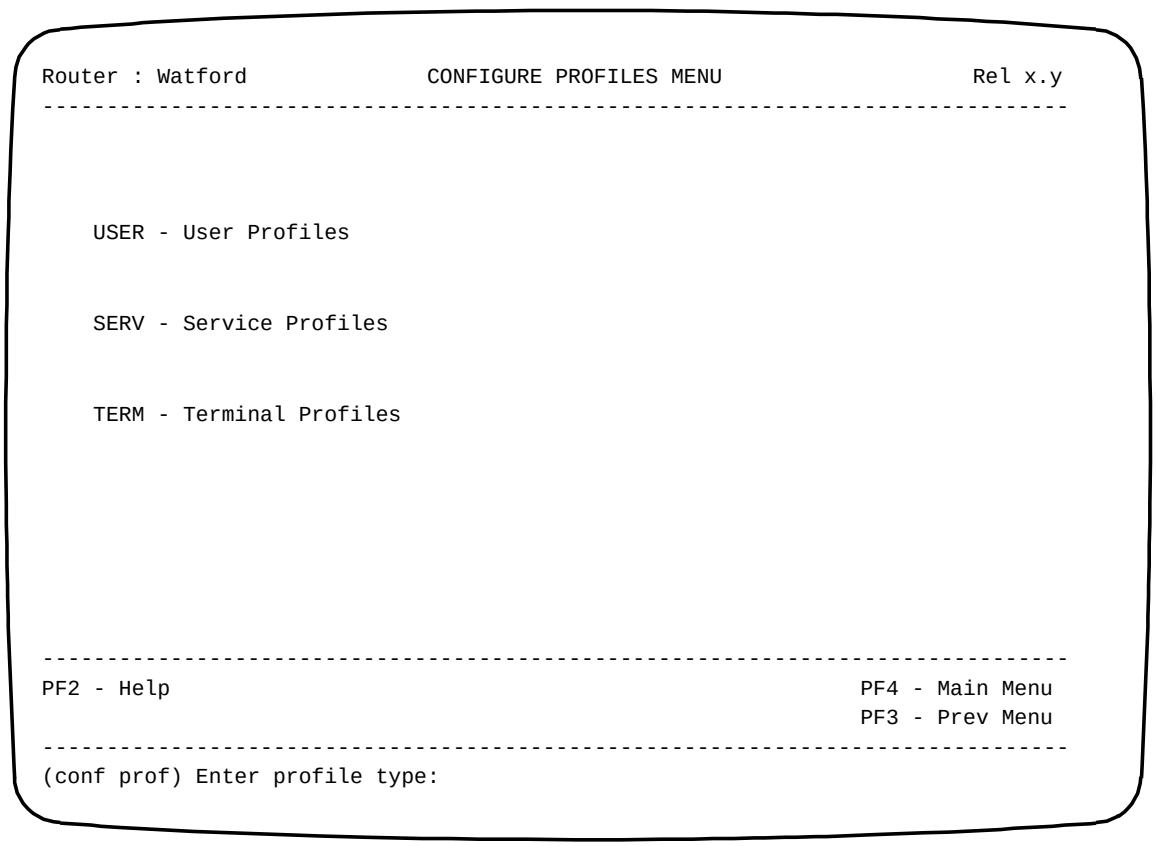
Keepalive Time (Free Format Text,6)
This field specifies the number of seconds between each poll and has a range of 30-999 seconds. The field defaults to 30 seconds.

X.121 Address (Free Format Text, 15)
This field represents the X.25 Address of this Router. From X.25, the user should enter dialogue mode when selecting this address.

RSET From X.25 (Constrained List)
This field controls whether the remote X.25 device can issue a remote X.29 SET to Router.

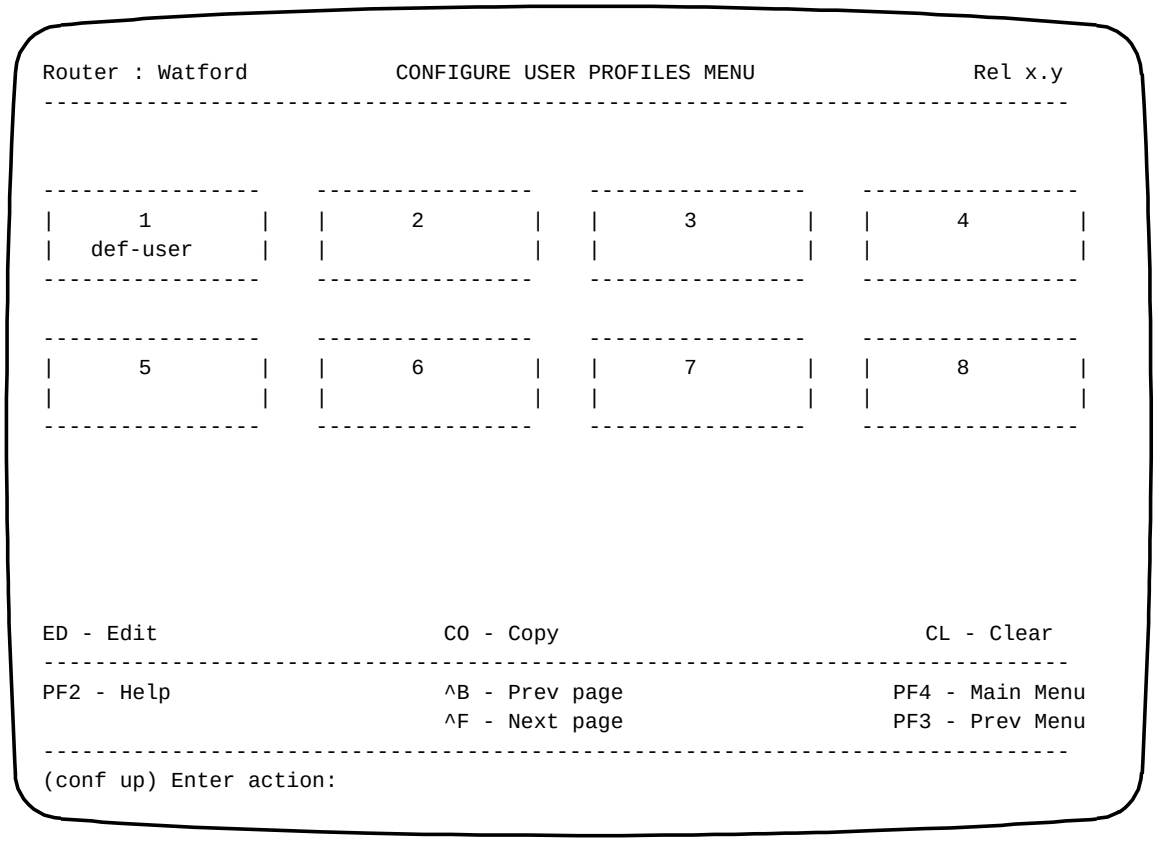
Enabled– Accept remote X.29 SET command.
Disabled – Do not accept X.29 SET command.

4.4.4 Configure Profiles Menu (**conf prof** command)



This menu allows you to choose menus for user profiles, service profiles and terminal profiles.

4.4.4.1 Configure User Profiles Menu (**conf prof user** or **conf up** command)



This menu displays eight profiles at a time. When a profile has a name, that is also displayed; if not, only the number is shown.

You can specify an action to be carried out on a user profile. When an action is entered you are prompted to specify the profile(s) required.

The edit action requests a single profile, and enters the 'configure user profile' form.

The copy action requests two profiles, a source profile and a destination profile; the contents are then copied (except the name).

The clear action requests a single profile and then clears the profile to the initial default values.

4.4.4.2 Configure User Profile Form (**conf up ed** command)

```
Router : Watford          CONFIGURE USER PROFILE FORM                  Rel x.y
-------------------------------------------------------------------------------

Name :                                                  Number : 1

Escape seq    :                                  Txt  :
Disc. seq     :                                  Txt  :
Switch seq1   :                                  Txt  :
Switch seq2   :                                  Txt  :
Switch seq3   :                                  Txt  :
Switch seq4   :                                  Txt  :

Directory banner         : ENABLE          Manager Login    : ENABLE
Free Service selection   : ENABLE          Session Quota    : 4
Inactivity disc. time    :                 Parity           : EVEN

Go-Ahead     : NOT SUPPRESSED              Binary           : ENABLED
CR map       : CR                          Break Map        : DISABLED




-------------------------------------------------------------------------------
PF2 - Help                                                    ^R - Restore
PF1 - Submit                                                  ^c -   Abort
-------------------------------------------------------------------------------
```

This form allows you to specify a set of characteristics to be adopted by a user of Router (the user is the originator of a call to Router: this can be a terminal or a host).

Name (Free Format Text, 15)
This field is optional. It can contain an alphanumeric name unique to this user profile.

Number (Information)
This displays the current profile number.

Escape Seq (Free Format Text, 20)
This field is optional. The string must begin with a control character (a carat) and may contain embedded control characters. It is used to define the key sequence required to indicate an escape to dialogue.

Disc. Seq (Free Format Text, 20)
This field is optional. The string must begin with a control character (a carat) and may contain embedded control characters. It is used to define the key sequence required to indicate disconnect from service (session).

Switch Seq1/2/3/4 (Free Format Text, 15)
These fields are optional. The strings must begin with a control character (a carat) and may contain embedded control characters to be used to define the key sequence required to indicate that a switch to that session number is required.

Txt (Free Format Text, 11)
These fields are optional. They correspond to their adjacent key sequence fields. They are used to describe in a more friendly way, the key sequence the user must use, e.g. PF1 instead of ^[OP.

Directory Banner (Constrained List)
This specifies whether a user automatically receives a directory listing after receiving the Welcome banner.

ENABLE – Directory listing is output
DISABLE – No directory listing is output

Manager Login (Constrained List)
This specifies whether a user using this profile can enter manager dialogue via the login/logon command.

ENABLE – Manager can be entered from dialogue
DISABLE – Manager cannot be entered from dialogue

Free Service Selection (Constrained List)
This controls whether a user is allowed to specify a service directly, if the service is not in the service tables.

ENABLE – Services may be specified directly (i.e. X.121 address, Internet Address etc.)
DISABLE – Only services contained in the service tables may be specified

Session Quota (Free Format Text, 2)
This field selects the maximum number of simultaneous sessions that the user can establish when using the profile. It can range from 1 to 4. (This is especially important when a user from the LAN is connecting to X.25 services and consuming valuable channels.)

Inactivity Disc. Time (Free Format Text, 4)
This field is optional. It contains a number from 1 to 9999 (minutes).

This value, when present, represents the time period that is allowed to elapse when no activity is taking place in user dialogue (user input or system output) before the user is logged out and all connections are lost.

Parity (Constrained List)
This allows you to define the parity of text to be generated when in dialogue.

ODD – Generate odd parity
EVEN – Generate even parity
MARK – Generate mark parity
SPACE– Generate space parity
NONE – Transparent from user

Router always ignores incoming parity.

Go-Ahead (Constrained List)
This field selects whether a Suppress Go-Ahead TELNET option is sent. It is only used when the user connection is on the LAN.

SUPPRESSED – Enable the use of Suppress Go-Ahead
NOT SUPPRESSED – Disable the use of Suppress Go-Ahead

Binary (Constrained List)
This field selects whether the Binary TELNET option should be negotiated. It is only used when the user is on the LAN. With Binary mode enabled, the connection is requested to use a full 8-bit data path. With Binary mode disabled, standard TELNET ASCII connection (7-bit data path) is established.

ENABLED – Binary TELNET option negotiated
DISABLED – Binary TELNET option not used

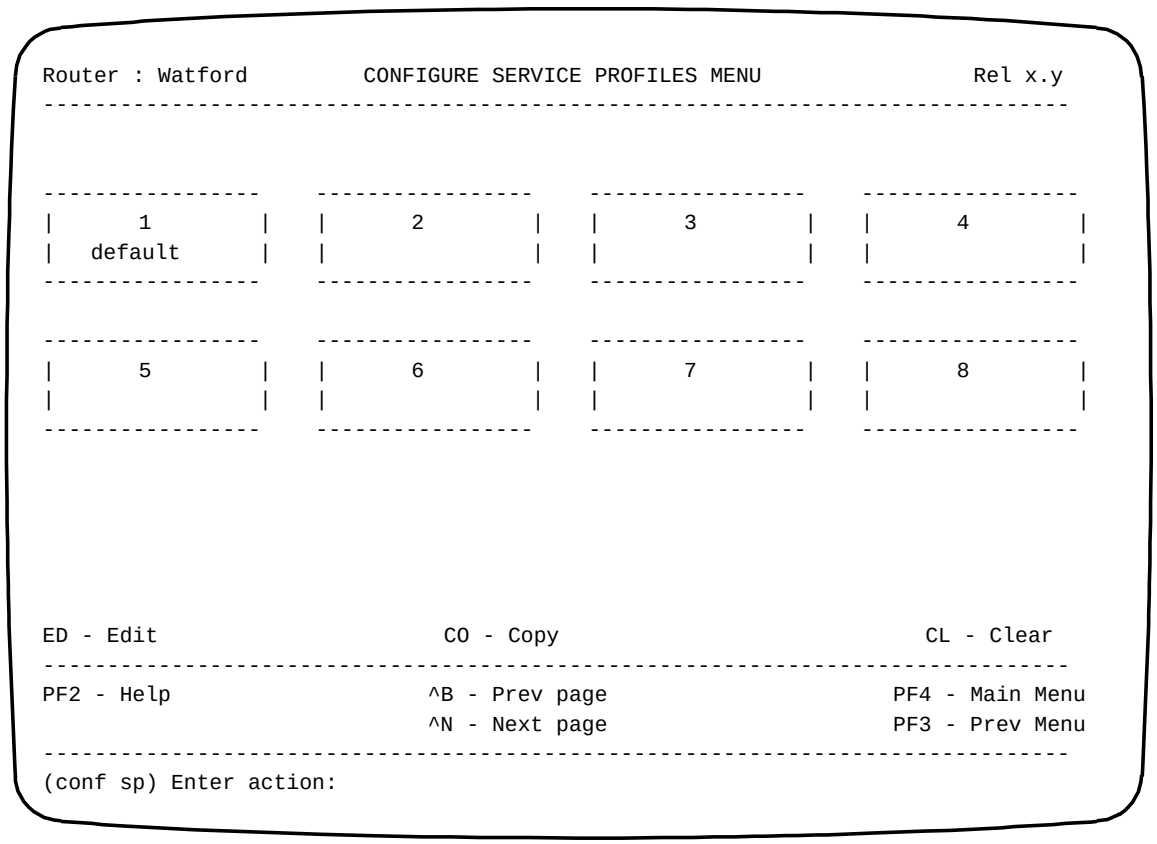
CR map (Constrained List)
This field selects whether CR (Carriage Return) is to be translated before sending to the LAN. TELNET specifies that a CR character should never be sent on its own, but as part of a sequence: CR-LF (Carriage Return-Line Feed) whenever it is meant as 'new line'; or CR-NUL (Carriage Return-Null) whenever it is meant as 'back to start of the current line'. This has been implemented differently by different vendors' devices, so Router allows it to be configured here to work with as many devices as possible. This is only used when the user is on the LAN. If Binary mode has been enabled, CR is always sent unchanged.

CR – CR is sent to the LAN unchanged
CR-LF – CR is sent to the LAN as CR-LF
CR-NUL – CR is sent to the LAN as CR-NUL, and CR-NUL received from the LAN is sent to X.25 as CR.

Break Map (Constrained List)
This field indicates whether Break is to be transmitted by Router, and selects the TELNET character that is to be used to indicate a Break character on the LAN.

BREAK – Translate WAN Break to TELNET BREAK
INTERRUPT – Translate WAN Break to TELNET INTERRUPT-PROCESS
DISABLED – No Break character sent to WAN or LAN.

4.4.4.3 Configure Service Profiles Menu (**conf prof serv** or **conf sp** command)



This menu displays eight profiles at a time. When a profile has a name, that is also displayed; if not, only the number is shown.

You can specify an action to be carried out on a service profile. Once selected, you are prompted to specify the profile(s) required.

The edit action requests a single profile, and enters the configure service profile form. The copy action requests two profiles, a source profile and a destination profile: the contents are then copied (except the name). The clear action requests a single profile and then clears the profile to the initial default values.

4.4.4.4 Configure Service Profile Form (**conf sp ed** command)

```
Router:Watford          CONFIGURE SERVICE PROFILE FORM                  Rel x.y
-------------------------------------------------------------------------------


Name  : def-service                        Number : 1
Inactivity Timeout   :
Initial sequence     :
Refresh sequence     :

CR map to X.25       : CR                  CR map from X.25      : CR
LF map to X.25       : LF                  LF map from X.25      : LF

Telnet Options                             Service will Echo     : YES
Supress GO AHEAD     : SUPRESSED           BINARY                : DISABLED

Local X.3 Parameters : ENABLED             Remote X.3 Parameters : ENABLED
Echo                 : ENABLED             Echo                  : DISABLED
Char. Forwarding     : 0                   Char. Forwarding      : 0
Forward timeout      : 2                   Forward timeout       : 2


-------------------------------------------------------------------------------
PF2 - Help                                                      ^R - Restore
PF1 - Submit                                                    ^C - Abort
-------------------------------------------------------------------------------
```

A service profile groups together all the characteristics that are specific to a service. It is used when establishing a session/connection to a service.

Name (Free Format Text, 15)
This field is optional. It can contain an alphanumeric name unique to this service profile.

Number (Information)
This field displays the current profile number.

Inactivity Timeout (Free Format Text, 4)
This field is optional. It contains a number from 1 to 9999 minutes.

This value, when present, represents the time that is allowed to elapse when no activity is taking place on the service connection (input to or output from the service) before the service connection (session) will be disconnected. A user connected to this service will then be returned to dialogue, or in the case of a seamless call will be disconnected.

Initial Sequence (Free Format Text, 39)
This field is optional. It may contain embedded control characters. This string will be sent to the service when first connected.

Refresh Sequence (Free Format Text, 9)
This field is optional. It may contain embedded control characters. This string will be sent to the service whenever the service is selected (excluding initial connection).

CR/LF mapping (Constrained List)
Four fields are provided to select CR and LF character mapping to and from X.25. Each field can be set to one of the following settings.

CR	-	map to CR
LF	-	map to LF
CR LF	-	map to the sequence CR LF
CR NULL	-	map to the sequence CR NULL
CR NULL LF	-	map to the sequence CR NULL LF
NOTHING	-	map to NOTHING

Service will Echo (Constrained List)
This field selects whether an Echo option is negotiated by TELNET.

YES	–	TELNET Echo option negotiated
NO	–	TELNET Echo option not used

Suppress Go-Ahead (Constrained List)
This field selects whether a Suppress Go-Ahead TELNET option is sent. It is only used when the service connection is on the LAN.

SUPPRESSED	–	Enable the use of Suppress Go-Ahead.
NOT SUPPRESSED	–	Disable the use of Suppress Go-Ahead.

Binary (Constrained List)
This field selects whether the TELNET Binary option should be negotiated. It is only used when the service is on the LAN. With Binary mode enabled, the connection is requested to use a full 8-bit data path. With Binary mode disabled, standard TELNET ASCII connection (7-bit data path) is established.

ENABLED	–	TELNET Binary option negotiated
DISABLED	–	TELNET Binary option not used

Local X.3 Parameters (Constrained List)
This field selects whether the local X.3 parameters are used when processing packets.

ENABLED	-	Process packet using X.3 parameters
DISABLED	-	Ignore X.3 parameters and forward packet immediately

Remote X.3 Parameters (Constrained List)
This field selects whether Router sets the remote X.3 parameters when making an X.25 connection.

ENABLED - Set remote X.3 parameters
DISABLED - Do not set remote X.3 parameters

Echo (Constrained List)
This field selects whether the local device will echo characters. With this option disabled it is assumed that the remote device will echo all characters.

ENABLED – Echo
DISABLED – No Echo

Char Forwarding (Free Format, 3)
This field is optional. It allows defined sets of characters received to be recognised by Router as an indication to forward packets.

0 No data forwarding character.
1 Alphanumeric characters (a-z, A-Z, 0-9).
2 Character CR.
4 Characters ESC, BEL, ENQ, ACK.
8 Characters DEL, CAN, DC2.
16 Characters ETX, EOT.
32 Characters HT, LF, VT, FF.
64 All other characters under the heading 'Name' of the ASCII table (Appendix D) not included above.
126 All characters under the heading 'Name' of the ASCII table (Appendix D) and DEL character.

Values may be added or subtracted: for example **10** would forward on characters DEL, CAN, DC2, CR, (8+2); and **124** would forward all characters under the heading 'Name' except CR (126–2).

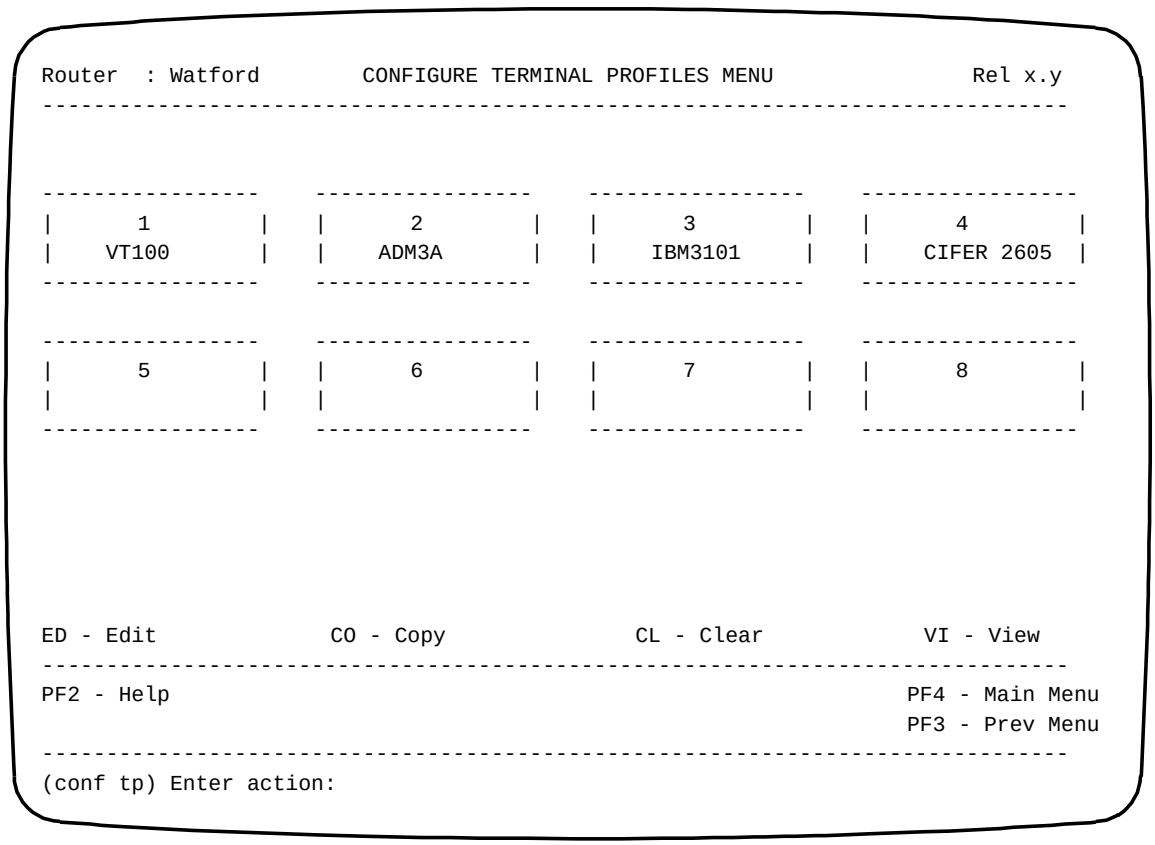
Forward Timeout (Free Format Text, 3)
This field is optional. It allows Router to forward packets after a specified time regardless of the forwarding character. The time indicated is in twentieth of a second and is disabled by setting it to 0.

X.3 Parameters
The values shown for the X.3 parameters Echo, Char Forwarding and Forward Timeout are initial values and may be changed during the connection.

Editing

If editing is enabled (X.3 parameter 15), data held in a local buffer may be edited using the delete character (parameter 16) and the buffer may be deleted using the buffer delete character (parameter 17). In addition the contents of the buffer may be displayed using the buffer display character (parameter 18).

4.4.4.5 Configure Terminal Profiles Menu (**conf prof term** or **conf tp** command)



This menu displays eight profiles at a time. When a profile has a name, it is also displayed; if not, only the number is shown.

You can specify an action to be carried out on a terminal profile. Once selected, you are prompted to specify the profile(s) required.

The edit action requests a single profile, and enters the Configure Terminal Profile form. The copy action requests two profiles, a source profile and a destination profile: the contents are then copied (except the name). The clear action requests a single profile and then clears it to the initial default values. The view action enters the Configure Terminal Profile form but does not allow the form to be submitted. Abort must be used to leave the form.

The first four profiles are fixed and cannot be edited, cleared or copied to. It is however possible to view, and copy from, these profiles.

4.4.4.6 Configure Terminal Profile Form (**conf tp ed** or **conf tp vi** command)

Page 1 of the form is:

```
Router : Watford     CONFIGURE TERMINAL PROFILE FORM (page 1)          Rel x.y
-------------------------------------------------------------------------------

Name  :                                          Number : 1

                              GENERAL KEY SEQUENCES

Cursor Left    :                           Txt  :
Cursor Right   :                           Txt  :
Cursor Up      :                           Txt  :
Cursor Down    :                           Txt  :
Redisplay      :                           Txt  :                  (^v)
Next Page      :                           Txt  :                  (^N)
Previous Page  :                           Txt  :                  (^B)
Help           :                           Txt  :                  (^Z)
Clear          :                           Txt  :                  (^X and ^U)
Restore        :                           Txt  :                  (^R)
Main Menu      :                           Txt  :                  (^G)
Previous Menu  :                           Txt  :                  (^L)

-------------------------------------------------------------------------------
PF2 - Help              ^B - Prev page                          ^R - Restore
PF1 - Submit            ^F - Next page                          ^C - Abort
-------------------------------------------------------------------------------
```

Name (Free Format Text, 15)
This field is mandatory. It must contain an alphanumeric name unique to this terminal profile.

Number (Information)
This field displays the current profile number.

CursorLeft (Free Format Text, 15)
This field defines the character sequence generated from the terminal to indicate a move-cursor-left.

CursorRight (Free Format Text, 15)
This field defines the character sequence generated from the terminal to indicate a move-cursor-right.

CursorUp (Free Format Text, 15)
This field defines the character sequence generated from the terminal to indicate a move-cursor-up.

CursorDown (Free Format Text, 15)
This field defines the character sequence generated from the terminal to indicate a move-cursor-down.

Redisplay (Free Format Text, 15)
^V can be generated from the terminal to indicate that a redisplay of the entire screen is required. This field allows an additional key sequence to be defined, if required.

Next Page (Free Format Text, 15)
^N or **^F** can be generated from the terminal to indicate that a move to the next page is required. This field allows an additional key sequence to be defined, if required.

Previous Page (Free Format Text, 15)
^B can be generated from the terminal to indicate that a move to the previous page is required. This field allows an additional key sequence to be defined, if required.

Help (Free Format Text, 15)
^W can be generated from the terminal to indicate that help is required. This field allows an additional key sequence to be defined, if required.

Clear (Free Format Text, 15)
^X or **^U** can be generated from the terminal to indicate that a clear line/field operation is required. This field allows an additional key sequence to be defined, if required.

Restore (Free Format Text, 15)
^R can be generated from the terminal to indicate that a restore line/field is required. This field allows an additional key sequence to be defined, if required.

Main Menu (Free Format Text, 15)
^G can be generated from the terminal to indicate that a move to the Main Menu is required. This field allows an additional key sequence to be defined, if required.

Previous Menu (Free Format Text, 15)
^L can be generated from the terminal to indicate that a move to the previous menu is required. This field allows an additional key sequence to be defined, if required.

Txt (Free Format Text, 11)
This text corresponds to the adjacent key sequence and is used to represent the key sequence in menus, etc (e.g. **PF1**).

Page 2 of the Configure Terminal Profile form is:

```
Router : Watford     CONFIGURE TERMINAL PROFILE FORM (page 2)          Rel x.y
-------------------------------------------------------------------------------

                                FORM KEY SEQUENCES
Submit Form  :                              Txt  :
Abort Form   :                              Txt  :
Back Tab     :                              Txt  :

                            SCREEN CONTROL SEQUENCES
Initialise Device    :
Clear Screen & Home  :
Clear Line           :
Cursor Pos Type      : ASCII                Offset   :   0
Cursor Pos String    :
Highlight On         :
Highlight Off        :









-------------------------------------------------------------------------------
PF2 - Help                    ^B - Prev page                    ^R - Restore
PF1 - Submit                  ^F - Next page                    ^C - Abort
-------------------------------------------------------------------------------
```

Submit Form (Free Format Text, 15)
^E can be generated from the terminal to indicate that the current form should be submitted for entry into the system. This field allows an additional key sequence to be defined, if required.

Abort Form (Free Format Text, 15)
^C can be generated from the terminal to indicate that the current form should be aborted without entry into the system. This field allows an additional key sequence to be defined, if required.

Back Tab (Free Format Text, 15)
This field defines the character sequence generated from the terminal to indicate that a move to the previous field is required.

Txt (Free Format Text, 8)
This text corresponds to the adjacent key sequence and is used to represent the key sequence in menus, etc (e.g. **PF1**).

Initialise Device (Free Format Text, 15)
This field defines the character sequence to be sent to the terminal to indicate that it should enter an initial state (as if after power up). It is sent to the terminal whenever the terminal profile is selected.

Clear Screen & Home (Free Format Text, 15)
This field defines the character sequence to be sent to the terminal to indicate that it should clear the screen and place the cursor at the top left-hand position. This must be specified to allow the manager to operate correctly.

Clear Line (Free Format Text, 15)
This field defines the character sequence to be sent to the terminal to indicate that it should clear the current line and place the cursor at the left-hand position. This must be specified to allow the manager to operate correctly. If not specified, then Router will position at the left-hand side and output a line of spaces followed by a re-position at the left-hand side.

Cursor Pos Type (Constrained List)
This field defines the method of cursor positioning. This can be **ASCII** (normal) or **BINARY**. ASCII outputs the co-ordinates as displayable numbers (e.g. as for ANSI or VT100); BINARY outputs the actual binary value. This must be specified to allow the manager to operate correctly.

Offset (Free Format Text, 5)
This field defines the offset to be added to the row and column numbers. The top left-hand position is 0,0 internally. For a VT100 or ANSI device this would be 1, i.e. top left is 1,1. This must be specified to allow the manager to operate correctly.

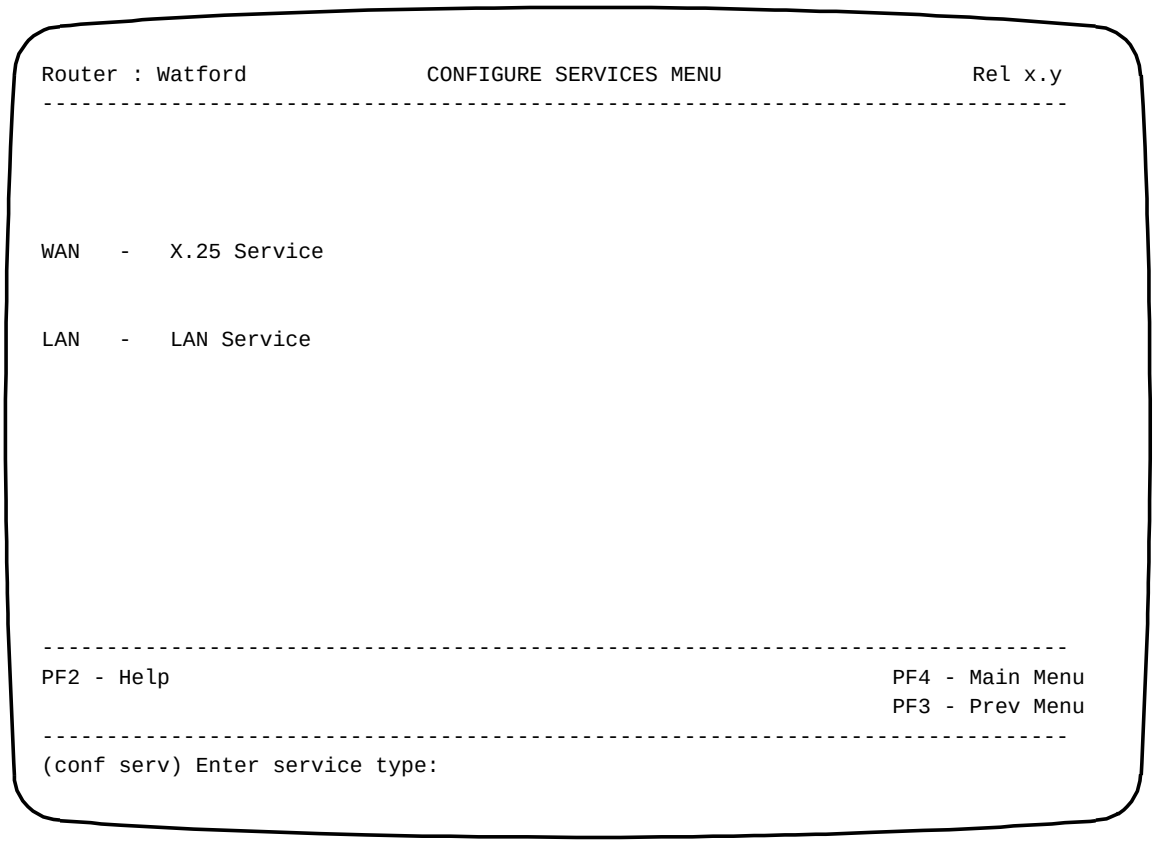
Cursor Pos String (Free Format Text, 15)
This field defines the character sequence to be sent to the terminal to move the cursor to a specified position. The string contains **%r** and **%c** to represent the row and column numbers respectively. For a VT100 or ANSI device this would be **^[[%r;%cH**. This must be specified to allow the manager to operate correctly. (**%%** will cause a single % to be output.)

Highlight On (Free Format Text, 15)
This field defines the character sequence to be sent to the terminal to indicate that the subsequent characters should be output in a highlighted fashion.

Highlight Off (Free Format Text, 15)
This field defines the character sequence to be sent to the terminal to indicate that the subsequent characters should no longer be output in a highlighted fashion.

4.4.5 Configure Services Menu (**conf serv** command)

This menu allows each of the individual service menus to be accessed.

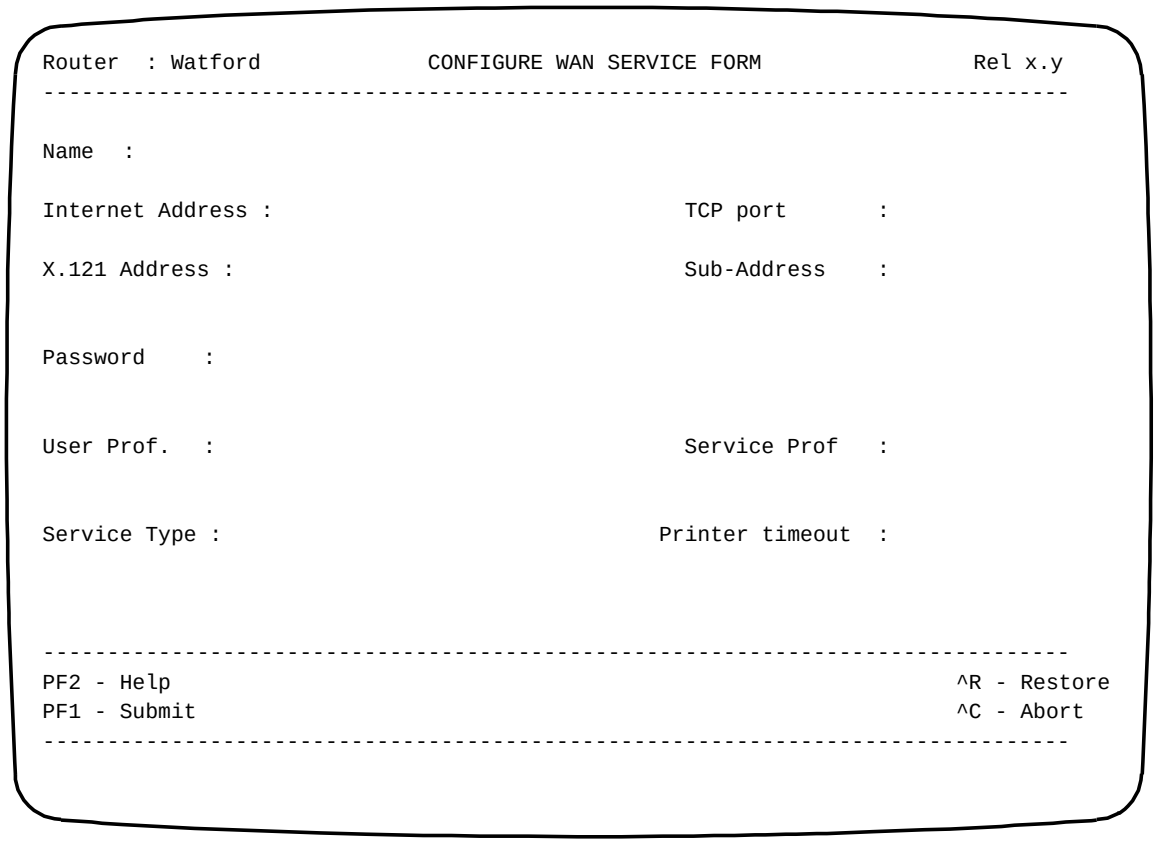


4.4.5.1 Configure X.25 Services Menu (**conf serv wan** or **conf wan** command)

```
Router : Watford              CONFIGURE WAN SERVICES MENU                Rel x.y
-------------------------------------------------------------------------------

Name                          Name                          Name
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>



* = Service Disabled


ED - Edit       EN - Enable     CO - Copy        DI - Disable       DE - Delete
-------------------------------------------------------------------------------
PF2 - Help                    ^B - Prev Page                    PF4 - Main Menu
                              ^F - Next Page                    PF3 - Prev Menu
-------------------------------------------------------------------------------
(conf wan) Enter Action :
```

This menu displays up to a page of configured WAN services. An asterisk is displayed by the name to indicate that the service is disabled. You can specify an action to be carried out on a WAN service. Once selected, you are prompted to specify the service required. The edit action requests a single service, and enters the Configure WAN Service form. The copy action requests two services, a source service and a destination service (the destination service must **not** already exist); the contents are then copied (except the name and TCP port). The delete action does not break any existing connections.

4.4.5.2 Configure X.25 Service Form (**conf serv wan ed** or **conf wan ed** command)



Name (Free Format Text, 15)
This a mandatory field. It must contain an alphanumeric name unique to this WAN service.

Internet Address (Information)
This is Router's Internet address.

TCP port (Free Format Text, 6)
This is an optional field. It contains a number between 0 and 65535 and must be unique within the WAN services. It is used to reference this service, upon incoming LAN calls.

X.121 Address (Free Format Text, 13)
This is an optional field. It contains the X.121 address of the service.

Sub-Address (Free Format Text, 2)
This field is optional. It contains the X.121 sub-address of the service.

Password (Free Format Blind Text, 13)
This is an optional field. If you enter a password here, then the user will be requested to confirm it prior to a connection being allowed to take place.

User prof (Free Format Text, 15)
This is an optional field. It contains a user profile number or name. If this service is selected automatically (i.e. by incoming LAN call's TCP port matching the above TCP port), then the user connection (originator Router) will adopt the characteristics of this user profile. If no profile is specified, then the default user profile will be used.

Service prof (Free Format Text, 15)
This is an optional field. It contains a service profile number or name. When this service is selected, then the session created will adopt the characteristics of this service profile. If no profile is specified, then the default service profile will be used.

Service Type (Constrained List)
This field selects whether the service is specifically for a printer on a WAN connection. The settings are:

NORMAL This is the default selection setting for (multi-user) WAN services.

PRINTER This setting indicates that the service can only be used by one LAN user at a time. It is particularly appropriate for connections to printers attached to the WAN. A LAN user requesting this service will not be connected unless the WAN service is ready to accept the incoming call.

HELD PRINTER As PRINTER but when a LAN user disconnects, the WAN half of the call is kept active (i.e. "held"). A subsequent LAN user connecting to this service is instantly connected to the WAN connection, saving WAN call set-up time. A held printer service will disconnect after the number of seconds given in Printer timeout if no LAN user re-connects.

Printer timeout (Free Format Test, 4)
The number of seconds for which a call to a Held Printer WAN Service type will be held 'open', with no LAN user.

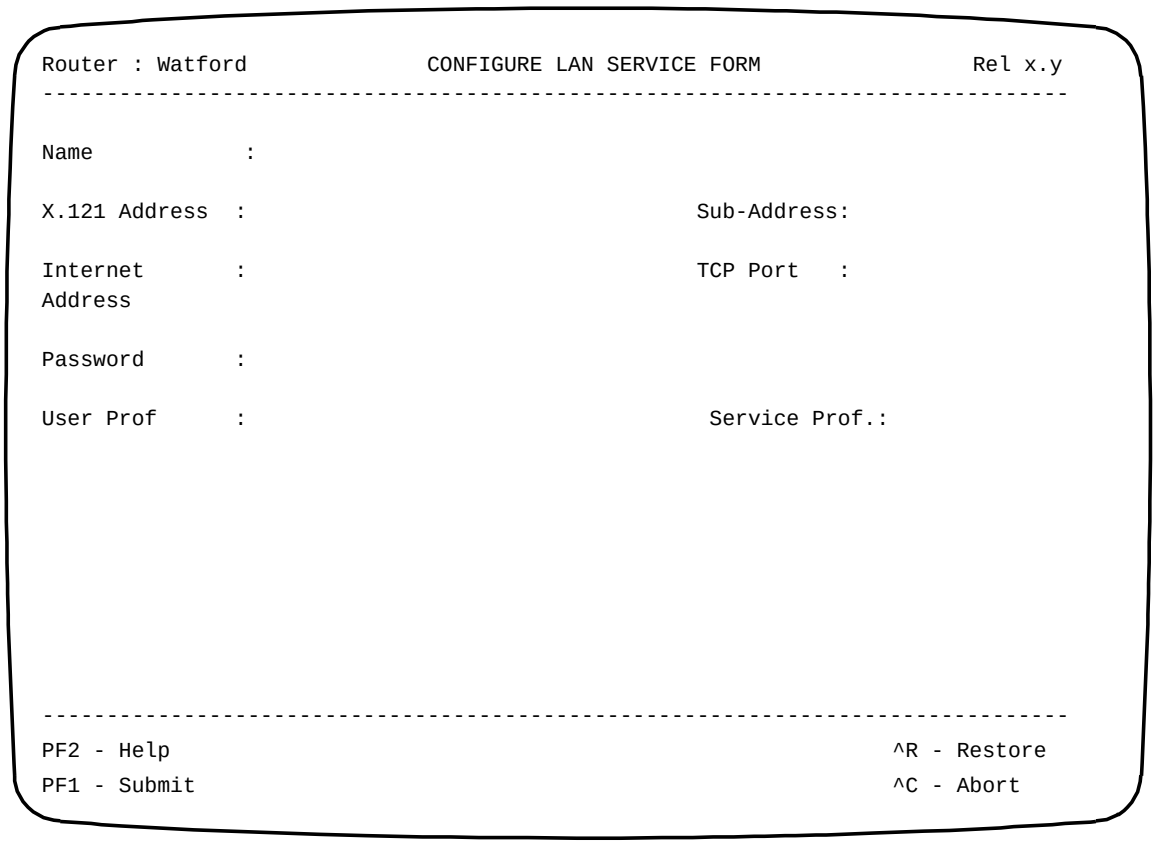
4.4.5.3 Configure LAN Services Menu (**conf serv lan** or **conf lan** command)

```
Router : Watford              CONFIGURE LAN SERVICES MENU                Rel x.y
--------------------------------------------------------------------------------

Name                          Name                          Name
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>



* = Service Disabled


ED - Edit       EN - Enable     CO - Copy        DI - Disable       DE - Delete
--------------------------------------------------------------------------------
PF2 - Help                    ^B - Prev Page                    PF4 - Main Menu
                              ^F - Next Page                    PF3 - Prev Menu
--------------------------------------------------------------------------------
(conf lan) Enter action:
```

This menu displays up to a page of configured LAN services. An asterisk displayed by the name indicates that the service is disabled. You can specify an action to be carried out on a LAN service. Once selected, you are prompted to specify the service required.

The edit action requests a single service, and enters the configure LAN service form. The copy action requests two services, a source service and a destination service (the destination service must **not** already exist); the contents are then copied (except the name). The delete action requests a single service and then removes that service from the system. This action does **not** break existing connections.

4.4.5.4 Configure LAN Service Form (**conf serv lan ed** or **conf lan ed** command)



Name (Free Format Text, 15)
This is a mandatory field. It must contain an alphanumeric name unique to this LAN service.

X.121 Address (Information)
This is Router's X.121 address.

Sub-Address (Free Format, 2)
This is an optional field. It contains the X.121 sub-address.

Internet Address (Free Format Text, 20)
This is an optional field. It contains the Internet address of the service.

TCP port (Free Format Text, 6)
This field is optional and contains the TCP port that this service resides on. It must be supplied when an Internet address is specified.

Password (Free Format Blind Text, 13)
This is an optional field. If you set a password here, it will be requested from the user prior to a connection being allowed to take place.

User prof (Free Format Text, 15)
This is an optional field. It contains a user profile number or name. If this service is selected automatically, then the user connection (originator Router) will adopt the characteristics of this user profile. If no profile is specified, then the default user profile will be used.

Service prof (Free Format Text, 15)
This is an optional field. It can contain a service profile number or name. When this service is selected, then the session created will adopt the characteristics of this service profile. If no profile is specified, then the default service profile will be used.

4.4.6 **Configure Load** (**conf lo** command)

This command causes Router to load the last saved configuration from disk and place it into the current configuration in memory: this operation over-writes any previous configuration not saved to disk. A message is displayed signifying whether the load was successful or not.

4.4.7 **Configure Dump**(**conf du** command)

This command causes Router to save (write) its configuration onto floppy disk. This operation over-writes the last configuration files on disk. A message is displayed signifying whether the dump was successful or not. Note that the disk used to save the configuration must not be write-protected.

4.5 Control Menu (**cont** command)

This menu allows you to control the X.25 and Ethernet interfaces, new gateway calls and connections, and also allows you to access the Service menu.

```
Router : Watford                    CONTROL MENU                          Rel x.y
-------------------------------------------------------------------------------

* LAN       -  further LAN calls (ENable/DIsable)

  WAN       -  further WAN calls (ENable/DIsable)

  SERV      -  Services

  CLEAR     -  Clear Connections

  TRACE     -  trace port (ENable/DIsable




* = Disabled

EN - Enable                        DI - Disable                      CL - Clear
-------------------------------------------------------------------------------
PF2 - Help                                                      PF4 - Main Menu
                                                                PF3 - Prev Menu
-------------------------------------------------------------------------------
(cont) Enter item or action:
```

You can either specify an action to be performed, followed by the item to be affected, or specify the item first and then the action. Each action can only be performed on certain items (displayed in brackets).

4.5.1 LAN (disable : **di lan** command)
(enable : **en lan** command)

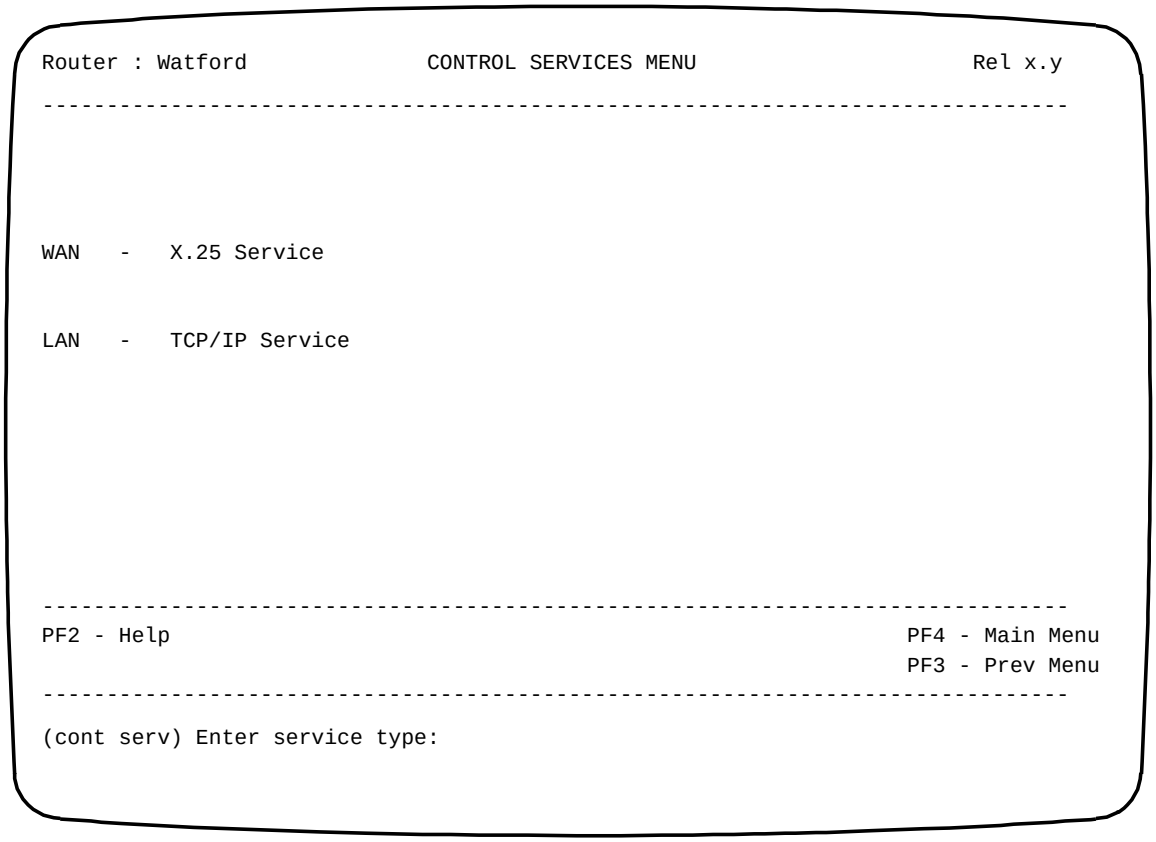
Disabling Ethernet prevents any new gateway calls to or from the LAN being established.

Enabling Ethernet allows new calls to be established.

4.5.2 WAN (disable **: di wan** command)
(enable **: en wan** command)

Disabling WAN prevents new gateway calls to or from X.25.

4.5.3 SERV (**cont serv** command)



This menu allows you to choose the WAN or LAN control service menu.

4.5.3.1 Control WAN Services Menu (**cont serv wan** or **cont wan** command)

```
Router : Watford              CONTROL WAN SERVICES MENU                  Rel x.y
-------------------------------------------------------------------------------

Name                          Name                          Name
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>


* = Service Disabled


EN - Enable                                                   DI - Disable
-------------------------------------------------------------------------------
PF2 - Help                    ^B - Prev Page                PF4 - Main Menu
                              ^F - Next Page                PF3 - Prev Menu
-------------------------------------------------------------------------------
(cont x25) Enter Action :
```

This menu displays up to a page of configured X.25 services. An asterisk is displayed by the name to indicate that the service is disabled. You can enable or disable X.25 services. When a service is disabled, no calls can be made to it, and it will not be displayed when you execute the DIRECTORY command (see Section 5.2.8). The enable and disable actions require a service to be specified. Existing connections are not broken. (Connections can be broken using the clear command (**cl**); see Section 4.5.5.)

4.5.3.2 Control LAN Services Menu (**cont serv lan** or **cont lan** command)

```
Router : Watford              CONTROL LAN SERVICES MENU                  Rel x.y
-------------------------------------------------------------------------------

Name                          Name                          Name
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>
*<ServiceName>                *<ServiceName>                *<ServiceName>


* = Service Disabled


EN - Enable                                                   DI - Disable
-------------------------------------------------------------------------------
PF2 - Help                    ^B - Prev Page                PF4 - Main Menu
                              ^F - Next Page                PF3 - Prev Menu
-------------------------------------------------------------------------------
(cont lan) Enter action :
```

This menu displays up to a page of configured LAN services. An asterisk is displayed by the name to indicate that the service is disabled. You can enable or disable LAN services. When a service is disabled then no calls can be made to it and it will not be displayed when you execute the DIRECTORY command (see Section 5.2.8). The enable and disable actions require a service to be specified. Existing connections are not broken. (Connections can be broken using the clear command (**cl**); see Section 4.5.5.)

4.5.4 **CLEAR** (**conn cl** command)

This command can be used to clear connections. If the specified connection is a user (source), this clears all the calls (sessions) associated with the user. Connections are identified by their channel number (<connId>). These numbers can be obtained from the status screens.

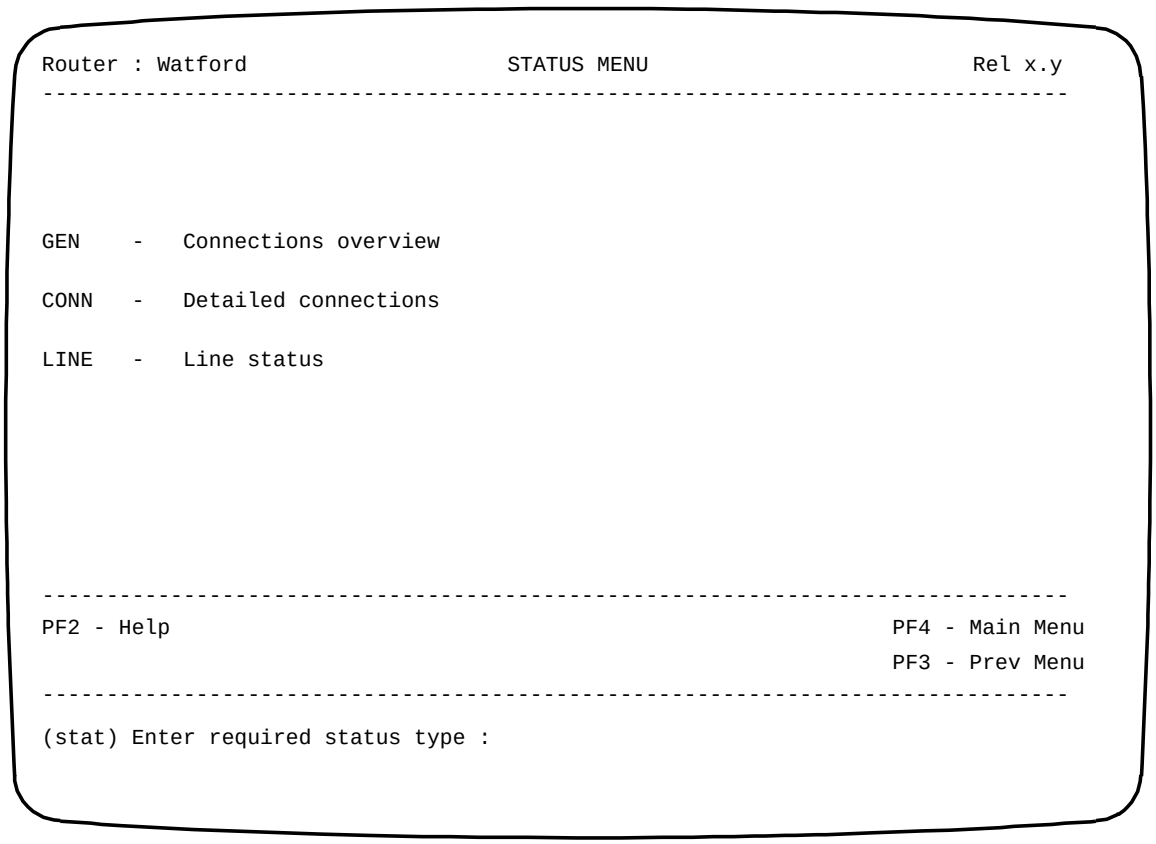
4.5.5 **TRACE** (disable: **di trace** command)
(enable: **en trace** command)

Disabling TRACE prevents diagnostic trace information being sent to the card's trace port.

Enabling TRACE causes diagnostic trace information to be sent to the card's trace ports.

4.6 Status Screen (**stat** command)

The status screen provides status and statistics on the operational aspects of Router for supervisors and engineers.



This menu allows you to select general connections overview, more detailed and specific status of connections, and line status (Ethernet and non-connection-based information).

4.6.1 General Status Menu (**stat gen** command)

This screen displays up to a page of connections.

```
Router : Watford           GENERAL CONNECTION STATUS                    Rel x.y
-------------------------------------------------------------------------------

Connid     Source             Connid       Destination         State
  1        1100001321          113         001.001.001.003     Ac
                               114         192.000.002.200     Ac
                               115         111.111.111.111     Cl
  2                            120         001.001.001.001     Ac
  100      111.111.111.111      64         110001123456        Ac
  3        110000112345        106         192.000.002.001     Ac









* = Currently selected                       CLEAR Connid = clear connection
-------------------------------------------------------------------------------
PF2 - Help                    ^B Prev - Page                    PF4 - Main Menu
                              ^F - Next Page                    PF3 - Prev Menu
-------------------------------------------------------------------------------
(stat gen) Enter command :
```

Connid (Source)
This field identifies the user by the X.25 channel number (1-64) or TCP connection identity (65 upwards). Either of these values can be used to gain further status from the Connection Status screen.

Source
This field displays information gained about the originator of the call (source) when the user contacted Router.

Connid (destination)
This field identifies the outgoing session within Router, i.e. by the TCP connection identity. Both of these values can be used to gain further status from the Connection Status screen.

Destination
This field displays the service description of the outgoing session. This can be the name of the service, an Internet address, or an X.121 address.

State

This displays the current status of the session as follows:

Cn	– connecting	–	a call attempt is being made and the user is waiting for the call to be accepted by the service
Cl	– clearing	–	the connection has been broken and Router is waiting for the clear to be processed
Ac	– active	–	the connection is fully established
Al	– allocated	–	the service is reserved, but the connection cannot be established yet

4.6.2 Connection Status/Statistics Menu (**stat conn** command)

```
Router  : Watford        CONNECTION STATUS/STATISTICS                    Rel x.y
-------------------------------------------------------------------------------

                                       LAN STATISTICS=

TELNET: Tx Data Chr       :            Rx Data Chars   :
        Tx Non-Data       :            Rx Non-Data     :

TCP:    Local Ip address  :            Rem IP address  :
        Local Port        :            Rem Port        :
        Tx Packets        :            Rx packets      :
        Re-Transmit       :            Checksum errs   :
        Incoming Window   :            RTT             :
        Outgoing Window   :

                                       WAN STATISTICS =
PAD:    Tx Data Chars     :            Rx Data Chars   :
        Tx state (rcvd)   :            Rx State (sent) : Xon

CONNID - Select connection id                              RE - Reset Stats
-------------------------------------------------------------------------------
PF2 - Help                                                    PF4 - Main Menu
                                                              PF3 - Prev Menu
-------------------------------------------------------------------------------
(stat conn) Enter command :
```

This screen displays the connection-oriented information, i.e. TELNET and TCP statistics for the LAN side of a connection, and channel statistics for the X.25 side. If a connection is in User Dialogue or Manager mode, or the session is not selected by the user, only the Channel information is displayed (according to the Channel number requested). The Channel numbers can be obtained from the General Status Menu; see Section 4.6.1.

CONNID command selects the LAN or WAN session to be displayed, e.g. **65**.

RE command resets the statistics for the currently displayed connection.

LAN STATISTICS = TTT
This is the connid number of the TCP/TELNET connection currently displayed.

TELNET:Tx Data Chr
This is the number of data characters that have been transmitted to the LAN from this TELNET connection.

TELNET:Rx Data Chr
This is the number of data characters that have been received from the LAN to this TELNET connection.

TELNET:Tx Non-Data
This is the number of non-data (special TELNET) characters that have been transmitted to the LAN from this TELNET connection.

TELNET:Rx Non-Data
This is the number of non-data (special TELNET) characters that have been received from the LAN to this TELNET connection.

TCP: Local IP address
This is the local IP address.

TCP: Rem IP address
This is the remote IP address.

TCP: Local port
This is the TCP port allocated locally, e.g. if this is an incoming standard TELNET connection, then it will probably be 23.

TCP: Rem port
This is the TCP port allocated remotely, e.g. if this is an outgoing standard TELNET connection, then it will probably be 23.

TCP: Tx/Rx Packets
The number of packets transmitted/received on this TCP connection.

TCP:Re-Transmit
The number of times TCP had to retransmit a packet for this connection.

TCP:Checksum errs
The total number of TCP packets received with errors, for all connections.

TCP: RTT
The current value of the 'round trip time', in tenths of a second. This is the time between sending a packet, and receiving and processing the acknowledgement for it.

TCP:Incoming Window
The current window size that we are reporting to the remote user/service on the LAN. A window size of zero indicates flow control when we are not accepting any data.

TCP:Outgoing Window
The current window size reported by the remote user/service on the LAN.

WAN STATISTICS=

PAD: Tx Data Chr
The number of characters transmitted on this channel since the current connection was established.

PAD: Rx Data Chr
The number of characters received on this channel since the current connection was established.

PAD: Tx state
The Xon/Xoff state of the transmit path. Xoff indicates that Router has been flow-controlled and is not allowed to send data.

PAD: Rx state
The Xon/Xoff state of the receive path. Xoff indicates that Router has flow-controlled the attached WAN and cannot receive data.

4.6.3 Line Status/Statistics Menu (**stat line** command)

```
Router : Watford            LINE STATUS/STATISTICS                    Rel x.y
-------------------------------------------------------------------------------

MAC:     Tx frames     :                   Rx frames     :
         CRC errors    :                   Long frames   :
         Overruns      :


IP:      Datagrams     :                   Checksum err  :
         Short Pkts    :                   Version err   :


ICMP:    Received                        Sent
         Echo Request :                  Echo Request :
         Dest unreach :                  Dest unreach :
         Srce Quench  :                  Srce Quench  :
         Time exceed  :                  Time exceed  :


ARP - ARP Table                                          RE - Reset stats
-------------------------------------------------------------------------------
PF2 - Help                                               PF4 - Main Menu
                                                         PF3 - Prev Menu
-------------------------------------------------------------------------------
(stat line/rtr mac) Enter action :
```

This screen displays information about MAC, IP and ICMP, i.e. the Ethernet line side. It is possible to enter the ARP status screen from here.

MAC: Tx frames, Rx frames
The number of frames transmitted and received on Ethernet.

MAC: CRC errors
The number of frames received from Ethernet with CRC errors.

MAC: Long frames
The number of frames received that exceed the maximum frame length.

MAC: Overruns
The number of times Router has been overrun by incoming Ethernet frames.

IP: Datagrams
The number of datagrams that IP has sent/received.

IP: Checksum err
The number of IP datagrams that were received with checksum errors.

IP: Short Packets
The number of IP datagrams that were too small.

IP: Version err
The number of IP datagrams that had an incorrect version number.

ICMP: Echo request
The number of echo request messages which have been received and sent. (Receipt of an echo request message causes an echo reply to be sent.)

ICMP: Dest unreach
The number of destination unreachable messages which have been received and sent (failure to deliver an IP datagram causes one of these messages to be sent).

ICMP : Srce Quench
The number of source quench messages which have been received and sent (these messages are generated by the Router when an IP datagram is discarded due to congestion).

ICMP : Time exceed
The number of time exceeded messages which have been received and sent (sent to a datagram's source when a datagrams hop count reaches zero or a timeout occurs whilst waiting for a fragment of a datagram).

4.6.3.1 ARP Status Table (**stat line arp** or **stat arp** commands)

```
Router : Watford                  ARP TABLE STATUS                        Rel x.y
-------------------------------------------------------------------------------

Internet Address               Ethernet Address
<InternetAddress>              <EthernetAddress>
<InternetAddress>              <EthernetAddress>
<InternetAddress>              <EthernetAddress>
<InternetAddress>              <EthernetAddress>
<InternetAddress>              <EthernetAddress>
<InternetAddress>              <EthernetAddress>
<InternetAddress>              <EthernetAddress>
<InternetAddress>              <EthernetAddress>
<InternetAddress>              <EthernetAddress>
<InternetAddress>              <EthernetAddress>



-------------------------------------------------------------------------------
PF2 - Help                     ^B - Prev Page                  PF4 - Main Menu
                               ^F - Next Page                  PF3 - Prev Menu
-------------------------------------------------------------------------------
(stat arp) Enter command :
```

The ARP status table displays up to a page of Internet addresses and their corresponding Ethernet addresses that have been resolved by ARP.

Internet Address
The destination Internet Address of a device on the local network.

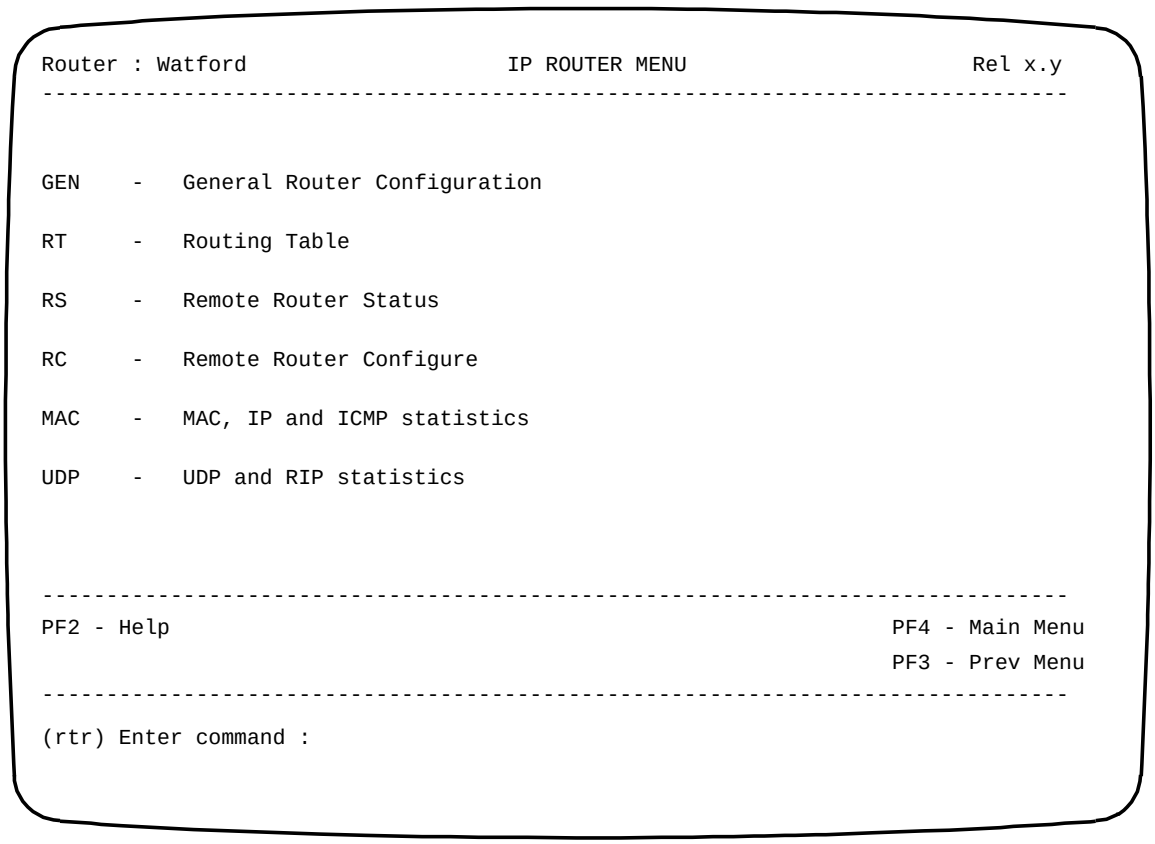
Ethernet Address
The corresponding Ethernet address.

ARP addresses are automatically discarded after a time period of 15 minutes.

Addresses waiting to be resolved appear in the table with an Ethernet address of 00: 00: 00: 00: 00: 00.

4.7 IP Router Screen (**rtr** command)

The IP Router screen is used to control and view all aspects of the IP Routing function of Router.



This menu allows you to select Routing Table for viewing the routing table, and Remote Router Status for viewing the status of all known remote Routers in the X.25 network. It also allows configuration of the addresses of remote Routers.

4.7.1 General Router Configuration Form

```
Router : Watford         GENERAL ROUTER CONFIGURATION FORM              Rel x.y
--------------------------------------------------------------------------------


Internet Address     : 001.001.001.001
Subnet Mask          : 255.000.000.000
IP Broadcast Address : 001.255.255.255

WARNING: Changes to IP parameters will only take effect after a warm restart

X.25 IP Address      : 255.255.255.255
X.25 Subnet Mask     : 255.255.255.255
X.25 IP Broadcast    : 255.255.255.255

RIP Broadcast        : ACTIVE

Router Password      :          Verify Password :




--------------------------------------------------------------------------------
PF2 - Help                                                          ^R - Restore
PF1 - Submit                                                        ^C - Abort
--------------------------------------------------------------------------------
```

Internet Address (Free Format Text, 16)
This is a mandatory field. The address represents the Internet address of this device and also appears in the Configure Protocols form.

Subnet mask (Free Format Text, 16)
This field defines the 'network' or 'subnet' part of the IP address. Bit positions in this mask identify which bits in the IP address are significant when determining if an address for a destination device is on the same network or subnet.

IP Broadcast Address (Free Format Text, 16)
This is the IP address used by the Router when broadcasting to the LAN. The Network part should be the same as the Router's own Network number and the host part if optionally all zeros or the decimal value obtained when all bits are set to one.

X.25 IP Address (Free Format Text, 16)
This field represents the IP address of the X.25 interface.

X.25 Subnet mask (Free Format Text, 16)
This field identifies the network portion of the X.25 IP address and is used in defining the X.25 IP Broadcast Address.

X.25 IP Broadcast (Free Format Text, 16)
This field represents the X.25 IP Broadcast address that will be used when receiving incoming RIP responses over X.25. The network portion should match the X.25 IP Address network number and the host part is optionally all zeros or the decimal value obtained when all host bits are set to one.

RIP Broadcasts (Constrained List)
The three options can be viewed by pressing the space bar.

- **LISTEN** – RIP broadcasts will be accepted from other routers and stored in the Routing Table.
- **ACTIVE** – RIP broadcasts will be accepted and the contents of our own routing table will be broadcast to other Routers.
- **OFF** – RIP broadcasts will neither be accepted nor generated.

Router Password (Free Format Text, 11)
This is an optional field which should be used if password checking is required when new X.25 calls are received from other IP Routers.

Verify Password (Free Format Text, 11)
This field is used to verify the above Router Password.

4.7.2 **Routing Table** (**rtr rt** command)

This screen allows you to page through the local routing table.

```
Router : Watford                ROUTING TABLE STATUS                    Rel x.y
-------------------------------------------------------------------------------

 Item   Network           Subnet Mask       Next Hop    Metric   TTL    i/f
 0      001.000.000.000   255.000.000.000   LOCAL       1        999    0
 1      100.000.000.000   255.000.000.000   Reading     2        170    1









 ED - Edit  DE - Delete
-------------------------------------------------------------------------------
PF2 - Help                    ^B - Prev Page                   PF4 - Main Menu
                              ^F - Next Page                   PF3 - Prev Menu
-------------------------------------------------------------------------------
(rtr rt) Enter command :
```

Item (Information)
This field displays the route number for reference by the EDit and DElete commands.

Network (Information)
This field displays the network number of the destination network which may be reached from this Router.

Subnet Mask (Information)
This field displays the subnet mask which will be applied to the network number of the distribution network.

Next Hop (Information)
This field displays the identity of the next router to which an IP packet must be sent in order to arrive at its final destination. If the route entry describes the local LAN network to which the router is connected the field will contain the word LOCAL. If the next hop is a configured remote router the field will contain the router's name. If the next hop is not LOCAL or a remote router the IP address will be shown.

Metric (Information)
This field displays the number of "hops" or routers through which an IP packet must pass before it reaches its final destination (a value of 16 means unreachable).

TTL (Information)
This field displays the "time to live" in seconds for this entry in the routing table. If this route is not re-advertised before the timeout expires (180 seconds), the destination will become unreachable (indicated by a metric of 16). At this point the TTL will be set to 120, after which time the route will be removed from the routing table. A TTL of 999 indicates a static route.

i/f (Information)
This field displays the number of the interface over which this route advertisement was received (0 indicates the LAN).

4.7.3 Static/Default Routes (**rtr rt ed** command)

```
Router : Watford                STATIC/DEFAULT ROUTES FORM              Rel x.y
--------------------------------------------------------------------------------

 Static route :

 Network       Next hop     Metric
 109.0.0.0     1.0.0.21     3



 Default route :

 Next hop      Metric
 1.0.0.19      1




--------------------------------------------------------------------------------
PF2 - Help                                                        ^R - Restore
PF1 - Submit                                                      ^C - Abort
--------------------------------------------------------------------------------
```

Network (Free Format Text, 16)
This field contains the network number of the destination network which may be reached from this Router.

Next hop (Free Format Text, 16)
This field contains the identity of the next router to which an IP packet should be sent in order to arrive at its final destination.

Metric (Free Format Text, 2)
This field contains the number of "hops" or routers through which an IP packet must pass before it reaches its final destination (a value of 16 means unreachable).

4.7.4 **Remote Router Status** (**rtr rs** command)

This screen displays the remote Router which may be accessed across the X.25 network.

```
Router : Watford              REMOTE X25 ROUTER STATUS                Rel x.y
-------------------------------------------------------------------------------

If      Name       IP Address   X.121 Address   SVCs   Tx Packets  Rx Packets
1       Reading    1.0.0.21     11000077050     0      0           0









-------------------------------------------------------------------------------
PF2 - Help                    ^B - Prev Page                   PF4 - Main Menu
                              ^F - Next Page                   PF3 - Prev Menu
-------------------------------------------------------------------------------
(rtr rs) Enter command :
```

If (Information)
This field displays the interface number of the remote router and corresponds to the interface number on the other Router screens.

Name (Information)
This field displays the identity of the remote router.

IP Address (Information)
This field displays the IP address of the remote router.

X.121 Address (Information)
This field displays the X.121 address of the remote router.

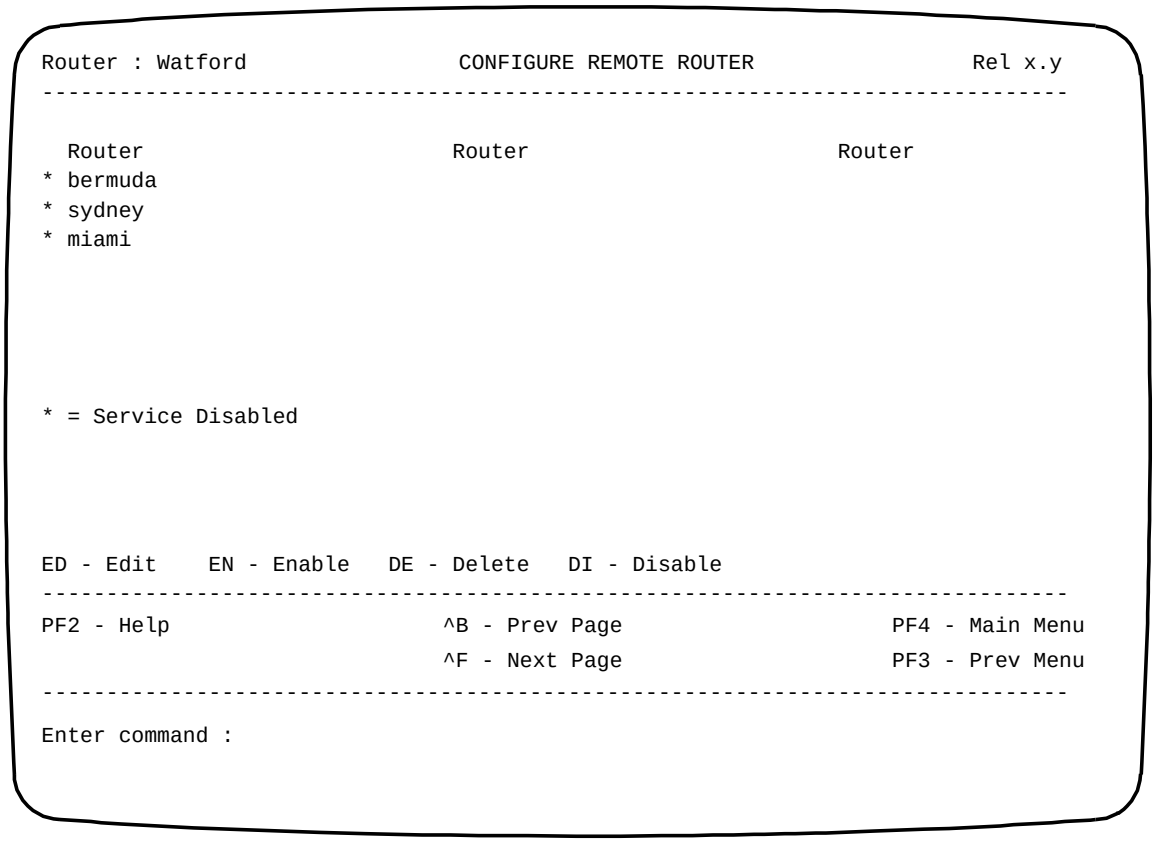
SVCs (Information)
This field displays the number of SVCs currently connected to the remote router.

Tx Packets (Information)
This field displays the number of IP packets sent to the remote router.

Rx Packets (Information)
This field displays the number of IP packets received from the remote router.

4.7.5 **Remote Router Configure** (**rtr rc** command)

This screen displays the configured remote routers.

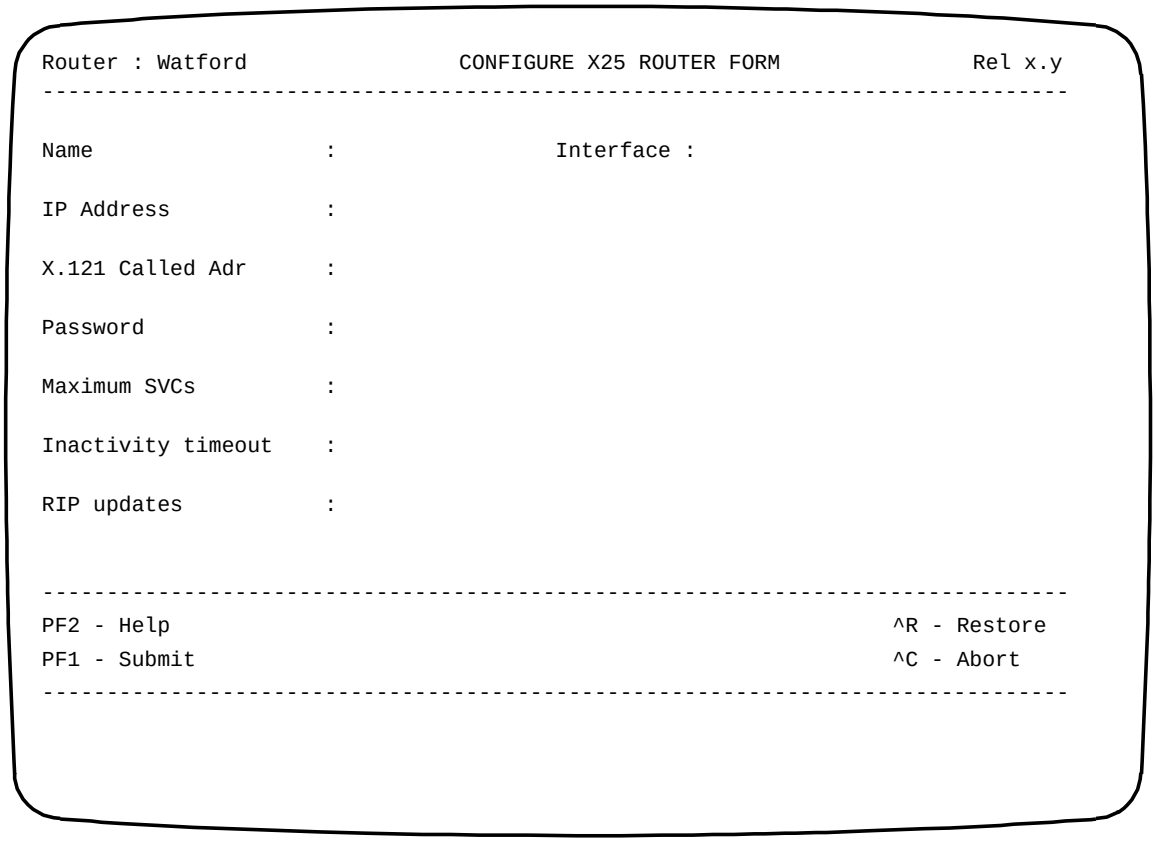


An asterisk displayed by the name indicates that access to the remote router is disabled. You can specify an action to be carried out for a remote router. Once selected, you are prompted to specify the router required.

The edit action requests a single router, and enters the Configure Remote Router form.

Disabling or deleting a remote router will result in any existing connections to the router being broken, and Routing Information will no longer be sent to that remote router.

4.7.6 Configure X.25 Router Form (**rtr rc ed** command)



Name (Free Format Text, 15)
This is a mandatory field that is used to input the identity of the remote router.

Interface (Information)
This field displays the interface number of the remote router and corresponds to the interface number on the other Router screens.

IP Address (Free Format Text, 20)
This is a mandatory field. It should contain the IP address of the X.25 interface of the remote router.

X.121 Called Adr (Free Format Text, 15)
This is a mandatory field. It contains the X.121 address of the remote router.

Password (Free Format Blind Text, 11)
This is an optional field. It will be used whenever a connection attempt is made to the remote router.

Maximum SVCs (Free Format Text, 2)
This field specifies the maximum number of SVCs which will be allowed between this and the remote Router.

Inactivity timeout (Free Format Text, 24)
This field specifies the length of time in seconds, after which if no packets have been received or sent on a particular SVC, it will be disconnected. (Note - Routing Information is advertised to each enabled remote router every 30 seconds, so if this timeout is greater than 30, then at least one SVC will remain permanently connected to the remote router.)

RIP updates (Constrained List)
RIP updates may be enabled/disabled on a per remote router basis. The options may be selected using the space bar.

ENABLED – Send RIP updates to remote router.
DISABLED – Do not send RIP updates to remote router.

4.7.7 MAC, IP and ICMP Statistics (**rtr mac** command)

This screen is identical to the Line Status/Statistics Menu as described in Section 4.6.3.

4.7.8 UDP and RIP Statistics

```
Router : Watford                UDP and RIP STATISTICS                  Rel x.y
-------------------------------------------------------------------------------


UDP: udpInDatagrams :                    udpOutDatagrams :
     udpInErrors    :                    udpNoPorts      :


RIP: riplnResponse  :                    ripOutResponse  :
     riplnRequest   :                    ripOutRequest   :


     Version 0      :                    Must be zero    :




                                                          RE - Reset stats
-------------------------------------------------------------------------------
PF2 - Help                                                PF4 - Main Menu
                                                          PF3 - Prev Menu
-------------------------------------------------------------------------------
(rtr udp) Enter command :
```

This section displays the UDP and RIP statistics collected by this Router (see Appendix C for a detailed description of UDP and RIP).

UDP: udpInDatagrams
A count of the number of UDP datagrams directed to this Router or picked up as UDP broadcasts.

UDP: udpOutDatagrams
A count of the number of UDP datagrams originated by this Router.

UDP: udpInErrors
A count of the number of UDP datagrams received with errors.

UDP: udpNoPorts
A count of the number of UDP datagrams received with unrecognised destination port numbers.

RIP: ripInResponse
The number of RIP response messages received by this Router.

RIP: ripOutResponse
The number of RIP response messages originated by this Router.

RIP: ripIn Request
The number of RIP request, messages received by this Router.

RIP: ripOutRequest
The number of RIP request messages originated by the Router.

Version 0
Count of RIP messages discarded because their version number is zero.

Must be zero
Count of RIP messages discarded because a non-zero value was found in a "must be zero" field.

4.8 Summary of Manager Commands

Commands are listed alphabetically. Each command and its associated short form is summarised using the following notation:

italic – optional part
(form) – command invokes a form

COMMAND				EXPLANATION	SHORT FORM
cl	**<connid>**			Clear a connection/user	
cl	**tcb**			Clear a TCB connection/user	
conf	**du**			Dump configuration	
conf	**gate**			Configure LAN gateways (form)	
conf	**gen**			Configure general items, password, etc. (form)	
conf	**lo**			Load configuration	
conf	**mess**			Configure banner / general messages (form)	
conf	**prof**	**serv**	**cl**	Clear service profile	**conf sp cl**
conf	**prof**	**serv**	**co**	Copy service profile	**conf sp co**
conf	**prof**	**serv**	**ed**	Edit service profile	**conf sp ed**
conf	**prof**	**term**	**cl**	Clear terminal profile	**conf tp cl**
conf	**prof**	**term**	**co**	Copy terminal profile	**conf tp co**
conf	**prof**	**term**	**ed**	Edit terminal profile	**conf tp ed**
conf	**prof**	**term**	**vi**	View terminal profile	**conf tp vi**
conf	**prof**	**user**	**cl**	Clear user profile	**conf up cl**
conf	**prof**	**user**	**co**	Copy user profile	**conf up co**
conf	**prof**	**user**	**ed**	Edit user profile	**conf up ed**
conf	**prot**			Configure protocols (form)	
conf	***serv***	**wan**	**co**	Copy an X.25 service	
conf	***serv***	**wan**	**de**	Delete an X.25 service	
conf	***serv***	**wan**	**di**	Disable a service	
conf	***serv***	**wan**	**ed**	Edit a service (form)	
conf	***serv***	**wan**	**en**	Enable an X.25 service	
conf	***serv***	**lan**	**co**	Copy a LAN service	
conf	***serv***	**lan**	**de**	Delete a LAN service	
conf	***serv***	**lan**	**di**	Disable a LAN service	
conf	***serv***	**lan**	**ed**	Edit a LAN service (form)	
conf	***serv***	**lan**	**en**	Enable a LAN service	

cont		**cl <connid>**		Clear connection/user on X.25 side
cont	**di**	**lan**		Disable Ethernet calls
cont	**en**	**lan**		Enable Ethernet calls
cont	***serv***	**wan**	**di**	Disable an X.25 service
cont	***serv***	**wan**	**en**	Enable an X.25 service
cont	***serv***	**lan**	**di**	Disable a LAN service
cont	***serv***	**lan**	**en**	Enable a LAN service
logoff				Logoff manager and disconnect
logout/bye				Logoff manager and disconnect
quit				Quit manager and return to user dialogue
rtr gen				General router configuration form
rtr	**rt**			Routing table status
rtr	**rt**	**ed**		Edit static/default routes
rtr	**rt**	**de**		Delete an item in the routing table
rtr	**rs**			Remote router status
rtr	**rc**	**ed**		Edit a remote router (form)
rtr	**rc**	**en**		Enable a remote router
rtr	**rc**	**de**		Delete a remote router
rtr	**rc**	**di**		Disable a remote router
rtr	**mac**			Line status/statistics
rtr	**udp**			UDP and RIP statistics
stat	**conn**			Connection status menu
stat	**conn**	**connid**		Select channel
stat	**conn**	**re**		Reset connections statistics
stat	**gen**			General status menu/screen
stat	**line**			Ethernet line status menu
stat	***line***	**arp**		ARP status menu
stat	**line**	**re**		Reset line statistics
term				Terminal selection

4.9 Item Definitions

The following definitions describe parameters to various commands and are used throughout this manual.

<Flag>

A flag is used to indicate a positive or negative response.
A positive response can be indicated in several ways:

TRUE
ON
ENABLE
YES

A negative response is indicated using the inverse of these:

FALSE
OFF
DISABLE
NO

<Internet Address>

An internet address represents a 32-bit device address within a network, or network of networks. The standard representation is four decimal numbers, with each number representing an individual octet, each number being separated by a dot.

<Number>.<Number>.<Number>.<Number> (e.g. **1.2.3.4**)

Each number can be in the range 0 to 255.

Note that a number can be entered in hex by preceding the hex number by **0x**, e.g.

0x01.0x02.0xfd.0xa9 is equivalent to **1.2.253.169**

<Key Def>

A key definition contains a string part (the key sequence) and a text part (the help text).

<String> <Text> e.g. **"^[OP" "PF1"**

<Name> (<ServiceName>, <ProfileName>)

A name is an ASCII name from one to fifteen characters. All names must start with an alphabetic character (A-Z). All letters are not case-significant, but are stored in the correct case for visual clarity.

Names can be used to identify Services (LAN and X.25) and profiles (USER, SERVICE, and TERMINAL). Names must be unique within a given context. This means that the name FRED cannot be used twice in the context of LAN services, but can be used to represent a LAN service, WAN service, user profile, service profile and terminal profile all at the same time. This allows the utmost flexibility. It is however recommended that names be chosen with some meaning, e.g. VT220 for a terminal profile.

<Number>

A number can be represented as decimal or hexadecimal. A decimal number is entered in standard form, e.g. 100. A hexadecimal number can be entered by preceding the hex number by 0x, e.g. 0xa9 = 169.

<SessionId>

A SessionId identifies a session within the context of one user. It can be a session number (1 to 4) or a ServiceName.

<String> (<Text>)

A string is a series of characters. It may contain embedded control characters. Control characters are indicated by preceding the character by a carat, e.g.

^G = Control-G

A carat can be entered by typing two carats (**^^**).

When it is required to enter a string in a command line, and not in a form, it is necessary to delimit the string by using double quotes. This allows the string to contain spaces and other item separators, e.g.

"This is an example string^M^J"

(A double quote can be entered into the string by typing two double quotes.)

<TCP port>

A TCP port is a number in the range 0 to 65535 (16 bits). The port refers to a logical device within a physical device (Internet Address). This number is often translated into a service, e.g. 23 is commonly used for the TELNET service on hosts that support TCP/IP.

<X.121 Address>

An X.121 address is a 14-digit address which will be interpreted by the Series 8000 PSE in the following way:

Digits 1-4 DNIC – 1100 is the Series 8000 default DNIC (Data Network Identification Code).

Digits 5-7 (000-999) the Series 8000 Node Number.

Digits 8-11 (0000-9999) the Logical Port Number of the port to which the calling or called device is connected.

Digits 12-14 (000-999) the Subaddress field.

5 User Procedures

This chapter is self-contained. It provides instructions for every-day users of Router's gateway facilities.

5.1 The User Environment

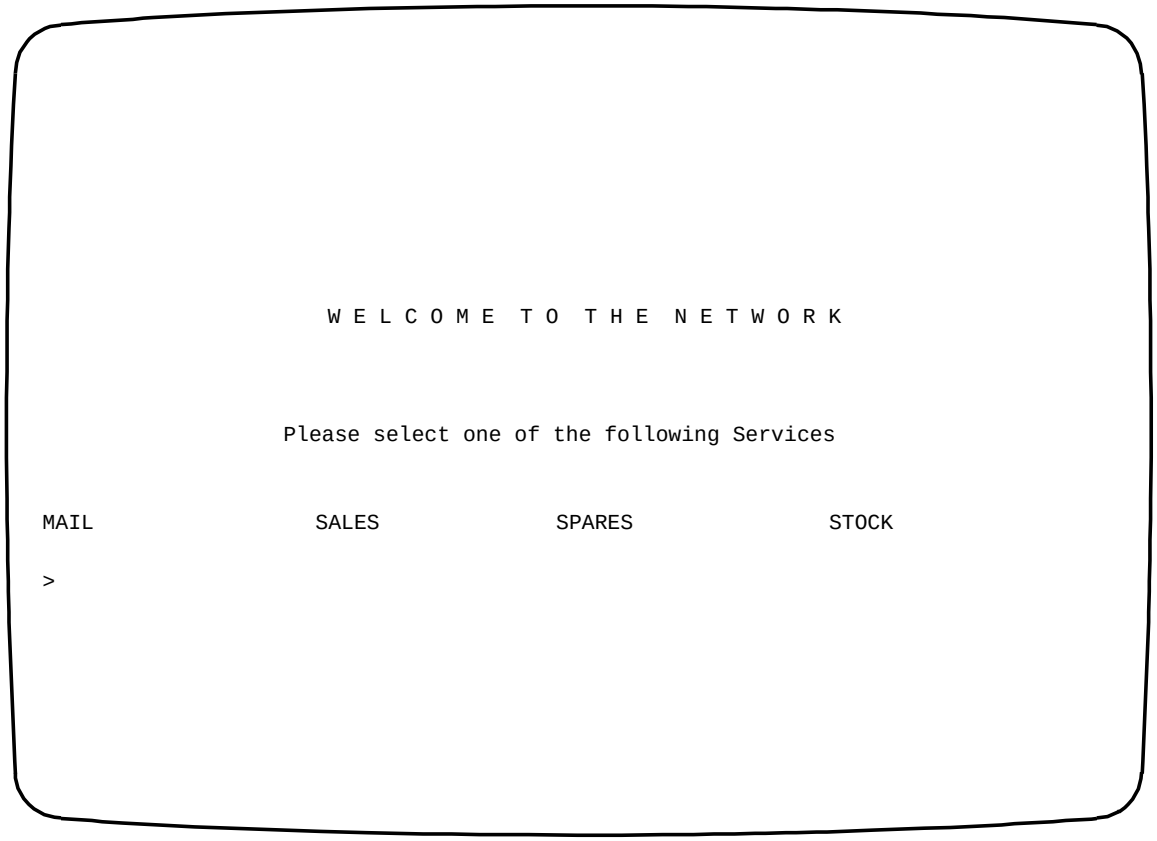
A connection to a service is called a session. You are given the ability to hold more than one session simultaneously. You cannot **communicate** with all sessions simultaneously, but you can **switch between them** with ease.

It is possible to 'hot-key' directly between sessions, escape into dialogue, and disconnect sessions.

When in dialogue you can obtain information about services, sessions, and options. You can also change options, gain help and, most importantly, connect and disconnect to/from services.

5.1.1 The User Welcome Screen

When you connect to the system, you will probably be presented with a display that prompts you to select one of a number of services. This will have been set up by the system supervisor, and may look like the following screen:



5.1.2 User Input

You can enter a character string on your input line (shown by the > symbol). It is terminated and submitted for evaluation when you enter a Carriage Return or Line Feed (usually the **RETURN**, |, or **ENTER** key).

While entering a line you may use the following editing facilities:

Delete a Character
When you enter a Delete (**DEL**) or Backspace (**BS**) character, the last character that you entered is erased.

Delete a Line
When you enter a Control-U (**^U**) or a Control-X (**^X**) character is entered, the line is erased ready for you to re-enter.

Repeat a Line
When you enter a Control-R (**^R**) is entered, your previous entry is repeated.

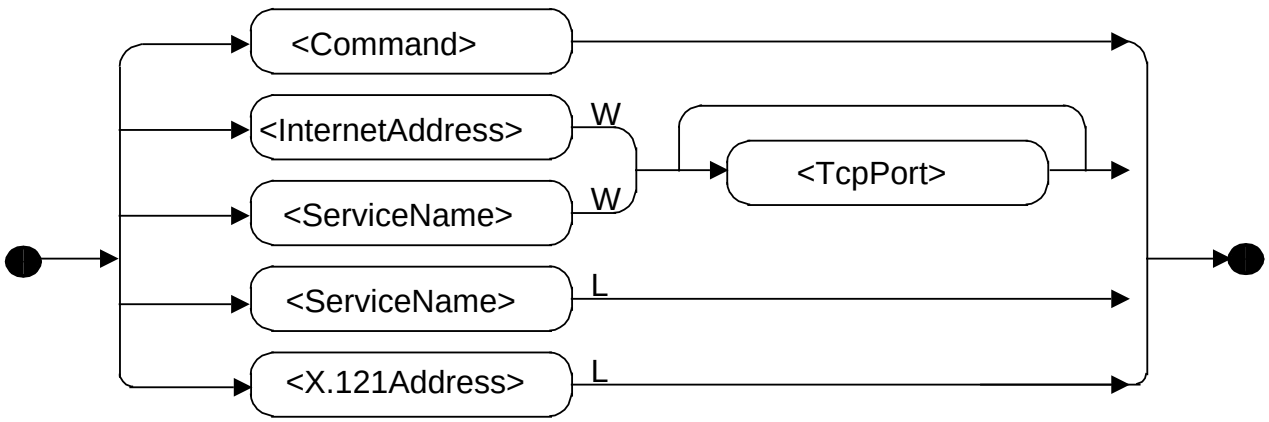
Illegal Characters
If you try to enter any control character except those listed above it will not appear on the line. Instead a **^G** (bell character) is returned and your entry ignored. This also occurs if the current input line is too full of characters.

5.2 User Commands

5.2.1 Command Specifications

The following explanation will help you to understand the specifications of the commands that are available to you, all of which are described in the subsequent subsections.

When you submit an entry line with **RETURN** etc, then the line is subject to the following evaluation:



W = only available to WAN users connecting to LAN.
L = only available to LAN users connecting to X25.

In an evaluation, the priority of recognition is taken from top to bottom (i.e. commands before services).

Each command has a minimum abbreviation, which is shown in the explanations below by the significant characters being underlined.

An input line can contain more than one command, with commands being separated by a semicolon.

All **commands** can be entered in upper or lower case, but case can be significant for some command **parameters**.

Items can be terminated by space, comma or semicolon; any extra spaces between items are ignored.

If an error is found with a command, and the input line contains more commands, then those commands are abandoned and you are informed of the command failure.

The following commands are available to you. They include the ability to make/break connections, gain status information, and obtain help.

Make connection commands:

CALL **CONN** **OPEN** **SESSION**

Break connection commands:

DISC **CLOSE** **QUIT** **LOGOFF**

Status/configure commands:

STATUS **SET**

Helpful commands:

HELP **?** **DIRECTORY** **CATALOGUE**

Ancillary commands:

LOGON **LOGIN**

Many commands have synonyms; this is to allow users who are familiar with a particular environment to use Router's gateway facilities with ease.

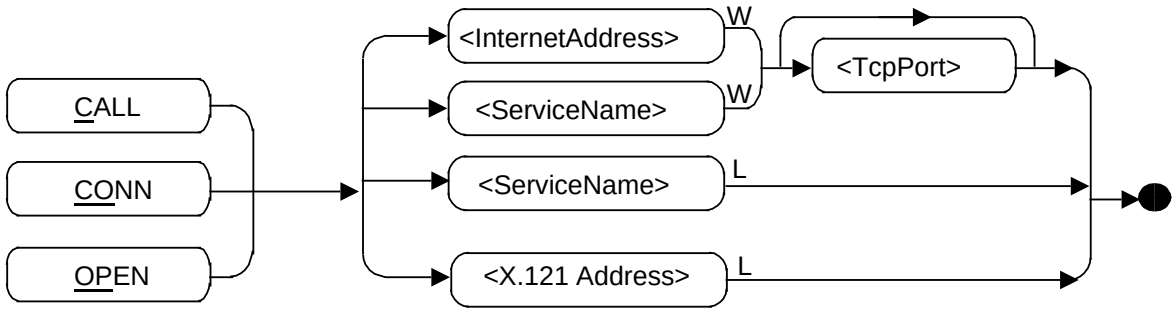
The following subsections describe the operations and syntax of the commands available to you. It is only necessary to follow the arrows to understand the syntax. There are however some minor points:

– When an arrow has a number associated with it, then it may be repeated only that many times.

– A parameter specified within <> brackets is a non-literal item defined elsewhere.

5.2.2 CALL/CONN/OPEN

These commands allow you to establish a connection to a service.



W = only available to WAN users connecting to LAN.
L = only available to LAN users connecting to X.25.

Prior to connection, if a password has been set on the selected service, you are requested to enter it. If you fail to enter the correct password (you are allowed three attempts) then you are disconnected from Router, losing any calls that you have established. When entering passwords, a space is echoed for every displayable character entered. It is possible to backspace and delete characters within a password.

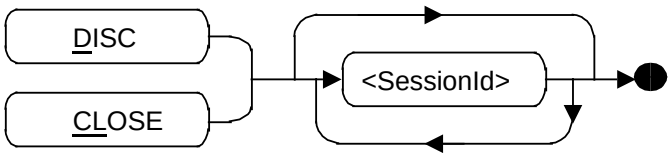
Upon connection you are presented with a connection message, for example:

>CALL VAX
Enter password:
Connected to VAX [1].

You may then proceed with the session.

5.2.3 DISC/CLOSE

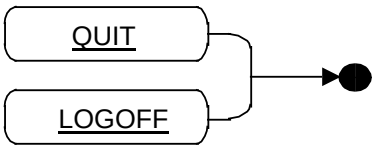
These commands allow you to disconnect either the last session used, or a specified session by its SessionId.



The session is disconnected and you are then presented with a disconnection message. You will stay in dialogue.

5.2.4 QUIT/LOGOFF

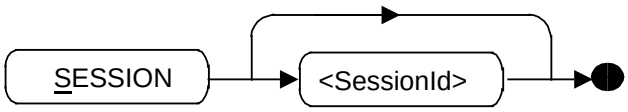
These commands terminate all sessions and disconnect you from Router.



You are not presented with disconnection messages for each session. The WAN or HOST to which you are attached sends you an appropriate message.

5.2.5 SESSION

This command allows you to enter communication with the last session used, or with a specific session.



You go directly into communication with the session selected. In general it is preferable to switch sessions using 'hot-keys'.

5.2.6 STATUS

This command provides you with information about currently-established sessions.

Session status is output as in the following example:

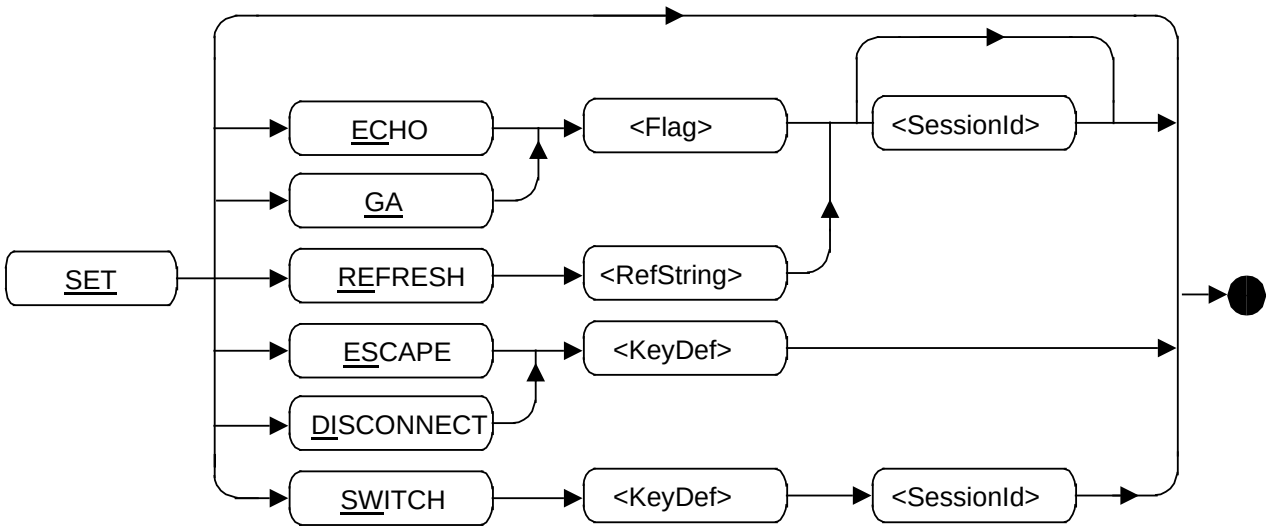
Sess	Service	TimeCnctd	TxChrs	RxChrs	State
1	DEVSYSA	3:25:10	2148	27352	Connected
2	MAIL	2:40:22	437	641	Connected
3	DEVSYSB	2:50:35	1292	600249	Connected
4	100.2.3	10:20	189	400	Connected

where:

Sess = Session number.
Service = Description of service at its highest level (i.e. displays name in preference to Internet Address).
TimeCnctd = HH:MM:SS.
Tx/RxChrs = 0 to 2,000,000,000 data characters.
State = TCP/TELNET connection state (Internal).

5.2.7 SET

This command allows various operational parameters to be viewed or changed.



If **SET** is entered on its own, a list of current settings is output, for example:

Sess	ECHO	GA	SWITCH	REFRESH	TIMEOUT
1	Loc.	Dis.	PF1	^M	30
*2	Rem.	Dis.	PF2	^M	---
3	Rem.	Dis.	PF3	^M	---
4	Rem.	Dis.	PF4	^V	---

Escape = ^A
Disconnect = ^D
Dialogue Inactivity Timeout = 5 mins.

where * indicates the currently-selected session (i.e. the session that will be entered if the **SESSION** command is used without any parameters, and the session that will be affected when the **SET** command is used without a SessionId.)

The following paragraphs discuss **SET** entered with a parameter.

The setting of ECHO to Rem implies that the attached service provides echo; the echoing of characters, e.g. password entry, is then up to the service.

The use of the TELNET Suppress Go-Ahead feature is selected by enabling GA suppression. Normally this is disabled by default, but some applications may use this TELNET option, which is provided for such an

occasion. This option has no effect when executed from a LAN user; it is only relevant in the case of a WAN user calling a TELNET service.

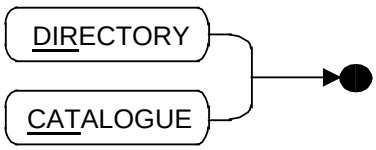
The REFRESH string is sent to the service when a session is reselected. In some applications it is possible to request that your screen is updated (refreshed). For example, a product may use **^V** to cause the screen to be refreshed. Therefore by setting the REFRESH string to **^V**, whenever the user reselects that session, a **^V** is transmitted to the product, causing the user's screen to be redisplayed automatically.

The ESCAPE, DISCONNECT and SWITCH key sequences (hot-keys) can be defined using this command. All key sequences are entered in the standard string format and may contain embedded control characters. It is not advisable to set duplicate key sequences. If there is any duplication, the following order of precedence is used: ESCAPE before DISCONNECT before SWITCH1 before SWITCH 2, etc. The full key definition includes the text to describe the key sequence, i.e. as above session SWITCH1 is the text PF1 and this relates to the control sequence **[OP**. If no text string is present then the ASCII representation of the key sequence is displayed (see ESCAPE and DISCONNECT).

Note that in the above display two types of timeout are shown: the service inactivity timeout and the dialogue inactivity timeout. These values can only be set or changed by the manager, and are provided for information only.

5.2.8 DIRECTORY/CATALOGUE

These commands list the services that are available to you. The list is tabulated and sorted into alphabetical order.



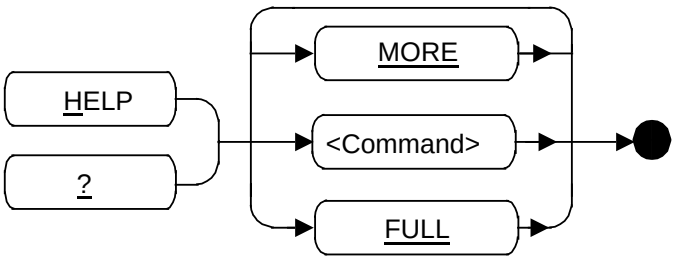
Typical output provided by this command:

Directory of services.

BARCODE	**DEC**	**DEVSYSA**	**DEVSYSB**
MAIL	**MVAX**	**SEQUENT**	

5.2.9 HELP/?

This command provides you with several levels of help.



HELP without any parameters gives a list of all the commands available, and advice on how to connect/disconnect services.

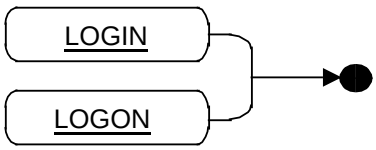
HELP MORE gives general help on syntax and line editing commands.

HELP <Command> gives the syntax definition of that command, and a brief description of its purposes.

HELP FULL gives a list of all the commands and their specific help (as in Help <command>).

5.2.10 LOGIN/LOGON

This command allows access to the management facilities of Router, but is restricted to personnel who know the manager password.



The password is entered in the same way as passwords for the CALL/OPEN/CONN commands. If you get the password wrong three times in succession then you will be disconnected from Router and any calls will be cleared. (This facility can be barred from use by certain users, by manager configuration of the User profiles.)

Appendix A Technical Specifications

A.1 Configuration Limits

Number of User Profiles	16
Number of Service Profiles	24
Number of Terminal Profiles	8
Number of Services	128 (sum of all services)
Maximum Simultaneous Sessions	128
Maximum Simultaneous Users	64
Maximum Simultaneous Users in Dialogue	16

A.2 Terminal Types

Pre-defined Profiles:	VT100/ANSI
	ADM3A
	IBM 3101
	TV920

In addition, four profiles can be specified.

A.3 Cables

The cable to connect the TGate/Router card (15-way D-type socket on the rear panel) to the LAN Transceiver is not supplied.

A.4 AUI Port

The following table shows the pin-out for the AUI port.

PIN	SIGNAL	DESCRIPTION
3	D0-A	DATA OUT CIRCUIT A
10	D0-B	DATA OUT CIRCUIT B
11	D0-S	DATA OUT CIRCUIT SHIELD
5	DI-A	DATA IN CIRCUIT A
12	DI-B	DATA IN CIRCUIT B
4	DI-S	DATA IN CIRCUIT SHIELD
2	CI-A	COLLISION CIRCUIT A
9	CI-B	COLLISION CIRCUIT B
1	CI-S	COLLISION CIRCUIT SHIELD
6	VC	VOLTAGE COMMON
13	VP	VOLTAGE PLUS
14	VS	VOLTAGE SHIELD
SHELL	PG	PROTECTIVE GROUND

A.5 TPIM Port

The following table shows the pin-out for the TPIM 10-way RJ45 connector.

PIN	SIGNAL	DESCRIPTION
2	TX+	Transmit Data +
3	TX –	Transmit Data –
4	RX+	Receive Data +
7	RX –	Receive Data –

All remaining pins are unused.

A.6 Standards and Approvals

The Ethernet Physical Interface conforms to IEEE 802.3 10BASE5, electrical and mechanical specifications. Cheapernet or IEEE 802.3 10BASE2 can be connected to by using a Cray IEEE 802.3 10BASE2 Transceiver.

All LAN protocols operate to the relevant RFC (Request For Comment) documents. These documents are used within the ARPA community to define the protocols. The relevant RFCs are:

RFC 791 (IP)
Internet Protocol - DARPA Internet Program Specification.
Information Sciences Institute,
University Southern California. September 1981.

RFC 792 (ICMP)
Internet Control Message Protocol – DARPA Internet Program Specification.
Postel, J.
Information Sciences Institute,
University Southern California. September 1981.

RFC 793 (TCP)
Transmission Control Protocol – DARPA Internet Program Specification.
Postel, J.
University Southern California. September 1981.

RFC 826 (ARP)
An Ethernet Address Resolution Protocol.
Plummer, David C.
Network Working Group. November 1982.

RFC 854 (TELNET)
TELNET protocol specification.
Postel, J., Reynolds, J.
Network Working Group. May 1983
(Information Sciences Institute, University Southern California.)

RFC 855 (TELNET OPTIONS)
TELNET option specifications.
Postel, J., Reynolds, J.
Network Working Group. May 1983
(Information Sciences Institute, University Southern California.)

RFC 856 (TELNET BINARY OPTION)
TELNET Binary Transmission.
Postel, J., Reynolds, J.
Network Working Group. May 1983
(Information Sciences Institute, University Southern California.)

RFC 857 (TELNET ECHO OPTION)
TELNET Echo Option.
Postel, J., Reynolds, J.
Network Working Group. May 1983
(Information Sciences Institute, University Southern California.)

RFC 858 (TELNET GO-AHEAD OPTION)
TELNET Suppress Go-Ahead Option.
Postel, J., Reynolds, J.
Network Working Group. May 1983
(Information Sciences Institute, University Southern California.)

RFC 877 (IP to X.25 INTERFACE)
A Standard for the Transmission of IP Datagrams Over Public Data Networks.
Korb, J.T.
Network Working Group. Sept 1983
(Purdue University.)

RFC 1058
Routing Information Protocol.
Hedrick, C.
June 1988
(Rutgers University.)

Other relevant documents:

The Ethernet: A Local Area Network: Data Link Layer and Physical Layer Specifications.
DEC/INTEL/XEROX Corporations.
Version 1.0. September 1980.

The Ethernet: A Local Area Network: Data Link Layer and Physical Layer Specifications.
DEC/INTEL/XEROX Corporations.
Version 2.0. September 1982.

IEEE 802.3 Standard 1985.
Carrier Sense Multiple Access with Collision Detect (CSMA/CD) Access Method and Physical Layer Specifications.
(10BASE5 and 10BASE2)

RFC 813
Window Acknowledgement Strategy in TCP
David D Clark
MIT Laboratory for Computer Science,
Computer Systems and Communications Group. July 1982.

DDN PROTOCOL HANDBOOK – Volume One
DOD MILITARY STANDARD PROTOCOLS
Defense Communication Agency - NIC 50004. December 1985.

DDN PROTOCOL HANDBOOK – Volume Two
DARPA INTER PROTOCOLS
Defense Communication Agency – NIC 50005. December 1985.

DDN PROTOCOL HANDBOOK – Volume Three
SUPPLEMENT
Defense Communication Agency – NIC 50006. December 1985.

Appendix B Default Configuration

The default configuration of Router is as follows:

General Information	Default User Profile	**1**
	Default Service Profile	**1**
	Manager Password	**carriage return**
	Manager Terminal Type	none
	Date/Time	preset value
Messages	Welcome Banner	none
	General Text	standard text (**DISC** etc) prompt = **'^M^J>'**
User Profiles (all)	Key Sequences (all)	empty
	Parity	**SPACE**
	Manager Login	**ENABLED**
	Directory Banner	**DISABLED**
	Free Service Selection	**DISABLED**
	Inactivity Disconnect Time	none
	Session Quota	**4**
	Go-Ahead	**NOT SUPPRESSED**
	Binary	**ENABLED**
	CR Map	**CR**
	Break Map	**DISABLED**
Service Profiles (all)	Echo	**REMOTE**
	Go-Ahead	**NOT SUPPRESSED**
	Binary	**ENABLED**
	CR Map	**CR**
	Break Map	**DISABLED**
	Inactivity Disconnect Time	none
	Inital Sequence	empty
	Refresh Sequence	empty
	Local Character Forward	**126**
	Local Character Timeout	**2**
	Remote X.3	**Enabled**
	Remote Character Forward	**126**
	Remote Character Timeout	**2**

Terminal Profiles (5-8)	Empty	
Protocols	MAC Ethernet Address	Pre-Programmed Prom
	MAC Protocol	**Ethernet**
	IP Internet address	**1.1.1.1**
	Subnet Mask	**255.0.0.0**
	IP Fragmentation	**576**
	IP Time to Live	**100**
	TCP Window Size	**512**
	TCP Max Segment Size	**536**
	TCP Initial RTT	**50**
WAN Services (1)	Name	**WAN_SERVICE**
	IP Address	**1.1.1.1**
	TCP Port	**23**
	X.121 Address	none
	Sub-Address	none
	Password	none
	User Profile	none
	Service Profile	none
LAN Services	Name	**LAN_SERVICE**
	X.121 Address	**11000017050**
	Sub-Address	**00**
	IP Address	none
	TCP Port	none
	Password	none
	User Profile	none
	Service Profile	none
X.25 Router	Maximum SVCs	1
	Inactivity Timeout	40

Appendix C Ethernet, TCP/IP and RIP

This appendix contains brief descriptions of Ethernet Local Area Networks, TCP/IP and RIP. They are introductory and are provided as additional information. It is not necessary to understand these systems to make use of the Series 8000 TGate successfully, and this appendix may be ignored if desired.

C.1 Ethernet - CSMA/CD Baseband

Ethernet is a Local Area Network technology that uses baseband signalling at 10 megabits per second over a coaxial cable. The principle of operation is that of a common bus with a standard method of access. This method of access is known as Carrier Sense Multiple Access with Collision Detection (CSMA/CD). Access control in LAN terminology is known as Media Access Control (MAC). CSMA/CD operates with multiple stations attached to the bus: any station first listens to establish if anyone else is transmitting before attempting to transmit. If the bus is free then it starts to transmit, checking if anyone else also starts transmitting at the same time – i.e. if a collision occurs. If a collision does occur then all stations involved in the collision backoff using a pseudo-random exponential delay. This process is similar to that of a group of people holding a conversation, although some people don't always backoff!

Rather like people, it is often necessary to address the person we are talking to. Ethernet defines that each 'frame' of data be sent using a 48-bit destination address and a 48-bit source address, with each station on the Ethernet having its own unique 48-bit address. Upon receipt of a frame addressed to it, a station continues to receive the entire frame. Frames can be transmitted to all stations on the network in one go, by using a well-known 'Broadcast' address (all 1's). In this case all stations receive the entire frame.

The CSMA/CD type of MAC is 'probabilistic' or 'non-deterministic'; this is because the ability of any one station to transmit information has a probability corresponding to the activity on the bus and the nature of that activity, thus preventing the pre-determination of performance or propagation delays for any given station on the network. This generally isn't a problem, but in some circumstances (e.g. process control), this form of system is unsuitable. In these situations other technologies can be used, such as token ring and token bus, both of which provide a 'deterministic' element to performance.

Ethernet technology is currently the most popular system and has been standardised – firstly by the inventors Xerox, DEC and Intel; the specification is the DIX Ethernet Specification Version 1 and Version 2. The Institute of Electrical and Electronics Engineers (IEEE) has adopted, improved, and slightly modified this specification. The IEEE specification is IEEE 802.3 – part of the 802 Local Area Networking standards. The differences between the DIX specification and the IEEE specification are detailed in C.3.

The topology of Ethernet is a tree structure of interconnecting segments. Each segment can be a maximum length of 500 metres, when using thick coax. Repeaters may be used to join segments up to a maximum of two repeaters per three segments, thus resulting in a maximum of 1500 metres between any two stations.

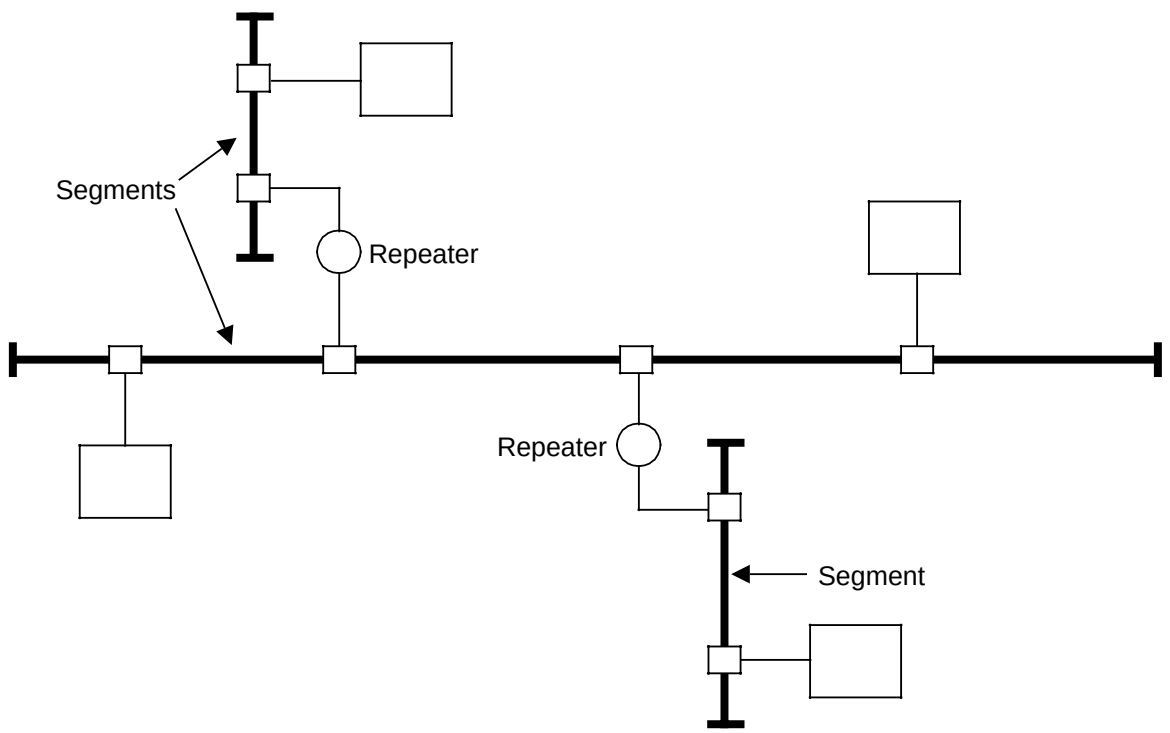


Figure C-1 Ethernet Topology

The IEEE standard allows the use of good quality coaxial cable ('yellow cable') or a thinner cheaper coaxial cable (RG58). These are known as Ethernet IEEE 802.3 10BASE5 and Thinwire Ethernet IEEE 802.3 10BASE2 (Cheapernet). Thinwire Ethernet has the disadvantage of reduced distance from 500 metre segments to 185 metre segments, and a maximum number of nodes (taps) per segment from 100 to 30.

Ethernet segments are connected together using repeaters or half-repeaters. A repeater simply connects two segments within a close proximity. A half-repeater uses some form of transmission line between the two halves (e.g. fibre optics); thus Ethernet networks can actually extend over 2 kilometre (usual limit for fibre repeaters). No two stations within an Ethernet can have more than two* repeaters (or four half-repeaters) between them.

LANs can be further extended by using bridges or routers.

* This number can be extended by some manufacturers' systems.

C.2 TCP/IP Protocols

TCP/IP is currently the de facto standard for LAN interworking. It was developed by researchers within and around the Advanced Research Projects Agency (ARPA) in the United States. It is currently the most popular non-proprietary protocol in use today. TCP and IP both refer to specific protocols within a complete suite of interworking protocols known as the 'Internet Protocol Suite'; however the term TCP/IP has evolved by common use to describe the suite of protocols as a collective. The purpose of the Internet Protocol Suite is to allow co-operating computers to share resources across a network. Today thousands of networks of all kinds, LAN or not, use TCP/IP as their main communication method.

Most of the work and knowledge gained from the development and use of TCP/IP has led to the definitions of the OSI/ISO protocols. It is therefore not very difficult to show similarities with the OSI model and TCP/IP.

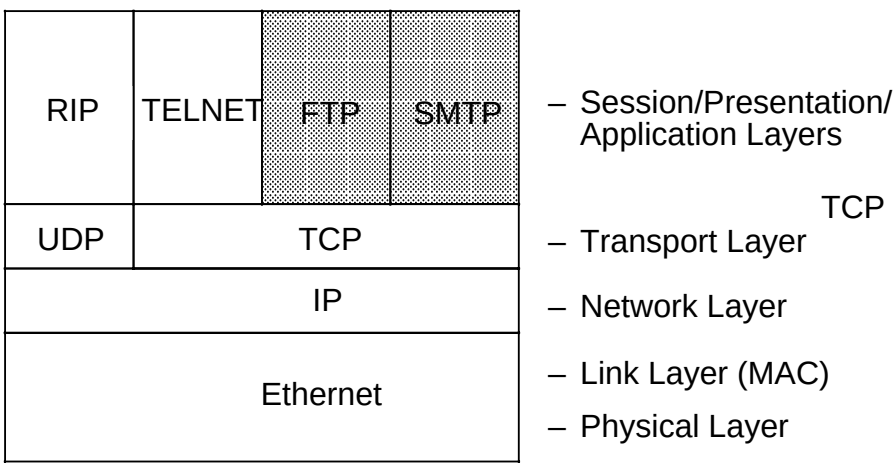


Figure C-2 TCP/IP Protocol Stack

The Internet Protocol Suite splits into two main areas – communication and application. The communication tower consists of a Connection-Less Internet Protocol (IP), and a Transmission Control Protocol (TCP). IP provides a connectionless datagram service for TCP; TCP then provides a connection-oriented error-free transmission service for applications. TCP is responsible for handling duplicate, out-of-sequence, missing and erroneous IP datagrams. TCP is very similar to the ISO Transport Layer Class 4 (ISO 8073). IP and TCP are then carried over any medium, in this case Ethernet. When operating IP over Ethernet a protocol called the Address Resolution Protocol (ARP) is used to convert IP addresses into Ethernet addresses.

The Internet Protocol (IP) layer is the common networking and inter-networking layer within the TCP/IP protocol suite. This allows a standard carrier network to deliver 'datagrams' independent of the higher layer protocols (applications), and conversely it allows an application to communicate without any knowledge of the underlying media/network.

An internet address is a 4-octet number and is described in decimal, e.g. 129.10.2.100. There are three classes of Internet address: A, B and C. Class A networks are usually used for very large networks that contain a great number of hosts (or sub-networks). The first octet of the address is used for the network number and ranges from 1 to 126. This leaves 3 octets for host number (16 million). Class B networks are for standard large networks and use two octets within the range 128.1 to 191.254. This leaves two octets for hosts (65 thousand). Class C networks use three octets in the range 192.1.1 to 223.254.254. This leaves one octet for hosts (254).

When specifying a full TCP/IP service address such as a remote login on a host (TELNET), then a TCP port number must be specified (0-65536). The concatenation of an IP address and TCP port number is known as a 'socket'. For example, the standard TELNET remote login TCP port number is 23. Therefore to fully describe the service it is necessary to specify the host IP address and the TCP port number, e.g. 1.1.1.1 23.

Address Resolution Protocol (ARP) is used to translate IP addresses automatically into Ethernet addresses. This protocol allows all addressing to standardise on the IP address and removes the need for manager configured tables. The physical station address is found by broadcasting an ARP request to resolve the IP address. All stations on the local network will receive the request. The station that recognises its own IP address responds to the request indicating its Ethernet station address. The originator of the request then uses this information to transmit a datagram, and also keeps a record of the address for future transmissions to the IP destination.

The TCP/IP protocol suite provides a myriad of applications, including functions for Remote Terminal serving, File Transfer and Electronic Mail, the most popular of which are TELNET, FTP and SMTP.

TELNET provides an ASCII Virtual Terminal interface; it allows remote login to hosts from other hosts and/or TCP/IP terminal servers running TELNET. To the host, the user appears to be a directly-attached ASCII terminal. ASCII is defined and allows entry into hosts whose native

character set may be different (e.g. IBM-EBCDIC), without requiring different terminal equipment.

FTP is a File Transfer Protocol; it allows the transfer of ASCII or IMAGE files from one machine to another across the network. Again the use of ASCII allows a common interchange to take place, even if the hosts have different character sets. The image mode allows exact images of the files to be transferred without conversion.

SMTP is a Simple Mail Transfer Protocol; it allows user electronic mail to be transferred from machine to machine across a network, until it is delivered to the end user.

The above only describes a small subset of TCP/IP – as stressed earlier it is a 'suite' of protocols, both communications and applications. The more popular components of these protocols have been touched upon, but readers who wish to become more familiar should refer to the many texts on the subject of TCP/IP.

Router supports Ethernet, IP, ARP, TCP, TELNET and RIP.

C.3 IEEE 802.3 and Ethernet Differences

In September 1980, Digital, Intel and Xerox (DIX) published 'the blue book' Version 1.0: A Local Area Network, Data Link Layer and Physical Layer specifications. It was later revised as Version 2 in November 1982. Version 2.0 stated that it was an interim specification and the Ethernet Specification would now evolve with the Standards bodies (IEEE). In June 1983 the IEEE published its specification for Ethernet under the banner of IEEE 802.3.

The IEEE improved and modified the original specifications in the following ways:

1. **SQE Test**. The SQE test or heartbeat in the transceiver is a collision detection circuit which is turned on inside the transceiver after each transmission. However, DIX version 1.0 does not specify this feature, and therefore transceivers designed to that specification will fail to operate with units designed to use IEEE standards.

2. **Jabber Control Function**. IEEE 802.3 provides a Jabber Control feature that prevents stations on a network from continually transmitting. It will disconnect the station if an attempt is made to transmit for a longer period than a valid data packet would normally take to transmit. DIX version 1.0 does not provide this protection.

3. **Transformer Coupling**. IEEE 802.3 specification provides a more sensitive signal across the transceiver cable by specifying a half-step differential voltage drop across the transceiver input, resulting in a zero voltage drop in the idle state on the transceiver input.

4. **Specific Range Values**. IEEE 802.3 specification defines more electrical tolerances than the DIX specification. These are input impedance, input capacitance, bias current, and collision detect thresholds.

5. **AUI Cable Earthing**. IEEE 802.3 requires the shield to be connected only to connector shell. DIX 1 and 2 require tie pin 1 to connect to shell and cable shield.

The above points do not prevent IEEE and DIX equipment operating on the same network (as long as IEEE stations use IEEE transceivers). However, there is a fundamental difference in the Data Link Layer of the DIX and IEEE specifications.

DIX defines that frames contain a 2-byte type field as opposed to a 2-byte length field in the ISO/IEEE specifications. The addressing parts of the frame are identical in both the IEEE and DIX specifications.

The type field has the advantage of using the same cabling for efficiently operating many different protocol sets (e.g. DECNet, DEC.LAT, TCP/IP, etc) without fear of interference. The IEEE specifications however do not allow such flexibility.

In some vendor networks it is possible to intermingle the ISO framing with DIX framing, since most DIX frame types are equivalent to an illegal ISO length field (TCP/IP is an example), and most IEEE systems do not generate frames big enough for the length field to be a valid type field. Therefore the two protocol sets can often coexist on the same cabling. Furthermore, most vendors' IEEE LAN bridges will transport complete Ethernet frames without regard to the length or type field contained within them. As a result, most bridges (Cray bridges included) can be used with TCP/IP and IEEE 802.2 protocols.

Router is designed to use IEEE 802.3 Transceivers and supports the Ethernet framing method for use on standard TCP/IP LANs.

C.4 RIP

Router implements the Routing Information Protocol (RIP) in order to propagate routing information throughout the network. The protocol is a straightforward implementation of vector-distance routing for local networks that partitions participants into active and passive (silent) machines. Active routers advertise their routes to others; passive machines listen and update their routes based on advertisements, but do not advertise.

A router running RIP will broadcast a message every 30 seconds to its neighbouring routers containing information taken from the router's current routing database. Each message consists of pairs, where each pair contains an IP network address and an integer distance to that network. RIP uses a hop count metric to measure the distance to a destination. In the RIP metric, a router is defined to be one hop from the directly-connected network, two hops from networks that are reachable through one other router, and so on. Thus, the number of hops along a path from a given source to a given destination refers to the number of routers that a datagram encounters along that path. When a router receives a broadcast from another device across a directly-connected network, the advertised routes are compared to the existing routes held in the router. The advertised routes are only installed in the current routing table if they offer a smaller metric to the same destination, or if no route to the advertised destination exists. If an advertised route is offered via a router that is already being used as the next hop to that destination, the advertised metric is used regardless of size. In order to detect faults in the network, RIP specifies that routes that are not advertised for 180 seconds become invalid. Therefore, if a router that is being used as a next hop fails, it will be detected within a period of 180 seconds, and an alternative route will be found if possible. If no alternative routes exist, the router will be forced to use the default route.

Appendix D ASCII Conversion Table

The following table shows equivalence between decimal and ASCII control characters.

Dec	Hex	Name	Symbol
0	00	NULL	^@
1	01	SOH	^A
2	02	STX	^B
3	03	ETX	^C
4	04	EOT	^D
5	05	ENQ	^E
6	06	AK	^F
7	07	BEL	^G
8	08	BS	^H
9	09	HT	^I
10	0A	LF	^J
11	0B	VT	^K
12	0C	FF	^L
13	0D	CR	^M
14	0E	SO	^N
15	0F	SI	^O
16	10	DLE	^P
17	11	DC1	^Q
18	12	DC2	^R
19	13	DC3	^S
20	14	DC4	^T
21	15	NAK	^U
22	16	SYN	^V
23	17	ETB	^W
24	18	CAN	^X
25	19	EM	^Y
26	1A	SUB	^Z
27	1B	ESC	^[
28	1C	FS	^\
29	1D	GS	^]
30	1E	RS	^~ *
31	1F	US	^_

* This is specific to Router and does not follow the standard ASCII convention.

Appendix E Example Applications

This appendix illustrates example applications of Router. It refers to information explained in Chapter 4.

E.1 Example of the Gateway Function of Router

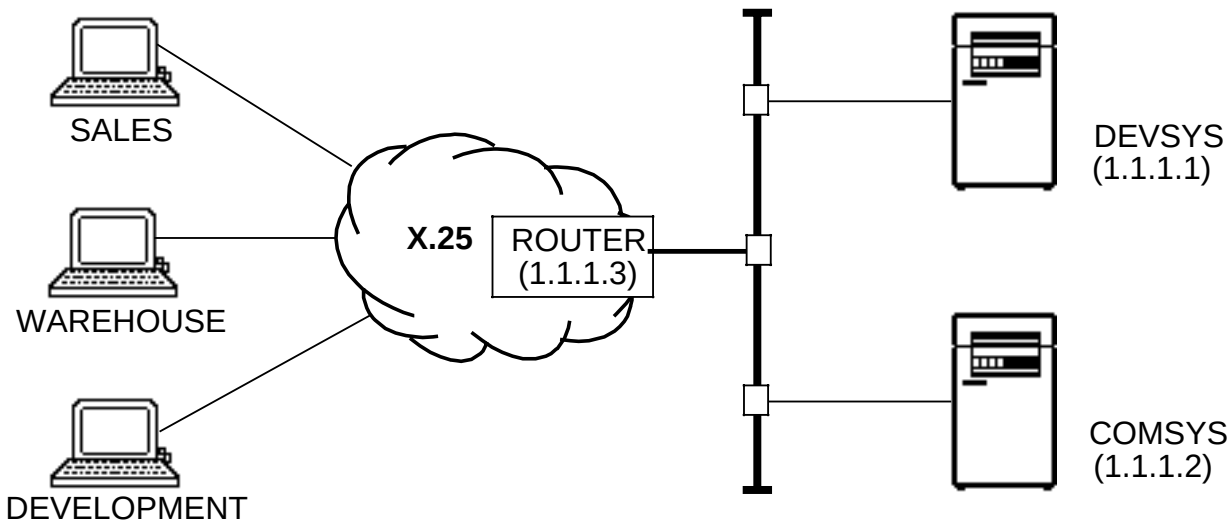


Figure E-1 Example Bulk Serving Application

Figure E-1 shows a network with two host computers, one for development (DEVSYS) and one for commercial use (COMSYS). The development system has one service which is called DEVSYS. The commercial system has two services, SALES and STOCK. Each system has its Internet (IP) address indicated in brackets.

In the network there are three groups of users: sales staff, warehouse staff and development staff. The sales staff require quick access to both the SALES and STOCK services. The warehouse staff and the development staff require access to a single service and will connect to these directly. The sales staff however will use the Router's multi-session capability to switch between SALES and STOCK. The sales terminals are VT100s.

The following can then be configured:

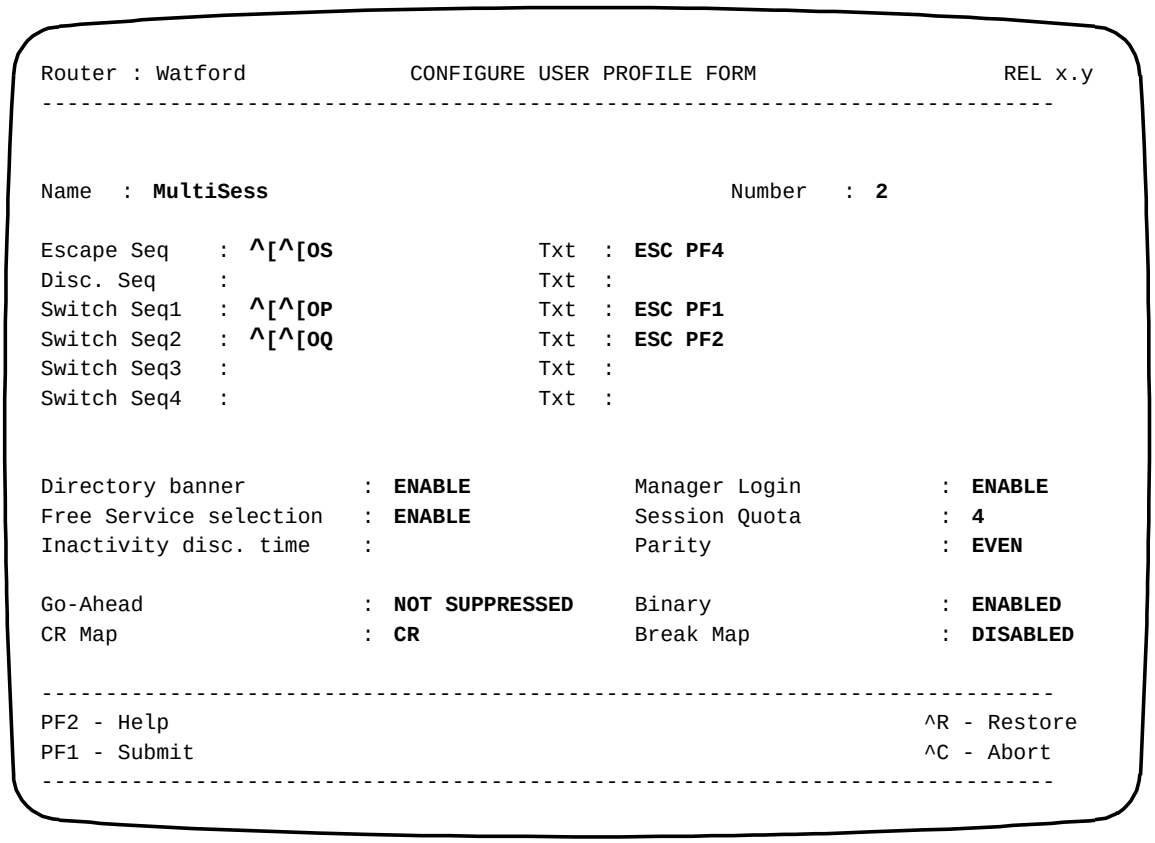
The Router IP address should be set to **1.1.1.3** using the **conf prot** command.

Two user profiles are required, one for the seamless connections (warehouse and development), and one for the dialogue connections (sales).

To edit each user profile, enter the **conf up ed** command followed by the profile number, and complete the forms as follows:

```
Router : Watford            CONFIGURE USER PROFILE FORM                  REL x.y
-------------------------------------------------------------------------------


Name : Seamless                                      Number   : 1

Escape seq    :                              Txt  :
Disc. seq     :                              Txt  :
Switch seq1   :                              Txt  :
Switch seq2   :                              Txt  :
Switch seq3   :                              Txt  :
Switch seq4   :                              Txt  :


Directory banner         : ENABLE            Manager Login          : ENABLE
Free Service selection   : ENABLE            Session Quota          : 1
Inactivity disc. time    :                   Parity                 : EVEN

Go-Ahead                 : NOT SUPPRESSED    Binary                 : ENABLED
CR map                   : CR                Break Map              : DISABLED

-------------------------------------------------------------------------------
PF2 - Help                                                    ^R - Restore
PF1 - Submit                                                  ^C - Abort
-------------------------------------------------------------------------------
```

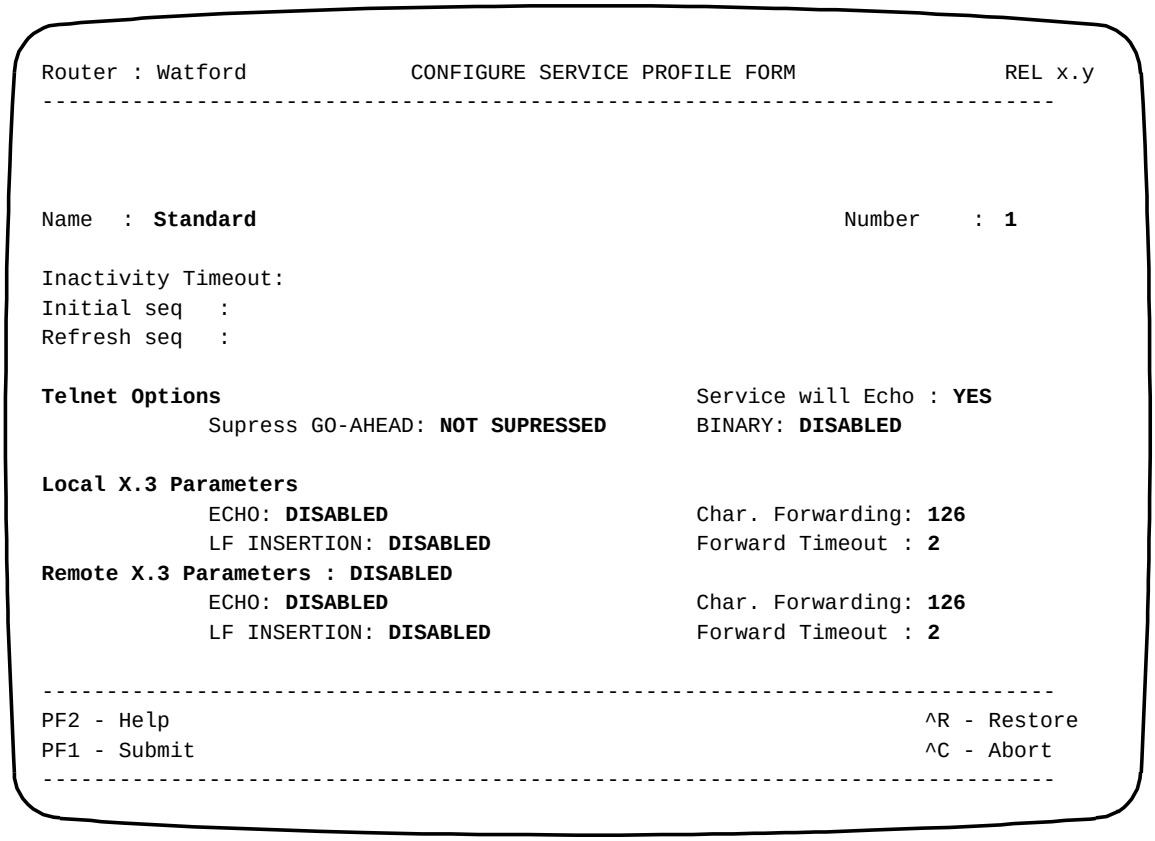
This profile (named Seamless) does not allow dialogue to be entered, or allow more than one session to be created. It is therefore suitable for use both by development and warehouse staff.

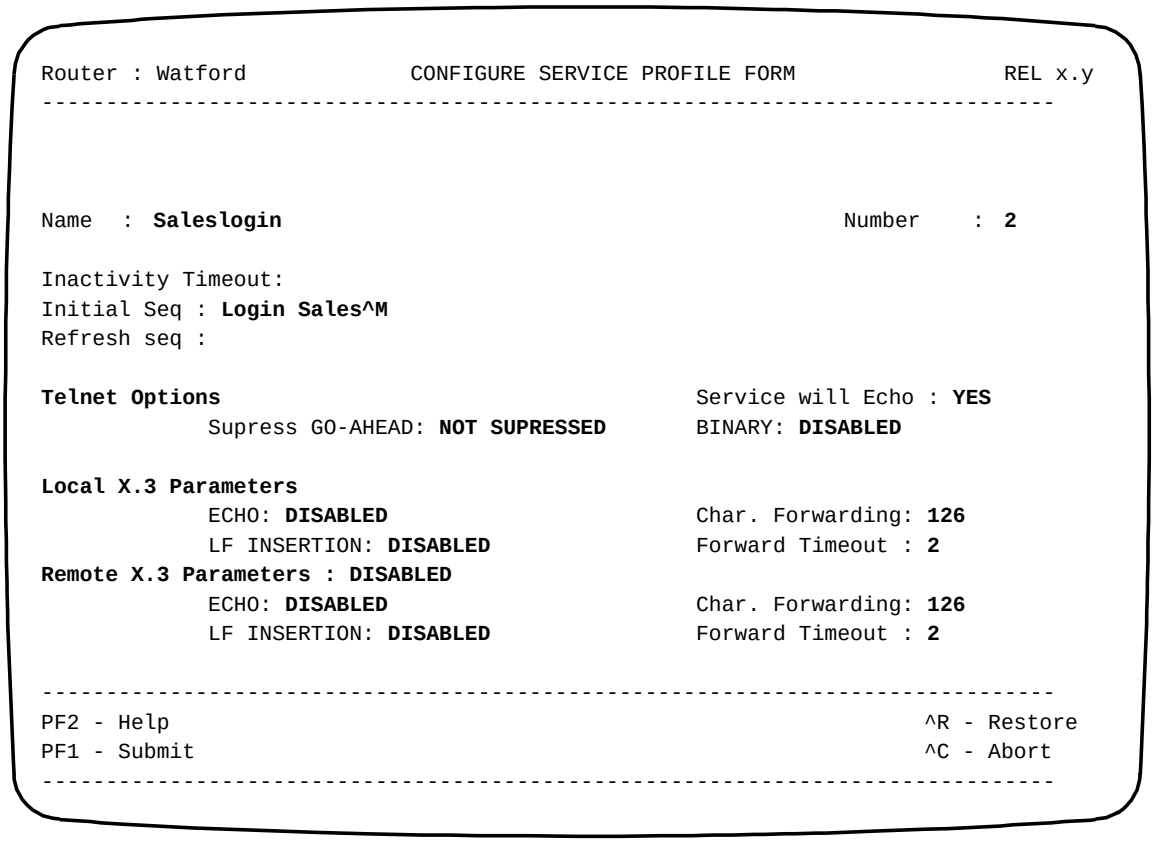


This profile (named MultiSess) allows the sales staff to enter dialogue with the Router by pressing the **ESC** key followed by the **PF4** key. They can then select a second service e.g. STOCK, switching between the two using **ESC PF1** for the first service (SALES) and **ESC PF2** for the second service (STOCK).

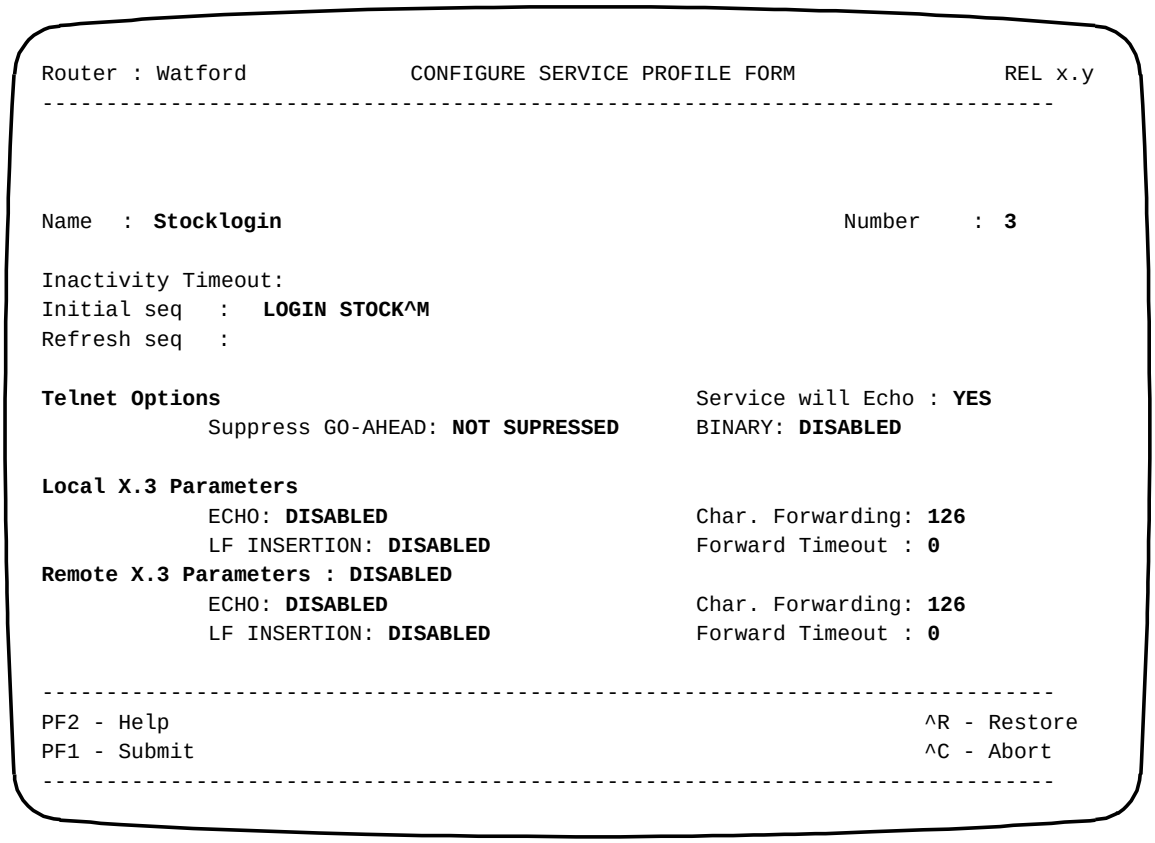
Three service profiles are then used, one for standard communications to a host for development, and two with automatic login sequences for the sales and stock applications.

To edit each service profile enter the **conf sp ed** command, followed by the profile number, and complete the forms as follows:


Router : Watford CONFIGURE SERVICE PROFILE FORM REL x.y
Name : Standard Number : 1
Inactivity Timeout:
Initial seq :
Refresh seq :
Telnet Options Service will Echo : YES
Supress GO-AHEAD: NOT SUPRESSED BINARY: DISABLED
Local X.3 Parameters
ECHO: DISABLED Char. Forwarding: 126
LF INSERTION: DISABLED Forward Timeout : 2
Remote X.3 Parameters : DISABLED
ECHO: DISABLED Char. Forwarding: 126
LF INSERTION: DISABLED Forward Timeout : 2
PF2 - Help ^R - Restore
PF1 - Submit ^C - Abort



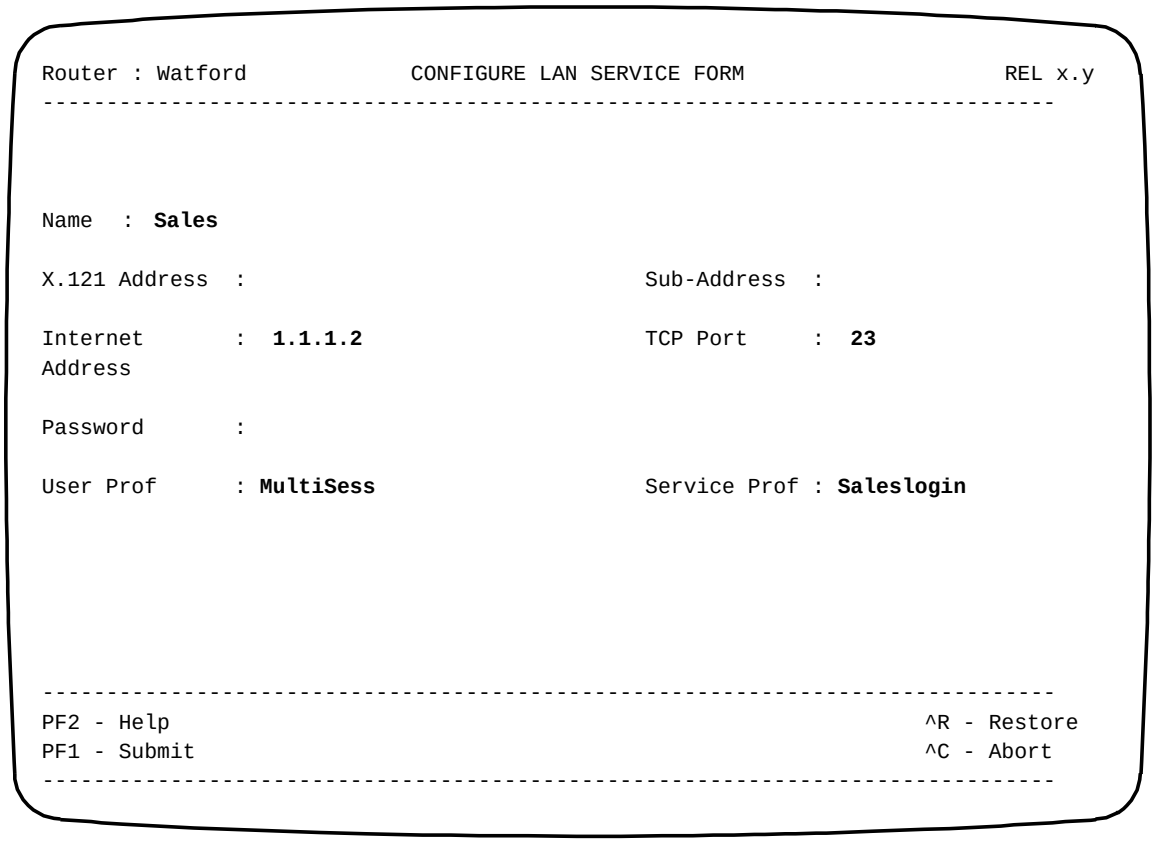
This profile (**SalesLogin**) will send **LOGIN SALES** followed by a carriage return when first connecting to the host computer.



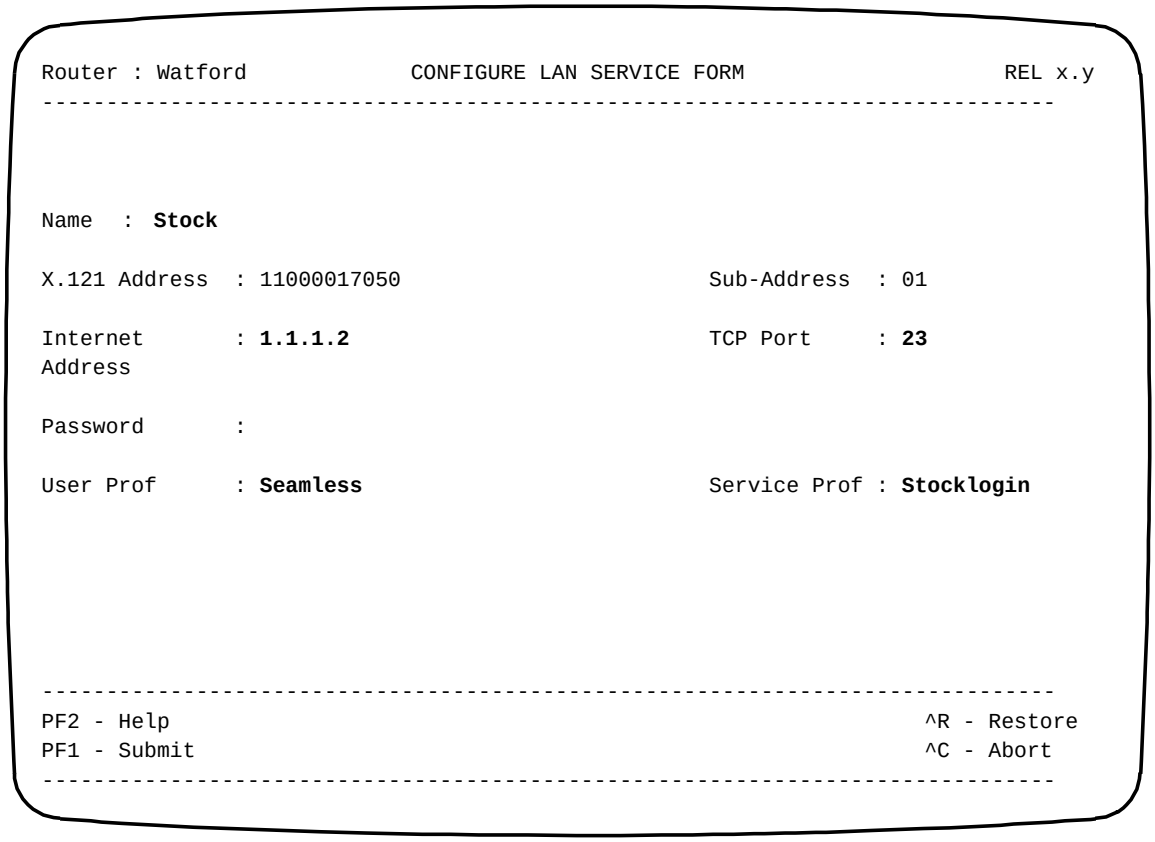
This profile (**StockLogin**) will send **LOGIN STOCK** followed by a carriage return when first connecting to the host computer.

Each service can then be configured using the **conf lan ed** command, followed by the service name, and completing the forms as follows:

```
Router : Watford            CONFIGURE LAN SERVICE FORM                    REL x.y
-------------------------------------------------------------------------------



Name   : DevSys

X.121 Address  :                                    Sub-Address :

Internet        :   1.1.1.1                         TCP Port :  23
Address

Password        :

User Prof       :   Seamless                     Service Prof : Standard









-------------------------------------------------------------------------------
PF2 - Help                                                          ^R - Restore
PF1 - Submit                                                        ^C - Abort
-------------------------------------------------------------------------------
```



This service uses the pre-configured user and service profiles to connect to a new service called **Sales**.



This service makes use of an X.121 address to route STOCK calls from X.25 to the LAN.

Once all these items have been configured, then the services should be enabled (**en lan DevSys, en lan Sales, en lan Stock**).

The above configuration allows the development staff to contact X.25 and simply enter the service name **DEVSYS**, which then automatically connects them to the development system over the Ethernet network. Warehouse staff also follow the same procedure using the **STOCK** service name; in this case they will be connected to the commercial system and logged in as STOCK.

The sales staff contact the WAN and enter the **SALES** service name. This automatically routes them to the SALES service on the commercial system. They may then enter **ESC PF4** on the keyboard. This brings them into dialogue with Router, which then requests that they enter a service, e.g. STOCK. Upon entering **STOCK**, TGate connects them to the STOCK service while leaving the SALES service available on session 1. The user can then switch between service by pressing **ESC PF1** for SALES and **ESC PF2** for STOCK.

E.2 Example Application of IP Routing

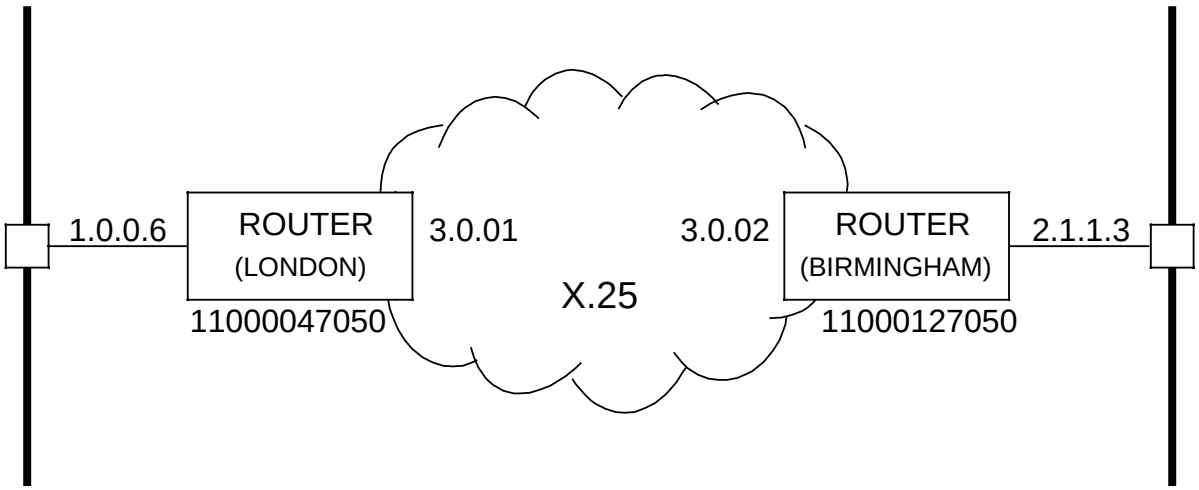


Figure E-2 Example IP Routing Application

Figure E-2 shows two IP Ethernet LANs at remote sites. The Routers are to be used for file transfer using FTP between the two host computers.

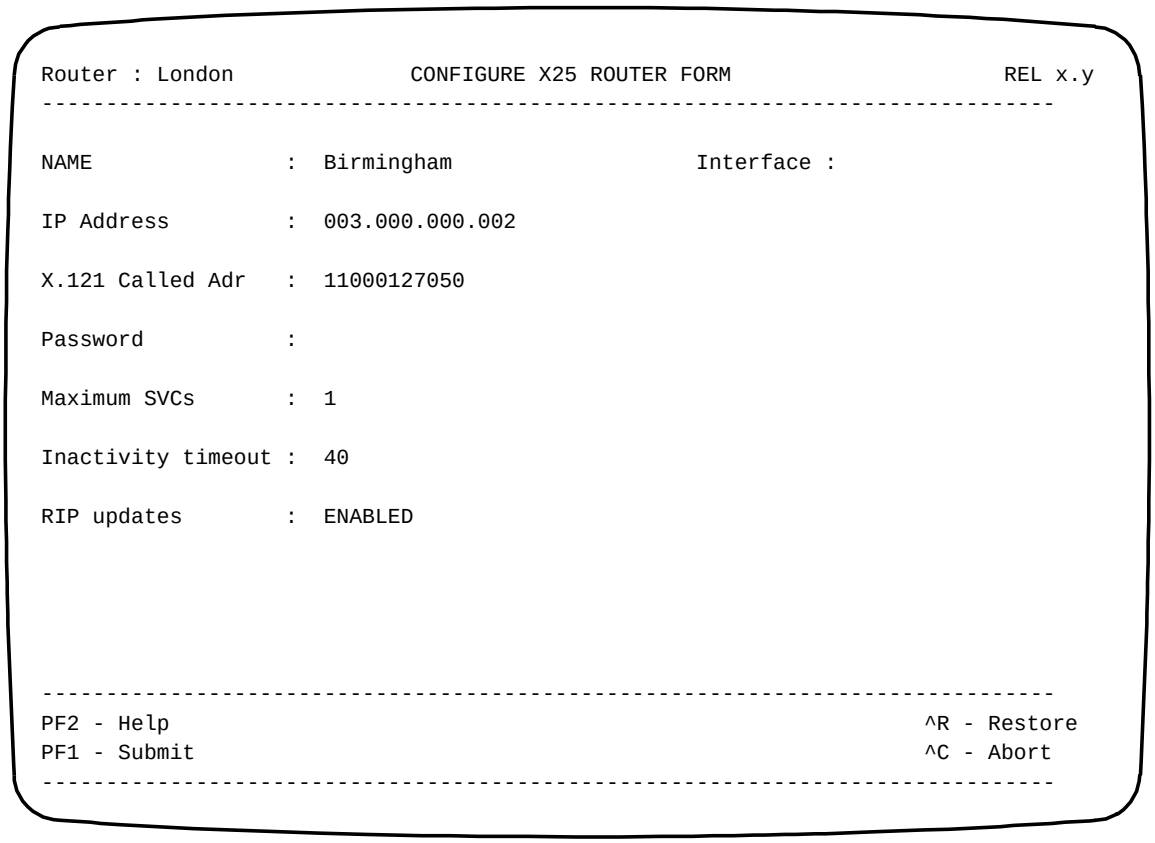
The following should be configured:

At London's Router:

Enter **rtr gen** and complete the form as follows:

```
Router : London           GENERAL ROUTER CONFIGURATION FORM             REL x.y
-------------------------------------------------------------------------------



Internet Address      : 001.000.000.006
Subnet Mask           : 255.000.000.000
IP Broadcast Address  : 001.255.255.255

WARNING:  Changes to IP parameters will only take effect after a warm restart

X.25 IP Address       : 003.000.000.001
X.25 Subnet mask      : 255.000.000.000
X.25 IP Broadcast     : 003.255.255.255

RIP Broadcast         : ACTIVE

Router Password       :        Verify Password :


-------------------------------------------------------------------------------
PF2 - Help                                                          ^R - Restore
PF1 - Submit                                                        ^C - Abort
-------------------------------------------------------------------------------
```

Enter **rtr rc ed** followed by the name of the remote Router (e.g. Birmingham) and complete form as follows:



At Birmingham's Router:

Enter **rtr gen** and complete the form as follows:

```
Router : Birmingham      GENERAL ROUTER CONFIGURATION FORM            REL x.y
--------------------------------------------------------------------------------



Internet Address      : 002.001.001.003
Subnet Mask           : 255.000.000.000
IP Broadcast Address  : 002.255.255.255

WARNING:  Changes to IP parameters will only take effect after a warm restart

X.25 IP Address       : 003.000.000.002
X.25 Subnet mask      : 255.000.000.000
X.25 IP Broadcast     : 003.255.255.255

RIP Broadcast         : ACTIVE

Router Password       :        Verify Password :


--------------------------------------------------------------------------------
PF2 - Help                                                          ^R - Restore
PF1 - Submit                                                        ^C - Abort
--------------------------------------------------------------------------------
```

Enter **rtr rc ed** followed by the name of the remote Router (e.g. London) and complete the form as follows:

```
Router : Birmingham          CONFIGURE X25 ROUTER FORM                    REL x.y
-------------------------------------------------------------------------------

NAME               :  London                  Interface :

IP Address         :  003.000.000.001

X.121 Called Adr   :  1100047050

Password           :

Maximum SVCs       :  1

Inactivity timeout :  40

RIP updates        :  ENABLED









-------------------------------------------------------------------------------
PF2 - Help                                                        ^R - Restore
PF1 - Submit                                                      ^C - Abort
-------------------------------------------------------------------------------
```

Once these remote routers have been enabled, routing information will be automatically exchanged between them – this can be verified by checking the Routing Table screen.

Provided that any necessary configuring of gateways has already been performed on the hosts, it should now be possible for file transfer to take place.

Appendix F Failure Codes

The following is a list of failure codes that may be displayed during the power-up sequence.

Test Number	Description
1	EPROM checksum
2	DRAM data/addressing
3	DRAM refresh
4	Random data pattern
5	DRAM execution
6	Bus cycle and software watchdog
7	VIA device
8	DRAM parity
9	Vector table read/write
10	No test
11	Novram checksum, RAM read/write
12	DMAC reg.R/W, INT, memory transfer
13	Write protection mechanism
14	LED segment check
15	ULA non-DMA R/W transfers
16	ULA fly-by DMA R/W transfers
17	ULA flow thru DMA R/W transfers
18	ULA packet Tx and Rx
19	ULA Tx error interrupt
20	ULA Tx nogo interrupt and counter
21	ULA clock fail interrupt
22	ULA supervisor/data flag check
23	ULA Rx/Tx length counters
30	ULA system test reflector
31-47	ULA packet Tx/Rx for Test 30

Test Number	Description
131	NOVRAM test
132	NOVRAM recall test
133	Visual status LED test
150	SCC1/UPM interface test
151	SCC1 test; no interrupts/internal clock
152	SCC1 test, Tx interrupt, internal clock
153	SCC1 test, Rx interrupt, internal clock
154	SCC1 test, no interrupts, baud rate clock
160	Channel 1 Rxd-Txd loop test
161	Channel 1 CTS-RTS loop test
162	Channel 1 CTS-BO loop test
163	Channel 1 DSR-DTR loop test
164	Channel 1 DSR-DRS loop test
166	Clear screen on port 1
167	Clear screen on port 2
170	Channel 2 Rxd-Txd loop test
171	Channel 2 CTS-RTS loop test
172	Channel 2 CTS-BO loop test
173	Channel 2 DSR-DTR loop test
174	Channel 2 DSR-DRS loop test
236	Ethernet transmission test(12500 pps)
237	Ethernet receive test
238	Ethernet transmission test(500 pps)
240	ILACC/CPU interface
241	ILACC initialisation, no interrupts
242	ILACC initialisation with interrupts
243	ILACC self-address internal loopback, Tx
244	ILACC self-address internal loopback, Rx
245	ILACC broadcast address int loopback, Rx
246	ILACC internal loopback collision
247	ILACC self-address external loopback, Tx
248	ILACC self-address external loopback, Rx
249	ILACC broadcast address ext loopback, Rx

Appendix G Glossary

ARP	Address Resolution Protocol. A member of the 'Internet Protocol Suite'. See Appendix C for more information.
ARPA	Advanced Research Projects Agency. An American Academic community involved in research, often for the Military (DoD).
Baseband	Transmission of a signal at its original frequency, without modulation.
Broadband	Use of multiple channels over the same medium using frequency division of the bandwidth.
CCITT	International Consultative Committee on Telegraph and Telephony (Comité Consultatif Internationale de Télégraphique et Téléphonique) based in Geneva.
Cheapernet	Thinwire Ethernet (IEEE 10BASE2).
CLIP	Connection-Less Internet Protocol e.g. IP or CLNP.
CLNP	Connection-Less Network Protocol (ISO).
CRC	Cyclic Redundancy Check.
CSMA/CD	Carrier Sense Multiple Access with Collision Detection. A method of controlling access to a common bus. Carrier sense allows stations to detect when the bus is busy, with collision detection for the occasion when two stations simultaneously access a free bus.
DDN	Defense Data Network. An American Military TCP/IP and X.25 data network.
DEC	Digital Equipment Corporation. A major computer manufacturer.
DIX	DEC, Intel and Xerox; the group of co-operating companies that developed and standardised Ethernet.

DTR	Data Terminal Ready. A CCITT V.24 interface signal. Normally pin 20 on a 25-way connector.
FDDI	Fibre Distribute Data Interface. ANSI definition of a fibre optic LAN at 100 Mbps.
FTP	File Transfer Protocol. A member protocol of the 'Internet Protocol Suite'. See Appendix C for more information.
IEEE	Institute of Electrical and Electronics Engineers (a standards body based in US).
Internet	A multiple-network network.
IP	Internet Protocol (ARPA, DDN).
ISO	International Standards Organisation.
LAN	Local Area Network; the subject of this document.
LLC	Logical Link Control.
LSAP	Link Service Access Point.
MAC	Media Access Control.
MAP	Manufacturing Automation Protocol.
NSAP	Network Service Access Point.
OSI	Open Systems Interconnection.
PSE	Packet Switch Exchange.
RG58	A low-cost coaxial cable, often used to carry IEEE 802.3 10BASE2 Ethernet signals.
RIP	Routing Information Protocol. See Appendix C for more information.
SAP	Service Access Point.
SMTP	Simple Mail Transfer Protocol. A member protocol of the 'Internet Protocol Suite'. See Appendix C for more information.
Socket	A concatenation of an IP address and a TCP port number. It identifies a logical point within a system.
SVC	Switched Virtual Circuit.

TCP	Transmission Control Protocol.
TELNET	TELNET Virtual Terminal protocol. A member protocol of the 'Internet Protocol Suite'. See Appendix C for more information.
TOP	Technical Office Protocols.
TP	Transport Protocol. Usually followed by a class number, e.g. TP4.
TSAP	Transport Service Access Point.
WAN	Wide Area Network.
10BASE2 10BASE5	A qualification to the IEEE 802.3 Specification. The first number (10) represents the speed of the network and the second number the distance. See Appendix C for more information.

Appendix H Telnet Printer Application Example S/W Program

This appendix provides an example of Telnet printer application software which may be used to transfer files from a host to a printer, configured on the Router WAN service menu, and mimicking a host spooler facility. For applicability see your Customer Services representative.

(The example is provided as a sample only and Cray do not guarantee the accuracy or full operability of it, nor is it supported by Cray.)

To use this application:

1. Compile under a c-compiler.
2. Rename the a.out file to an appropriate file.
3. Configure a service with TCP PORT No 2000 on the Router.
4. **cat<file name>\<a.out file renamed><Egate IP add> tcp port no –n**

If any problems arise, consult your Telnet specialist. It may be necessary to remove lines marked · for certain hosts.

```
/*****************************************************************************************/
/*   TITLE : Printer TELNET application                                                  */
/*****************************************************************************************/
/*  set #define constants for BSD_4_2+ ULTRIX*/

#include <sys/types/h>
#include <netinet/in.h>
#include <sys/socket.h>
#include <netdb.h>
#include <stdio.h>
#include <signal.h>

#define DSTPORT 2000                          /* Default TCP port number - dec. - 1 per app*/
#define NULADDR (struct sockaddr *)           /* System assigns socket address             */
#define TYPE SOCK_STREAM                      /* Sequenced, reliable two way connection    */
#define LINGER_TIME 1
#define BUFF_SIZE 512

char buff[ BUFF_SIZE ];          /* Buffer to hold text in transit                         */
int newline = 0 ;                /* non-zero(2 then 1) when CR RETURN found                */
char previous = '\000';          /* remember the previous character                        */
int sock = -1;                   /* Socket descriptor (like a file descriptor              */
char *progname;                  /* program name o/p with error messages                   */
int expand = 0;                  /* True when option to expand \r to \r\n selected         */


main( argc, argv)

register int argc;
register char *argv[];
{
int size;                                     /* Number of bytes in the buffer   */

struct sockaddr_in addr;                      /* Describes socket connection     */
struct linger optval;                         /* for setting socket option       */
struct hostent *gethostbyname(), *raddr;      /* For finding internet address    */

interrupts()                                  /* Be prepared for interrupts      */

    /*            Verify the parameters and make a connection                    */
if ((argc < 2) || (argc > 4 ))
  error( “Usage: %s host-name [port] [-n]” , argv[0] );
if (argc ==4)
{
  if (strcmp(argv[3], ”-n”) )
              error (”Usage: %s host-name [port] [-n]” , argv[0] );
  else
              expand = 1;
}
if ((argc == 3) && (strcmp(argv[2], ”-n”) == 0 ) )
   expand = 1;

progname = argv[0];

if ((raddr = gethostbyname(argv[1]) ) == 0)
      error(”Unknown host %s”, agrv[1] );

addr.sin_addr.s_addr = *((long *) raddr->h_addr);
```

```
if ((argc == 4) || ((argc == 3) && (expand == 0) ) )  /* Requested port number - decimal   */
      addr.sin_port = atoi( argv[2] );
else
      addr.sin_port = DSTPORT;                        /* Default port number               */

addr.sin_port = htons(addr.sin_port);  /* Byte flip port number                    */
addr.sin_family = AF_INET;

    /* Create a communication end point*/

if ((sock = socket( AF_INET, SOCK_STREAM, 0 )) < 0)
      error (”socket failed”);

/* linger a second after close request before chopping connection, in case         */
/* of any buffer flushing probs

   optval.l_onoff = 1;
   optval.l_linger = LINGER_TIME;

   if (setsockopt(sock,SOL_SOCKET,SO_LINGER,&optval,sizeof(optval))<0)
       error( ”failed to set LINGER option”);

   /* Make a connection request */
   if  (connect( sock, &addr, sizeof(addr) ) < 0 )
         error( ”connect failed”);

   /* Transfer the data */
• write( sock, “\033\065\001”,3);             /* ESC 5 1 (Begin Autoline Feed mode)  */
  while (more_data( buff, &size ))
  {
        if (write( sock, buff, size ) != size)          /* While not EOF write away buffer   */
            error (”write failed”);
  }
  if (size)
  {
         if  (write( sock, buff, size) != size)
            error(”write failed”);
  }
• write (sock, “\014”,1);                                /* Write FF                          */
   close( sock );
}
/* .............. MORE_DATA .............. */
int more_data( array, size)

register char *array;         /* Data buffer filled from stdin                    */
register int *size;  /* Returns number of bytes in data buffer                    */
{
   register int c;  /* temp storage for characters                                */

   /* Put data into buffer from standard input stream                             */

    /* TELNET requires CR LF to be sent as ”\r” + ”\r\n” to ”\r                    */

   for ( *size = 0 ; *size < BUFF_SIZE ; (*size)++ )
   {
      if (expand)
         {                                  /* option to convert \n to \000\n    */
```

```
            if (newline)
               {
                  if (--newline)
                        *array++ = '\000';    /* (1) now \r\000            */
                  else
                        *array++ = '\n';        /* (0) now \r\000\n        */
•                      return (1);
               }

            else
              {
                     if ((c = getchar() ) == EOF)
                        break;                  /* End of File               */
                     if (c == '\n')             /* Needs expanding to (2)    */
                     {                          /* now \r                    */
                       newline = 2;
                       *array++ = '\r';
                     }
                    else
                     {
                        *array++ = c;               /* All other characters            */
                     }
              }
         }
      else
      {                                     /* option to convert \r\n to \r000\n   */
       if  (previous == '\n')
          {
            *array++ = '\n';                /* now \r\000\0 and reset value        */
            previous = \000';
          }
       else
          {
                   if ((c = getchar() ) == EOF)
                      break;
                   if (c == '\n')
                   {
                            if (previous == '\r')
                           {
                                previous = '\n';
                                *array++ = '\000';
                           }
                           else
                           {
                           previous = '\000';
                           *array++ = '\n';
•                         return (1) ;
                           }
                   }
                  else
                  {
                           previous = c;
                           *array++ = c;
                    }
            }
       }
    }
  return (c != EOF);                        /* more data returns TRUE until EOF found  */
}
```

```
/*------------------------------ E R R O R ----------------------------------------*/

error( message1, message2)

register char *message1;
register char *message2;

{
    extern int errno;                       /* print system errors like perror()      */
    extern int sys_nerr;
    extern char *sys_errlist[];

    if (progname)
         fprintf( stderr, "%s: ", progname );

    fprintf ( stderr, message1, message2 );

    if ((errno > 0) && (errno < sys_nerr) )
           fprintf( stderr, " (%s)", sys_errlist[errno] );
    else
           fprintf( stderr, " (%d)", errno);

    fprintf( stderr, "\n" );

    if (sock >= 0)
           close(sock );                    /* Required to shut down TCP/IP properly   */
    exit( 1);
}

/*------------------------ I N T _ F N ----------------------------------------*/
/* If an interrupt comes in (& interruptible) jump to this code                  */

int_fn ( )
{
   close( sock );        /* Required to shut down TCP/IP properly    */

   exit( 1 );
}

/*------------------------ I N T E R R U P T S ----------------------------------------*/
/* Indicate willigness to handle interrupts in int_fn( )                          */
/* But, if in background mode, interrupts must be left disabled      */

interrupts ( )
{
   if  (signal( SIGINT , SIG_IGN ) != SIG_IGN)         /* interrupt */
         signal( SIGINT, int_fn);

   if  (signal( SIGQUIT, SIG_IGN) !=SIG_IGN)            /* quit      */
         signal (SIGQUIT, int_fn);
}

/****************** End of application Software TELNET PRINTER ***************************/
```